

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
AATSR Advanced Along-Track Scanning Radiometer BNSC	Envisat	Operational	Imaging multi-spectral radiometers (vis/IR) & Multiple direction/polarisation radiometers	Measurements of sea surface temperature, land surface temperature, cloud top temperature, cloud cover, aerosols, vegetation, atmospheric water vapour and liquid water content	Waveband: VIS - NIR: 0.555, 0.659, 0.865µm, SWIR: 1.6µm, MWIR: 3.7µm, TIR: 10.85, 12µm Spatial resolution: IR ocean channels: 1km x 1km, Visible land channels: 1km x 1km Swath width: 500 km Accuracy: Sea surface temperature: <0.5K over 0.5 deg x 0.5 deg (lat/long) area with 80% cloud cover Land surface temperature: 0.1K (relative)
ABI Advanced Baseline Imager NOAA	GOES-R	Approved	Imaging multi-spectral radiometers (vis/IR)	Measures cloud cover, atmospheric radiance, winds, atmospheric stability, rainfall estimates. Used to provide severe storm warnings/ monitoring day and night (type, amount, storm features)	The GOES-R Project is in the formulation phase. The satellite will comprise improved spacecraft and instrument technologies, which will result in more timely and accurate weather forecasts, and improve support for the detection and observations of meteorological phenomena that directly affect public safety, protection of property, and ultimately, economic health and development.
ACC Accelerometer ESA	Swarm	Operational	Gravity & Space environment	Measures the non-gravitational accelerations, caused for example by air-drag, winds, Earth albedo and solar radiation pressure acting on the satellites. In-situ air density measurements together with magnetic data can be used to obtain new insights on the geomagnetic forcing of the upper atmosphere.	Waveband: N/A Spatial resolution: 0.1nm/s2 Swath width: N/A Accuracy: 0.1nm/s2
ACE-FTS Atmospheric Chemistry Experiment (ACE) mission CSA	SCISAT-1	Operational	Atmospheric chemistry	Objective is to measure and understand the chemical processes that control the distribution of ozone in the Earth's atmosphere, especially at high altitudes.	Waveband: SWIR - TIR: 2 - 5.5 µm, 5.5 - 13 µm (0.02cm ⁻¹ resolution) Spatial resolution: Swath width: Accuracy:
ACRIM II Active Cavity Radiometer Irradiance Monitor NASA	UARS	Not operational	Earth radiation budget radiometer	Measurements of solar luminosity and solar constant. Data used as record of time variation of total solar irradiance, from extreme UV through to infra-red	Waveband: UV-FIR: 1nm-50µm Spatial resolution: Not applicable Swath width: Not applicable Accuracy: Measures integrated flux of solar radiation to <0.1%
ACRIM III Active Cavity Radiometer Irradiance Monitor NASA	ACRIMSAT	Operational	Earth radiation budget radiometer	Measurements of solar luminosity and solar constant. Data used as record of time variation of total solar irradiance, from extreme UV through to infra-red	Waveband: UV - MWIR: 0.15 - 5 µm Spatial resolution: 5 deg FOV Swath width: 55 mins per orbit of full solar disk data Accuracy: 0.1% of full scale
A-DCS ARGOS-Data Collection System NOAA	NPOESS-1, NPOESS-2, NPOESS-3, NPOESS-4, NPOESS-5, NPOESS-6	Being developed	Data collection	Data collection and communication system for receiving and retransmitting data from ocean and land-based remote observing platforms/transponders	The Argos DCS is a data collection relay system and not an Earth observing instrument.

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AIRS Atmospheric Infra-red Sounder NASA	Aqua	Operational	Atmospheric temperature and humidity sounders	High spectral resolution measurement of temperature and humidity profiles in the atmosphere. Long-wave Earth surface emissivity. Cloud diagnostics. Trace gas profiles. Surface temperatures.	Waveband: VIS - TIR: 0.4 - 1.7µm, 3.4 - 15.4µm, Has approximately 2382 bands from VIS to TIR Spatial resolution: 1.1 degree (13X13 Km at nadir) Swath width: +/-48.95 degrees Accuracy: Humidity: 20%, Temperature: 1K
ALADIN Atmospheric Laser Doppler Instrument ESA	ADM-Aeolus	Prototype	Lidars	Primary objective is to provide wind profile measurements for an improved analysis of global 3-D wind fields. Measures Doppler shift information from molecules and particles advected by the wind	Waveband: UV: 355nm Spatial resolution: 50km (footprint: 70m) Swath width: Accuracy: 0.5ms ⁻¹ (0 to 2km), 1ms ⁻¹ (2 to 16km), 2ms ⁻¹ (above 16km)
ALI Advanced Land Imager NASA	NMP EO-1	Operational	High resolution optical imagers	Measurement of Earth surface reflectance. Will validate new technologies contributing to cost reduction and increased capabilities for future missions. ALI comprises a wide field telescope and multispectral and panchromatic instrument	Waveband: 10 bands: VIS&NIR: 0.480-0.690µm, 0.433-0.453µm, 0.450-0.515µm, 0.525-0.605µm, 0.630-0.690µm, 0.775-0.805µm, 0.845-0.890µm, 1.200-1.300µm, SWIR: 1.550-1.750µm, 2.080-2.350µm Spatial resolution: PAN: 10m, VNIR&SWIR: 30m Swath width: 37km Accuracy: SNR @ 5% surf refl Pan:220, Multi 1: 215, Multi 2: 280, Multi 3: 290, Multi 4:240, Multi 4':190, Multi 5':130, Multi 5:175, Multi 7:170 (prototype instrument exceeds ETM+ SNR by a factor of 4 - 8)
ALT Altimeter NOAA	NPOESS-3, NPOESS-6	Being developed	Radar altimeters	Obtains precise altimeter height measurements over world's oceans	Waveband: 13.6 and 5.3 GHZ Spatial resolution: Along track 15km Swath width: 15km Accuracy: SST height 4cm
AMI/SAR/Image Active Microwave Instrumentation. Image Mode ESA	ERS-2	Operational	Imaging microwave radars	All-weather images of ocean, ice and land surfaces. Monitoring of coastal zones, polar ice, sea state, geological features, vegetation (including forests), land surface processes, hydrology.	Waveband: Microwave: 5.3 GHz, C band, VV polarisation, bandwidth 15.5 ± 0.06 MHz Spatial resolution: 30m Swath width: 100km Accuracy: Landscape topography: 3m, Bathymetry: 0.3m, Sea ice type: 3 classes
AMI/SAR/wave Active Microwave Instrumentation. Wave mode ESA	ERS-2	Operational	Imaging microwave radars	Provides measurements of ocean wave spectra	Waveband: Microwave: 5.3GHz (C-band), VV polarisation Spatial resolution: 30m Swath width: Accuracy: Sea surface wind speed: 3m/s, Significant wave height: 0.2m

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AMI/scatterometer Active Microwave Instrumentation. Wind mode ESA	ERS-2	Operational	Scatterometers	Provides measurements of wind fields at the ocean surface, wind direction (range 0-360 deg), wind speed (range 1m/s - 30m/s)	Waveband: Microwave: 5.3GHz (C-band), VV polarisation Spatial resolution: Cells of 50km x 50km at 25km intervals Swath width: 500km Accuracy: Sea surface wind speed: 3m/s, Sea ice type: 2 classes
AMSR follow-on Advanced Microwave Scanning Radiometer follow-on JAXA	GCOM-W	Prototype	Imaging multi-spectral radiometers (passive microwave)	Provides measurements of water vapour, cloud liquid water, precipitation, winds, sea surface temperature, sea ice concentration, snow cover, soil moisture	Waveband: Microwave: 6.925, 10.65, 18.7, 23.8, 36.5, 50.3, 52.8, 89.0 GHz Spatial resolution: 5-50km (dependent on frequency) Swath width: 1600km Accuracy: Sea surface temperature: 0.5K, Sea ice cover: 10%, Cloud liquid water: 0.05kg/m ² , Precipitation rate: 10%, Water vapour: 3.5kg/m ² through total column, Sea surface wind speed 1.5m/s
AMSR-E Advanced Microwave Scanning Radiometer-EOS JAXA (NASA)	Aqua	Prototype	Imaging multi-spectral radiometers (passive microwave)	Provides measurements of water vapour, cloud liquid water, precipitation, winds, sea surface temperature, sea ice concentration, snow cover and soil moisture	Waveband: Microwave: 6.925, 10.65, 18.7, 23.8, 36.5, 89.0 GHz Spatial resolution: 5-50km (dependent on frequency) Swath width: 1445km Accuracy: Sea surface temperature: 0.5K, Sea ice cover: 10%, Cloud liquid water: 0.05kg/m ² , Precipitation rate: 10%, Water vapour: 3.5kg/m ² through total column, Sea surface wind speed 1.5m/s
AMSU-A Advanced Microwave Sounding Unit-A NOAA (BNSC)	Aqua, METOP-1, METOP-2, METOP-3, NOAA-15, NOAA-16, NOAA-17, NOAA-N, NOAA-N'	Operational	Atmospheric temperature and humidity sounders	Provides all weather night-day temperature sounding to an altitude of 45km	Waveband: Microwave: 15 channels, 23.8-89.0GHz Spatial resolution: 48km Swath width: 2054km Accuracy: Temperature profile: 2K, Humidity: 3kg/m ² , Ice & snow cover: 10%
AMSU-B Advanced Microwave Sounding Unit-B NOAA (BNSC)	NOAA-15, NOAA-16, NOAA-17	Operational	Atmospheric temperature and humidity sounders	Provides all weather night-day humidity sounding	Waveband: Microwave: 89GHz, 150GHz, 183.3± 1.0 GHz (2bands), 183.3± 3.0 GHz (2bands), 183.3± 7.0 GHz (2bands) Spatial resolution: 16km Swath width: 2200km Accuracy: Humidity profile: 1kg/m ² ,
APS Aerosol Polarimetry Sensor NOAA	Glory, NPOESS-1, NPOESS-4	Proposed	Atmospheric chemistry	Global distribution of natural and anthropogenic aerosols for quantification of the aerosol effect on climate, the anthropogenic component of this effect, and the long-term change of this effect caused by natural and anthropogenic factors	Waveband: Microwave: 89GHz, 150GHz, 183.3± 1.0 GHz (2bands), 183.3± 3.0 GHz (2bands), 183.3± 7.0 GHz (2bands) Spatial resolution: 16km Swath width: 2200km Accuracy: Humidity profile: 1kg/m ² ,

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Aquarius NASA (CONAE)	SAC-D/ Aquarius	Proposed	Imaging multi-spectral radiometers (passive microwave) & Scatterometers	The Aquarius mission will measure global sea surface salinity with unprecedented resolution. The instruments include a set of three radiometers that are sensitive to salinity (1.413 GHz; L-band). The scatterometer corrects for the ocean's surface roughness.	Waveband: L Band (1.413-1.260 GHz) Spatial resolution: 100km Swath width: 300km Accuracy: . 2 psu
ARGOS CNES (NASA)	METOP-1, METOP-2, NOAA-12, NOAA-14, NOAA-15, NOAA-16, NOAA-17, NOAA-N, NOAA-N'	Operational	Data collection & Precision orbit	Provides location data by Doppler measurements	The Argos DCS is a data collection relay system and not an Earth observing instrument.
Arina ROSKOSMOS	Resurs DK		Space Environment	Space particle detection experiment	Arina is an instrument for observation of solar magnetosphere variations of charged particle fluxes.
ASAR Advanced Synthetic-Aperture Radar ESA	Envisat	Operational	Imaging microwave radars	Provides all weather images of ocean, land and ice for monitoring of land surface processes, sea and polar ice, sea state, and geological and hydrological applications. Has 2 stripmap modes (Image and Wave (for ocean wave spectra)) and 3 ScanSAR modes	Waveband: Microwave: C-band, with choice of 5 polarisation modes (VV, HH, VV/HH, HV/HH, or VH/VV) Spatial resolution: Image, wave and alternating polarisation modes: approx 30m x 30m, Wide swath mode: 150m x 150m, Global monitoring mode: 950mm x 950m Swath width: Image and alternating polarisation modes: up to 100km, Wave mode: 5km, Wide swath and global monitoring modes: 400km or more Accuracy: Radiometric resolution in range: 1.5-3.5 dB, Radiometric accuracy: 0.65 dB
ASAR (image mode) Advanced Synthetic Aperture Radar (Image mode) ESA	Envisat	Operational	Imaging microwave radars	Provides all weather images of ocean, land and ice for monitoring of land surface processes, sea and polar ice, sea state, and geological and hydrological applications	See above.
ASAR (wave mode) Advanced Synthetic Aperture Radar (Wave mode) ESA	Envisat	Operational	ASAR (wave mode) Advanced Synthetic Aperture Radar (Wave mode) ESA	Provides measurements of ocean wave spectra	See above.

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ASCAT Advanced Scatterometer EUMETSAT (ESA)	METOP-1, METOP-2, METOP-3	Being developed	Scatterometers	Provides sea ice cover, sea ice type and wind speed over sea surface measurements. Air pressure over ocean, Polar ice contours, Ice/snow imagery, Soil moisture	Waveband: Microwave: C Band, 5.256Ghz Spatial resolution: Hi-res mode: 25-37km, Nominal mode: 50km Swath width: Continuous Accuracy: Wind speeds in range 4-24m/s: 2m/s and direction accuracy of 20deg
ASM Absolute Scalar Magnetometer ESA (CNES)	Swarm	Being developed	Magnetic field	The objective of the Absolute Scalar Magnetometer (ASM) is to calibrate the vector field magnetometer (VFM) to maintain the absolute accuracy in the multi-year geomagnetic field mission	Waveband: N/A Spatial resolution: 0.016pT Swath width: N/A Accuracy: 0.3nT
ASTER Advanced Spaceborne Thermal Emission and Reflection Radiometer METI (Japan) (NASA)	Terra	Operational	High resolution optical imagers	Surface and cloud imaging with high spatial resolution, stereoscopic observation of local topography, cloud heights, volcanic plumes, and generation of local surface digital elevation maps. Surface temperature and emissivity	Waveband: VIS&NIR: 3 bands in 0.52-0.86µm, SWIR: 6 bands in 1.6-2.43µm, TIR: 5 bands in 8.125-11.65µm Spatial resolution: VNIR: 15m, stereo: 15m horizontally and 25m vertical, SWIR: 30m, TIR: 90m Swath width: 60km Accuracy: VNIR and SWIR: 4% (absolute), TIR: 4K, Geolocation: 7m
ATLID ATmospheric LIDar ESA	ESA Future Missions	Prototype	Lidars	Provides measurements of cloud top heights, aerosol properties, troposphere height, vertical distribution of cloud, boundary layer height	Waveband: UV: 355nm Spatial resolution: footprint: 30m Swath width: Nadir Accuracy: Detection of cirrus cloud with optical thickness 1 with 15% error
ATMS Advanced Technology Microwave Sounder NOAA (NASA)	NPOESS-2, NPOESS-5, NPP	Approved	Atmospheric temperature and humidity sounders	Collects microwave radiance data that when combined with the CrIS data will permit calculation of atmospheric temperature and water vapor profiles	Waveband: Microwave: 22 bands, 23-184 GHz Spatial resolution: 5.2 deg - 1.1 deg Swath width: 2300 km Accuracy: 0.75 K - 3.60 K
ATSR/M CNES	ERS-2	Operational	Imaging multi-spectral radiometers (passive microwave)	Part of the ATSR payload on board ERS1 and ERS2	See ATSR-2.
ATSR-2 Along Track Scanning Radiometer - 2 BNSC (CSIRO)	ERS-2	Operational	Imaging multi-spectral radiometers (vis/IR) & Multiple direction/polarisation radiometers	Provides measurements of sea surface temperature, land surface temperature, cloud top temperature and cloud cover, aerosols, vegetation, atmospheric water vapour and liquid water content	Waveband: VIS-SWIR: 0.65, 0.85, 1.27, and 1.6µm, SWIR-TIR: 1.6, 3.7, 11 and 12µm, Microwave: 23.8, 36.5GHz (bandwidth of 400MHz) Spatial resolution: IR ocean channels: 1km x 1km, Microwave near-nadir viewing: 20km instantaneous field of view Swath width: 500km Accuracy: Sea surface temperature to <0.5K over 0.5 deg x 0.5 deg (lat/long) area with 80% cloud cover, Land surface temperature: 0.1K

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AVHRR/2 Advanced Very High Resolution Radiometer/2 NOAA	NOAA-12, NOAA-14	Operational	Imaging multi-spectral radiometers (vis/IR)	Provides measurements of land and sea surface temperature, cloud cover, snow and ice cover, soil moisture and vegetation indices. Data also used for volcanic eruption monitoring	Waveband: VIS: 0.58-0.68µm, NIR: 0.725-1.1µm, MWIR: 3.55-3.93µm, TIR: 10.3-11.3µm, 11.5-12.5µm Spatial resolution: 1.1km Swath width: 3000km approx Accuracy:
AVHRR/3 Advanced Very High Resolution Radiometer/3 NOAA	METOP-1, METOP-2, METOP-3, NOAA-15, NOAA-16, NOAA-17, NOAA-N, NOAA-N'	Operational	Imaging multi-spectral radiometers (vis/IR)	Provides measurements of land and sea surface temperature, cloud cover, snow and ice cover, soil moisture and vegetation indices. Data also used for volcanic eruption monitoring	Waveband: VIS: 0.58-0.68µm, NIR: 0.725-1.1µm, SWIR: 1.58-1.64µm, MWIR: 3.55-3.93µm, TIR: 10.3-11.3µm, 11.5-12.5µm Spatial resolution: 1.1km Swath width: 3000km approx, Ensures full global coverage twice daily Accuracy:
AVNIR-2 Advanced Visible and Near Infra-red Radiometer type 2 JAXA	ALOS	Being developed	High resolution optical imagers	High resolution multi-spectral imager for land applications which include environmental monitoring, agriculture and forestry, disaster monitoring	Waveband: VIS: 0.42-0.50µm, 0.52-0.60µm, 0.61-0.69µm, NIR: 0.76-0.89µm Spatial resolution: 10m Swath width: 70km Accuracy:
AWIFS Advanced Wide Field Sensor ISRO	RESOURCE-SAT-1, RESOURCE-SAT-2	Operational	High resolution optical imagers	Vegetation and crop monitoring, resource assessment (regional scale), forest mapping, land cover/land use mapping, and change detection	Waveband: VIS: 0.52-0.59 & 0.62-0.68µm, NIR: 0.77-0.86µm, SWIR: 1.55-1.7µm Spatial resolution: 55m Swath width: 730km Accuracy: 10 bit data
BISSAT Bissat Passive Radar ASI	BISSAT	TBD	Imaging microwave radars	Evaluation of bistatic radar cross section of natural and man-made targets, image classification, land surface. Passive instrument flown with main SAR mission	Waveband: Microwave: X-band (passive) Spatial resolution: Swath width: Accuracy:
CALIOP Cloud-Aerosol Lidar with Orthogonal Polarization NASA	CALIPSO	Approved	Lidars	Two-wavelength, polarization lidar capable of providing aerosol and cloud profiles and properties	Waveband: 532 nm (polarization-sensitive), 1064 nm, VIS - NIR Spatial resolution: Vertical sampling: 30 m, 0 – 40 km Swath width: 333 m along-track Accuracy: 5% (532 nm)
CCD (CBERS) High Resolution CCD Camera CAST (INPE)	CBERS-2, CBERS-2B	Operational	High resolution optical imagers	Provides measurements of cloud type and extent and land surface reflectance, and used for global land surface applications	Waveband: VIS: 0.45-0.52µm, 0.52-0.59µm, 0.63-0.69µm, NIR: 0.77-0.89µm, PAN: 0.51-0.71µm Spatial resolution: 20m Swath width: 113km Accuracy:
CCD (HJ, HY) CCD camera CAST	HJ-1A, HJ-1B		High resolution optical imagers	Land surface applications	Waveband: 0.43-0.90µm Spatial resolution: 30m Swath width: 360km (per set)700km (two sets) Accuracy:

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CCD camera ISRO	INSAT-2E, INSAT-3A	Operational	Imaging multi-spectral radiometers (vis/IR)	Cloud and Vegetation monitoring	Waveband: VIS: 0.62-0.68µm, NIR: 0.77-0.86µm, SWIR: 1.55-1.69µm Spatial resolution: 1X1km Swath width: Normal: 6000km (N-S) X 6000km (E-W) anywhere on earth disc, Program: 6000km (N-S) X (n X 300) km (E-W) : n and number of frames programmable Accuracy:
CERES Cloud and the Earth's Radiant Energy System NASA	Aqua, NPOESS-2, NPOESS-5, Terra	Operational	Earth radiation budget radiometer	Long term measurement of the Earth's radiation budget and atmospheric radiation from the top of the atmosphere to the surface; provision of an accurate and self-consistent cloud and radiation database	Waveband: 3 channels: 0.3-5 µm, 0.3 - 100 µm, 8-12 µm, UV-FIR Spatial resolution: 20km Swath width: Accuracy: 0.5%, 1%, 1% (respectively for the 3 channels)
CHAMP GPS Sounder GPS TurboRogue Space Receiver (TRSR) NASA (DLR)	CHAMP	Operational	Atmospheric temperature and humidity sounders & Precision orbit	Temperature and water vapour profiles	Uses GPS frequencies for sounding of temperature and water profiles of the atmosphere. CHAMP provides temperature profiles in the troposphere up to the middle stratosphere, and water vapour profiles in the troposphere only.
CHAMP gravity package (Accelerometer+GPS) STAR Accelerometer CNES (DLR)	CHAMP	Operational	Gravity	Earth gravity field measurements	Since the advent of CHAMP, the first in a series of low-altitude satellites being almost continuously and precisely tracked by GPS, a new generation of long-wavelength gravitational geopotential models have been derived.
CHAMP magnetometry package (1 Scalar + 2 Vector Magnetometer) Overhauser Magnetometer and Fluxgate Magnetometer DLR	CHAMP	Operational	Magnetic field	Earth gravity field measurements	A high performance Fluxgate magnetometer set measuring the three components of the ambient magnetic field in the instrument frame combined with a star camera determining the attitude of the assembly with respect to a stellar frame and a Overhauser scalar magnetometer serving as magnetic reference.
CIA Advanced Hyperspectral camera ASI	Hyperspectral Mission		Imaging multi-spectral radiometers (vis/IR)	Panromatic and Hyperspectral data for complex land ecosystem studies	Waveband: HYC spectral range + MIR and TIR channels Spatial resolution: Improved (wrt HYC) resolution PAN 2-3m Swath width: Greater swath Accuracy:
CLAES Cryogenic Limb Array Etalon Spectrometer instrument NASA	UARS	Not operational	Earth radiation budget radiometer	Measures many of the chemical species which are involved in stratospheric chemistry as well as global distribution of stratospheric aerosols	Waveband: SWIR: 3.5µm, 6µm, TIR: 8µm, 12.7µm Spatial resolution: Vert 2.8km, Horiz 480km Swath width: 50.7km vert limb Accuracy: 20%, 3K
Cloud Sensor Cloud and aerosol sensor JAXA	GOSAT		Cloud profile and rain radars	Will contribute to GOSAT main mission of CO2 profile measurement - which requires detection and removal of contaminating signals from clouds and aerosols	No data yet available.

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CMIS Conical-scanning Microwave Imager/Sounder NOAA	NPOESS-1, NPOESS-2, NPOESS-3, NPOESS-4, NPOESS-5, NPOESS-6	Being developed	Imaging multi-spectral radiometers (passive microwave) & Atmospheric temperature and humidity sounders	Collects microwave radiometry and sounding data. Data types include atmospheric temperature and moisture profiles, clouds, sea surface winds, and all-weather land/water surfaces.	Waveband: Microwave: 190Ghz Spatial resolution: 15-50km depending on frequency Swath width: 1700km Accuracy: Temperature Profiles to 1.6K, water vapor 20%
COCTS Ocean colour scanner CAST	HY-1B	Being developed	Ocean colour instruments	Ocean chlorophyll, Ocean yellow substance absorbance, Sea-ice surface temperature	Waveband: B1: 0.402-0.422, B2: 0.433-0.453, B3: 0.480-0.500, B4: 0.510-0.530, B5: 0.555-0.575, B6: 0.660-0.680, B7: 0.740-0.760, B8: 0.845-0.885, B9: 10.30-11.40, B10: 11.40-12.50µm Spatial resolution: 1.1km Swath width: 3083km Accuracy:
Communications payload (Ka and UHF band) CSIRO	FedSat	Operational	Communications		Waveband: up 313.55MHz, down 400.4MHz
CPR Cloud Profiling Radar ESA	ESA Future Missions	Prototype	Cloud profile and rain radars	Measures cloud characteristics including base height	Waveband: Microwave: 94GHz Spatial resolution: 750m Swath width: nadir only Accuracy: 98% detection of radiatively significant ice cloud
CPR (Cloudsat) Cloud Profiling Radar NASA	CloudSat	Approved	Cloud profile and rain radars	Primary goal is to provided data needed to evaluate and improve the way clouds are represented in global climate models. Measures vertical profile of clouds	Waveband: Microwave: 94Ghz Spatial resolution: Vertical: 500m, Cross-track: 1.4km, Along-track: 2.5km Swath width: Instantaneous Footprint < 2km Accuracy: Cloud liquid water content<=50%; ice water content within +100%, -50%; detect all single layer clouds with optical depth>=1.0
CrIS Cross-track Infrared Sounder NOAA (NASA)	NPOESS-2, NPOESS-5 NPP	Prototype	Atmospheric temperature and humidity sounders	Daily measurements of vertical atmospheric distribution of temperature, moisture, and pressure	Waveband: MWIR-TIR: 3.92-4.4µm, 5.7-8.62µm, 9.1-14.7µm, 1300 spectral channels Spatial resolution: IFOV 14km diameter, 1km vertical layer resolution Swath width: 2200km Accuracy: Temperature profiles: to 0.9K, Moisture profiles: 20-35%, Pressure profiles: 1%
CZI Coast region imager CAST	HY-1B	Being developed	Imaging multi-spectral radiometers (vis/IR)	Coastal Zone monitoring and environmental applications	Waveband: B1: 0.433-0.453, B2: 0.555-0.575, B3: 0.655-0.675, B4: 0.675-0.695_m Spatial resolution: 250m Swath width: 500km Accuracy:
DCP (SCD) Data Collecting Platform Transponder INPE	SCD-1, SCD-2	Operational	Data collection	Environmental data collection from ground based data collecting platforms	Data collection and relay system.

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DCS (CAST) Data Collecting System Transponder (CAST) CAST	SCD-1, SCCBERS-2, CBERS-2B, CBERS-3, CBERS-4D-2	Operational	Data collection	Data collection and communication	Data collection and relay system.
DCS (JAXA) Data Collection System (JAXA) JAXA	GMS-5	Prototype	Data collection	Data Collection System, Receives in-situ data from data collection platforms worldwide and transmits to ground station	Data collection and relay system.
DCS (NOAA) Data Collection System (NOAA) NOAA	GOES-9, GOES-10, GOES-11, GOES-12, GOES-N, GOES-O, GOES-P, GOES-R	Operational	Data collection	Collects data on temperature (air/water), atmospheric pressure, humidity and wind speed/direction, speed and direction of ocean and river currents	Data collection and relay system.
DCS (ROSHYDROMET) Data Collection System ROSHYDROMET (ROSKOSMOS)	Elektro-L, METEOR-3M N2	Operational	Data collection	Collects data on temperature (air/water), atmospheric pressure, humidity and wind speed/direction, speed and direction of ocean and river currents	Data collection and relay system.
DMC Imager Disaster Management Constellation Imager BNSC	UK-DMC	Operational	High resolution optical imagers	Visible and NIR imagery in support of disaster management	Waveband: VIS and NIR Spatial resolution: 32m Swath width: 2 beams of 300km Accuracy:
DORIS Doppler Orbitography and Radio-positioning Integrated by Satellite CNES	SPOT-2, SPOT-4, Topex-Poseidon	Operational	Precision orbit	Orbit determination	Waveband: Spatial resolution: Swath width: Accuracy: Orbit error ~2.5cm
DORIS-NG Doppler Orbitography and Radio-positioning Integrated by Satellite-NG CNES	CRYOSAT, Envisat, Jason, Jason-2 (also known as OSTM), SPOT-5	Operational	Precision orbit	Precise orbit determination Real time onboard orbit determination (navigation)	Waveband: 401.25MHz, 2036.25MHz Spatial resolution: Swath width: FOV :130 degrees Accuracy: Orbit error ~1cm
DPR Dual-frequency Precipitation Radar JAXA (NASA)	GPM Core	TBD	Cloud profile and rain radars	Measures rain rate classified by rain and snow, in latitudes up to 70 degrees	Waveband: Microwave: 13.6 GHz (Ku band) and 35.5 GHz (Ka band) Spatial resolution: Range resolution: 4-5 km Horizontal Swath width: 245 km (Ku-band), 100km (Ka band) Accuracy: rainfall rate 0.2mm/h
DRF ROSKOSMOS	Vulkan-Kompas-2		Space Environment	Space radiation and ultraviolet measurements	Waveband: UV: 0.2-0.35 μ m, Ee>30keV, Ep>7keV Spatial resolution: Swath width: Accuracy:
ECHO-V ROSKOSMOS	Kanopus-Vulkan		Space Environment	Space particle detection experiment	Waveband: Ee 3-30MeV, Ee 30-100MeV Spatial resolution: Swath width: Accuracy:

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EFI Electric Field Instrument ESA (CSA)	Swarm	Being developed	Gravity & Space environment	Measures ion density, drift velocity and electric field	Waveband: N/A Spatial resolution: 0.3mV/m Swath width: N/A Accuracy: <3mV/m
EGG 3-Axis Electrostatic Gravity Gradiometer ESA	GOCE	Being developed	Gravity & Precision orbit	The main objective of EGG is to measure the 3 components of the gravity-gradient tensor (ie gradiometer data)	Designed specifically for determining the stationary gravity field. The measured signal is the difference in gravitational acceleration at the test-mass location inside the spacecraft caused by gravity anomalies from attracting masses of the Earth.
EHIS Energetic Heavy Ion Sensor NOAA	GOES-R	Approved	Space Environment	Space particle detection	The GOES-R Project is in the formulation phase. The satellite will comprise improved spacecraft and instrument technologies, which will result in more timely and accurate weather forecasts, and improve support for the detection and observations of meteorological phenomena that directly affect public safety, protection of property, and ultimately, economic health and development.
ENVISAT Comms Communications package on ENVISAT ESA	Envisat	Operational	Communications	Communication package onboard ENVISAT series satellites	Data communication only.
EOC Electro-Optical Camera KARI	KOMPSAT-1	Operational	High resolution optical imagers	High resolution stereo imager for land applications of cartography and disaster monitoring	Waveband: Panchromatic VIS: 0.51-0.73µm Spatial resolution: 6.6m Swath width: 17km Accuracy:
EPIC Earth PolyChromatic Imaging Camera NASA	DSCOVR	Proposed	Atmospheric chemistry	Measures ozone amounts, aerosol amounts, cloud height and phase, hotspot land properties, and UV radiation estimates at the Earth's surface	Waveband: UV-NIR: 0.317-0.905µm 10 bands Spatial resolution: 8km Swath width: Accuracy:
ERBE Earth Radiation Budget Experiment (non-scanner) NASA	ERBS	Operational	Earth radiation budget radiometer	Radiation budget measurements - Total energy of Sun's radiant heat and light, Reflected solar radiation, Earth emitted radiation	Waveband: UV-FIR Spatial resolution: Narrow: 250km; Wide: 1000km Swath width: Medium and wide earth views Accuracy: Shortwave- 15%, Longwave- 5%
ERBS Earth Radiation Budget Sensor NOAA	NPOESS-3, NPOESS-6	TBD	Earth radiation budget radiometer	Measures Earth radiation gains and losses on regional, zonal and global scales	Waveband: 0.3-50µm Spatial resolution: 25km Swath width: 2200Km Accuracy: DLR/DSR10 watts/m2 net solar 3w/m2OLR 5w/m2
ERS Comms Communication package for ERS ESA	ERS-2	Operational	Communications	Communication package onboard ERS series satellites	Data communication only.

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
ETM+ Enhanced Thematic Mapper Plus USGS	Landsat-7	Operational	Imaging multi-spectral radiometers (vis/IR)	Measures surface radiance and emittance, land cover state and change (eg vegetation type). Used as multi-purpose imagery for land applications	Waveband: VIS-TIR: 8 channels: 0.45-12.5µm, Panchromatic channel: VIS 0.5-0.9µm Spatial resolution: Pan: 15m, Vis-SWIR: 30m, TIR: 60m Swath width: 185km Accuracy: 50-250m systematically corrected geodetic accuracy
EUVS Extreme Ultraviolet Sensor NOAA	GOES-R	Approved	Other	Solar EUV radiation is a dominant energy source for the upper atmosphere and the ionizing radiation produces the ionosphere. Solar variability at these wavelengths is one of the primary drivers of thermospheric/ ionospheric variability. EUVS will measure this radiation	The GOES-R Project is in the formulation phase. The satellite will comprise improved spacecraft and instrument technologies, which will result in more timely and accurate weather forecasts, and improve support for the detection and observations of meteorological phenomena that directly affect public safety, protection of property, and ultimately, economic health and development.
Fluxgate magnetometer CRCSS	FedSat	Approved	Magnetic field	Measures electrical currents and perturbations in the Earth's magnetic field in the range 0.1Hz to 1kHz	A high precision instrument designed to measure magnetic fields at all latitudes at an 800 km altitude over a range of ±65,000 nT.
GALS-M Galactic space rays detector ROSHYDROMET	Meteor-M No1, Meteor-M No2	TBD	Space Environment	Space environment monitoring	Waveband: protons fluxes density > 600 MeV Spatial resolution: Swath width: Accuracy:
Geomicrowave sounder NOAA	GOES-R	Approved	Atmospheric temperature and humidity sounders	For geo orbit, will provides atmospheric soundings and data on atmospheric stability and thermal gradient winds	The GOES-R Project is in the formulation phase. The satellite will comprise improved spacecraft and instrument technologies, which will result in more timely and accurate weather forecasts, and improve support for the detection and observations of meteorological phenomena that directly affect public safety, protection of property, and ultimately, economic health and development.
Geoton-L1 ROSKOSMOS	Resurs DK		Imaging multi-spectral radiometers (vis/IR)	Natural resource surveying, environmental monitoring	Waveband: 0.5-0.8µm Spatial resolution: 1-3m Swath width: 28.3-42km Accuracy:
GERB Geostationary Earth Radiation Budget EUMETSAT (ASI)	METEOSAT-8, METEOSAT-9, METEOSAT-10, METEOSAT-11	Operational	Earth radiation budget radiometer	Measures long and short wave radiation emitted and reflected from the Earth's surface, clouds and top of atmosphere. Full Earth disk, all channels in 5 mins	Waveband: UV-MWIR: 0.32-4.0µm, UV-FIR: 0.32-30µm Spatial resolution: 44.6km x 39.3km Swath width: Full Earth disk Accuracy: Emitted radiation: 0.12-1.3 W/m2, Reflectance: 1%
GGAK-E Heliogeophysical hardware complex ROSKOSMOS	Elektro-L		Magnetic field & Space environment	Electromagnetic field measurements	Electro-L carries an array of solar and magnetic sensors providing data on solar activity and radiation levels needed for near-earth environment forecasts.
GGAK-M Heliogeophysical hardware complex ROSKOSMOS	Meteor-M No1, Meteor-M No2		Magnetic field & Space environment	Electromagnetic field measurements	A complex of heliogeophysical instruments

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
GHG Sensor Greenhouse gases observing sensor JAXA	GOSAT	TBD	Atmospheric chemistry	This mission is in response to the Kyoto Protocol - and aims to observe Green House Gases (GHGs) including CO ₂ with 1% relative accuracy in sub-continental spatial resolution and to identify the GHGs sources and sinks in conjunction with data from ground instruments	No data yet available.
GID-12T ROSKOSMOS	Kanopus-Vulkan, Vulkan-Kompas-2		Magnetic field & Space environment	Electromagnetic field measurements	Waveband: 1200MHz, 1600MHz Spatial resolution: Swath width: Accuracy:
GIFTS Geosynchronous Imaging Fourier Transform Spectrometer NASA	NMP EO-3 GIFTS	Proposed	Atmospheric temperature and humidity sounders	Measures temperature, water vapour, tracer winds, chemical composition with high spatial and temporal resolution for considerable improvements in weather observations and air quality monitoring. Tests next-generation met observing systems.	Waveband: MWIR-TIR: 1724 channels in the bands 4.45-6.06µm and 8.85-14.6µm Spatial resolution: Visible: 1km x 1km, IR: 4km x 4km Swath width: Full Earth disk Accuracy:
GLAS Geoscience Laser Altimeter System NASA	ICESat	Operational	Lidars	Provision of data on ice sheet height/thickness, land altitude, aerosol height distributions, cloud height and boundary layer height	Waveband: VIS-NIR: Laser emits at 1064nm (for altimetry) and 532nm (for atmospheric measurements) Spatial resolution: 66m spots separated by 170m Swath width: N/A Accuracy: Aerosol profile: 20%, Ice elevation: 20cm, Cloud top height: 75m, Land elevation: 20cm, geoid: 5m
GLI follow-on Global Imager follow-on JAXA	GCOM-C	Prototype	Imaging multi-spectral radiometers (vis/IR) & Ocean colour instruments	Measures water vapour, aerosols, cloud cover, cloud top height/temp, ocean colour, sea surface temperature, land surface temperature, glacier extent, icebergs, sea ice and snow cover, photosynthetically active radiation, vegetation type and land cover	Waveband: VIS&NIR: 23 bands (380-830nm), NIR-SWIR: 6 bands (1050-2215nm), MWIR-TIR: 7 bands (3.75-11.95µm) Spatial resolution: 1km for 28 bands, 250m for 6 bands Swath width: 1600km Accuracy: Specific humidity profile: 0.5g/m ² through total column, Surface temp 0.4-0.5K, Cloud top temp: 0.5K, Cloud cover: 3%, Cloud top height: 0.5km, Ice and snow cover: 5%
GLM GEO Lightning Mapper NOAA	GOES-R	Approved	Lightning imager		The GOES-R Project is in the formulation phase. The satellite will comprise improved spacecraft and instrument technologies, which will result in more timely and accurate weather forecasts, and improve support for the detection and observations of meteorological phenomena that directly affect public safety, protection of property, and ultimately, economic health and development.

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
GMI GPM Microwave Imager NASA	GPM Constellation, GPM Core	Proposed	Imaging multi-spectral radiometers (passive microwave)	Measures rainfall rates over oceans and land, combined rainfall structure and surface rainfall rates with associated latent heating. Used to produce three hour, daily, and monthly total rainfall maps over oceans and land	Waveband: Microwave: 10.65, 19.4, 21.3, 37, and 85.5 GHz Spatial resolution: Horizontal: 36 km cross-track at 10.65 GHz (required - Primary Spacecraft, goal - Constellation Spacecraft); 10 km along-track and cross-track (goal - Primary Spacecraft) Swath width: 800km (Primary Spacecraft) 1300 km (Constellation Spacecraft) Accuracy: NEDT 0.5 K - 1.0 K
GMS Comms Communications package on GMS JAXA (JMA)	GMS-5	Prototype	Communications	Communication package onboard GMS series satellites	Data communication only.
GOES Comms Communications package on GOES NOAA	GOES-9, GOES-10, GOES-11, GOES-12, GOES-N, GOES-O, GOES-P, GOES-R	Prototype	Communications		Data communication only.
GOLPE GPS Occultation and Passive reflection Experiment NASA	SAC-C	Operational	Precision orbit & Atmospheric temperature and humidity sounders	Measurements of atmospheric effects on GPS signals, and precise positioning information to assist gravitational measurements	Waveband: Uses GPS frequencies. Spatial resolution: Swath width: Accuracy: 0.05 K or better appears attainable
GOME Global Ozone Monitoring Experiment ESA	ERS-2	Prototype	Atmospheric chemistry	Measures concentration of O3, NO, NO2, BrO, H2O, O2/O4, plus aerosols and polar stratospheric clouds, and other gases in special conditions	Waveband: UV-NIR: 0.24-0.79µm (resolution 0.2-0.4nm) Spatial resolution: Vertical: 5km (for O3), Horizontal: 40 x 40 km to 40 x 320 km Swath width: 120-960km Accuracy:
GOME-2 Global Ozone Monitoring Experiment - 2 EUMETSAT (ESA)	METOP-1, METOP-2, METOP-3	Prototype	Atmospheric chemistry	Measurement of total column amounts and stratospheric and tropospheric profiles of ozone. Also amounts of H2O, NO2, OClO, BrO, SO2 and HCHO	Waveband: UV-NIR: 0.24-0.79µm (resolution 0.2-0.4nm) Spatial resolution: Horizontal: 40 x 40 km (960km swath) to 40 x 5 km (for polarization monitoring) Swath width: 120-960km Accuracy: Cloud top height: 1km (rms), Outgoing short wave radiation and solar irradiance: 5W/m2, Trace gas profile: 10-20%, Specific humidity profile: 10-50g/kg
GOMOS Global Ozone Monitoring by Occultation of Stars ESA (CNES)	Envisat	Operational	Atmospheric chemistry	Provides stratospheric profiles of temperature and of ozone, NO2, H2O, aerosols and other trace species	Waveband: Spectrometers: UV-Vis: 248-371nm & 387-693nm, NIR: 750-776nm & 915-956nm, Photometers: 644-705nm & 466-528nm Spatial resolution: 1.7km vertical Swath width: Not applicable Accuracy:

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
GPS (ESA) GPS receiver ESA	GOCE, Swarm	TBD	Precision orbit	Satellite positioning	Used for precision satellite positioning only – not an Earth observing instrument.
GPS (GRACE) Global Positioning System Receiver NASA	GRACE			Microwave: 1227.60MHz, 1575.42MHz	Used for precision satellite positioning only – not an Earth observing instrument.
GPS receiver CRCSS	FedSat	Operational	Precision orbit & Atmospheric temperature and humidity sounders	Sounding data for study of physics of upper atmosphere, and water vapour, temperature and refractivity profiles	Waveband: Spatial resolution: 1 sample every 30 secs Swath width: Accuracy:
GPSDR GPS Demonstration Receiver CONAE (NASA)	Topex-Poseidon	Operational	Precision orbit & Atmospheric temperature and humidity sounders	Provides precise continuous tracking data of satellite to decimeter accuracy	Used for precision satellite positioning only – not an Earth observing instrument.
GRAS GNSS Receiver for Atmospheric Sounding EUMETSAT (ESA)	METOP-1, METOP-2, METOP-3	Prototype	Atmospheric temperature and humidity sounders & Precision orbit	GNSS receiver for atmospheric temperature and humidity profile sounding	Waveband: Spatial resolution: Vertical: 150m (troposphere) and 1.5km (stratosphere), Horizontal: 100km approx (troposphere), 300km approx (stratosphere) Swath width: Altitude range of 5-30km Accuracy: Temperature sounding to 1K rms
HAIRS High Accuracy Inter-satellite Ranging System NASA	GRACE	Operational	Gravity	Ranging instrument between the 2 GRACE spacecraft - to derive Earth gravity field measurements	Waveband: Microwave: K Band, Ka Band Spatial resolution: Swath width: Accuracy: 10 microns total at twice per revolution
HALOE Halogen Occultation Experiment NASA	UARS	Operational	Atmospheric chemistry	Provides data on vertical distributions of hydrofluoric and hydrochloric acids, methane, water vapour and members of the nitrogen family. It also provides atmospheric temperature versus pressure profiles from observations of carbon dioxide	Waveband: channels between 2.4µm - 10µm, SWIR - TIR Spatial resolution: 2km-4km Swath width: Accuracy: HCL: 12-24%, HF: 15-27%, CH4: 6-27%, NO: 14-30%, H2O: 14-30%, O3: 9-25%, NO2: 9-21% Temperature: 3-5K, Aerosol Extinction: < 30%
HES Hyperspectral Environmental Suite NOAA	GOES-R	Approved	Imaging multi-spectral radiometers (vis/IR)	Will sense emitted thermal energy and reflected solar energy from sampled areas of the Earth's surface and atmosphere. These data are used to compute vertical profiles of temperature and moisture, surface and cloud-top temperatures, and winds, and provide information about the Earth surface and oceans	The GOES-R Project is in the formulation phase. The satellite will comprise improved spacecraft and instrument technologies, which will result in more timely and accurate weather forecasts, and improve support for the detection and observations of meteorological phenomena that directly affect public safety, protection of property, and ultimately, economic health and development.

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
HIRDLS High Resolution Dynamics Limb Sounder NASA (BNSC)	Aura	Approved	Atmospheric chemistry	Measures atmospheric temperature, concentrations of ozone, water vapour, methane, NOx, N2O, CFCs and other minor species, aerosol concentration, location of polar stratospheric clouds and cloud tops	Waveband: TIR: 6.12-17.76µm (21 channels) Spatial resolution: Vertical: 1km, Horizontal: 10km Swath width: Accuracy: Trace gas: 10%, Temperature: 1K, Ozone: 10%
HIRS/2 High Resolution Infra-red Sounder/2 NOAA	NOAA-12, NOAA-14	Operational	Atmospheric temperature and humidity sounders	Measures atmospheric temperature, concentrations of ozone, water vapour, methane, NOx, N2O, CFCs and other minor species, aerosol concentration, location of polar stratospheric clouds and cloud tops	Waveband: VIS-TIR: 0.69-14.95µm (20 channels) Spatial resolution: 20.3km Swath width: 2240km Accuracy:
HIRS/3 High Resolution Infra-red Sounder/3 NOAA	NOAA-15, NOAA-16, NOAA-17	Operational	Atmospheric temperature and humidity sounders	Provides atmospheric temperature profiles and data on cloud parameters, humidity soundings, water vapour, total ozone content, and surface temperatures	Waveband: VIS-TIR: 0.69-14.95µm (20 channels) Spatial resolution: 20.3km Swath width: 2240km Accuracy:
HIRS/4 High Resolution Infra-red Sounder/4 NOAA	METOP-1, METOP-2, METOP-3, NOAA-N, NOAA-N'	Operational	Atmospheric temperature and humidity sounders	Provides atmospheric temperature profiles and data on cloud parameters, humidity soundings, water vapour, total ozone content, and surface temperatures. Same as HIRS/3, with 10km IFOV	Waveband: VIS-TIR: 0.69-14.95µm (20 channels) Spatial resolution: 20.3km Swath width: 2240km Accuracy:
HRDI High Resolution Doppler Imager NASA	UARS	Operational	Atmospheric chemistry	Daytime wind measurements below 50km from Doppler shifts of molecular oxygen absorption lines. Day and night wind measurements above about 60km from Doppler shifts of neutral and ionised atomic oxygen emission lines. Also measures temperature	Waveband: 0.557-0.776µm Spatial resolution: Vertical (limb): 4km, Horizontal (limb): 80km Swath width: 5 to 100km (vertical coverage) Accuracy: Vector winds in the stratosphere, mesosphere and lower thermosphere during the day, and the lower thermosphere at night to an accuracy of 5 m/s
HRG High Resolution Geometry CNES	SPOT-5	Operational	High resolution optical imagers	High resolution multispectral mapper. 2 HRG instruments on this mission can be processed to produce simulated imagery of 2.5m. Images are 60km x 60km in size	Waveband: VIS: B1:0.50-0.59µm, B2: 0.61-0.68µm, NIR: B3: 0.79-0.89µm, SWIR: 1.50-1.75µm, Panchromatic: 0.49-0.69µm Spatial resolution: Panchromatic: 2, 5m, Multispectral: 10m Swath width: 60km (1 instrument), 117km (2 instruments). Same as SPOT 4 with off-track steering capability (±27 deg) Accuracy:
HRMS High Resolution Multi-spectral Scanner CONAE	SAC-F	Approved	Imaging multi-spectral radiometers (vis/IR)		Waveband: Spatial resolution: Swath width: Accuracy:

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
HR-PAN High Resolution Panchromatic Camera ISRO	CARTOSAT-2	Prototype	High resolution optical imagers	High resolution stereo images for large scale (better than 1:0000) mapping applications, urban applications, GIS ingest	Waveband: VIS: 0.5-0.75µm Spatial resolution: 1 m Swath width: 12 km Accuracy:
HRS High Resolution Stereoscopy CNES	SPOT-5	Operational	High resolution optical imagers	High resolution stereo instrument	Waveband: Panchromatic: VIS 0.49-0.69µm Spatial resolution: Panchromatic: 10m, Altitude: 15m Swath width: 120km Accuracy:
HRTC High Resolution Panchromatic Camera CONAE	SAC-C	Operational	High resolution optical imagers	High resolution earth imagery to complement MMRS on the same mission	Waveband: VIS-NIR: 400-900nm Spatial resolution: 35m Swath width: 90km Accuracy:
HRV High Resolution Visible CNES	SPOT-2	Operational	High resolution optical imagers	2 HRV instruments on this mission provide 60km x 60km images for a range of land and coastal applications	Waveband: VIS: B1:0.5-0.59µm, B2:0.61-0.68µm, NIR: B3:0.79-0.89µm, Panchromatic: VIS 0.51-0.73µm Spatial resolution: 10m (panchromatic) or 20m Swath width: 117km (ie 60km + 60km with 3km overlap) - steerable up to ±27 deg off-track Accuracy:
HRVIR High Resolution Visible and Infra-red CNES	SPOT-4	Operational	High resolution optical imagers	2 HRVIR instruments on this mission provide 60km x 60km images for a range of land and coastal applications	Waveband: VIS: B1: 0.50-0.59µm, B2: 0.61-0.68µm, NIR: 0.79-0.89µm, SWIR: 1.58-1.75µm, Panchromatic:(B2) 0.61-0.68µm Spatial resolution: 10m (0.64µm) or 20m Swath width: 117km (ie 60km + 60km with 3km overlap). Steerable up to ±27 deg off-track Accuracy:
HSB Humidity Sounder/Brazil INPE (NASA)	Aqua	Not operational	Atmospheric temperature and humidity sounders	Humidity soundings for climatological and atmospheric dynamics applications	Waveband: Microwave: 5 discreet channels in the range of 150-183 MHz Spatial resolution: 13.5km Swath width: 1650km Accuracy: Temperature: 1.0-1.2k coverage of land and ocean surfaces, Humidity: 20%
HSC High Sensitivity Camera CONAE	SAC-D/ Aquarius	Approved	Imaging multi-spectral radiometers (vis/IR)		Waveband: PAN: VIR-NIR: 450-900 nm Spatial resolution: 200-300m Swath width: > 700 km Accuracy:
HSI (HJ-1A) Hyper Spectrum Imager CAST	HJ-1A	Being developed	Imaging multi-spectral radiometers (vis/IR)	Hyperspectral imaging	Waveband: 0.45-0.95µm Spatial resolution: 100m Swath width: 50km Accuracy:
HSMS High Swath Multi-spectral Scanner CONAE	SAC-F	Approved	Imaging multi-spectral radiometers (vis/IR)		Waveband: Spatial resolution: Swath width: Accuracy:

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
HSRS Hot Spot Recognition System DLR	BIRD	Operational	Imaging multi-spectral radiometers (vis/IR)	Hot spot Detection (vegetation fires, volcanic activities, burning oil wells or coal seams)	Waveband: MWIR: 3.4-4.2µm, TIR: 8.4-9.3µm Spatial resolution: 370m Swath width: 190km Accuracy:
HSS Hyper-spectral Scanner CONAE	SAC-F	Approved	Imaging multi-spectral radiometers (vis/IR)	Hyperspectral imaging	Waveband: Spatial resolution: Swath width: Accuracy:
HSTC High Sensitivity Technological Camera CONAE	SAC-C	Operational	Imaging multi-spectral radiometers (vis/IR)	Provides data to Monitor forest fires, electrical storms and geophysical studies of aurora borealis	Waveband: PAN: VIS-NIR: 450-850nm Spatial resolution: 250m Swath width: 900km Accuracy:
HYC Hyperspectral Camera ASI	Hyperspectral Mission	TBD	Imaging multi-spectral radiometers (vis/IR)	Pancromatic and Hyperspectral data for complex land ecosystem studies	Waveband: VIS-NIR:400-900 nm, 400-1000nm; SWIR: 900-2500nm; Spectral resolution 10 nm, 220 bands Spatial resolution: PAN: 5m ; VNIR-SWIR:20m; Swath width: 20 Km Accuracy:
HYDROS NASA	HYDROS	Proposed	Multiple direction/ polarisation radiometers	Microwave measurement of soil moisture and freeze/thaw timeline	Waveband: 1.26 GHz for the radar and 1.41 GHz for the radiometer and will be capable of both horizontal and vertical polarizations Spatial resolution: Radar 3km&10km, Radiometer 40km Swath width: 1000km Accuracy:
Hyperion Hyperspectral Imager NASA	NMP EO-1	Operational	Imaging multi-spectral radiometers (vis/IR)	Hyperspectral imaging of land surfaces	Waveband: VIS-NIR: 400-1000nm; NIR-SWIR: 900-2500nm; 10nm spectral resolution for 220 bands Spatial resolution: 30m Swath width: 7.5km Accuracy: SNR @ 10% refl target: vis 10-40 swir 10-20
IAP Instrument for plasma analysis CNES	DEMETER	Operational	Space Environment	Density, temperatures, speeds of major ions	Waveband: Spatial resolution: Swath width: Accuracy: Ion density: +5%, Temperature +5%, Speed +5%
IASI Infra-red Atmospheric Sounding Interferometer CNES (EUMETSAT)	METOP-1, METOP-2, METOP-3	Being developed	Atmospheric temperature and humidity sounders & Atmospheric chemistry instruments	Measures tropospheric moisture and temperature, column integrated contents of ozone, carbon monoxide, methane, dinitrogen oxide and other minor gases which affect tropospheric chemistry. Also measures sea surface and land temperature	Waveband: MWIR-TIR: 3.4-15.5µm with gaps at 5µm and 9µm Spatial resolution: Vertical: 1-30km, Horizontal: 25km Swath width: 2052km Accuracy: Temperature: 0.5-2K, Specific humidity: 0.1-0.3g/kg, Ozone, trace gas profile: 10%

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
ICARE Influence of Space Radiation on Advanced Components CNES	SAC-C, SAC-D/ Aquarius	Operational	Space Environment	Improvement of risk estimation models on latest generation of integrated circuits technology	Will measure high energy radiation environment, trapped particle intensities and energy distribution and correlate them with advanced electronic components degradation. ICARE will be able to conduct regular environment characterization campaigns for ten days every six months and exceptional ones during solar events.
ICE Instrument for Electric Field CNES	DEMETER	Operational	Space Environment	Electric field	Waveband: DC to 3MHz Spatial resolution: Swath width: Accuracy: DC field +3mV/m
IDP Instrument For Plasma Detection CNES	DEMETER	Operational	Space Environment	Energy spectrum of electrons	Waveband: Spatial resolution: Swath width: Accuracy:
IGPM radiometer IGPM microwave radiometer ASI	IGPM	TBD	Imaging multi-spectral radiometers (passive microwave)	Global water and energy cycle	No data available yet.
IGPM rain radar ASI	IGPM	TBD	Cloud profile and rain radars	Global water and energy cycle	No data available yet.
IIR Imaging infrared radiometer CNES	CALIPSO	TBD	Imaging multi-spectral radiometers (vis/IR)	Radiometer optimized for combined IIR/lidar retrievals of cirrus particle size	Waveband: TIR: 8.7, 10.5, and 12.0 μm (08. μm resolution) Spatial resolution: 1km Swath width: 64km Accuracy: 1K
IKFS-2 Fourier spectrometer ROSHYDROMET	METEOR-3M N2, Meteor-M No1, Meteor-M No2	TBD	Atmospheric temperature and humidity sounders	Atmospheric temperature and humidity sounding and radiation budget assessment	Waveband: 5-15 μm , 1300 spectral channels Spatial resolution: Swath width: 2500km Accuracy: 1K
IKOR-M The modernized measuring instrument of short-wave reflected radiation ROSKOSMOS	Meteor-M No1, Meteor-M No2		Earth radiation budget radiometer		Waveband: Spatial resolution: Swath width: Accuracy:
Imager NOAA	GOES-9, GOES-10, GOES-11, GOES-12, GOES-N, GOES-O, GOES-P, GOES-R	Operational	Imaging multi-spectral radiometers (vis/IR)	Measures cloud cover, atmospheric radiance, winds, atmospheric stability, rainfall estimates. Used to provide severe storm warnings/ monitoring day and night (type, amount, storm features)	Waveband: GOES 8-12; N,O,P: VIS: 1 channel (8 detectors), IR: 4 channels: 3.9, 6.7, 10.7 and 12 μm , GOES 12-Q: VIS: 1 channel (8 detectors), IR: 4 channels: 3.9, 6.7, 10.7 and 13.3 μm Spatial resolution: 1km in visible 4km in IR (8km for 13.3 μm band (water vapour)) Swath width: Full Earth disk Accuracy:

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
Imager (INSAT) ISRO	INSAT-3D	TBD	Imaging multi-spectral radiometers (vis/IR)	Cloud cover, severe storm warnings/monitoring day and night (type, amount, storm features), atmospheric radiance winds, atmospheric stability rainfall	Waveband: VIS: 0.55-0.75µm, SWIR: 1.55-1.7µm, MWIR: 3.80-4.00µm, 6.50-7.00µm, TIR: 10.2-11.3µm, 11.5-12.5µm Spatial resolution: 1x1km (VIS & SWIR), 4x4km (MWIR, TIR), 8x8km (in 6.50-7.00µm) Swath width: Full Earth disc and space around, Normal Frame (50 deg. N to 40 deg. S and full E-W coverage), Program Frame (Programmable, E-W Full coverage) Accuracy:
IMAGER/MTSAT-1R Imager/MTSAT JMA	MTSAT-1R	Prototype	Imaging multi-spectral radiometers (vis/IR)	Measures cloud cover, cloud motion, cloud height, water vapour, rainfall, sea surface temperature and Earth radiation	Waveband: VIS-SWIR: 0.55-0.90µm, MWIR-TIR: 3.5-4µm, 6.5-7µm, 10.5-11.3µm, 11.5-12.5µm Spatial resolution: Visible: 1km, TIR: 4km Swath width: Full Earth disk every hour Accuracy:
IMAGER/MTSAT-2 Imager/MTSAT JMA	MTSAT-2	Prototype	Imaging multi-spectral radiometers (vis/IR)	Measures cloud cover, cloud motion, cloud height, water vapour, rainfall, sea surface temperature and Earth radiation	Waveband: VIS-SWIR: 0.55-0.90µm, MWIR-TIR: 3.5-4µm, 6.5-7µm, 10.5-11.3µm, 11.5-12.5µm Spatial resolution: Visible: 1km, TIR: 4km Swath width: Full Earth disk every hour Accuracy:
IMSC Instrument Search Coil Magnetometer CNES	DEMETER	Operational	Magnetic field	Magnetic field	Waveband: 10Hz - 17.4kHz Spatial resolution: Swath width: Accuracy:
IMWTS Improved MicroWave Temperature Sounder NRSCC (CAST)	FY-3C, FY-3D, FY-3E, FY-3F, FY-3G	Approved	Atmospheric temperature and humidity sounders	Atmospheric temperature soundings for meteorological applications	Waveband: Microwave: 50-57GHz (4channels) Spatial resolution: 50km Swath width: ±48° Accuracy:
INES Italian Navigation Experiment ASI	SAC-C	Operational	Precision orbit	Composed of GPS Tensor and GNSS Lagrange Receiver to perform navigation experiment on precise orbit determination	Precision positioning only – not an Earth observing instrument.
IR (HJ-1B) Infrared Camera CAST	HJ-1B	Being developed	Imaging multi-spectral radiometers (vis/IR)	Global environmental applications	Waveband: 0.75-1.10, 1.55-1.75, 3.50-3.90, 10.5-12.5µm Spatial resolution: 300m (10.5-12.5µm), 150m (the other bands) Swath width: 720km Accuracy:
IR Camera (SAOCOM) CONAE	SAOCOM 1A, SAOCOM 1B, SAOCOM-2B (1), SAOCOM-2B (2)	Being developed	Imaging multi-spectral radiometers (vis/IR)	Fires monitoring	Waveband: NIR-TIR Spatial resolution: 200m Swath width: Accuracy:

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
IRAS InfraRed Atmospheric Sounder NRSCC (CAST)	FY-3A, FY-3B, FY-3C, FY-3D, FY-3E, FY-3F, FY-3G	Approved	Atmospheric temperature and humidity sounders	Atmospheric sounding for weather forecasting	Waveband: VIS-TIR: 0.65-14.95µm (26 channels) Spatial resolution: 1.254km Swath width: ±49.5° Accuracy:
IR-MSS Infrared Multispectral Scanner CAST (INPE)	CBERS-2, CBERS-2B	Operational	High resolution optical imagers	Used for fire detection, fire extent and temperature measurement	Waveband: VIS-NIR: 0.5-1.1µm, NIR-SWIR: 1.55-1.75µm, 2.08-2.35µm, TIR: 10.4-12.5µm Spatial resolution: Visible, NIR, SWIR: 78m, TIR: 156m Swath width: 120km Accuracy:
IRS CAST (INPE)	CBERS-3, CBERS-4	Operational	High resolution optical imagers	Used for fire detection, fire extent and temperature measurement	Waveband: VIS-NIR: 0.5-1.1µm, NIR-SWIR: 1.55-1.75µm, 2.08-2.35µm, TIR: 10.4-12.5µm Spatial resolution: Visible, NIR, SWIR: 78m, TIR: 156m Swath width: 120km Accuracy:
ISAMS Improved Stratospheric and Mesospheric Sounder instrument NASA	UARS	Not operational	Earth radiation budget radiometer	Concentrations of nitrogen chemical species, ozone, water vapour, methane, and carbon monoxide. Aerosols. Atmospheric temperature	Waveband: SWIR-TIR: 4.6-16.6µm Spatial resolution: vert 2.6km, horiz: 18km Swath width: 65km Accuracy:
ISL Langmuir probes CNES	DEMETER	Operational	Space Environment	Density of the plasma and electron temperature	Waveband: Spatial resolution: Swath width: Accuracy: Relative ion and electron density <5%, Absolute temperature <5%, Potential 10mV Ion direction +15°
IST Italian Star Tracker ASI	SAC-C	Operational	Precision orbit	Test of a fully autonomous system for attitude and orbit determination using a star tracker	Precision positioning only – not an Earth observing instrument.
IVISSR (FY-2) Improved Multispectral Visible and Infra-red Spin Radiometer (5 channels) NRSCC (CAST)	FY-2C, FY-2D, FY-2E	Approved	Imaging multi-spectral radiometers (vis/IR)	Meteorological	Waveband: VIS-TIR: 0.55-0.9, 10.3-11.3, 11.5-12.5, 6.5-7.0, 3.5-4.0µm (5 channels) Spatial resolution: 1.4km, 5km Swath width: Accuracy:
JMR JASON Microwave Radiometer NASA	Jason, Jason-2 (also known as OSTM)	Operational	Imaging multi-spectral radiometers (passive microwave)	Provides altimeter data to correct for errors caused by water vapour and cloud-cover. Also measures total water vapour and brightness temperature	Waveband: Microwave: 18.7GHz, 23.8GHz, 34GHz Spatial resolution: 41.6km at 18.7GHz, 36.1km at 23.8GHz, 22.9km at 34GHz Swath width: 120 deg cone centred on nadir Accuracy: Total water vapour: 0.2g/sq cm, Brightness temperature: 0.15 K

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
KGI-4C Module for Geophysical Measurements ROSHYDROMET	METEOR-3M N1	Prototype	Earth radiation budget radiometer	Measures particle flux and electromagnetic emissions	Waveband: Electron flux density range: 0.15-3.2MeV, proton flux density range: 5- 90MeV, Protons density of energy more that 600 MeV (5-10 channels) Spatial resolution: 8-12km Swath width: 3100km Accuracy: 1.6K
Klimat Scanning IR radiometer ROSHYDROMET	METEOR-3M N1	Operational	Imaging multi-spectral radiometers (vis/IR)	Provides images of cloud, ice and snow. Measures sea surface temperature	Waveband: TIR: 10.5-12.5µm Spatial resolution: 0.45km x 0.9km Swath width: 1300km Accuracy:
KMSS Medium range multi-spectral scanner ROSHYDROMET (ROSKOSMOS)	METEOR-3M N2, Meteor-M No1, Meteor-M No2	Operational	Imaging multi-spectral radiometers (passive microwave)	Moderate resolution imaging applications	Waveband: Microwave:0.45-0.50, 0.535-0.575, 0.63-0.68, 0.76-0.9µm Spatial resolution: 70m Swath width: 1000-1200km Accuracy:
LAC Laser Atmospheric Corrector NASA	NMP EO-1	Operational	Imaging multi-spectral radiometers (vis/IR)	Corrects high spatial resolution multispectral imager data for atmospheric effects	Waveband: 256 bands, NIR-SWIR: 0.89-1.58µm Spatial resolution: 250m Swath width: 185km Accuracy:
Landsat Comms Communications package for Landsat USGS	Landsat-5, Landsat-7	Operational	Communications		Data communications only.
Laser reflectors CNES	STARLETTE, STELLA	Operational	Precision orbit	Measures distance between the satellite and the laser tracking stations	24cm sphere covered in 60 retro-reflectors
Laser reflectors (ESA) Laser reflectors ESA	CRYOSAT, GOCE	TBD	Precision orbit	Measures distance between the satellite and the laser tracking stations	Cluster of 9 laser reflectors provide orbit determination with cm accuracy using laser ground stations.
L-band SAR INPE	SSR-2	Proposed	Imaging microwave radars	Microwave imaging of land and ice for use in environmental monitoring, agriculture and forestry, disaster monitoring, Earth resource management and interferometry	Waveband: Spatial resolution: Swath width: Accuracy:
LISS-III Linear Imaging Self Scanner - III ISRO	RESOURCE-SAT-1, RESOURCE-SAT-2	Operational	High resolution optical imagers	Data used for vegetation type assessment, resource assessment, crop stress detection, crop production forecasting, forestry, land use and land cover change	Waveband: VIS: Band 2: 0.52-0.59µm, Band 3: 0.62-0.68µm, NIR: Band 4: 0.77-0.86µm, SWIR: Band 5: 1.55-1.75µm Spatial resolution: Bands 2, 3 & 4: 23.5m, Band 5: 70.5m Swath width: 140km Accuracy:
LISS-IV Linear Imaging Self Scanner - IV ISRO	RESOURCE-SAT-1, RESOURCE-SAT-2	Operational	High resolution optical imagers	Vegetation monitoring, improved crop discrimination, crop yield, disaster monitoring and rapid assessment of natural resources	Waveband: VIS: 0.52-0.59µm, 0.62-0.68µm, NIR: 0.77-0.86µm, Spatial resolution: 5.8m Swath width: 70km Accuracy:

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
LRA Laser Retroreflector Array NASA (ASI)	Jason, Jason-2 (also known as OSTM), Topex-Poseidon	Operational	Precision orbit	Provides baseline tracking data for precision orbit determination and/or geodesy. Also for calibration of radar altimeter bias. Several types used on various missions. (ASI involved in LAGEOS 2 development)	The LRA is an array of mirrors that provide a target for laser tracking measurements from the ground. By analyzing the round-trip time of the laser beam, we can locate very precisely where the satellite is on its orbit.
LRA (LAGEOS) Laser Retroreflector Array NASA (ASI)	LAGEOS-1, LAGEOS-2, LAGEOS-3	Being developed	Precision orbit	Provides baseline tracking data for precision geodesy. Also for calibration of radar altimeter bias. Several types used on various missions. (ASI involved in LAGEOS 2 development)	The LAGEOS satellites are passive vehicles covered with retro-reflectors designed to reflect laser beams transmitted from ground stations. Accuracy: 2cm overhead ranging
L-SAR L-Band SAR BNSC	TerraSAR-L	Prototype	Imaging microwave radars	L-Band Sar for agriculture and forestry	Waveband: Microwave: L-band (2GHz) Spatial resolution: 5m Swath width: 10-200km depending on mode Accuracy:
MADRAS CNES	MEGHA-TROPIQUES	Operational	Imaging multi-spectral radiometers (passive microwave)	Studies precipitation and clouds properties	Data not yet available.
MAESTRO Measurements of Aerosol Extinction in the Stratosphere and Troposphere Retrieved by Occultation CSA	SCISAT-1	Operational	Atmospheric chemistry	Will aid in the SCISAT-1 overall mission of increasing our understanding of the chemical processes involved in the depletion of the ozone layer	Waveband: UV-NIR: 0.285 to 1.03um (1-2nm spectral resolution) Spatial resolution: Approx 1km vertical Swath width: Accuracy:
Magnetometer (NOAA) NOAA	GOES-R	Approved	Magnetic field	Measures magnitude and direction of Earth's ambient magnetic field in three orthogonal directions in an Earth referenced coordinate system. Will provide a map of the space environment that controls charged particle dynamics in the outer region of the magnetosphere	The GOES-R Project is in the formulation phase. The satellite will comprise improved spacecraft and instrument technologies, which will result in more timely and accurate weather forecasts, and improve support for the detection and observations of meteorological phenomena that directly affect public safety, protection of property, and ultimately, economic health and development.
MASTER ESA	ESA Future Missions	TBD	Atmospheric temperature and humidity sounders & Atmospheric chemistry instruments	Data for study of exchange mechanisms between stratosphere/troposphere, and information for studies on global change. Measures upper troposphere/ lower stratosphere profiles of O3, H2O, CO, HNO3, SO2, N2O, pressure and temperature	Waveband: Microwave: 199-207, 296-306, 318-326, 342-348GHz Spatial resolution: 3km Swath width: Accuracy: 199-207GHz channel: 1K, Other channels: 1.5K, 50MHz resolution, 0.3 secs integration time
MBEI Multi-band Earth Imager NSAU	SICH-2	Approved	High resolution optical imagers	Multispectral scanner images of land surface	Waveband: VIS-NIR: 0.50-0.885µm, VIS: 0.50-0.59, 0.605-0.68µm, NIR: 0.785-0.885µm Spatial resolution: 7.8m Swath width: 46.6km pointable ±35° from nadir Accuracy:

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
MCP Meteorological Communications Package (MCP) EUMETSAT	METOP-1, METOP-2, METOP-3	TBD	Communications	Meteorological Communications Package (MCP) onboard METOP series satellites	Data communication only.
MERIS Medium-Resolution Imaging Spectrometer ESA	Envisat	Operational	Imaging multi-spectral radiometers (vis/IR)	Main objective is monitoring marine biophysical and biochemical parameters. Secondary objectives are related to atmospheric properties such as cloud and water vapour and to vegetation conditions on land surfaces	Waveband: VIS-NIR: 15 bands selectable across range: 0.4-1.05µm (bandwidth programmable between 0.0025 and 0.03µm) Spatial resolution: Ocean: 1040m x 1200 m, Land & coast: 260m x 300m Swath width: 1150km, global coverage every 3 days Accuracy: Ocean colour bands typical S:N = 1700
MERSI Moderate Resolution Spectral Imager NRSCC (CAST)	FY-3A, FY-3B, FY-3C, FY-3D, FY-3E, FY-3F, FY-3G	Approved	Imaging multi-spectral radiometers (vis/IR)	Measures surface temperature and cloud and ice cover. Used for snow and flood monitoring and surface temperature	Waveband: VIS-TIR: 0.47-12.5µm (20 channels) Spatial resolution: 250m-1.1km Swath width: 3200km Accuracy:
METEOSAT Comms Communications package for METEOSAT EUMETSAT	METEOSAT-5, METEOSAT-6, METEOSAT-7	Prototype	Communications	Communication package onboard METEOSAT series satellites	Data communication only.
MHS Microwave Humidity Sounder EUMETSAT	METOP-1, METOP-2, METOP-3, NOAA-N, NOAA-N'	Prototype	Atmospheric temperature and humidity sounders	Provides atmospheric humidity profiles, cloud cover, cloud liquid, water content, ice boundaries and precipitation data	Waveband: Microwave: 89, 166GHz and 3 channels near 183GHz Spatial resolution: Vertical: 3-7km, Horizontal: 30-50km Swath width: 1650km Accuracy: Cloud water profile: 10g/m ² , Specific humidity profile: 10-20%
MIPAS Michelson Interferometric Passive Atmosphere Sounder ESA	Envisat	Operational	Atmospheric chemistry instruments & Atmospheric temperature and humidity sounders	Provides data on stratosphere chemistry (global/polar ozone), climate research (trace gases/clouds), transport dynamics, tropospheric chemistry. Primary/secondary species: O ₃ , NO, NO ₂ , HNO ₃ , N ₂ O ₅ , ClONO ₂ , CH ₄	Waveband: MWIR-TIR: between 4.15 and 14.6µm Spatial resolution: Vertical resolution: 3km, vertical scan range 5-150km, Horizontal: 3km x 30km, Spectral resolution: 0.035 lines/cm Swath width: Accuracy: Radiometric precision: 685-970cm ⁻¹ : 1%, 2410 cm ⁻¹ : 3%
MIRAS Multichannel Infrared Atmospheric Sounder NRSCC (CAST)	FY-3C, FY-3D, FY-3E, FY-3F, FY-3G	Prototype	Imaging multi-spectral radiometers (passive microwave)	Atmospheric sounding for weather forecasting	No data available
MIRAS (SMOS) 2-D Passive L-Band Microwave Interferometer ESA	SMOS	Proposed	Multiple direction/polarisation radiometers & Imaging multi-spectral radiometers (passive microwave)	Objective is to demonstrate observations of sea surface salinity and soil moisture in support of climate, meteorology, hydrology, and oceanography applications.	Waveband: Microwave: L-Band 1.41GHz (based on MIRAS concept) Spatial resolution: Requirements: Soil moisture: 30km (desired), Sea surface salinity: 200km (desired) 934km (at 756km altitude), allowing a 3 day revisit time at the equator Swath width: Accuracy: Radiometric accuracy: 3.5K for land, 2.5K for sea

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
MIREI Middle IR Earth Imager NSAU	SICH-2	Approved	High resolution optical imagers	Scanner images of land surface	Waveband: NIR: 1.55-1.7µm Spatial resolution: 39.5m Swath width: 55.3 km pointable ±35° from nadir Accuracy:
MISR Multi-angle Imaging SpectroRadiometer NASA	Terra	Operational	Multiple direction/polarisation radiometers	Provides measurements of global surface albedo, aerosol and vegetation properties. Also provides multi-angle bidirectional data (1% angle-to-angle accuracy) for cloud cover and reflectances at the surface and aerosol opacities. Global and local modes	Waveband: VIS: 0.44, 0.56, 0.67µm, NIR: 0.86µm Spatial resolution: 275m, 550m or 1.1km, Summation modes available on selected cameras/bands: 1x1, 2x2, 4x4, 1x4. 1 pixel = 275m x 275m Swath width: 360km common overlap of all 9 cameras Accuracy: 0.03% hemispherical albedo, 10% aerosol opacity, 1-2% angle to angle accuracy in bidirectional reflectance
MIVZA Microwave scanning radiometer ROSHYDROMET	METEOR-3M N1	Prototype	Atmospheric temperature and humidity sounders	Microwave radiometer for humidity sounding of atmosphere	Waveband: Microwave:22-94 GHz, 5 channels Spatial resolution: 25-100km Swath width: 1500m Accuracy:
MLS Microwave Limb Sounder NASA	Aura	Operational	Atmospheric temperature and humidity sounders & Atmospheric chemistry instruments	Provides data on emissions of chlorine monoxide, water vapour and ozone. Data also used for determination of atmospheric pressure and temperatures as a function of altitude from observations of molecular oxygen emissions	Waveband: 118GHz, 190GHz, 240GHz, 640GHz, 2.5THz Spatial resolution: Measurements are performed along the sub-orbital track, and resolution varies for different parameters; 5 km cross-track x 500 km along-track x 3 km vertical are typical values. Swath width: 1.5 km vertical x 3 km cross-track x 300 km along-track at the limb tangent point Accuracy: Depends on measurement
MMP Magnetic Mapping Payload CONAE (DSRI (Denmark))	SAC-C	Operational	Magnetic field	Measurement of the Earth's magnetic field with a vector and a scalar magnetometer	Waveband: Scalar (SHM) 1nTeslaVectorial 3-5 nT Spatial resolution: Res angular 20 sec arc Swath width: Vector 0.5 nT Accuracy:
MMRS Multispectral Medium Resolution Scanner CONAE	SAC-C	Operational	Imaging multi-spectral radiometers (vis/IR)	Applications related to agriculture, environment, forestry, hydrology, oceanography, mineralogy and geology, desertification, contamination and protection of ecosystems.	Waveband: VIS-NIR: 480 - 500nm, 540-560nm, 630-690nm, 795-835nm, SWIR: 1550-1700nm Spatial resolution: 175m Swath width: 360kmAccuracy:
MOC Multi-spectral Optical Camera CONAE	SAC-E/SABIA	Approved	Imaging multi-spectral radiometers (vis/IR)		Waveband: Spatial resolution: Swath width: Accuracy:

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
MODerate-Resolution Imaging Spectroradiometer NASA	Aqua, Terra	Operational	Imaging multi-spectral radiometers (vis/IR) & Ocean colour instruments	Data on biological and physical processes on the surface of the Earth and in the lower atmosphere, and on global dynamics. Surface temperatures of land and ocean, chlorophyll fluorescence, land cover measurements, cloud cover (day and night)	Waveband: VIS-TIR: 36 bands in range 0.4-14.4µm Spatial resolution: Cloud cover: 250m (day) and 1000m (night), Surface temperature: 1000m Swath width: 2330km Accuracy: Long wave radiance: 100nW/m2, Short wave radiance: 5%, Surface temperature of land: <1K, Surface temperature of ocean: <0.2K, Snow and ice cover: 10%
MOPITT Measurements Of Pollution In The Troposphere GSA	Terra	Prototype	Atmospheric chemistry	Measurements of greenhouse gases (CO, methane) in the troposphere	Waveband: SWIR-MWIR: 2.3, 2.4 and 4.7µm Spatial resolution: CO profile: 4km vertical, 22 x 22km horizontal, CO, CH4 column: 22x22km horizontal Swath width: 616km Accuracy: Carbon monoxide (4km layers): 10%, Methane column: 1%
MPS Magnetospheric Particle Sensor NOAA	GOES-R	Approved	Space Environment	Studies of natural radiation hazard to humans at high altitudes and in space, as well as risk assessment and warning of episodes of surface charging, deep dielectric charging, and single event upset of satellite systems	The GOES-R Project is in the formulation phase. The satellite will comprise improved spacecraft and instrument technologies, which will result in more timely and accurate weather forecasts, and improve support for the detection and observations of meteorological phenomena that directly affect public safety, protection of property, and ultimately, economic health and development.
MR-2000M1 Scanning visible radiometer ROSHYDROMET	METEOR-3M N1	Prototype	Imaging multi-spectral radiometers (vis/IR)	TV camera images of cloud, snow and ice	Waveband: VIS-NIR: 0.5-0.8µm Spatial resolution: 1.5km Swath width: 3100km Accuracy:
MS (GISTDA) Multi spectral imager GISTDA	THEOS	Approved	Imaging multi-spectral radiometers (vis/IR)	Land surface applications	Waveband: 0.45-0.52, 0.53-0.60, 0.62-0.69, 0.77-0.90µm Spatial resolution: 15m Swath width: 90km Accuracy:
MSC Multi-Spectral Camera KARI	KOMPSAT-2	Being developed	High resolution optical imagers	High resolution imager for land applications of cartography and disaster monitoring	Waveband: VIS-NIR: 0.50-0.92µm, VIS: 0.45-0.52µm, 0.52-0.60µm, 0.63-0.69µm, NIR: 0.76-0.90µm Spatial resolution: Pan: 1m, VNIR: 4m Swath width: 15km Accuracy:
MSG Comms Communications package for MSG EUMETSAT	METEOSAT-8, METEOSAT-9, METEOSAT-10, METEOSAT-11	Being developed	Communications	Communication package onboard MSG series satellites	Data communication only.
MSGI-MKA Spectrometer ROSHYDROMET	METEOR-3M N2, Meteor-M No1, Meteor-M No2	TBD	Other	Geoactive corpuscular emissions measurements	The MSGI-MKA instrument features four channels for the measurement of the following parameters: Electron fluxes in the energy range of 0.1-15 keV (high-sensitivity channel); Ion (proton) fluxes in the energy range of 0.1-15 keV (high-sensitivity channel); Electron fluxes in the energy range of 0.1-15 keV (low-sensitivity channel); Monitoring of integral electron fluxes with a threshold energy of 40 keV. The Field of View is 10° x 10° for each channel (3) and 20° x 20° for the integral electron flux.

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
MSI Multi Spectral Imager DLR	RapidEye	Approved	High resolution optical imagers	High resolution images with short observing cycle for commercial and scientific applications	Waveband: 4 VIS + 1 NIR band: 440-510nm, 520-590nm, 630-685nm, 690-730nm, 760-850nm Spatial resolution: 6.5m Swath width: 78km Accuracy: 2-3%
MSMR Multifrequency Scanning Microwave Radiometer ISRO	IRS-P4	Operational	Imaging multi-spectral radiometers (passive microwave)	Sea state and meteorological parameter monitoring (sea surface temperature, surface wind speed, water vapour over ocean and liquid water content of the cloud)	Waveband: Microwave: 6.6, 10.6, 18 and 21GHz Spatial resolution: 40m at 21GHz to 120m at 6.6GHz, Wind speed: 75 x 75km, Sea surface temperature: 146 x 150km Swath width: 1360km Accuracy: Sea surface temperature: 1.5K, Sea surface wind speed: 1.5 m/s
MSS Multispectral Scanner USGS	Landsat-5	Operational	Imaging multi-spectral radiometers (vis/IR)	Measures surface radiance. Data mostly used for land applications	Waveband: 0.5-1.1µm Spatial resolution: 82m Swath width: 185km Accuracy:
MSS (Roskosmos) Multispectral film-making system ROSKOSMOS	BelKA		Imaging multi-spectral radiometers (vis/IR)	Land surface applications	Waveband: VIS-NIR: 0.54-0.6, 0.63-0.69, 0.69-0.72, 0.75-0.86µm Spatial resolution: 12m Swath width: 20km Accuracy:
MSS-BIO Polyzonal scanning system of bioefficiency of sea water areas ROSKOSMOS	Meteor-M No1, Meteor-M No2		Ocean colour instruments	Ocean biology applications	Waveband: 0.43-0.48, 0.5-0.58, 0.6-0.68, 0.7-0.9, 2.0-2.3µm Spatial resolution: 60-100m Swath width: 520km Accuracy:
MSTE-5E Multichannel system of geoactive measurements ROSHYDROMET	METEOR-3M N1	TBD	Other	Geoactive Emission Measurements	Waveband: Ions energetic spectrum: 0.1 – 15 keV, 3 channels, Energy of electrons: 0.05 – 20 keV and more than 40 keV, 4 channels Spatial resolution: Swath width: Accuracy:
MSU Microwave Sounding Unit NOAA	NOAA-12, NOAA-14	Operational	Atmospheric temperature and humidity sounders	Provides temperature sounding through cloud up to 20km in altitude	Waveband: 4 channels: 50.3 to 57.95 GHz Spatial resolution: 109.3 km Swath width: 2348 km Accuracy:
MSU-E Multispectral high resolution electronic scanner ROSHYDROMET	METEOR-3M N1	Operational	Imaging multi-spectral radiometers (vis/IR)	Multispectral scanner images of land surface and ice cover	Waveband: VIS: 0.5-0.6, 0.6-0.7µm, NIR: 0.8-0.9µm Spatial resolution: 35-45m Swath width: 45km for one scanner, 80km for two scanners (pointable ±30 deg from nadir) Accuracy:

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
MSU-EU Multi-Spectral Radiometer with High Resolution NSAU	SICH-1M	Being developed	High resolution optical imagers	Multispectral scanner images of land surface	Waveband: VIS: 0.5-0.6, 0.6-0.7 μ m, NIR: 0.8-0.9 μ m Spatial resolution: Visible: 24x34m Swath width: 48km or 105km; pointable \pm 30° from nadir Accuracy:
MSU-GS Multispectral scanning imager-radiometer ROSHYDROMET	Elektro-L	TBD	Imaging multi-spectral radiometers (vis/IR)	Measurements of cloud cover, cloud top height, precipitation, cloud motion, vegetation, radiation fluxes, convection, air mass analysis, cirrus cloud discrimination, tropopause monitoring, stability monitoring, total ozone and sea surface temperature	Waveband: VIS: 0.5-0.65, 0.65-0.8 μ m, NIR: 0.9 μ m, SWIR: 1.5 μ m, MWIR: 3.5-4.01 μ m, TIR: 5.7-7.0, 8-8.7, 9.7, 10.2-11.2, 11.2-12.5 μ m Spatial resolution: 1km (at SSP) for visible and 4 km for IR channels Swath width: Full Earth disk Accuracy:
MSU-M Multi-Spectral Low Resolution Scanning System NSAU	SICH-1M	Prototype	Imaging multi-spectral radiometers (vis/IR)	Provide images of ocean surface and ice sheets	Waveband: VIS: 0.5-0.6, 0.6-0.7 μ m, NIR: 0.7-0.8, 0.8-1.1 μ m Spatial resolution: 1.7km x 1.8km Swath width: 1930km Accuracy:
MSU-MR Images of clouds, snow, ice and land cover ROSHYDROMET	METEOR-3M N2, Meteor-M No1, Meteor-M No2	TBD	Imaging multi-spectral radiometers (vis/IR)	Images of clouds, snow, ice and land cover	Waveband: Visible: 0.5-0.7 μ m, NIR: 0.7-1.1 μ m, SWIR: 1.6-1.8 μ m, MWIR: 3.5-4.1 μ m, TIR: 10.5-11.5 μ m, 11.5-12.5 μ m Spatial resolution: 1km Swath width: 3000km Accuracy: VIS: 0.5%, IR: 0.1K
MSU-SM Multi-Spectral Medium Resolution Scanning System ROSHYDROMET	METEOR-3M N1	TBD	Imaging multi-spectral radiometers (vis/IR)	Images of clouds, snow, ice and land cover	Waveband: VIS: 0.5-0.7 μ m, NIR: 0.7-1.1 μ m Spatial resolution: 225m Swath width: 2250km Accuracy:
MTSAT Comms Communications package for MTSAT JMA (JAXA)	MTSAT-1R, MTSAT-2	Prototype	Communications		Data communication only
MTVZA Scanning microwave radiometer ROSHYDROMET	METEOR-3M N1, METEOR-3M N2, Meteor-M No1, Meteor-M No2	Prototype	Atmospheric temperature and humidity sounders	Provision of atmospheric temperature and humidity profiles	Waveband: Microwave: 18.7-183 GHz, 52-55 GHz, 19 channels Spatial resolution: 12x22km to 75x136km Swath width: 2200km Accuracy:
MTVZA-OK Scanning microwave radiometer ROSHYDROMET	Kanopus-Vulkan, SICH-1M	Approved	Atmospheric temperature and humidity sounders	Multi-Spectral Scanner Images of Earth Surface	Waveband: MW: 6.9, 10.6, 18.7, 23.8, 31.5, 36.7, 42, 48, 52.3-57.0, 89, 183.32 GHz, VIS: 0.37-0.45, 0.45-0.51, 0.58-0.68, 0.68-0.78 μ m, MWIR: 3.55-3.93 μ m Spatial resolution: MW: 12-260km, VIS: 0.96km, MWIR: 1.1km Swath width: MW: 2000km, VIS: 1280km, MWIR: 1850km Accuracy:

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
MUX Multispectral CCD Camera CAST (INPE)	CBERS-3, CBERS-4	Being developed	Imaging multi-spectral radiometers (vis/IR)	Earth resources, environmental monitoring, land use	Waveband: Spatial resolution: 20m Swath width: Accuracy:
MVIRI METEOSAT Visible and Infra-Red Imager EUMETSAT (ESA)	METEOSAT-5, METEOSAT-6, METEOSAT-7	Operational	Imaging multi-spectral radiometers (vis/IR)	Measures cloud cover, motion, height, upper tropospheric humidity and sea surface temperature	Waveband: VIS-NIR: 0.5-0.9µm, TIR: 5.7-7.1µm (water vapour), 10.5-12.5µm Spatial resolution: Visible: 2.5km, Water vapour: 5km (after processing), TIR: 5 km Swath width: Full Earth disk in all three channels, every 30 minutes Accuracy: Cloud top height: 0.5km, Cloud top/ sea surface temperature: 0.7K, Cloud cover 15%
MWHS MicroWave Humidity Sounder NRSCC (CAST)	FY-3C, FY-3D, FY-3E, FY-3F, FY-3G	Approved	Atmospheric temperature and humidity sounders	Meteorological applications	Waveband: Microwave: 150-183GHz (5channels) Spatial resolution: 15km Swath width: ±48° Accuracy:
MWR (BNSC) Microwave Radiometer BNSC	Envisat, ERS-2	Operational	Imaging multi-spectral radiometers (passive microwave) & Atmospheric temperature and humidity sounders	To provide multispectral analysis of hydrological, oceanographic, land use and meteorological parameters. Global imager & SST. Ocean colour	Waveband: Microwave: 23.8 and 36.5GHz Spatial resolution: 20km Swath width: 20km Accuracy: Temperature: 2.6K
MWR (CONAE) Microwave radiometer CONAE	SAC-D/ Aquarius	Approved	Imaging multi-spectral radiometers (passive microwave)	The Aquarius mission will measure global sea surface salinity with unprecedented resolution. The instruments include a set of three radiometers that are sensitive to salinity (1.413 GHz; L-band). The scatterometer corrects for the ocean's surface roughness	Waveband: Ka Band (23.8 and 36.56 GHz) Spatial resolution: 400km Swath width: 300km Accuracy: 5K
MWRI MicroWave Radiation Imager NRSCC (CAST)	FY-3A, FY-3B, FY-3C, FY-3D, FY-3E, FY-3F, FY-3G	Approved	Imaging multi-spectral radiometers (passive microwave)	Meteorological applications	Waveband: 10.65-89GHz (10channels) Spatial resolution: 15-80km Swath width: 1400km Accuracy:
MWTS MicroWave Temperature Sounder NRSCC (CAST)	FY-3A, FY-3B	Approved	Atmospheric temperature and humidity sounders	Meteorological applications	Waveband: Microwave: 50-57GHz (4channels) Spatial resolution: 50km Swath width: ±48° Accuracy:

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
NIRST New Infrared Sensor Technology CONAE	SAC-D/ Aquarius	Approved	Imaging multi-spectral radiometers (vis/IR)	Fire area, Fire Temperature, Volcanic ash	Waveband: 3.5-4.5µm, 10.5-11.5µ, 11.5-12.5µm Spatial resolution: 150m Swath width: Normal mode: 75km, Accessible swath width: 700km Accuracy:
NISTAR NIST Advanced Radiometer NASA	DSCOVR	Approved	Earth radiation budget radiometer	Measures radiance output from the sunlit Earth over a broad spectrum (UV and VIS reflected and IR emitted) to detect energy balance changes in support of climate studies	Waveband: UV-FIR: 0.2-100µm, 0.2-4µm, 0.7-4µm, 0.3-1µm Spatial resolution: Swath width: Full Earth disk Accuracy: Total Earth reflected and emitted power to within 0.1%
NOAA Comms Communications package for NOAA NOAA	NOAA-12, NOAA-14, NOAA-15, NOAA-16, NOAA-17, NOAA-N, NOAA-N'	Prototype	Communications		Data communication only.
NVK Low-frequency wave complex ROSKOSMOS	Kanopus-Vulkan, Vulkan-Kompas-2		Other	Geomagnetic applications related to volcanoes and earthquakes	Waveband: 1Hz - 25kHz Spatial resolution: Swath width: Accuracy:
OBA Observador Brasileiro da Amazonia INPE	SSR-1, SSR-2	Approved	Imaging multi-spectral radiometers (vis/IR)	Used for fire extent detection and temperature measurement, coastal and vegetation monitoring, land cover and land use mapping	Waveband: VIS: 0.45-0.50µm, 0.52-0.57µm, 0.63-0.69µm, NIR: 0.76-0.90µm, MWIR: 3.4-4.2µm Spatial resolution: VIS-NIR: 100m, MIR: 300m Swath width: 2200km (equatorial belt from latitude 5N to 15S) Accuracy:
OCM Ocean Colour Monitor ISRO	IRS-P4, OCEANSAT-2	Operational	Ocean colour instruments	Ocean colour information, coastal zone monitoring, land resources monitoring	Waveband: VIS-NIR: 0.40-0.88µm (8 channels) Spatial resolution: 236m x 360m Swath width: 1440km Accuracy:
OCO Orbiting Carbon Observatory NASA	OCO		Atmospheric chemistry	Precise global maps of carbon dioxide (CO2) in the Earth's atmosphere. Scientists will analyse OCO data to improve our understanding of the natural processes and human activities that regulate the distribution of CO2 in the atmosphere	The Orbiting Carbon Observatory (OCO) is a single instrument consisting of three high resolution grating spectrometers that flies on a dedicated spacecraft. Each spectrometer detects the intensity of radiation within a very specific narrow band at Near Infrared (NIR) wavelengths.
OEA Optical-electronic equipment ROSKOSMOS	Baumanets		Imaging multi-spectral radiometers (vis/IR)		Waveband: 0.5-0.9µm Spatial resolution: 50m Swath width: 100km Accuracy:

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
OLS Operational Linescan System NOAA (US DoD)	DMSP F-13, DMSP F-15, DMSP F-16, DMSP F-17, DMSP F-18, DMSP F-19	Operational	Imaging multi-spectral radiometers (vis/IR)	Day and night cloud cover imagery	Waveband: VIS-NIR: 0.4-1.1µm, TIR: 10.0-13.4µm, and 0.47-0.95µm Spatial resolution: 0.56km (fine), 5.4km (stereo products) Swath width: 3000km Accuracy:
OMI Ozone Measuring Instrument NASA (NIVR (Netherland))	Aura	Operational	Atmospheric chemistry	Mapping of ozone columns, key air quality components (NO ₂ , SO ₂ , BrO, OCIO and aerosols), measurements of cloud pressure and coverage, global distribution and trends in UV-B radiation	Waveband: UV: 270-314nm & 306-380nm, VIS: 350-500nm Spatial resolution: 13km x 24km or 36km x 48km depending on the product. Also has zoom modes (13km x 13km) for example for urban pollution detection Swath width: 2600km Accuracy:
OMPS Ozone Mapping and Profiler Suite NOAA	NPOESS-2, NPOESS-5, NPP	Being developed	Atmospheric chemistry	Measures total amount of ozone in the atmosphere and the ozone concentration variation with altitude	Waveband: Nadir Mapper: UV 0.3-0.38µm, Nadir profiler: UV 0.25-0.31µm, Limb soundings: UV-TIR 0.29-10µm Spatial resolution: Mapper: 50km, Profiler: 250km, Limb: 1km vertical Swath width: Mapper: 2800km, Profiler: 250km, Limb: 3 vertical slits along track +/- 250km Accuracy: Total Ozone: 15 Dobson units. Profile Ozone: 10% between 15 and 60km, 20% between Tropopause and 15km
OP Ozone Profiler NRSCC (CAST)	FY-3A, FY-3B, FY-3C, FY-3D, FY-3E, FY-3F, FY-3G	Being developed	Atmospheric chemistry	Ozone chemistry measurements	Waveband: UV Spatial resolution: 200km Swath width: Accuracy:
OSIRIS Optical Spectrograph and Infra-Red Imaging System CSA	Odin	Prototype	Atmospheric chemistry	Detects aerosol layers and abundance of species such as O ₃ , NO ₂ , OCIO, and NO. Consists of spectrograph and IR imager. Measures temperature for altitudes above 30km	Waveband: Spectrograph: UV-NIR: 0.28-0.80µm, IR Imager, NIR: 1.26µm, 1.27µm, 1.52µm Spatial resolution: Spectrograph 1km at limb, Imager 1km in vertical Swath width: N/A, but measures in the altitude range 5-100 km Accuracy: Depends on species
OSMI Ocean Scanning Multispectral Imager KARI	KOMPSAT-1	Operational	Imaging multi-spectral radiometers (vis/IR) & Ocean colour instruments	Ocean color measurements for biological oceanography	Waveband: VIS: 0.412µm, 0.443µm, 0.490µm, 0.555µm, NIR: 0.765µm, 0.865µm Spatial resolution: 1km Swath width: 800km Accuracy:
PALSAR Phased Array type L-band Synthetic Aperture Radar JAXA (METI (Japan))	ALOS	Being developed	Imaging microwave radars	High resolution microwave imaging of land and ice for use in environmental monitoring, agriculture and forestry, disaster monitoring, Earth resource management and interferometry	Waveband: Microwave: L-Band 1270MHz Spatial resolution: Hi-res: 7-44m or 14-88m (depends on polarisation and looks), ScanSAR mode: <100m, Polarimetry 24-88m Swath width: High resolution mode: 70km, Scan SAR mode: 250-360km, Polarimetry: 30km Accuracy: Radiometric: ±1dB

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
Pamela ROSKOSMOS	Resurs DK		Space Environment	Measures the energy spectrum of antiprotons and positrons in the cosmic radiation. Will allow significant comparisons between competing models of antimatter production in our galaxy	PAMELA consists of a time-of-flight / trigger system, transition radiation detector, a magnetic spectrometer with silicon tracking, an anticoincidence system, a silicon-tungsten imaging electromagnetic calorimeter, a shower-tail catcher and a neutron counter.
PAN Panchromatic and multispectral imager CAST	CBERS-3, CBERS-4	Being developed	High resolution optical imagers	Provides measurements of cloud type and extent and land surface reflectance, and used for global land surface applications	Waveband: VIS: 0.52-0.59µm, 0.63-0.69µm, NIR: 0.77-0.89µm, PAN: 0.51-0.85µm Spatial resolution: 5m panchromatic and 10m multispectral Swath width: 60 km Accuracy:
PAN (Cartosat-1) Panchromatic sensor ISRO	CARTOSAT-1	Operational	High resolution optical imagers	High resolution stereo images for study of topography, urban areas, development of DTM, run-off models etc. Urban sprawl, forest cover/timber volume, land use change	Waveband: Panchromatic VIS: 0.5-0.75µm Spatial resolution: 2.5m Swath width: Accuracy:
PAN (GISTDA) Panchromatic imager GISTDA	THEOS	Approved	High resolution optical imagers	Land surface applications	Waveband: 0.45-0.90µm Spatial resolution: 2m Swath width: 22km Accuracy:
PEM Particle Environment Monitor NASA	UARS	Operational	Magnetic field	PEM measures UV and charged particle energy inputs: determines type, amount, energy and distribution of charged particles injected into Earth's thermosphere, mesosphere and stratosphere	There are four PEM 'instruments', AXIS, HEPS, MEPS, and VMAG. Their purpose is to provide quantitative measurements of both local and global energy inputs into the Earth's atmosphere by charged particles and Joule dissipation – via measurements of x-rays, charged particles, and the magnetic field.
Plasma-Mag NASA	DSCOVR	Proposed	Magnetic field & Space environment	Sun-viewing instrument to measure the solar wind and magnetic field parameters. Also serves as early-warning for solar-event storms that could damage satellites and equipment on Earth	Plasma-Mag contains a triaxial fluxgate magnetometer that will investigate solar- wind magnetic fields with a sensitivity level of better than 0.1nT.
Pleiades HR High Resolution Optical Imaging CNES	Pleiades 1, Pleiades 2		High resolution optical imagers	Cartography, land use, risk, agriculture and forestry, civil planning and mapping, digital terrain models, defense	Waveband: 4 bands: Near IR, Red, Green, Blue Spatial resolution: <1m Swath width: in vertical: 20km Accuracy:
POLDER-P POLarization and Directionality of the Earth's Reflectances (PARASOL version) CNES	PARASOL	Approved	Multiple direction/polarisation radiometers	Measures polarization, and directional and spectral characteristics of the solar light reflected by aerosols, clouds, oceans and land surfaces	Waveband: VIS-NIR: 0.490, 0.670 and 0.865µm at 3 polarisations, and 0.49, 0.565, 0.763, 0.765, 0.91µm, and 1.02µm with no polarisation Spatial resolution: 5.5km x 5.5km Swath width: 1600km Accuracy: Radiation budget, land surface, Reflectance: 2%

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
POSEIDON-1 (SSALT-1) Positioning Ocean Solid Earth Ice Dynamics Orbiting Navigator (Single frequency solid state radar altimeter) CNES	Topex-Poseidon	Operational	Radar altimeters	Nadir viewing sounding radar for provision of real-time high precision sea surface topography, ocean circulation and wave height data	Waveband: Microwave: Ku-band (13.575GHz) Spatial resolution: Swath width: Accuracy:
POSEIDON-2 (SSALT-2) Positioning Ocean Solid Earth Ice Dynamics Orbiting Navigator (Single frequency solid state radar altimeter) CNES	Jason	Operational	Radar altimeters	Nadir viewing sounding radar for provision of real-time high precision sea surface topography, ocean circulation and wave height data	Waveband: Microwave: Ku-band (13.575GHz), C-band (5.3GHz) Spatial resolution: Basic measurement: 1/sec (6km along track), Raw measurement: 10/sec (600m along track) Swath width: On baseline TOPEX/POSEIDON orbit (10 day cycle): 300km between tracks at equator Accuracy: Sea level: 3.9cm, Significant waveheight: 0.5m, Horizontal sea surface wind speed: 2m/s
POSEIDON-3 Positioning Ocean Solid Earth Ice Dynamics Orbiting Navigator (Single frequency solid state radar altimeter) CNES	Jason-2 (also known as OSTM)	Operational	Radar altimeters	Nadir viewing sounding radar for provision of real-time high precision sea surface topography, ocean circulation and wave height data	Waveband: Microwave: Ku-band (13.575GHz), C-band (5.3GHz) Spatial resolution: Basic measurement: 1/sec (6km along track), Raw measurement: 10/sec (600m along track) Swath width: On baseline TOPEX/POSEIDON orbit (10 day cycle): 300km between tracks at equator Accuracy: Sea level: 3.9cm, Significant waveheight: 0.5m, Horizontal sea surface wind speed: 2m/s
PREMOS PRECision Monitoring of Solar variability CNES	PICARD	TBD	Earth radiation budget radiometer	Solar UV and visible flux in selected wavelength bands	Waveband: UV: 230nm, 311nm, 402nm; VIS: 548 nm Spatial resolution: Swath width: Accuracy:
PRISM Panchromatic Remote-sensing Instrument for Stereo Mapping JAXA	ALOS	Being developed	High resolution optical imagers	High resolution panchromatic stereo imager for land applications which include cartography, digital terrain models, civil planning, agriculture and forestry	Waveband: VIS-NIR: 0.52-0.77µm (panchromatic) Spatial resolution: 2.5m Swath width: 35km (triplet stereo observations), 70km (nadir observations) Accuracy:
PSA Panchromatic film-making equipment ROSKOSMOS	Monitor-E		Imaging multi-spectral radiometers (vis/IR)	High resolution thematic mapping, agriculture and forestry	Waveband: VIS-NIR: 0.51-0.85µm Spatial resolution: 8m Swath width: 90/730km Accuracy:
PSS Panchromatic film-making system ROSKOSMOS	BeKA		Imaging multi-spectral radiometers (vis/IR)	High resolution mapping, environmental, and resource survey applications	Waveband: VIS-NIR: 0.52-0.85µm Spatial resolution: 3.2m Swath width: 23km Accuracy:

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
RA Radar Altimeter ESA	ERS-2	Operational	Radar altimeters	Measures wind speed, significant wave height, sea surface elevation, ice profile, land and ice topography, and sea ice boundaries	Waveband: Microwave: Ku-band: 13.8GHz Spatial resolution: Footprint is 16-20km Swath width: Accuracy: Wave height: 0.5m or 10% (whichever is smaller) Sea surface elevation: better than 10cm
RA-2 Radar Altimeter - 2 ESA	ERS-2	Operational	Radar altimeters	Measures wind speed, significant wave height, sea surface elevation, ice profile, land and ice topography, and sea ice boundaries	Waveband: Microwave: 13.575Ghz (Ku-Band) & 3.2GHz (S-Band) Spatial resolution: Swath width: Accuracy: Altitude: better than 4.5cm, Wave height: better than 5% or 0.25m
RADARSAT DTT X band (downlink of payload) CSA	RADARSAT-1	Operational	Communications		Data communication only.
RADARSAT TTC S band (Tracking, Telemetry and Command) CSA	RADARSAT-1	Operational	Communications		Data communication only.
Radiomet ROSKOSMOS	Meteor-M No1, Meteor-M No2		Atmospheric temperature and humidity sounders	Atmospheric sounding for weather forecasting	Waveband: 3cm, 32cm Spatial resolution: Swath width: Accuracy:
RBE ROSKOSMOS	Kanopus-Vulkan, Vulkan-Kompas-2		Magnetic field & Space environment	Geomagnetic applications related to volcanoes and earthquakes	Waveband: 150MHz, 400MHz Spatial resolution: Swath width: Accuracy:
RCHA ROSKOSMOS	Kanopus-Vulkan, Vulkan-Kompas-2		Other	Geomagnetic applications related to volcanoes and earthquakes	Waveband: 50kHz -15MHz Spatial resolution: Swath width: Accuracy:
RDSA ROSKOSMOS	Monitor-E		Imaging multi-spectral radiometers (vis/IR)	Thematic mapping, agriculture and forestry	Waveband: VIS-NIR: 0.54-0.59, 0.63-0.68, 0.79-0.9µm Spatial resolution: 20/40m Swath width: 160/890km Accuracy:
RIMS-M Mass-spectrometer ROSHYDROMET	Meteor-M No1, Meteor-M No2	TBD	Other	Ion composition in upper atmosphere	Waveband: 1-4 a.e.m., 5-20 a.e.m Spatial resolution: Swath width: Accuracy:
RLSBO Side looking microwave radar ROSKOSMOS (NIIRI)	SICH-1M	Prototype	Imaging microwave radars	Provides images of ocean surface and ice sheets	Waveband: Microwave: 0.8cm Spatial resolution: 25x25km Swath width: 550km Accuracy: 3K temperature sensitivity"

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
RM-08 Scanning Microwave Radiometer ROSHYDROMET (NSAU)	SICH-1M	Prototype	Imaging multi-spectral radiometers (passive microwave)	Passive microwave images of ocean surface and ice sheets	Waveband: Microwave: 0.8cm Spatial resolution: 25x25km Swath width: 550km Accuracy: 3K temperature sensitivity
ROSA formerly called Lagrange ASI	SAC-D/ Aquarius	TBD	Precision orbit & Atmospheric temperature and humidity sounders	GPS Receiver. Including specialized version equipped with limb sounding antenna and dedicated signal tracking capability for metereological, climate and space weather applications	Uses observations of GPS satellite occultations in order to supply information about the atmosphere temperature, pressure and water vapour content.
RRA Retroreflector Array CNES	Diademe 1&2		Precision orbit	Satellite laser ranging for geodynamic measurements	The RRA consist of 2 flattened truncated cones with 77 cube corners per cone for a total of 144 cube corners.
S&R (GOES) Search and Rescue NOAA	GOES-9, GOES-10, GOES-11, GOES-12, GOES-N, GOES-O, GOES-P, GOES-R	Prototype	Other	Satellite and ground based system to detect and locate aviators, mariners, and land-based users in distress	Communications payload.
S&R (NOAA) Search and Rescue Satellite Aided Tracking NOAA	METOP-1, METOP-2, NOAA-14, NOAA-15, NOAA-16, NOAA-17, NOAA-N, NOAA-N'	Operational	Other	Satellite and ground based system to detect and locate aviators, mariners, and land-based users in distress	Communications payload.
SABER Sounding of the Atmosphere using Broadband Emission Radiometry NASA	TIMED	Operational	Atmospheric temperature and humidity sounders & Atmospheric chemistry instruments	SABER provides measurements of the mesosphere and lower thermosphere globally to support investigations into the fundamental processes governing the energetics, chemistry, dynamics, and transport of the atmospheric region extending from 60 km to 180 km	Waveband: NIR-FIR: 1.27µm - 17µm (10 channels) Spatial resolution: 2km vertical resolution Swath width: Accuracy:
SAGE II Stratospheric Aerosol and Gas Experiment-II NASA	ERBS	Operational	Atmospheric chemistry	Profiles of ozone, aerosols, NO ₂ , and water vapor. Data suitable for atmospheric chemistry, ozone trend, and climate studies	Waveband: 7 channels, UV-NIR: 0.385 - 1.02 µm Spatial resolution: 0.75 km Swath width: N/A Accuracy: O ₃ - 4%, Aerosol – 1%, NO ₂ – 15%, H ₂ O- 20% in lower stratosphere

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
SAGE III Stratospheric Aerosol and Gas Experiment-III NASA (ROSKOSMOS)	METEOR-3M N1	Operational	Atmospheric chemistry	Profiles of ozone, water vapor, NO ₂ , NO ₃ , OClO, aerosols, temperature and pressure for atmospheric chemistry and climate studies using a 809 element CCD-based grating spectrometer and discrete photodiode channel at 1550 nm	Waveband: UV-NIR: 0.29-1.55µm Spatial resolution: 1-2km vertical resolution Swath width: N/A Accuracy: Temperature: 2K, Ozone: 6%, Humidity: 3-10%, Aerosol and trace gases: 5-10%
SAPHIR CNES (ISRO)	MEGHA-TROPIQUES	Approved	Atmospheric temperature and humidity sounders	Cross-track sounder with the objective of measuring water vapour profiles in the troposphere in six layers from 2-12km altitudes	Waveband: Microwave: 183.3GHz (6 channels) Spatial resolution: 10km Swath width: Accuracy:
SAR (RADARSAT) Synthetic Aperture Radar (CSA) C band CSA	RADARSAT-1	Operational	Imaging microwave radars	Provides all-weather images of ocean, ice and land surfaces. Used for monitoring of coastal zones, polar ice, sea ice, sea state, geological features, vegetation and land surface processes	Waveband: Microwave: C band: 5.3GHz, HH polarisation Spatial resolution: Standard: 25 x28 m (4 looks), Wide beam (1/2):48-30 x 28m/ 32-25 x 28m (4 looks), Fine resolution: 11-9 x 9m (1 look), ScanSAR (N/W): 50 x 50m/ 100 x 100m (2-4/4-8 looks), Extended (H/L): 22-19x28m/ 63-28 x 28m (4 looks) Swath width: Standard: 100km Wide: 150km Fine: 45km ScanSAR Narrow: 300km ScanSAR Wide: 500km Extended (H): 75km Extended (L): 170kmWide: 150km Fine: 45km ScanSAR Narrow: 300km ScanSAR Wide: 500km Extended (H): 75km Extended (L): 170km Accuracy: Geometric distortion: < 40m, Radiometric: 1.0dB
SAR (RADARSAT-2) Synthetic Aperture Radar (CSA) C band CSA	RADARSAT-2	Being developed	Imaging microwave radars	Provides all-weather images of ocean, ice and land surfaces. Used for monitoring of coastal zones, polar ice, sea ice, sea state, geological features, vegetation and land surface processes	Waveband: Microwave: C band 5.405 GHz: HH, VV, HV, VH polarisation - includes fully polarimetric imaging modes, and left- and right-looking capability Spatial resolution: Standard: 25 x28 m (4 looks), Wide beam (1/2):48-30 x 28m/ 32-25 x 28m (4 looks), Fine resolution: 11-9 x 9m (1 look), ScanSAR (N/W): 50 x 50m/ 100 x 100m (2-4/4-8 looks), Extended (H/L): 22-19x28m/ 63-28 x 28m (4 looks), Ultrafine: 3m Swath width: Standard: 100km (20-49deg), Wide beam (1/2): 165km/ 150km (20-31/ 31-39deg), Fine resolution: 45km (37-48deg), ScanSAR (W): 510km (20-49deg), Extended (H/L): 75km/170km (50-60/ 10-23deg), Ultrafine: 10-20km Accuracy: Geometric distortion: < 40m, Radiometric: 1.0dB

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
SAR (RISAT) ISRO	RISAT-1	Proposed	Imaging microwave radars	Radar backscatter measurements of land, water and ocean surfaces for applications in soil moisture, crop applications (under cloud cover), terrain mapping etc	Waveband: C-Band (5.350 Ghz) Spatial resolution: 3-6m (FRS-1), 9-12m (FRS-2), 25/50m (MRS/CRS) Swath width: 10km (HRS), 30km (FRS-1/FRS-2), 120/240km (MRS/CRS) Accuracy:
SAR (ROSHYDROMET) Synthetic Aperture Radar ROSHYDROMET (ROSKOSMOS)	METEOR-3M N2	Operational	Imaging microwave radars	Provides all-weather images of ocean, ice and land surfaces. Used for monitoring of coastal zones, polar ice, sea ice, sea state, geological features, vegetation and land surface processes	No data available.
SAR (SAOCOM) Synthetic Aperture Radar (CONAE) CONAE	SAOCOM 1A, SAOCOM 1B, SAOCOM-2B (1), SAOCOM-2B (2)	Being developed	Imaging microwave radars	Land and Ocean Emergencies	Waveband: Microwave: L-Band SAR 1.275 GHz Spatial resolution: 10x10m - 100x100m Swath width: Accuracy: 70m
SAR 2000 Multi-Mode Synthetic Aperture Radar ASI	COSMO - SkyMed	TBD	Imaging microwave radars	All weather images of ocean, land and ice for monitoring of land surface processes, ice, environmental monitoring, risk management, environmental resources, maritime management, earth topographic mapping	Waveband: Microwave: X-band, with choice of 4 polarisation modes (VV, HH, VV/HH, HV/HH). Spatial resolution: Single polarisation mode; Stripmap: few metres, ScanSAR: from few tens to several tens of metres; Frame: resolution: order of the m Swath width: Two polarisation mode-PING PONG: few metres Single polarisation modes: Stripmap (tens of km), ScanSAR (hundreds of km), Frame (spot width several tens km ²) Accuracy: Two polarisation modes: PING PONG (several tens of km)
SARSAT Search and Rescue Satellite Aided Tracking NOAA	NPOESS-1, NPOESS-2, NPOESS-3, NPOESS-4, NPOESS-5, NPOESS-6	TBD	Data collection	Satellite and ground based system to detect and locate aviators, mariners, and land-based users in distress	Waveband: UHF 406.0 MHZ
S-band SAR S-band Synthetic Aperture Radar CAST	HJ-1C	Being developed	Imaging microwave radars	All weather microwave 3-D images	Waveband: Spatial resolution: 20m (4looks) Swath width: 100km Accuracy: 3dB
SBUV/2 Solar Backscatterer Ultra-Violet Instrument/2 NOAA	NOAA-14, NOAA-15, NOAA-16, NOAA-17, NOAA-N, NOAA-N'	Operational	Atmospheric chemistry	Provides data on trace gases including vertical profile ozone, and solar irradiance and total ozone concentration measurements	Waveband: UV: 0.16-0.4µm (12 channels) Spatial resolution: 170km Swath width: Accuracy: Absolute accuracy: 1%

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
ScaRaB Scanner for Earth's Radiation Budget CNES (NPO "PLANETA")	MEGHA-TROPIQUES	Operational	Earth radiation budget radiometer	Measures top-of-atmosphere shortwave radiation (0.2-4.0µm) and total radiation (0.2-50µm). Two additional narrow-band channels (0.5-0.7µm and 11-12µm) allow cloud detection and scene identification	Waveband: VIS window channel: 0.5-0.7µm, Solar channel UV-SWIR: 0.2-4µm, Total channel UV-FIR: 0.2-50µm, Thermal window channel: 10.5-12.5µm Spatial resolution: 60km Swath width: 2200km Accuracy: Absolute: ± 2.5W/m ² /sr, Relative: ± 0.7W/m ² /sr
Scatterometer (ISRO) ISRO	OCEANSAT-2	TBD	Scatterometers	Mainly for wind measurements	Under definition.
Scatterometer (JAXA) Scatterometer JAXA	GCOM-W	TBD	Scatterometers	Ocean surface wind measurements	Under definition.
SCIAMACHY Scanning Imaging Absorption Spectrometer for Atmospheric Cartography ESA	Envisat	Operational	Atmospheric chemistry	Measures middle atmosphere temperature. Provides tropospheric and stratospheric profiles of O ₂ , O ₃ , O ₄ , CO, N ₂ O, NO ₂ , CO ₂ , CH ₄ , H ₂ O, and tropospheric and stratospheric profiles of aerosols and cloud altitude	Waveband: UV-SWIR: 240-314, 309-3405, 394-620, 604-805, 785-1050, 1000-1750, 1940-2040 and 2265-2380nm Spatial resolution: Limb vertical 3 x 132km, Nadir horizontal 32 x 215km Swath width: Limb and nadir mode: 1000km (max) Accuracy: Radiometric: <4%
SeaWinds NASA (JAXA)	QuikSCAT	Operational	Scatterometers	Measurement of surface wind speed and direction; lost power on-orbit in October 2003	Waveband: Microwave: 13.402 GHz Spatial resolution: 25 km Swath width: 1600 km Accuracy: Speed: 2-3.5 m/s Direction: 20 deg
SEM (GOES) Space Environment Monitor NOAA	GOES-9, GOES-10, GOES-11, GOES-12, GOES-N, GOES-O, GOES-P, GOES-R	Operational	Space Environment	Used for equipment failure analysis, solar flux measurement, solar storm warning, and magnetic and electric field measurement at satellite	The SEM System consists of a three-axis vector magnetometer, an Energetic Particle Sensor (EPS) and associated High-Energy Proton and Alpha Detector (HEPAD), and an X-Ray Sensor (XRS). This set of instruments is designed to provide real-time measurement of solar activity, the charged particle environment, and the Earth's magnetic field at synchronous orbit.
SEM (POES) Space Environment Monitor NOAA	METOP-2, NOAA-12, NOAA-14, NOAA-15, NOAA-16, NOAA-17, NOAA-N, NOAA-N'	Operational	Space Environment	Used for equipment failure analysis, solar flux measurement, solar storm warning, and magnetic and electric field measurement at satellite	The SEM consists of two separate sensor units: the Total Energy Detector (TED) and the Medium Energy Proton and Electron Detector (MEPED). The TED senses and quantifies the intensity in the sequentially selected energy bands. The particles of interest have energies ranging from 0.05 keV to 20 keV. The MEPED senses protons, electrons, and ions with energies from 30 keV to levels exceeding 6.9 MeV.
SESS Space Environmental Sensor Suite NOAA	NPOESS-2, NPOESS-3, NPOESS-4, NPOESS-5, NPOESS-6	Being developed	Space environment & Magnetic field	Measures characteristics of auroral boundary, auroral energy deposition, auroral imagery, electric field, electron density profile, geomagnetic field, in-situ plasma fluctuations, ionosphere scintillation. Data aids future space system design	Multiple sensors to measure auroral characteristics, geomagnetic field, electron density profile, and total electron content, 10-km vertical resolution from 60 km to 3000 km.

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
SEVIRI Spinning Enhanced Visible and Infra-Red Imager EUMETSAT (ESA)	METEOSAT-8, METEOSAT-9, METEOSAT-10, METEOSAT-11	Prototype	Imaging multi-spectral radiometers (vis/IR)	Measurements of cloud cover, cloud top height, precipitation, cloud motion, vegetation, radiation fluxes, convection, air mass analysis, cirrus cloud discrimination, tropopause monitoring, stability monitoring, total ozone and sea surface temperature	Waveband: VIS: 0.56-0.71µm, 0.5-0.9µm (broadband), NIR: 0.74-0.88µm, SWIR 1.5-1.78µm, SWIR: 3.48-4.36µm, TIR: 5.35-7.15µm, 6.85-7.85µm, 8.3-9.1µm, 9.38-9.94µm, 9.8-11.8µm, 11-13µm, 12.4-14.46µm Spatial resolution: 1km (at SSP) for one broadband visible channel HRV, 5km (at SSP) for all other channels Swath width: Full Earth disk Accuracy: Cloud cover: 10%, Cloud top height: 1km, Cloud top temperature: 1K, Cloud type: 8 classes, Surface temperature: 0.7-2.0K, Specific humidity profile: 10%, Wind profile (horizontal component): 2-10m/s, Long wave Earth surface radiation: 5W/m2
SFM-2 UV limb spectrometer ROSHYDROMET	METEOR-3M N1	Operational	Atmospheric chemistry	Global ozone monitoring	Waveband: UV-VIS: 0.2-0.51µm (4 channels) Spatial resolution: Swath width: Accuracy:
SGPS Solar and Galactic Proton Sensor NOAA	GOES-R	Approved	Space Environment	Studies natural radiation hazard to humans at high altitudes and in space, as well as risk assessment and warning of episodes of surface charging, deep dielectric charging, and single event upset of satellite systems	The GOES-R Project is in the formulation phase. The satellite will comprise improved spacecraft and instrument technologies, which will result in more timely and accurate weather forecasts, and improve support for the detection and observations of meteorological phenomena that directly affect public safety, protection of property, and ultimately, economic health and development.
SIM Spectral Irradiance Monitor NASA	SORCE	Operational	Earth radiation budget radiometer	Measures solar spectral irradiance in the 200-2000nm range	Waveband: UV-SWIR: 200-2000nm Spatial resolution: Swath width: Accuracy:
SIRAL SAR Interferometer Radar Altimeter ESA	CRYOSAT	Being developed	Radar altimeters	Objective is to observe ice sheet interiors, the ice sheet margins, for sea ice and other topography	Waveband: Microwave: 13.575GHz (Ku-Band) Spatial resolution: Range resolution 45cm, along-track resolution 250m Swath width: Footprint 15km Accuracy: Arctic sea-ice: 1.6cm/year for 300kmx300km cells, Land ice (small scale): 3.3cm/year for 100km x 100km cells, Land ice (large scale): 0.17cm/year for Antarctica size area
SKL-M Solar ray spectrometer ROSHYDROMET	Meteor-M No1, Meteor-M No2	TBD		Proton flux density	Waveband: 2, 4, 6 and > 6 MeV, 30, 50, 100, 300 and > 300 MeV Spatial resolution: Swath width: Accuracy:

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
SMR Submillimetre Radiometer SNSB	Odin	Operational	Atmospheric chemistry instruments & Atmospheric temperature and humidity sounders	Measures global distributions of ozone and species of importance for ozone chemistry, ClO, HNO ₃ , H ₂ O, N ₂ O, (HO ₂ , H ₂ O ₂). Measures temperature in the height range 15-100km	Waveband: Microwave: 118.7GHz + 4 bands in the region 480-580GHz: Tunable measures 2-3 x 1GHz regions at a time Spatial resolution: Vertical resolution 1.5-3km, along track 600km Swath width: Altitudes of 5-100km Accuracy: 2-40% depending on species and altitude
SODAD Orbital System for an Active Detection of Debris CNES	SAC-D/ Aquarius	Approved	TBD	Space Debris	Instrument for the measurement of the properties of micrometeorites and space debris.
SODISM SOlar Diameter Imager and Surface Mapper CNES	PICARD	TBD	Earth radiation budget radiometer	Measures diameter and differential rotation of the sun - a whole Sun imager	Waveband: UV: 230nm, VIS: 548nm, Active regions: 160nm plus Lyman alpha detector Spatial resolution: Swath width: Accuracy:
SOLSTICE SOlar STellar Irradiance Comparison Experiment NASA	SORCE, UARS	Operational	Earth radiation budget radiometer	Provides data on UV and charged particle energy inputs, and on time variation of full-disk solar UV spectrum. Measures solar UV radiation (115 to 430nm) with resolution of 0.12nm. Compares solar UV output with UV radiation of stable bright blue stars	Waveband: UV: 115-180nm & 170-320nm Spatial resolution: Swath width: Accuracy: 1%
Sounder NOAA	GOES-9, GOES-10, GOES-11, GOES-12, GOES-N, GOES-O, GOES-P, GOES-R	Operational	Atmospheric temperature and humidity sounders	Provides atmospheric soundings and data on atmospheric stability and thermal gradient winds	Waveband: GOES 8-12; N,O,P: VIS-TIR: 19 channels Spatial resolution: 10km Swath width: Horizon to horizon Accuracy:
Sounder (INSAT) ISRO	INSAT-3D	TBD	Atmospheric temperature and humidity sounders	Atmospheric soundings, atmospheric stability, thermal gradient winds	Waveband: SWIR: 3.74-4.74µm, MWIR: 6.51-11.03µm, TIR: 12.02-14.71µm, VIS: 0.55-0.75µm Spatial resolution: 10x10 km Swath width: Full (Full Earth disc sounding), Program (Options provided for for Sector Scans) Accuracy:
SOVAP SOlar Variability Picard radiometer CNES	PICARD	Being developed	Earth radiation budget radiometer	Total solar irradiance measurements	Waveband: Total irradiance Spatial resolution: Swath width: Accuracy:

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
SSB/X-2 Special Sensor Gamma Ray Particle Detector NOAA (US DoD)	DMSP F-13, DMSP F-15, DMSP F-16	Operational	Space Environment	Detects the location, intensity, and spectrum of X-rays emitted from the Earth's atmosphere	Array-based system.
SSIES-2 Special Sensor Ionospheric Plasma Drift/Scintillation Meter NOAA (US DoD)	DMSP F-13, DMSP F-15, DMSP F-16	Operational	Space Environment	Measurement of the ambient electron density and temperatures, the ambient ion density, and ion temperature and molecular weight	Consists of an electron sensor (Langmuir probe) and an ion sensor mounted on a 2.5 meter boom. The ion sensor is a planar aperture, planar collector sensor oriented to face the spacecraft velocity vector at all times. In addition to the Langmuir probe and planar collector, has a plasma drift meter and a scintillation meter.
SSIES-3 Special Sensor Ionospheric Plasma Drift/Scintillation Meter NOAA (US DoD)	DMSP F-16, DMSP F-17, DMSP F-18, DMSP F-19, DMSP F-20	TBD	Space Environment	Measurement of the ambient electron density and temperatures, the ambient ion density, and ion temperature and molecular weight	Consists of an electron sensor (Langmuir probe) and an ion sensor mounted on a 2.5 meter boom. The ion sensor is a planar aperture, planar collector sensor oriented to face the spacecraft velocity vector at all times. In addition to the Langmuir probe and planar collector, has a plasma drift meter and a scintillation meter.
SPECTRA Surface Processes and Ecosystem Changes Through Response Analysis ESA	ESA Future Missions	Prototype	Imaging multi-spectral radiometers (vis/IR) & Multiple direction/polarisation radiometers	Data for study of land surface processes	Waveband: VIS-SWIR: 450-2350 nm and TIR: 10.3-12.3 micron Spatial resolution: Spatial sampling interval approx 50m, along track pointing ±30 deg Swath width: 50km Accuracy:
SSJ/4 Special Sensor Precipitating Plasma Monitor NOAA (US DoD)	DMSP F-13, DMSP F-15, DMSP F-16	Operational	Magnetic field	Measurement of transfer energy, mass, and momentum of charged particles through the magnetosphere-ionosphere in the Earth's magnetic field	Consists of four electrostatic analyzers that record electrons and ions between 30 eV and 30 KeV as they flow past the spacecraft toward the Earth. The instruments "look" toward the satellite zenith.
SSJ/5 Special Sensor Precipitating Plasma Monitor NOAA (US DoD)	DMSP F-16, DMSP F-17, DMSP F-18, DMSP F-19, DMSP F-20	TBD	Magnetic field	Measurement of transfer energy, mass, and momentum of charged particles through the magnetosphere-ionosphere in the Earth's magnetic field	Consists of four electrostatic analyzers that record electrons and ions between 30 eV and 30 KeV as they flow past the spacecraft toward the Earth. The instruments "look" toward the satellite zenith.
SSM Special Sensor Magnetometer NOAA (US DoD)	DMSP F-13, DMSP F-15, DMSP F-16, DMSP F-17, DMSP F-18, DMSP F-19, DMSP F-20	Operational	Magnetic field	Measures geomagnetic fluctuations associated with Measures geomagnetic fluctuations associated with solar geophysical phenomena. With SSIES and SSJ provides heating and electron density profiles in the ionosphere	A triaxial fluxgate magnetometer
SSM/I Special Sensor Microwave Imager NOAA (US DoD)	DMSP F-13, DMSP F-15, DMSP F-16	Operational	Imaging multi-spectral radiometers (passive microwave)	Measures atmospheric, ocean and terrain microwave brightness temperatures to provide: sea surface winds, rain rates, cloud water, precipitation, soil moisture, ice edge, ice age	Waveband: Microwave: 19.35, 22.235, 37, 85 GHz Spatial resolution: 15.7km x 13.9km to 68.9 x 44.3km (depends on frequency) Swath width: 1400km Accuracy:

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
SSM/T-1 Special Sensor Microwave Temperature Sounder NOAA (US DoD)	DMSP F-13, DMSP F-15, DMSP F-16, DMSP F-18, DMSP F-19, DMSP F-20	Operational	Atmospheric temperature and humidity sounders	Measures Earth's surface and atmospheric emission in the 50-60GHz oxygen band	Waveband: Microwave: 7 channels in the 50-60GHz range Spatial resolution: 174km diameter beam Swath width: 1500km Accuracy:
SSM/T-2 Special Sensor Microwave Water Vapor Sounder NOAA (US DoD)	DMSP F-13, DMSP F-15, DMSP F-16	Operational	Atmospheric temperature and humidity sounders	Water Vapour profiler	Waveband: Microwave: 91.6, 150, 183.31 (3 channels) (Total 5 channels) Spatial resolution: approx 48km Swath width: 1500km Accuracy:
SSMIS Special Sensor Microwave Imager Sounder NOAA (US DoD)	DMSP F-16, DMSP F-17, DMSP F-18, DMSP F-19, DMSP F-20	Operational	Atmospheric temperature and humidity sounders	Measures thermal microwave radiation. Global measurements of air temp profile, humidity profile, ocean surface winds, rain overland/ocean, ice concentration/age, ice/snow edge, water vapour/clouds over ocean, snow water content, land surface temperature	Waveband: Microwave: 19 - 183GHz (24 frequencies) Spatial resolution: Varies with frequency: 25x17km to 70x42km Swath width: 1700km Accuracy:
SSU Stratospheric Sounding Unit NOAA	NOAA-12, NOAA-14	Operational	Atmospheric temperature and humidity sounders	Provides temperature profiles in stratosphere, top-of-atmosphere radiation from 25km to 50km altitude	Waveband: 669.99, 669.63 and 669.36/cm (carbon dioxide) Spatial resolution: 147.3km at nadir Swath width: ±40 deg scan Accuracy:
SSULI Special Sensor Ultraviolet Limb Imager NOAA	DMSP F-16, DMSP F-17, DMSP F-18, DMSP F-19, DMSP F-20	TBD	Space Environment	Measures vertical profiles of the natural airglow radiation from atoms, molecules and ions in the upper atmosphere and ionosphere	SSULI makes measurements from the extreme ultraviolet (EUV) to the far ultraviolet (FUV) (80nm-170nm with 1.5 nm resolution). Uses a spectrograph fed by a mirror capable of scanning below the satellite horizon from 10-27 deg, every 90 seconds (which gives a vertical slice of Earth's atmosphere from 750-50km in altitude).
SSUSI Special Sensor Ultraviolet Spectrographic Imager NOAA	DMSP F-16, DMSP F-17, DMSP F-18, DMSP F-19, DMSP F-20	TBD	Space Environment	Monitors the composition and structure of the upper atmosphere and ionosphere, as well as auroral energetic particle inputs, with spectrographic imaging and photometry	A scanning imaging spectrograph whose field-of-view is scanned from horizon to horizon and a nadir-looking photometer system. The SIS produces simultaneous multispectral images over the spectral range 115-180nm.
SSZ NOAA (US DoD)	DMSP F-13, DMSP F-15, DMSP F-16	Operational	Space Environment	Laser threat detector	The SSZ is a static Earth viewing sensor, monitoring electro magnetic radiation.
STR Star Tracker ESA	Swarm	Operational	Precision orbit	Precise satellite orbit and attitude determination	Waveband: N/A Spatial resolution: <1arcsec Swath width: N/A Accuracy: <0.7arcsec
SUSIM (UARS) Solar Ultraviolet Irradiance Monitor NASA	UARS	Operational	Earth radiation budget radiometer	Provides data on UV and charged particle energy inputs, and on time variation of full-disk solar UV spectrum	Waveband: UV: 0.12-0.4µm Spatial resolution: Not applicable Spectral resolution: 0.15nm Accuracy: 1% Swath width: Looks at sun

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
SXI Solar X-ray Imager NOAA (USAF)	GOES-12, GOES-N, GOES-P, GOES-R	Prototype	Space Environment	Obtains data on structure of solar corona. Full disk imagery also provides warnings of geomagnetic storms, solar flares, and information on active regions of sun and filaments	Waveband: GOES 12,N,P: X-Ray 0.6-6.0nm bandpass Spatial resolution: Swath width: FWHM of ~10 arcsec Accuracy:
SXS Solar X-Ray Sensor NOAA	GOES-R	Approved	Space Environment	Studies of natural radiation hazard to humans at high altitudes and in space, as well as risk assessment and warning of episodes of surface charging, deep dielectric charging, and single event upset of satellite systems.	The GOES-R Project is in the formulation phase. The satellite will comprise improved spacecraft and instrument technologies, which will result in more timely and accurate weather forecasts, and improve support for the detection and observations of meteorological phenomena that directly affect public safety, protection of property, and ultimately, economic health and development.
TerraSAR-X X-Band Synthetic Aperture Radar DLR	TerraSAR-X	Approved	Imaging microwave radars	High resolution images for monitoring of land surface and coastal processes and for agricultural, geological and hydrological applications	Waveband: 9.65GHz, 300MHz bandwidth, all 4 polarisation modes Spatial resolution: Spotlight: 1,2m x 1-4m Stripmap: 3m x 3-6m ScanSAR: 16m x 16m Swath width: Spotlight: 5-10km x 10 km, Stripmap: 30 km, ScanSAR: 100 km Accuracy:
TES Tropospheric Emission Spectrometer NASA	Aura	Operational	Atmospheric chemistry	3-D profiles on a global scale of all infra-red active species from surface to lower stratosphere. Measures greenhouse gas concentrations, tropospheric ozone, acid rain precursors, gas exchange leading to stratospheric ozone depletion	Waveband: SWIR-TIR: 3.2-15.4µm Spatial resolution: In limb mode: 2.3km vertical resolution. In down-looking mode: 50km x 5km (global), 5km x 0.5km (local) Swath width: Limb mode: global: 50km x 180km, local: 5km x 18km Accuracy: Ozone: 20ppb, Trace gases: 3-500ppb
TIM Total Irradiance Monitor NASA	Glory, SORCE	Operational	Earth radiation budget radiometer	Measurement of total solar irradiance directly traceable to SI units with an absolute accuracy of 0.03% and relative accuracy of 0.001% per year	Waveband: Spatial resolution: Swath width: Looks at the sun every orbit, providing 15 measurements per day Accuracy:
TIS (CONAE) Thermal IR Scanner CONAE	SAC-F	Approved	Imaging multi-spectral radiometers (vis/IR)		Data not available
TM Thematic Mapper USGS	Landsat-5	Operational	Imaging multi-spectral radiometers (vis/IR)	Measures surface radiance and emittance, lands cover state and change (eg vegetation type). Used as multipurpose imagery for land applications	Waveband: 0.45-12.50µm Spatial resolution: VIS-SWIR, 30m; TIR: 120m Swath width: 185km Accuracy:

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
TMR TOPEX Microwave Radiometer NASA	Topex-Poseidon	Operational	Imaging multi-spectral radiometers (vis/IR)	Provides altimeter data to correct for errors caused by water vapour and cloud-cover. Also measures total water vapour and brightness temperature	Waveband: Microwave: 18GHz, 21GHz, 37GHz Spatial resolution: 44.7km at 18GHz, 37.4km at 21GHz, 23.6km at 37GHz Swath width: 120 deg cone centred on nadir Accuracy: Total water vapour: 0.2g/sq cm, Brightness temperature: 0.3 K
TOM Total Ozone Mapper NRSCC (CAST)	FY-3A, FY-3B, FY-3C, FY-3D, FY-3E, FY-3F, FY-3G	Being developed	Atmospheric chemistry	Ozone chemistry measurements	Waveband: UV Spatial resolution: 50km Swath width: Accuracy:
TOPEX TOPEX NASA Radar Altimeter NASA	Topex-Poseidon	Operational	Radar altimeters	Measurement of global ocean surface topography	Waveband: Microwave: 126 GHz and 5.3 GHz Spatial resolution: Swath width: 6km Accuracy: 2.4cm
TOPSAT telescope BNSC	TopSat	Prototype	High resolution optical imagers	Experimental medium-resolution imaging satellite supporting a range of possible land applications	Waveband: Panchromatic VIS: 0.5-0.75µm. 3-band multi-spectral. Spatial resolution: 2.5m pan. 5m multi-spectral. Swath width: 10km-MS, 15km-Pan Accuracy:
TRSR Turbo-Rogue Space Receiver NASA	Jason, Jason-2 (also known as OSTM)	TBD	Precision orbit & Atmospheric temperature and humidity sounders	Provides precise continuous tracking data of satellite to decimeter accuracy	Waveband: L-band:1228 and 1575MHz Spatial resolution: Not applicable Swath width: Not applicable Accuracy:
TSIS Total Solar Irradiance Sensor NOAA	NPOESS-3, NPOESS-6	Being developed	Earth radiation budget radiometer	0.2- 2 micron solar spectral irradiance monitor	Waveband: UV-SWIR: 0.2-2µm Spatial resolution: Swath width: Accuracy: 1.5w/m2
Variant ROSKOSMOS	SICH-1M		Magnetic field	Studies of the ionosphere	Payload package which includes: an electric probe, a wave probe, a Rogovsky coil, a Faraday cup, a fluxgate magnetometer, and a data acquisition unit.
VEGETATION CNES (EEC)	SPOT-4, SPOT-5	Operational	Imaging multi-spectral radiometers (vis/IR)	Data of use for crop forecast and monitoring, vegetation monitoring, and biosphere/geosphere interaction studies	Waveband: Operational mode: VIS: 0.61-0.68µm, NIR: 0.78-0.89µm, SWIR: 1.58-1.75µm, Experimental mode: VIS: 0.43-0.47µm Spatial resolution: 1.15km at nadir - minimal variation for off-nadir viewing Swath width: 2200km Accuracy:
VFM Vector Magnetometer ESA	Swarm	Operational	Magnetic field	The VFM is the prime instrument of the Swarm mission. It will provide ultra linear and low-noise measurements of the Earth's magnetic field vector components	Waveband: N/A Spatial resolution: <0.1nT Swath width: N/A Accuracy: <0.5nT/15days

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
VHRR Very High Resolution Radiometer ISRO	INSAT-2E, INSAT-3A, KALAPANA	Operational	Imaging multi-spectral radiometers (vis/IR)	Cloud cover, rainfall, wind velocity, sea surface temperature, outgoing longwave radiation, reflected solar radiation in spectral band 0.55-0.75µm, emitted radiation in 10.5-12.5µm range	Waveband: VIS: 0.55-0.75µm, NIR: 5.7-7.1µm, TIR: 10.5-12.5µm Spatial resolution: 2km in visible, 8km in IR Swath width: Full Earth disk every 30 minutes Accuracy:
VIIRS Visible/Infrared Imager Radiometer Suite NOAA (NASA)	NPOESS-1, NPOESS-2, NPOESS-3, NPOESS-4, NPOESS-5, NPOESS-6, NPP	Approved	Imaging multi-spectral radiometers (vis/IR)	Global observations of land, ocean, and atmosphere parameters: cloud/weather imagery, sea-surface temperature, ocean colour, land surface vegetation indices	Waveband: VIS - TIR: 0.4-12.5µm (22 channels) Spatial resolution: 400m-1.6km Swath width: 3000km Accuracy: SST 0.35K
VIRR Multispectral Visible and Infra-red Scan Radiometer (10 channels) NRSCC (CAST)	FY-3A, FY-3B, FY-3C, FY-3D, FY-3E, FY-3F, FY-3G	Being developed	Imaging multi-spectral radiometers (vis/IR)	Multispectral Visible and Infra-red Scan Radiometer	Waveband: Spatial resolution: 1.1km Swath width: 3200km Accuracy:
VISSR (GMS-5) Visible and Infra-red Spin Scan Radiometer (GMS-5) JAXA (JMA)	GMS-5	Operational	Imaging multi-spectral radiometers (vis/IR)	Data used for cloud type and motion detection wind. Also measures sea surface temperature and atmospheric water vapour	Waveband: VIS: 0.55-0.9µm, TIR: 6.5-7, 10.5-11.5, 11.5-12.5µm Spatial resolution: Visible: 1.25km, TIR: 5km Swath width: Full Earth disk in all channels, every 1 hour Accuracy:
WAOSS-B Wide-Angle Optoelectronic Stereo Scanner DLR	BIRD	Operational	Imaging multi-spectral radiometers (vis/IR)	Vegetation and Cloud coverage	Waveband: VIS: 600-670nm, NIR: 840-900nm Spatial resolution: 185m Swath width: 533km Accuracy:
WEFAX Weather Facsimile NOAA	GOES-9, GOES-10, GOES-11, GOES-12, GOES-N, GOES-O, GOES-P, GOES-R	Operational	Communications	Weather Facsimile	Data communications
WFC Wide Field Camera NASA	CALIPSO	Approved	Imaging multi-spectral radiometers (vis/IR)	Acquires high spatial resolution imagery for meteorological context	Waveband: VIS: 620 to 670 nm Spatial resolution: 125m Swath width: 60km Accuracy:
WFI Wide Field Imager CAST (INPE)	CBERS-2, CBERS-2B	Operational	Imaging multi-spectral radiometers (vis/IR)	Earth resources, environmental monitoring, land use	Waveband: VIS: 0.63-0.69µm, NIR: 0.77-0.89µm Spatial resolution: 258m Swath width: 890km Accuracy: 0.3pixels

Instrument & agency (& any partners)	Missions	Status	Type	Measurements & applications	Technical characteristics
WFI-2 Wide Field Imager 2 CAST (INPE)	CBERS-3, CBERS-4	Operational	Imaging multi-spectral radiometers (vis/IR)	Earth resources, environmental monitoring, land use	Waveband: VIS: 0.45-0.52, 0.52-0.59, 0.63-0.69, 0.77-0.89µm Spatial resolution: 73m Swath width: Accuracy:
WiFS Wide Field Sensor ISRO	IRS-P4	Operational	Imaging multi-spectral radiometers (vis/IR)	Vegetation monitoring, environmental monitoring, drought monitoring, snow melt run-off forecasting, global green cover assessment, agro- climatic regional planning	Waveband: VIS: 0.62-0.68µm NIR: 0.77-0.86µm SWIR: 1.55-1.7µm (IRS P3 only) Spatial resolution: 188m Swath width: 810km Accuracy:
WINDII CNES (NASA)	UARS	Not operational	Atmospheric chemistry	Day and night wind measurements between 80km and 300km altitude. Measures atmospheric temperature and concentration of emitting species. WINDII is no longer operational on UARS	Waveband: Visible-NIR:0.55-0.78µm Spatial resolution: Vertical: 2km Horizontal: 25km Swath width: 70-310km Accuracy: Wind speed: 10m/s
WTE Whale Tracker Experiment CONAE	SAC-C	TBD	Data collection	Environmental data collection system	Data communication
XPS XUV Photometer System NASA	SORCE	Operational	Other	Objective is to measure the extreme UV solar irradiance from 1-35nm	Waveband: UV: 1-35nm Spatial resolution: Swath width: Accuracy: