



CGMS-39 EUM-WP-02
14 October 2011
Prepared by EUMETSAT
Agenda Item: 02
Discussed in Plenary

CURRENT AND FUTURE LEO/GEO/R&R SATELLITE TABLES

In response to CGMS permanent action 01 and for inclusion in the final CGMS-39 meeting report

This Working Paper contains the current and future LEO, GEO, and R&D coordinated satellite tables to be included in the final CGMS-39 report (following correctness confirmation at the meeting).

The Working Paper confirms the satellite status for EUMETSAT.

Unless already done, other CGMS Members are requested to verify the input and provide feedback as necessary to ensure correctness of the tables.

Action/Recommendation proposed:

Members who have not yet revised the tables are kindly invited to provide feedback on the data including any updates of their respective satellites to the CGMS Secretariat (cgmssec@eumetsat.int) and/or directly to Sarah Stoeckel at CGMS-39

Last updated on 14 October 2011

Table 1/6: Current geostationary satellites contributing to the GOS

Sector	Satellites in orbit P=pre-operational Op=operational B=back-up L=limited availability	Operator	Location	Launch date	Details on near real time access to L0/L1 data (Links)	Environmental payload and status
East Pacific (180°W-108°W)	GOES-11 (Op)	USA/NOAA	135°W	03/05/2000	GOES I-M Databook OSDPD/SSD SAT-info-links	5-channel imager, 19-channel sounder, DCIS, SEM Operational at GOES-West position X-Ray positioner failed in Oct 2008 Planned to be decommissioned in December 2011
West Atlantic (108°W-36°W)	GOES-13 (Op)	USA/NOAA	75 °W	24/05/2006	GOES NOP Databook (26MB)	5-channel imager, 19-channel sounder, DCIS, SEM, SXI Operational at GOES-East position XRS/EUV instrument had a capacitor failure rendering unit inoperable.
	GOES-15 (P)	USA/NOAA	89.27°W	4/03/2010	GOES NOP Databook (26MB)	In standby mode, Primary SXI and XRS for SWPC. Planned to become GOES-West December 2011
	GOES-14 (B)	USA/NOAA	104.86°W	28/06/2009	GOES NOP Databook (26MB)	5-channel imager, 19-channel sounder, DCIS, SEM, SXI In storage. Available for operation GOES-W when needed (2012)
	GOES-12 (B)	USA/NOAA	60°W	23/07/2001	GOES I-M Databook OSDPD/SSD SAT-info-links	5-channel imager, 19-channel sounder, DCIS, SEM Supports South America. SXI failed 4/12/2007, X-Ray Positioner failed 4/12/2007. No fuel remaining for inclination control.
East Atlantic (36°W-36°E)	Meteosat-9 (Op)	EUMETSAT	0°	21/12/2005	Service Status Data access Level 1 data info	12-channel SEVIRI imager, GERB, DCS Data disseminated via EUMETCAST and LRIT
	Meteosat-8 (Op)	EUMETSAT	9.5°E	28/08/2002		Rapid Scanning Service and back-up of Meteosat-9. No Direct broadcast. Dissemination by EUMETCast.
Indian Ocean (36°E-108°E)	Meteosat-7 (Op)	EUMETSAT	57.5°E	02/09/1997		3-channel imager Dissemination via EUMETCast Indian Ocean Data Coverage (IODC), currently approved



						until 1 end of 2013
	Kalpana-1 (Op) (previously METSAT)	INDIA	74°E	12/09/2002	INSAT images	3-channel VHRR imager, DCS
	Electro-L N1 (P)	Russia	76°E	20/01/2011		In commissioning MSU-GS, HMS, DCS, GeoSAR. Direct broadcast HRIT, LRIT
	FY-2D (Op)	CHINA/CMA	86.5°E	8/12/2006	S-VISSR(NRT) Data Centre	5-channel improved S-VISSR, SEM, DCS Complements FY-2 at 105°E
	INSAT-3A (Op)	INDIA	93.5°E	10/04/2003	INSAT images	Operational since 24/04/03. 3-channel VHRR imager, DCS and CCD camera
	FY-2E (Op)	China/CMA	105°E	23/12/2008	S-VISSR(NRT) Data Centre	5-channel improved VISSR, SEM, DCS. Direct broadcast via LRIT
West Pacific (108°E-180°E)	FY-2C (B)	CHINA/CMA	123.5°E	19/10/2004	Limited Operations	5-channel improved S-VISSR, SEM, DCS. Maintained as a back-up since 23 November 09.
	COMS-1(Op)	Korea/KMA, KORDI	128.2°E	26/06/2010	HRIT specification LRIT specification	5-channel VIS/IR Meteorological Imager (MI), Geost. Ocean Colour Imager (GOCI) Direct Broadcast via HRIT/LRIT
	Himawari-6 (B) (MTSAT-1R)	JAPAN	140°E	26/02/2005	See below	5-channel VIS/IR imager, DCS. Supports MTSAT-2 for direct broadcast from 140°E
	Himawari-7 (Op) (MTSAT-2)	JAPAN	145°E	18/02/2006	Access details	5-channel VIS/IR imager, DCS. Operational since July 2010, with data transmitted by MTSAT-1R

Table 2/6: Future geostationary satellites contributing to the GOS
(Last updated on 14 October 2011)

Sector	Satellites in orbit P=pre-operational Op=operational B=back-up L=limited availability	Operator	Location	Launch date	Details on near real time access to L0/L1 data (Links)	Environmental payload and status
East						ABI, GLM, SUV, EXIS,

Pacific (180°W- 108°W) and West Atlantic (108°W- 36°W)	GOES-R		135°W or 75°W			SEISS (Advanced Baseline Imager, Geostationary Lightning Mapper, Solar UV Imager, Extreme UV and X-ray Irradiance Sensors, Space Environment In-Situ Suite). Ready for launch in 2015 if needed.
	GOES-S	USA/NOAA	135°W or 75°W	02/2017	Architecture	ABI, GLM, SUV, EXIS, SEISS Ready for launch in 2016 if needed.
East Atlantic (36°W -36°E)	Electro-L N2	Russia	14.5°W	2013		MSU-GS, HMS, DCS, GeoSAR. Direct broadcast HRIT, LRIT
	Electro-L N3	Russia	165.8°E	2015		MSU-GS, HMS, DCS, GeoSAR. Direct broadcast HRIT, LRIT
	Meteosat-10 (MSG-3)	EUMETSAT	0°	06-08/2012		12-channel SEVIRI imager, GERB, DCS Dissemination by LRIT and EUMETCast
	Meteosat-11 (MSG-4)	EUMETSAT	0°	01/2015		12-channel SEVIRI imager, GERB, DCS
	MTG I1	EUMETSAT	0°	12/2018		Meteosat Third Generation/ Imaging (FCI, LI)
	MTG S1	EUMETSAT	0°	2019		Meteosat Third Generation/ Sounding (IRS, UVN)
	MTG I2	EUMETSAT	0°	2022		Meteosat Third Generation/ Imaging (FCI, LI)
	MTG I3	EUMETSAT	0°	2026		Meteosat Third Generation/

					Imaging (FCI, LI)
	MTG S2	EUMETSAT	0°	2027	Meteosat Third Generation/ Sounding (IRS, UVN)
	MTG I4	EUMETSAT	0°	2030	Meteosat Third Generation/ Imaging (FCI, LI)
Indian Ocean (36°E-108°E)	Electro-M N1	Russia	76°E	2018	
	INSAT-3D	India	82° E	2011	Improved 6-channel Imager and 19-channel sounder
	FY-2F	China/CMA	86.5°E	2012	5-channel improved VISSR, DCS, SEM. Direct broadcast via LRIT
	FY-4A	China/CMA	TBD	2015	multi-spectral imager, Atmospheric sounder, lightning mapper, SEM
	FY-2H	China/CMA	86.5°E	2016	5-channel improved VISSR, DCS, SEM. Direct broadcast via LRIT
	FY-4C	China/CMA	TBD	2019	multi-spectral imager, Atmospheric sounder, lightning mapper, SEM
	FY-4E	China/CMA	TBD	TBD	multi-spectral imager, Atmospheric sounder, lightning mapper, SEM
West Pacific (108°E-180°E) Himawari	FY-2G	China/CMA	123°E	2014	5-channel improved VISSR, DCS, SEM. Direct broadcast via LRIT
	FY-4B	China/CMA	TBD	2017	multi-spectral imager, Atmospheric sounder, lightning mapper, SEM
	FY-4D	China/CMA	TBD	TBD	multi-spectral imager, Atmospheric sounder,

					lightning mapper, SEM
FY-4 F	China/CMA	TBD	TBD		multi-spectral imager, Atmospheric sounder, lightning mapper, SEM
GEO-KOMPSAT-2A	Korea/KMA	116.2°E or 128.2°E	2017		Advanced Meteorological Imager, Space Environmental monitoring payload Direct Broadcast via HRIT/LRIT
GEO-KOMPSAT-2B	Korea/MLTM ¹ , ME ²	116.2°E or 128.2°E	2018		Advanced GOCI, Geostationary Environmental Monitoring Spectrometer (GEMS)
Himawari-8 (MTSAT follow-on)	JAPAN	140.7°E or 143.3°E	2014		-Advanced Himawari Imager (AHI), DCS, SEM
Himawari-9	JAPAN	140.7°E or 143.3°E	2016		-Advanced Himawari Imager (AHI), DCS, SEM
Arctica-M N1	RUSSIA	Molnya Orbit	2015		MSU-GS, Space Weather Instruments, DCS
Arctica-M N2	RUSSIA	Molnya Orbit	2016		MSU-GS, Space Weather Instruments, DCS

¹ Ministry of Land, Transport and Maritime Affairs (Korea)

² Ministry of Environment (Korea)

Table 3/6: Current LEO satellites contributing to the GOS

Sun-synchronous satellites are listed by Equatorial Crossing Time at the Ascending Node, in ascending order.

Orbit type ECT=Equator Crossing Time (for sun-synchronous orbits)	Satellites in orbit P=pre-operational Op=operational B=back-up, secondary L=limited availability	Operator	Equator Crossing Time (ECT) Ascending Node	Mean Altitude	Launch date	Details on near real time access to L0/L1 data (links)	Instrument payload and status
Sun-synchronous "Afternoon" orbit ECT between 12:00-17:00 and between 00:00-05:00	NOAA-19 (Op)	USA/NOAA	13:32	870 km	06/02/2009	User Guide	Functional. Noise on MHS Channel H3. Noise on AMSU-A1 channel 8.
	FY-3B (Op)	CHINA/CMA	13:38 (A)	836 km	0511/2010	Data access	VIRR, MERSI-1, MWRI, IRAS, MWTS-1, MWHS-1, TOU/SBUS, SEM, SIM-1. AHRPT/MPT ERM failed
	NOAA-18 (B)	USA/NOAA	14:22	854 km	20/05/2005	User Guide	Functional. Noise on HIRS long wave channels. SBUV chopper motor intermittent seizures, but self-corrected via macros. 6/7/2009 – MIMU-2 failure (loss of redundancy).
	DMSP-F14 (B)	NOAA	15:47	852 km	04/97		Defense satellite. SSMI, SSMT1, SSMT2 non-functional. No functional on-board recorder
	FY-1D (Op)	China/CMA	16:18	866 km	15/05/2002	Details	Functional. VIRR, SEM. Direct Broadcast CHRPT Expected end of service after 2010
	NOAA-15 (B)	USA/NOAA	16:38	807 km	05/1998	User Guide	Functional. AVHRR provides images with degraded navigation. AMSU-B scan motor stalled on March 28, 2011 & HIRS/Filter wheel failed on June 6, 2009) AMSU-A1 channels 11 & 14 inoperative and AMSU-B scan motor stalled on March 28, 2011.
Orbit type ECT=Equator Crossing Time (for sun-	Satellites in orbit P=pre-operational Op=operational	Operator	Equator Crossing Time (ECT)	Mean Altitude	Launch date	Details on near real time	Instrument payload and status

synchronous orbits)	B=back-up, secondary L=limited availability		Ascending Node			access to L0/L1 data (links)	
Sun-synchronous "Early morning" orbit ECT between 17:00-19:00 and between 05:00-07:00	DMSP-F15 (B)	USA/NOAA-DOD	17:06	850 km	12/12/1999	Archive : CLASS	Defense satellite. SSMT2 non-functional. Reduced pointer accuracy. Data available to civilian users through NOAA.
	DMSP-F17 (Op)	USA/NOAA-DOD	17:37	850 km	04/11/2006	Archive : CLASS	SSMIS . Defense satellite. Data available to civilian users through NOAA.
	DMSP-F13 (B)	USA/NOAA-DOD	18:05	850 km	03/1995	Archive : CLASS	SSMIS . Defense satellite. Data available to civilian users through NOAA. No functional recorders on board
	DMSP-F16 (B)	USA/NOAA-DOD	18:51	850 km	18/10/2003	Archive : CLASS	SSMIS . Defense satellite. Reduced pointing accuracy. Data available to civilian users through NOAA.

Orbit type ECT=Equator Crossing Time (for sun-synchronous orbits)	Satellites in orbit P=pre-operational Op=operational B=back-up, secondary L=limited availability	Operator	Equator Crossing Time (ECT) Ascending Node	Mean Altitude	Launch date	Details on near real time access to L0/L1 data (links)	Instrument payload and status
Sun-synchronous "Morning" orbit ECT between 19:00-24:00 and between 07:00-12:00	NOAA-16 (B)	USA/NOAA	19:45	849 km	21/09/2000	User Guide	Functional, no APT. Intermittent problems with AVHRR.
	DMSP F-18 (Op)	USA/NOAA-DOD	20:08	850 km	18/10/2009	Archive : CLASS	SSMIS. Defense satellite. Data available to civilian users through NOAA.
	FY-3A (Op)	China/CMA	10:15 (D)	836 km	27/05/2008	Data access	Direct Broadcast: AHRPT/MPT AHRPT transmission of: VISR, MWTS, MWHS, TOU, SEM, SIM. MPT transmission of: MERSI SBUS, MWRI, ERM, IRAS failed
	NOAA-17 (B)	USA/NOAA	20:43	810 km	24/06/2002	User Guide	Functional. 10/28/2003 – AMSU-A1 Failed. 2/15/2003 – DTR5 Failed. 2/14/2008 – STX3 output power degraded to inoperable level. STX1 diminished performance. AMSU-B channels 18-20 inoperative. AVHRR scan motor stalled on October 15, 2010.
	Metop-A (Op)	EUMETSAT	21:30	837 km	19/10/2006	Data access L1 data info	AVHRR/3, HIRS/4, AMSU-A, MHS, IASI, GRAS, ASCAT, GOME-2, SEM (HRPT partly functional) Dissemination via EUMETCast
	METEOR M-N1(P)	RUSSIA	21:30	830 km	17/09/2009	Signal structure	MSU-MR, MTVZA, KMSS, Severjanin, GGAK-M. Dissemination: HRPT, LRPT
Orbit type ECT=Equator Crossing Time (for sun-synchronous orbits)	Satellites in orbit P=pre-operational Op=operational B=back-up, secondary L=limited availability	Operator	Equator Crossing Time (ECT) Ascending Node	Mean Altitude	Launch date	Details on near real time access to L0/L1 data (links)	Instrument payload and status



Non sun-synchronous	JASON-2 (Op) (Ocean Surface Topography Mission) (NOAA , EUMETSAT)	NASA/NOAA/ EUMETSAT/ CNES	(66° inclin.)	1336 km	20/06/2008	Handbook	Follow-on of JASON-1 Sea surface topography measurement
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Table 4/6: Future LEO satellites contributing to the GOS

Sun-synchronous satellites are listed by Equatorial Crossing Time at the Ascending Node, in ascending order.

Orbit type ECT=Equator Crossing Time (for sun- synchronous orbits)	Satellites in orbit P=pre- operational Op=operational B=back-up, secondary L=limited availability	Operator	Equator Crossing Time (ECT) Ascending Node	Mean Altitude	Launch date	Details on near real time access to L0/L1 data (links)	Instrument payload and status
Sun- synchronous "Afternoon" orbit ECT between 12:00-17:00 and between 00:00-05:00	NPP (NPOESS Preparatory Project)	USA NOAA/NASA	13:30	833 km	25 Oct 2011	IDPS DRL NPP Formats	VIIRS, CrIS, ATMS, OMPS, CERES
	JPSS-1	USA/NOAA	13:30	833 km	11/2016	NDE IDPS FTS Formats	VIIRS, CrIS, ATMS, CERES, TSIS, OMPS/Nadir. Products: Products Payload and products still TBC
	JPSS-2	USA/NOAA	13:30	833 km	11/2021	NDE IDPS FTS	VIIRS, CrIS, ATMS, OMPS/Nadir Products: Products Payload and products still TBC
	FY-3D	CHINA/CMA	14:00	836 km	2015		AHRPT/MPT transmission; MERSI-2, GAS, HIRAS, MWTS-2, MWHS-2, SES, GNOS
	FY-3F	CHINA/CMA	14:00	836 km	2019		AHRPT/MPT transmission; MERSI-2, GAS, HIRAS, MWTS-2, MWHS-2, SES, GNOS
	METEOR M-N2	RUSSIA	09:30	836 km	2012		MSU-MR, MTVZA, IRFS-2, KMSS, Severjanin, GGAK-M, DCS. Dissemination: HRPT, LRPT
	METEOR M-N2-1	RUSSIA	09:30	820 km	2014		MSU-MR, MTVZA, IRFS-2, KMSS, Severjanin, GGAK-M, DCS. Dissemination: HRPT, LRPT
	METEOR M-N2-2	RUSSIA	09:30	820 km	2015		MSU-MR, MTVZA, , KMSS, Severjanin GGAK-M,IRFS-2, DCS. Dissemination: HRPT, LRPT

Orbit type ECT=Equator Crossing Time (for sun-synchronous orbits)	Satellites in orbit P=pre-operational Op=operational B=back-up, secondary L=limited availability	Operator	Equator Crossing Time (ECT) Ascending Node	Mean Altitude	Launch date	Details on near real time access to L0/L1 data (links)	Instrument payload and status
Sun-synchronous "Early morning" orbit between 17:00-19:00 and 05:00-07:00	DMSP-F19	USA/NOAA- DOD	17:XX	848 km	End 2012		
Sun-synchronous "Morning" orbit ECT between 19:00-24:00 and between 07:00-12:00	DMSP-F20	USA/NOAA	19:XX	848 km	End 2014		
	Metop-B (Metop-1)	EUMETSAT	21:30	837 km	05/2012		AVHRR, HIRS, MHS, AMSU-A, IASI, ASCAT, GRAS GOME.
	Metop-C (Metop-3)	EUMETSAT	21:30	837 km	End 2016		AVHRR, MHS, AMSU-A, IASI, ASCAT, GRAS GOME
	FY-3C	CHINA/CMA	10:00 (D)	836 km	2013		VIRR, MERSI-2, IRAS, MWTS-2, MWHS-2, TOUS/SBUS, MWIRI, ERM-1, SIM-2. AHRPT/MPT
	FY-3E	CHINA/CMA	10:00 (D)	836 km	2017		AHRPT/MPT transmission; MERSI-2, WindRD, HIRAS, MWTS-2, MWHS-2, WindRAD, OMS, SES, ERM-2, SIM-2, GNOS
	FY-3G	CHINA/CMA	22:00	836 km	2021		AHRPT/MPT transmission; MERSI-2, WindRD, HIRAS, MWTS-2, MWHS-2, WindRAD, OMS, SES, ERM-2, SIM-2, GNOS
	METEOR M-N3	RUSSIA	TBD	835 km	2016		MSS-BIO, SCAT, OCS, Radiomet, Severjanin-plus Dissemination: HRPT, LRPT



Orbit type ECT=Equator Crossing Time (for sun-synchronous orbits)	Satellites in orbit P=pre-operational Op=operational B=back-up, secondary L=limited availability	Operator	Equator Crossing Time (ECT) Ascending Node	Mean Altitude	Launch date	Details on near real time access to L0/L1 data (links)	Instrument payload and status
Non sun- synchronous	Jason-3 (Sea Surface Topography Mission)	NASA/NOAA/ EUMETSAT/ CNES	(66° inclin.)	1336 km	2014		Follow-on of Jason-2 Sea surface topography measurement
	FY-3 RM 1	CHINA/CMA	inclin.TBD	TBD	2015		Ku/Ka Precipitation Radar, MWTS, MWHS, MWRI
	FY-3 RM 2	CHINA/CMA	inclin.TBD	TBD	2019		Ku/Ka Precipitation Radar, MWTS, MWHS, MWRI

Table 5/6: Current Research&Development (R&D) satellites

Sorted by launch date.

Satellites	Space Agency	Equator Crossing Time + Altitude	Launch date	Access to data or products (Links)	Instruments	Status, applications and other information
ERS-2	ESA	10:30 (D) 785 km	21/04/95	Earthnet on line	- Altimeter - SAR, SAR-wave - ATSR-2 - Scatterometer - GOME	No on-board recorder since 06/03. Data acquisition is ensured over ESA agreed acquisition stations ATSR-2 anomaly since Febr.2008 On 4 July 2011, the ERS-2 payload was switched-off nominally to start the satellite de-orbitation after 16 years of operations.
Orbview-2 (former SeaStar)	Geoeye (partnership with NASA)	12:00 (D) 780 km	01/08/97		- SeaWiFs (Sea-Viewing Wide Field-of-view Sensor)	8-channel imager for ocean colour, vegetation and aerosols. Operated by GeoEye company under data-buy contract with US agencies.
TRMM	NASA/ JAXA	non-sun-synchronous (35° incl) 402 km	28/11/97	PMM data access page TRMM data products	- PR (Precipitation Radar) - TMI (TRMM MW Imager) - CERES - VIRS - LIS (Lightning Imaging Sensor)	Measures tropical rainfall/precipitation and radiation energy Precipitation Radar (PR) provided by JAXA Satellite bus and other instruments provided by NASA CERES no longer functional
Landsat-7	NASA	10:05 (D) 705 km	15/04/99	Details	- ETM+ (Enhanced Thematic Mapper Plus)	Well-calibrated, multispectral, moderate resolution, substantially cloud-free, sunlit digital images of the Earth's continental and coastal areas and selected coral reefs

Satellites	Space Agency	Equator Crossing Time + Altitude	Launch date	Access to data or products (Links)	Instruments	Status, applications and other information
QuikSCAT (Quick Scatterometer)	NASA	06:00 (A) 803 km	19/06/99	PODAAC	- SeaWinds	Sea surface wind speed and direction data for global climate research and operational weather forecasting and storm warning Stopped operating on 23/11/09 after antenna failure. Provides radar backscatter data for calibration of ISRO Oceansat-2 scatterometer.
Terra	NASA	10:30 (D) 705 km	18/12/99	DAAC	- CERES - MISR - MODIS - MOPITT - ASTER	Measurement of Earth' climate system, atmosphere, land, oceans and interactions with solar radiation
ACRIMSAT	NASA	10:50 (D) 720 km	20/12/99		- ACRIM 3	Active Cavity Radiometer Irradiance Monitor Satellite Measures total solar irradiance
NMP EO-1 (New Millennium Program Earth Observing-1)	NASA	10:01 (D) 705 km	21/11/00		- Advanced Land Imager - Hyperion - LAC (atmospheric corrector)	Demonstrates and validates advanced technology instruments (multi and hyperspectral), spacecraft systems, and mission concepts in flight
PROBA	ESA	10:30 (D) 615 km	22/10/2001	Earthnet on line	- CHRIS	Drifting orbit. Technology experiment. AO Science mission since 2001.

Satellites	Space Agency	Equator Crossing Time + Altitude	Launch date	Access to data or products (Links)	Instruments	Status, applications and other information
Jason-1	NASA/ CNES	non-sun-synchronous (66° incl) 1336 km	07/12/01	Aviso PO.DAAC	<ul style="list-style-type: none"> - LRA (Laser retroreflector array) - Poseidon2 (solid state radar altimeter) - DORIS receiver - Jason Microwave Radiometer - BlackJack GPS Receiver 	Ocean surface topography follow-on mission to TOPEX/Poseidon. Monitors global ocean circulation for global climate prediction
ENVISAT	ESA	10:00 (D) 800 km	1/03/2002	Earthnet on line	<ul style="list-style-type: none"> - ASAR, RA-2 - AATSR - MERIS - GOMOS - MIPAS - MWR - SCHIAMACHY 	MIPAS is operated at 80% of its duty cycle. GOMOS performs regularly with reduced azimuth range since 29 august 2005. RA-2: loss of secondary frequency (in S-band) in Jan 2008, compensated with on-ground ionospheric corrections. ENVISAT orbit modified in Oct. 2010 (new altitude, new repeat cycle,) to allow the operations to be extended to 2013. All scientific and operational applications have been maintained after the orbital change, with the exception of SAR Interferometry.
GRACE (Gravity Recovery and Climate Experiment)	NASA/ DLR	non-sun-synchronous (89°incl) 485 km	17/03/02	PO.DAAC	<ul style="list-style-type: none"> - Star Camera Assembly - BlackJack GPS Receiver - Instruments Processing Unit - Laser Retro-Reflector Assembly - K-Band Ranging Instruments - SuperSTAR Accelerometers 	Accurate global and high-resolution determination of static and time-variable components of Earth's gravity field. Measurement of: <ul style="list-style-type: none"> - Gravitational field - GPS atmospheric and ionospheric limb sounding
Satellites	Space Agency	Equator Crossing Time + Altitude	Launch date	Access to data or products (Links)	Instruments	Status, applications and other information
Aqua	NASA	13:30 (A)	04/05/02	Direct Broadcast	- AMSR-E	Collects data on Earth's water cycle, precise

		705 km		and data centres	<ul style="list-style-type: none"> - AIRS - HSB - AMSU-A - CERES - MODIS 	atmospheric, land and oceanic measurements, and interaction with solar radiation AMSR-E provided by JAXA. HSB provided by INPE (no longer functional)
SORCE (Solar Radiation and Climate Experiment)	NASA	non-sun-synchronous (40° incl) 640 km	25/01/03	DISC	<ul style="list-style-type: none"> - XPS (Extreme Ultraviolet (XUV) Photometer System) - TIM (Total Irradiance Monitor) - SIM (Spectral Irradiance Monitor A&B) - SOLSTICE (Solar Stellar Irradiance Comparison Experiment A&B) 	Provides total solar irradiance measurements and full solar spectral irradiance measurements. Continuation of ACRIMSAT total solar irradiance measurements.
Resourcesat-1	ISRO	10:30 (D) 817 km	10/2003		- AWIFS	Land monitoring 4-channel camera
Aura	NASA	13:45 (A) 705 km	15/07/04	DISC	<ul style="list-style-type: none"> - HIRDLS, - MLS (Microwave Limb Sounder) - OMI (Ozone Monitoring Instrument) - TES 	Comprehensive measurements of atmospheric chemistry and trace gasses : HIRDLS = High Resolution Dynamic Limb Sounder (IR) TES = Tropospheric Emission Spectrometer

Satellites	Space Agency	Equator Crossing Time + Altitude	Launch date	Access to data or products (Links)	Instruments	Status, applications and other information
PARASOL	CNES	13:32 (A) 705 km	18/12/04	CNES Icare	- POLDER	Characterisation of clouds and aerosols microphysical and radiative properties. Data can be accessed for level 1 from CNES and for level 2 and more from Icare
Cartosat-1	ISRO	10:30 (D) 618 km	05/2005		- Carto-dem	High resolution stereo imagery 2 Panchromatic cameras
CALIPSO	NASA/ CNES	13:30 (A) 705 km	28/04/06	ASDC Icare	- CALIOP - WFC - IIR	Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations for climate predictions
CloudSat	NASA/ CSA	13:30 (A) 705 km	28/04/06	DPC	- CPR (Cloud Profiling Radar)	Global cloud properties (applications: air quality, aviation safety, disaster management, energy and water management)
Resurs-DK	Roscosmos	360-690 km (70.4°incl)	15/06/06		- Land Observing satellite	-
HY-1B	CNSA	10:30 (D) 798 km	04/2007		- 4-band CCD Camera - Ocean Colour and Temperature Scanner (OCTS)	Ocean monitoring

Satellites	Space Agency	Equator Crossing Time + Altitude	Launch date	Access to data or products (Links)	Instruments	Status, applications and other information
HJ-1A	CNSA	10:30 (D) 650 km	6/09/2008		CCD camera, Hyperspectral camera	Land, resource and environment monitoring
HJ-1B	CNSA	10:30 (D) 650 km	6/09/2008		CCD camera, IR camera	Land resource and environment monitoring
<u>GOSAT</u> (IBUKI)	JAXA & Japan's Ministry of Environment	13:00 (D) 666km	23/01/2009		- TANSO/FTS, TANSO/CAI	Greenhouse Gases Observing Satellite monitoring the distribution of the density of carbon dioxide
<u>GOCE</u>	ESA	06:00 (A) 260 km	17/03/2009	Data products	Electrostatic Gravity Gradiometer Satellite-to-Satellite Tracking Instrument	Gravity field and Ocean steady-state Circulation Explorer
<u>Oceansat-2</u>	ISRO	12:00am (D) 720 km	23/09/2009		OCM, ROSA , Scatterometer	ocean colour, Radio-occultation, ocean surface wind
<u>SMOS</u>	ESA	06:00 (A) 755 km	2/11/2009	Data	MIRAS (Microwave Imaging Radiometer using Aperture Synthesis)	L-band radiometer for Salinity & Soil Moisture observation
<u>CRYOSAT-2</u>	ESA	717 km (92° incl)	8/04/2010	Data	SIRAL (SAR Interferometric Radar Altimeter) + DORIS	Polar ice monitoring
Resourcesat-2	ISRO	10:30 (D) 817 km	20/04/2011		AWIFS	Land monitoring 4-channel camera
<u>SAC-D</u> <u>Aquarius</u>	CONAE / NASA	18:00 (A) 657 km	10/06/2011		L-band Radiometer and Scatterometer, HSC, MWR, NIRST, ROSA, Carmen-I, SODAD	Sea surface salinity Soil temperature, atmospheric sounding, space environment
HY-2A	CNSA, NSOAS	06:00 (D) 964 km	16/08/2011		Altimeter, MW radiometer, Scatterometer	Ocean monitoring

Table 6/6: Future Research&Development (R&D) satellites

Sorted by launch date.

Satellites	Space Agency	Equator Crossing Time + Altitude	Planned Launch Date	Planned access to data or products (Links)	Status, applications and other information
HJ-1C	CNSA	06:00 (D) 500 km	2012		Land monitoring S-band SAR
Kanopus-V N1	ROSCOSMOS	510-540 km	2011		Monitoring of natural and man-made extreme events
CBERS-3	CNSA + AEB	10:30 (A) 778 km	2012		Land monitoring CCD camera, IRMSS, WFI
SWARM	ESA	300/530 km (3 spacecraft)	07/2012		Geomagnetic field
Megha-Tropiques	ISRO + CNES	Non sun-synchronous (20° incl) 870 km	12/10/2011	MOSDAC	Monitoring convective systems, water cycle and energy budget in tropical atmosphere MADRAS (microwave imager), SAPHIR (humidity microwave sounder) 183 GHz, SCARAB (outgoing radiative flux at TOA)
Lomonosovs-	ROSCOSMOS/Moscow State University	510-540 km	2012		Monitoring of natural and man-made extreme events
GCOM-W1	JAXA	13:30 (A) 700 km	JFY 03/2011		Global water and energy circulation. Will join the A-train.
SARAL-Altika	ISRO + CNES	06:00 800 km	2012	MOSDAC	Altika altimeter Argos Data Collection System

Satellites	Space Agency	Equator Crossing Time + Altitude	Planned Launch Date	Planned access to data or products (Links)	Status, applications and other information
CBERS-4	CNSA + AEB	10:30 (A) 778 km	2014		Land monitoring CCD camera, IRMSS, WFI
<u>LDCM</u> (Landsat Data Continuity Mission)	NASA / US Geological Survey	828 km (at equator) sun- synchronous	12/2012		Extension of Landsat record of multispectral 30m resolution
<u>OCO-2</u>	NASA	13:25 (A) 705 km	02/2013		Orbiting Carbon Observatory (Remanufacturing of OCO spacecraft lost at launch on 24Feb 2009)
<u>Sentinel-3A</u>	<u>ESA</u> / <u>EUMETSAT</u>	10:00 (D) 815 km	10/2013		Ocean and global land monitoring Radar altimeter (SRAL) and MWR, OLCI, SLSTR
<u>ADM-Aeolus</u>	ESA	18:00 (A) 405 km	2013	<u>Presentation</u>	Doppler Lidar (ALADIN) wind profile by aerosol, clouds and molecular backscatter
<u>GPM</u> (Core Observatory)	NASA / JAXA	407 km Non sun-synchronous (65° incl)	02/2014	<u>Data access</u>	Global Precipitation Measurement core spacecraft, follow- on and improvement of TRMM Dual-frequency (Ka/Ku) Precipitation Radar (DPR), GPM Microwave Imager (GMI)
<u>EarthCARE</u>	ESA-JAXA	10:30 (D) 450 km	11/2015		ATLID, BBR, CPR, MSI, Cloud, radiation and aerosol interaction processes
<u>GCOM-C1</u>	JAXA	10:30 (D) 798 km	JFY 2014		Carbon cycle and radiation budget (Atmosphere, Ocean, Land and Cryosphere)
ALOS-2	JAXA	12:00 628km	JFY 2014		PALSAR-2



Satellites	Space Agency	Equator Crossing Time + Altitude	Planned Launch Date	Planned access to data or products (Links)	Status, applications and other information
SMAP	NASA	06:00 690 km	11/2014		Soil Moisture Active and Passive mission (L-band Synthetic Aperture Radar and L-band radiometer)
Sentinel-3B	ESA / EUMETSAT	10:00 (D) 815 km	2015		Ocean and global land monitoring Radar altimeter (SRAL) and MWR, OLCI, SLSTR
ICESat-2	NASA	(94° incl) 600 km	10/2015		Ice, Cloud and land Elevation Satellite (ICESat Follow-on) Payload: GLAS
GRACE-FO (Gravity Recovery and Climate Experiment Follow-On)	NASA, DLR	Non-sun-synchronous (89° incl) 485 km	2016		Accurate global and high-resolution determination of static and time-variable components of Earth's gravity field for ocean currents, ocean mass, and ice sheets. GPS atmospheric and ionospheric limb sounding measurements for pressure, temperature and humidity.
SWOT (Surface Water Ocean Topography)	NASA, CNES, USGS	TBD	2019		KA-Band Radar Interferometer for lake levels, river discharge, and ocean surface topography. Carbon Monoxide sensor.
ASCENDS (Active Sensing of Carbon dioxide Emissions over Nights, Days and Seasons)	NASA	TBD	2019		Active laser measurements of Carbon Dioxide (day and night)
PACE (Pre-Aerosols, Carbon and Ecosystems Mission)	NASA, CNES, ESA	TBD	2019		Spectrometer measurements of ocean color, Polarimeter measurements of aerosols.