CEOS Missions, Instruments and Measurements Database

Survey Table Definitions and Valid Values

The following survey response support documents are available.

- Survey Guide - PDF
- Table Definitions and Valid Values (this web page) - PDF

This page contains a listing of the table defintions and valid values for the CEOS Missions, Instruments and Measurements database update survey. Table definitions and valid values are available as follows.

Missions Table

A listing of each mission for which an agency is either leading or contributing to.

Field	Description
Mission	The short or abbreviated name for the mission.
Name	The full name for the mission.
Alternate Name(s)	Alternate names for the mission, i.e. pre-approval or public
Mission Instrument(s)	List the instruments(s) that the mission carries, comma separated.
Launch Date	The past, planned or proposed launch date for the mission.
EOL Date	The past, planned or projected end of life (EOL) date for the mission.
Status^	The current status of the mission.
Agency	The lead agency for the mission.
Cooperating Agency	The cooperating agency for the mission.
Objectives and Applications	A full text description of the objectives and applications of the mission.
Orbit Type^	The type of orbit the mission will employ.
Orbit Sense^	The sense that the mission orbit will be traveling in.
Period	The orbital period of the mission in minutes.
Altitude	The altitude of the orbit in km.
Inclination	The inclination of the orbit in degrees.
Longitude	The longitude of the orbit (if geostationary).
LST	The Local Solar Time (the time of satellite equator overpass) for the mission.
Repeat Cycle	The mission repeat cycle in days.

Mission URL	The mission website URL.
Data Site URL	The URL of any mission data access websites or portals.
CEOS MIM DB Mission Summary	The URL of the CEOS MIM DB online page for this mission.

^ - only certain valid values may be selected.

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Missions Valid Values

Field	Valid Values
Status	*Nominal:* Considered: conceptual studies and feasibility studies have been completed, and definition of financing is in preparation. Planned: financing of the full series is being considered or is available up to the end of detailed definition phase. Approved: financing is available for the whole series, the prototype is fully defined and development is ongoing. Currently being flown: the prototype has been launched and financing is approved for the whole series. Mission complete: flown, but not currently flying. *Other:* Cancelled, N/A
Orbit Type	Sun-synchronous, Inclined non-sun-synchronous, Geostationary, Highly elliptical, Earth-Sun L-1, TBD
Orbit Sense	Ascending, Descending, N/A, TBD

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Instruments Table

A listing of each instrument to which an agency is either leading or contributing to.

Field	Description
Instrument	The short or abbreviated name of the instrument.
Name	The full name of the instrument.
Alternate Name(s)	Alternate names for the mission, i.e. pre-approval or public
Instrument Mission(s)	List the mission(s) that carry the instrument, comma separated.
Agency	The lead agency for the instrument.
Cooperating Agency	The cooperating agency for the instrument.
Type^	The type of the instrument (used for the tutorial pages in the EO Handbook).
Technology^	The technology of the instrument.
Status^	The current status of the instrument.
Data Access^	The instruments data access policy.
Data Format	A description of the data formats used for this instrument (NetCDF, etc.).
Measurement and Application Summary	A free text description of the instrument.
Geometry^	The instrument's geometry.
Sampling^	The instrument's sampling method.
Wave Band Summary	A free text description of the instrument wave band.
Resolution Summary	A free text description of the instrument resolution.
Best Resolution	The best resolution across all modes in metres.
Swath Summary	A free text description of the instrument swath.

Maximum Swath	The maximum swath width across all modes in kilometres.
Accuracy Summary	A free text description of the instrument accuracy.
CEOS MIM DB Instrument Summary	The URL of the CEOS MIM DB online page for this instrument.

^ - only certain valid values may be selected.

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Instruments Valid Values

Field	Valid Values
Type	*See detail below*
Technology	*See detail below*
Status	*Nominal:* TBD, Proposed, Approved, Being developed, Prototype, Operational, No longer operational *Other:* No longer considered
Data Access	*See detail below*
Geometry	Conical scanning, Cross-track scanning, Earth disk scanning, Limb-scanning, Nadir-viewing, Occultation, Push-broom scanning, Side-looking, Steerable viewing, Whisk-broom scanning, TBD
Sampling	Imaging, Sounding, Other, TBD

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Instrument Type Valid Values

Valid Values: Instruments – Type	
Atmospheric chemistry	Imaging multi-spectral radiometers (vis/IR)
Atmospheric temperature and humidity sounders	Lidars
Cloud profile and rain radars	Lightning sensor
Communications	Magnetic field
Data collection	Multiple direction/polarisation radiometers
Earth radiation budget radiometers	Ocean colour instruments
Gravity instruments	Other
High resolution optical imagers	Precision orbit
Hyperspectral imagers	Radar altimeters
Imaging microwave radars	Scatterometers
Imaging multi-spectral radiometers (passive microwave)	Space environment
	TBD

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Instrument Technology Valid Values

Valid Values: Instruments – Technology (*Click here for definitions*)	
Absorption-band MW radiometer/spectrometer	Lightning imager
Atmospheric lidar	Limb-scanning IR spectrometer
Broad-band radiometer	Limb-scanning MW spectrometer
Cloud and precipitation radar	Limb-scanning SW spectrometer
Communications system	Magnetometer
Data collection system	Medium-resolution IR spectrometer
Doppler lidar	Medium-resolution spectro-radiometer
Electric field sensor	Multi-channel/direction/polarisation radiometer
GNSS radio-occultation receiver	Multi-purpose imaging MW radiometer
GNSS receiver	Multi-purpose imaging Vis/IR radiometer
Gradiometer/accelerometer	Narrow-band channel IR radiometer

High resolution optical imager	Non-scanning MW radiometer
High-resolution nadir-scanning IR spectrometer	Radar altimeter
High-resolution nadir-scanning SW spectrometer	Radar scatterometer
Imaging radar (SAR)	Radio-positioning system
Laser retroreflector	Satellite-to-satellite ranging system
Lidar altimeter	Solar irradiance monitor
	Space environment monitor
	Star tracker

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Instruments Data Access Valid Values

Valid Values: Instruments - Data Access		
Access	Description	Timeliness
Open Access	Data publicly available and utilised by user communities internationally.	Timeliness requirements of the user communities for data access are fully met.
Constrained Access	Some constraints to data access by the recognised user communities internationally.	Timeliness requirements of the user communities for data access are mostly met.
Very Constrained Access	Significant constraints to data access by the recognised user communities internationally.	Timeliness requirements of the user communities are not typically met.
No Access	No data access by the user communities internationally.	

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Instruments Measurements Table

A listing of all measurements that a given instrument is capable of capturing, including a measurement utility assessment.

Field	Description
Instrument	The short or abbreviated name for the instrument.
Lead Agency	Agencies should only update or add measurement parameters for missions for which they are the lead agency.
Parameter^	The name of the parameter being measured by the instrument.
Utility^	An assessment of the utility of the instrument to measure the parameter specified.
Atmospheric Layers	The abiltiy of an instrument to measure applicable atmospheric parameters at various atmospheric layers (LT, HT, LS, HSnM, TC). Click here for detailed definitions.
Accuracy	The accuracy (one sigma) of the instrument's measurement of the parameter indicated. The units for the accuracy in the "Accuracy Units" field.
Accuracy Units	The measurement units in which the accuracy is expressed.

^ - only certain valid values may be selected.

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Instruments Measurements Valid Values

Valid Values: Instruments Measurements - Parameter	
ATMOSPHERE	LAND SURFACE
Aerosol absorption optical depth (column/profile)	Above Ground Biomass (AGB)
Aerosol effective radius (column/profile)	Active Fire Detection

Aerosol Extinction / Backscatter (column/profile)

Aerosol Layer Height

Aerosol optical depth (column/profile)

Aerosol Single Scattering Albedo

Atmospheric Chemistry - BrO (column/profile)

Atmospheric Chemistry - C2H2 (column/profile)

Atmospheric Chemistry - C2H6 (column/profile)

Atmospheric Chemistry - CFC-11 (column/profile)

Atmospheric Chemistry - CFC-12 (column/profile)

Atmospheric Chemistry - CH2O (column/profile)

Atmospheric Chemistry - CH3Br (column/profile)

Atmospheric Chemistry - CH4 (column/profile)

Atmospheric Chemistry - CHOCHO (column/profile)

Atmospheric Chemistry - ClO (column/profile)

Atmospheric Chemistry - ClONO2 (column/profile)

Atmospheric Chemistry - CO (column/profile)

Atmospheric Chemistry - CO2 (column/profile)

Atmospheric Chemistry - COS (column/profile)

Atmospheric Chemistry - HCFC-22 (column/profile)

Atmospheric Chemistry - HCl (column/profile)

Atmospheric Chemistry - HDO (column/profile)

Atmospheric Chemistry - HNO3 (column/profile)

Atmospheric Chemistry - N2O (column/profile)

Atmospheric Chemistry - N2O5 (column/profile)

Atmospheric Chemistry - NO (column/profile)

Atmospheric Chemistry - NO2 (column/profile)

Atmospheric Chemistry - OClO (column/profile)

Atmospheric Chemistry - OH (column/profile)

Atmospheric Chemistry - PAN (column/profile)

Atmospheric Chemistry - PSC (column/profile)

Atmospheric Chemistry - SF6 (column/profile)

Atmospheric Chemistry - SO2 (column/profile)

Atmospheric pressure (over land surface)

Atmospheric pressure (over sea surface)

Atmospheric specific humidity (at surface)

Atmospheric specific humidity (column/profile)

Atmospheric stability index

Atmospheric temperature (at surface)

Atmospheric temperature (column/profile)

Height of the top of the Planetary Boundary Layer

Height of tropopause

Lightning detection

Ozone profile

Temperature of tropopause

Turbulence

Visibility

Volcanic ash

Water vapour imagery

CLOUDS & PRECIPITATION

Cloud base height

Cloud cover

Cloud drop size (at cloud top)

Cloud ice (column/profile)

Cloud ice content (at cloud top)

Chlorophyll Fluorescence from Vegetation on Land

Fire area

Fire temperature

Fractionally absorbed PAR (FPAR)

Land cover

Land surface imagery

Land surface temperature

Land surface topography

Leaf Area Index (LAI)

Normalized Differential Vegetation Index (NDVI)

Photosynthetically Active Radiation (PAR)

Soil moisture at the surface

Soil moisture in the roots region

Soil type

Surface Coherent Change Detection

Vegetation Canopy (cover)

Vegetation Canopy (height)

Vegetation Cover

Vegetation type

OCEAN

Bathymetry

Color dissolved organic matter (CDOM)

Diffuse attenuation coefficient (DAC)

Dominant wave direction

Dominant wave period

Ocean chlorophyll concentration

Ocean dynamic topography

Ocean imagery and water leaving radiance

Ocean salinity

Ocean surface currents (vector)

Ocean suspended sediment concentration

Oil spill cover

Sea level

Sea State Wavelength

Sea surface temperature

Significant wave height

Wave directional energy frequency spectrum

RADIATION BUDGET

Black and White Sky Albedo

Downwelling (Incoming) long-wave radiation at the Earth surface

Downwelling (Incoming) short-wave radiation at the Earth surface

Downwelling (Incoming) solar radiation at TOA

Earth surface albedo

Long-wave cloud emissivity

Long-wave Earth surface emissivity

Short-wave cloud reflectance

Short-wave Earth surface bi-directional reflectance

Snow albedo

Solar Spectral Irradiance

Upwelling (Outgoing) long-wave radiation at Earth surface

Upwelling (Outgoing) long-wave radiation at TOA

Upwelling (Outgoing) Short-wave Radiation at the Earth Surface

Upwelling (Outgoing) short-wave radiation at TOA

Cloud ice effective radius (column/profile)	Upwelling (Outgoing) spectral radiance at TOA
Cloud imagery	**SOLID EARTH**
Cloud liquid water (column/profile)	Crustal Motion
Cloud mask	Crustal plates positioning
Cloud optical depth	Geoid
Cloud top height	Gravity field
Cloud top temperature	Gravity gradients
Cloud type	Magnetic field (scalar)
Freezing level height	Magnetic field (vector)
Lake Area	**SPACE ENVIRONMENT**
Lake Surface Height	Auroral Emissions
Melting layer depth in clouds	Electric Field (vector)
Precipitation index (daily cumulative)	Electron density profile
Precipitation Profile (liquid or solid)	Electron Energy and Pitch Angle Distribution
Precipitation rate (liquid) at the surface	Ion Density, Drift Velocity, and Temperature
Precipitation rate (solid) at the surface	Neutral Particle Composition and Flow Velocity
ICE & SNOW STUDIES	Total electron content (TEC)
Glacier Area	ULF-HF Electromagnetic Waves
Glacier cover	**SURFACE WINDS**
Glacier motion	Wind profile (horizontal)
Glacier topography	Wind profile (vertical)
Ice sheet topography	Wind speed over land surface (horizontal)
Iceberg fractional cover	Wind speed over sea surface (horizontal)
Iceberg height	Wind stress
Permafrost	Wind vector over land surface (horizontal)
Sea-ice Concentration	Wind vector over sea surface (horizontal)
Sea-ice cover	
Sea-ice Drift	
Sea-ice sheet topography	
Sea-ice surface temperature	
Sea-ice thickness	
Sea-ice type	
Snow cover	
Snow detection (mask)	
Snow Grain Size	
Snow melting status (wet/dry)	
Snow surface temperature	
Snow water equivalent	

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Instruments Measurements Utility Values

Utility	Maturity	User Requirements
High Utility	Measurement techniques and instrument technologies proven with high heritage.	Meets all key requirements for a given measurement and is widely recognised or anticipated as a primary (or operational) source by the user communities.
General Utility	Measurement techniques/instrument heritage not fully mature but have expected utility for the future.	Meets most key requirements for a given measurement. Instrument recognised or anticipated as having some utility for the indicated measurement but not a primary source.
Potential Utility	Measurement techniques/instrument heritage not fully mature but have potential.	Meets some user requirements for a given measurement. Instrument is recognised as having potential utility for the indicated measurement.
Marginal Utility	Measurement techniques/instrument heritage not mature or are experimental.	Does not meet key user requirements for a given measurement. May

		provide some useful or complementary information under certain conditions for the indicated measurement. But is not not widely recognised or exploited internationally for its capabilities for this measurement.

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Instruments Measurements Atmospheric Layer Values

Atmospheric Layer	Description
Lower Troposphere (LT)	Instrument can measure the parameter at altitudes of 0 - 5500 m or pressures of 1000 - 500 hPa.
Higher Troposphere (HT)	Instrument can measure the parameter at altitudes of 5.5 - 16 km or pressures of 500 - 100 hPa.
Lower Stratosphere (LS)	Instrument can measure the parameter at altitudes of 16 - 32 km or pressures of 100 - 10 hPa.
Higher Stratosphere and Mesosphere (HSnM)	Instrument can measure the parameter at altitudes of > 32 km or pressures of < 10 hPa.
Total Column (TC)	Instrument provides a vertically integrated measrurement (i.e. for atmospheric constituents).

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Instruments Wavebands Table

A listing of all wavebands in which a given instrument takes measurements.

Field	Description
Instrument	The short or abbreviated name for the instrument.
Lead Agency	Agencies should only update or add measurement parameters for missions for which they are the lead agency.
Wave Band^	The waveband that is used by the instrument for sensing.

^ - only certain valid values may be selected.

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Instruments Wavebands Valid Values

Valid Values: Instruments Wavebands	
UV	~0.01 µm - ~0.40 µm
VIS	~0.40 µm - ~0.75 µm
NIR	~0.75 µm - ~1.3 µm
SWIR	~1.3 µm - ~3.0 µm
MWIR	~3.0 µm - ~6.0 µm
TIR	~6.0 µm - ~15.0 µm
FIR	~15.0 µm - ~0.1 cm
MW	~1.0 cm - ~100 cm
Ka-Band	40 - 26.5 GHz
K-Band	26.5 - 18 GHz
Ku-Band	18 - 12.5 GHz
X-Band	12.5 - 8 GHz

Valid Values: Instruments Wavebands	
C-Band	8 - 4 GHz
S-Band	4-2 GHz
L-Band	2 - 1 GHz
P-Band	0.999 - 0.2998 GHz
TBD, N/A	

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Definition of Instruments> Technology Field Valid Values

Definitions of the Instrument technology valid values.

Valid Values: Instruments - Technology	
Multi-purpose imaging Vis/IR radiometer	Instrument designed to address more objectives by appropriate blending of the characteristics of spectral coverage and resolution, spatial resolution, radiometric accuracy, etc.. Spectral coverage in bands of Vis, NIR, SWIR, MWIR and TIR (0.4-15 µm). Number of channels from a few to a few tens, separated by dichroics and filters. Channel bandwidths around 10 %. Spatial resolution typically 30m - 3 km. Applicable in LEO and GEO.
High resolution optical imager	Imaging Vis/IR radiometer whose characteristics are stressed towards spatial resolution (typically <30 m). Spectral coverage in bands of Vis and NIR (0.4-1.3 µm). Number of channels can be small (extreme: one, i.e. panchromatic) or very large (hyperspectral) separated in-field (array detectors) or by a spectrometer, or a combination of both. Channel bandwidths from 0.5 µm (PAN) to 5 nm (hyperspectral). Applicable only in LEO.
Multi-channel/direction/polarization radiometer	Imaging Vis/IR radiometer that addresses parameters observable by exploiting different viewing conditions (e.g., to convert radiances into irradiances), different polarisations (to reconstruct the electric field, i.e. the Stokes vector) and more channels (to collect more spectral signatures). A variety of configurations are possible. Multi-polarisation and multi-directionality are appropriate for short wavelengths. Channels bandwidths 2-5 %, spatial resolution typically 0.5-5 km. Applicable only in LEO.
Medium-resolution spectro-radiometer	Used when the number of channels is high and they are too close to be separated by dichroics and filters. The instrument spreads the radiation beam by means of a spectrometer, but thereafter only a limited number of channels is selected, that generally is re-programmable. Channels bandwidths 1-3 %, spatial resolution typically 0.5-5 km. Applicable in LEO and GEO.
High-resolution nadir-scanning SW spectrometer	Spectrometers to cover bands in UV, Vis, NIR and SWIR with spectral resolution typically of 0.1-0.3 %, required for atmospheric chemistry. Earth viewing so as to measure vertical profiles and total columns. Thousands of channels. Spatial resolution typically 2-20 km. Applicable in LEO and GEO.
Limb-scanning SW spectrometer	Spectrometers to cover bands in UV, Vis, NIR and SWIR with spectral resolution typically of 0.1-0.3 %, required for atmospheric chemistry. Designed to provide high vertical resolution in the upper troposphere and above by scanning the EarthÕs limb. Also, scanning may be performed during occultation of the sun or the moon or bright stars. Thousands of channels. Spatial resolution typically 1-3 km vertical, 300-500 km horizontal. Applicable only in LEO.
Narrow-band channel IR radiometer	Radiometer operating in MWIR and TIR with many channels of bandwidth around 1 % in absorption bands of CO2 and H2O to retrieve temperature and humidity profiles in cloud-free or partially cloudy areas. Cross-nadir scanning for vertical profiling. A few tens of channels. Spatial resolution typically 10-20 km horizontal, ~ 2 km vertical (referred to the retrieved profile). Applicable in LEO and GEO.
Medium-resolution IR spectrometer	Spectrometer operating in MWIR and TIR with spectral resolution typically around 0.1 % to retrieve temperature and humidity profiles from absorption bands of CO2 and H2O in cloud-free or partially cloudy areas, and also total columns of some greenhouse gas species (and coarse profile of O3). Cross-nadir scanning for vertical profiling and total-columns. Many thousands of channels. Spatial resolution typically 10-20 km horizontal, ~ 1 km vertical (referred to the retrieved profile). Applicable in LEO and GEO.

Valid Values: Instruments - Technology	
High-resolution nadir-scanning IR spectrometer	Spectrometer operating in MWIR and TIR with spectral resolution typically around 0.01 % required for atmospheric chemistry. Earth viewing so as to measure vertical profiles and total columns in cloud-free or partially cloudy areas. Cross-nadir scanning for vertical profiling and total-columns. Many thousands of channels. Spatial resolution typically 5-10 km horizontal, ~ 1 km vertical (referred to the retrieved profiles). Applicable only in LEO.
Limb-scanning IR spectrometer	Spectrometer operating in MWIR and TIR with spectral resolution typically around 0.01 % required for atmospheric chemistry. Designed to provide high vertical resolution in the upper troposphere and above by scanning the EarthÕs limb. Many thousands of channels. Spatial resolution typically 1-3 km vertical, 300-500 km horizontal. Applicable only in LEO.
Multi-purpose imaging MW radiometer	Radiometer operating in bands of frequency ranging from 1 to 300 GHz. A specific instrument can only cover a limited part of the range, for instance from 7 to 200 GHz. Several parameters can be observed in this range, thus the instrument is designed by optimally blending the various features. For certain parameters very low frequencies are need (e.g., 1.4 GHz for ocean salinity and soil moisture in the roots region). Several channels, of bandwidths often constrained by frequency protection regulations. The basic channels operate in atmospheric windows, but in few cases absorption channels also are added. Conical scanning is the rule, which enables constant incidence angle, thus homogeneous polarisation conditions. If full polarisation is implemented, the instrument provides sea-surface wind vector. The resolution is diffraction-limited, thus for a given antenna (e.g., diameter 180 cm) changes with frequency (e.g., from 4 to 50 km moving frequency from 90 to 7 GHz). For very low frequencies, synthetic
Non-scanning MW radiometer	This MW radiometer has the limited purpose of supporting radar altimeter by providing information on total-column water vapour over the sea. The main channel is centred on the water vapour band at 23 GHz, with one or two windows around. The instrument only points nadir exactly as the radar altimeter, thus provides measurement only along track. The resolution is tuned to that one of the altimeter, typically around 25 km. Applicable only in LEO.
Absorption-band MW radiometer/spectrometer	Radiometers operating in bands of absorption from O2 (typical, ~ 54 GHz) and from H2O (typical: ~ 183 GHz) enable measuring the atmospheric temperature and humidity profiles in nearly-all-weather conditions. Cross-nadir scanning is utilised, though also conical scanners use to include channels in absorption bands. Radiometric accuracy is a driver for profiling, thus scanning speed must be relatively slow, that implies coarse resolution (typical, 50 km for 54 GHZ, 15 km for 183 GHz, horizontal; the vertical, referring to the product, is ~ 2 km). Applicable in LEO; however by adding higher frequencies (e.g. 118 and 425 GHz for O2 and 380 GHz for H2O) sounding is also possible from GEO.
Limb-scanning MW spectrometer	Spectrometer operating in the millimetre-submillimetre range (30-3000 GHz) with spectral resolution typically around 0.01 % required for atmospheric chemistry. Designed to provide high vertical resolution in the upper troposphere and above by scanning the EarthÕs limb. Some thousands of channels. Spatial resolution typically 1-3 km vertical, 300-500 km horizontal. Applicable only in LEO.
Imaging radar (SAR)	If radar is used, the problem of diffraction-limited resolution in MW still applies. In this case, however, by analysing range, azimuth and Doppler effect of the (coherent) signals, synthetic aperture can be implemented, and resolutions typically of 10-30 m can be achieved. Several combinations of polarisations in transmission and reception can be implemented. Resolution can be traded-off with swath (e.g. 30 m / 100 km or 150 m / 400 km). Interferometry between views from different passes enable appreciating changes. SAR exploiting different bands (L, S, C, X) emphasise different features. Applicable only in LEO.
Lightning imager	Detector matrix all-time watching the earth in a very-narrow O2 band at 777.4 nm, to count the flash rate and intensity in the instantaneous field of view (5-10 km). Applicable in LEO and, better, in GEO.
Cloud and precipitation radar	Nadir-pointing radar to observe the profile of liquid and ice water in clouds. Depending on the frequency, the radar better observes liquid precipitation (~ 14 GHz), solid precipitation (~ 35 GHz) or non-precipitating clouds (~ 94 GHz). The antenna size is dimensioned for a ground resolution typically of ~ 5 km and the vertical resolution is 250-500 m. Pushbroom multi-feed provides limited swath (few 100Õs km for lower frequencies, basically zero at the highest frequency). Applicable only in LEO.
Radar scatterometer	Radar with very accurate calibration, to observe an earthÕs spot from several directions (ahead, after, aside) and measure differential backscatter coefficients (s0) from sea capillary waves (thus observing surface wind). On land, the s0 are correlated with soil moisture. Two concepts exist: electronic scanning, side looking, exploiting C-band (~ 5 GHz); and conical scanning, exploiting Ku-band (~ 13 GHz). The resolution is typically 25-50 km, the swath 1100-1500 km. Applicable only in LEO.

Valid Values: Instruments - Technology	
Radar altimeter	Nadir-viewing radar for very accurate ranging measurement between satellite and surface. The spread of echoes provides information on significant wave height, the intensity on the wind speed, the multi-temporal analysis the ocean dynamic topography and the geoid. The instantaneous field of view is ~ 25 km and moves along track. The radar altimeter operates in Ku-band (~ 13 GHz) with the support of C-band (~ 5 GHz) for correction from ionospheric rotation; and is associated to a nadir-pointing MW radiometer for water vapour correction. Applicable only in LEO.
GNSS receiver	Precision positioning system exploiting the differential phase of signals from a few satellites of the Global Navigation Satellite System. Applicable only in LEO.
GNSS radio-occultation receiver	GNSS receiver equipped with directional antennas to receive the signal from one of the GNSS satellites during occultation, and measure the phase, thus the bending angle and the refractivity index profile. Simultaneously, a companion GNSS receiver provides precision positioning. The refractivity index is associated to temperature, humidity and density. The vertical resolution of the product can be as good as 0.5 m, the horizontal resolution is conditioned by the limb geometry (~ 300 km). Applicable only in LEO.
Atmospheric lidar	Lidar measuring the backscattering of atmospheric components such as clouds and aerosol. One or two wavelengths can be exploited, in UV or Vis or NIR. Nadir-only, resolution typically ~ 100 m both horizontal and vertical. Applicable only in LEO.
Doppler lidar	Lidar measuring the Doppler shift of echoes from atmospheric components such as air molecules and aerosol. A UV wavelength is exploited, but other ones are possible. Side looking, measuring the radial component of wind in clear air. The resolution is controlled by sampling needs, and may be in the range of 100-200 km, aside of the orbital track. Applicable only in LEO.
Lidar altimeter	Altimeter that exploits lidar in order to detect polar ice edge with an accuracy of ~100 m instead of the 25 km of the radar altimetry. Designed to measure polar ice thickness and ultimately topography. Other observations common to atmospheric lidar also possible, such as vegetation canopy height. Applicable only in LEO.
Broad-band radiometer	Radiometer with channels that integrate the total radiation emerging from TOA (0.2-100 µm) and the fraction of reflected solar radiation (0.2-4.0 µm). Ancillary channels in atmospheric windows may be present. Capability of observing under more viewing directions so as to help converting radiances into irradiances may be present. Resolution in the range of 20-50 km. Applicable in LEO and GEO.
Solar irradiance monitor	Observes radiation coming from the Sun, either integrated (i.e., in the interval 0.2-10 µm, observed by cavity radiometers) or spectrally resolved (e.g., in the interval 0.2-2 µm, observed by a spectrometer), or for special features (X-rays, UV, etc,). Applicable in LEO and GEO.
Gradiometer/accelerometer	System designed to be sensitive to anomalies of the EarthÕs gravity field. Implemented in several modes by approprate networking of accelerometers, tensors, etc.). Applicable only in LEO.
Satellite-to-satellite ranging system	System to accurately measure the distance (e.g. by K-band, ~ 25 GHz) and its variations between satellites in coordinated orbits. Used to measured long-wave anomalies of the EarthÕs gravity filed. Applicable only in LEO.
Magnetometer	System designed to measure the EarthÕs magnetic field in its various components (scalar, vector). Applicable only in LEO.
Electric field sensor	System designed to measure the EarthÕs electric field. Applicable only in LEO.
Space environment monitor	Package of instruments mainly to measure the energy of charged particles hitting the platform, both integrated and spectrally analysed. A main purpose is to monitor the platform safety. Applicable in LEO and GEO.
Laser retroreflector	Mirrors (generally cube corners) to reflect laser beams sent to the satellite by ground laser-equipped sites during positioning sessions. Applicable only in LEO.
Radio-positioning system	System of transponders involving satellite and ground transmitting-receiving stations. Applicable only in LEO.
Star tracker	CCD imager that tracks bright stars, recognise the pattern and sends information to the satellite attitude control system. Applicable in LEO and GEO.

Valid Values: Instruments - Technology	
Data collection system	Transponder that relays to ground the data collected in situ by Data Collection Platforms. It might localise the DCP if mobile (only from LEO). It might retrieve the collected data after interrogation of the DPC. Applicable in LEO and GEO.
Communications system	To command and control the satellite, to transmit the data from the satellite to the ground, to transpond data from ground sites to other ground sites via satellite, etc.. It includes Search & Rescue by satellite. Applicable in LEO and GEO.

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