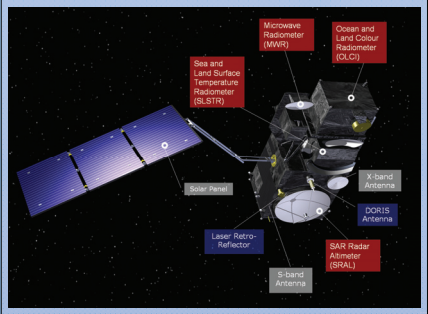
SENTINEL-3 MISSION STATUS

Ulf Klein, B. Berruti, C. Donlon, J. Frerick, C. Mavrocordatos, J. Nieke, H. Rebhan, B. Seitz, J. Stroede

European Space Agency, ESTEC (EOP-PVP), Keplerlaan 1, 2201AZ Noordwijk, The Netherlands

http://www.esa.int/gmes

Sentinel-3 Spacecraft



Geophysical Product Requirements

Surface Topography:

SSH, SWH, Wind, Geostrophic Currents
Marine & ice sheet surface topography
River and Lake levels

Ocean Colour & Sea-Surface Temperature:

Chl, PFTs, HAB, Transparency, Sediment loading, Turbidity
SST

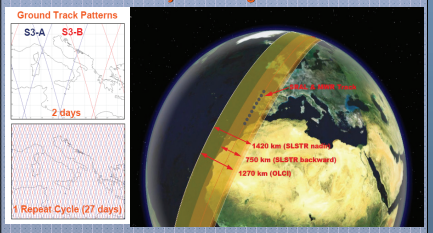
Land Surface and Vegetation

fCover, LAI, NDVI, MGVI, MTCI, faPAR, Burned Area
Land Surface Temperature, Fire Radiative Power

Atmospheric products:

Atmospheric Aerosols & Clouds

Measurement Geometry & Coverage



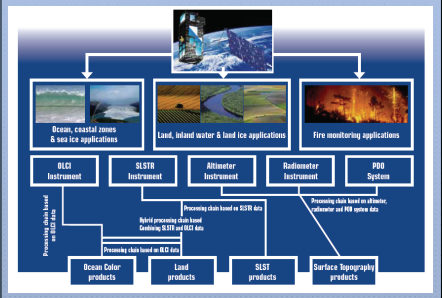
Orbit: SSO 14+7/27, Average altitude 815 km , LTDN 10:00, i=98,65°

Background & Mission Objectives

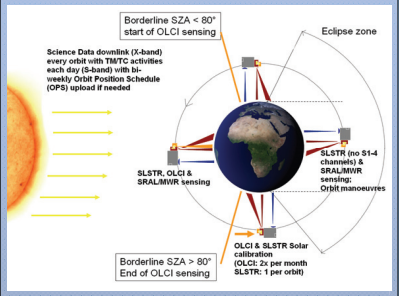
The Sentinel-3 Mission (S-3) is part of the Global Monitoring for Environment and Security (GMES) European initiative. S-3 is an operational mission in high-inclination, low-earth orbit designed to acquire global coverage microwave, optical (visible and IR) data for operational oceanography and global land applications with near-real-time product delivery (< 3hrs). The S-3 mission provides continuity into the 2020th to the following existing data records:

- **Ocean/land colour** data, at least at the level of the Envisat/MEdium Resolution Imaging Spectrometer (MERIS) instrument
- **Sea/Land Surface Temperature**, at least at the level of quality of the Envisat/Advanced Along-Track Scanning Radiometer (AATSR) instrument
- **Sea surface and land ice topography** data at least at the level of quality of the Envisat Radar Altimeter (RA) system
- **SPOT-Vegetation** continuity products exploiting synergy between collocated data streams from optical instruments

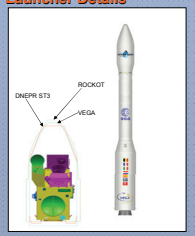
Sentinel-3 System Overview



Operations and Acquisitions per Orbit



Launcher Details



The Sentinel-3 schedule foresees for the first model (S3A) a late 2013 launch using either a Vega launch vehicle from the European Spaceport in Kourou, French Guyana or a Rockot Launch Vehicle from Plesetzk in Russia. The launch date for the S3B model is not yet established

Altimeter Instrument Modes

Surface type	Measurement mode	Tracking mode
Open ocean	LRM	Closed loop
Coastal zones	SAR	Open loop / Closed loop
Sea ice	SAR	Closed loop
Ice sheet interiors	LRM	Closed loop
Ice sheet margins	SAR	Open loop
Inland water	SAR	Open loop
Other	Depends on S/C resources	Depends on S/C resources

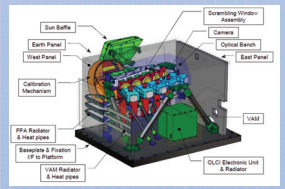
Optical Instrument Resolution

OLCI – Open ocean	1.2 km
OLCI – Coastal ocean	300 m
OLCI - Land	300 m
SLST – solar channels	500 m
SLST – Thermal channels	1 km

OLCI & SLSTR Bands

Instrument: OLCI (O); SLSTR (S)	Central wavelength in nm	Width in nm
O1 (New)	400	15
O2	412.5	10
O3	442.5	10
O4	490	10
O5	510	10
S1	555	20
O6	560	10
O7	620	10
S2	659	20
O8	665	10
O22 (New)	673.75	7.5
O9	681.25	7.5
O10	708.75	10
O11	753.75	7.5
O12	761.25	2.5
O13 (New)	764.375	3.75
O23 (New)	765.5	2.5
O14/15	778.75	15
O16/17 & S3	865	20
O18	885	10
O19	900	10
O20 (New)	940	20
O21 (New)	1020	40
S4	1375	15
S5	1610	60
S6	2250	50
S7	3740	380
S8	10.85	900
S9	12.00	1000

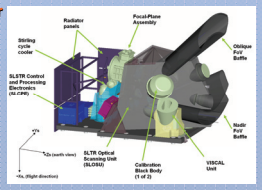
Ocean and Land Colour Instrument (OLCI)



OLCI will provide unrivalled performances with **21 narrow spectral bands**, enhanced image quality and outstanding radiometric performances. The instrument is built around:

- Push-broom imager constituted by five fan-arranged cameras, each of them realizing one fifth of the complete instrument swath,
- A unique Electronic Unit interfacing with the satellite, performing the image processing, managing the Calibration Mechanism and the active thermal control of the detectors and of the optical bench, and providing the power lines to the imaging chain.
- A calibration assembly based on a rotation wheel supporting radiometric and spectrometric diffusers as well as a shutter for dark current measurement.

Sea and Land Surface Temperature Radiometer



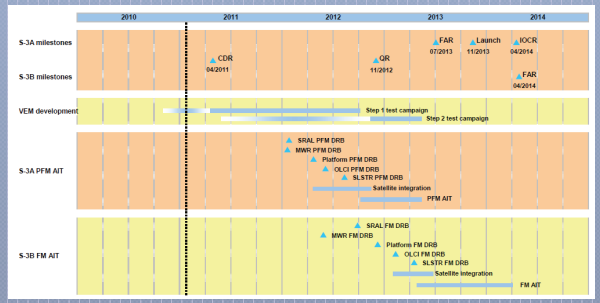
The **SLSTR** instrument is dedicated to the measurement of Sea and Land Surface Temperature with:

- Nine spectral channels from **visible to thermal Infrared**
- Thermal Infrared channels at 10.8 and 12 µm
- Medium Wave Infrared channels at 3.7 µm
- Visible channels at 0.55, 0.66 and 0.85 µm
- Short Wave InfraRed (SWIR) channels at 1.378, 1.6 and 2.25 µm with 500 m ground sampling distance.

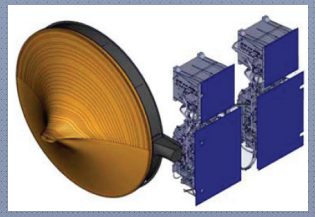
The main characteristics of the instrument are the following:

- A dual view capability to provide robust atmospheric correction over the dual 750km swath,
- Common focal plane optics and detectors for both views to ensure spectral and radiometric probity of the resulting data.
- On-board radiometric sources for accurate and stable in-flight calibration
- Cryogenic infrared detectors allowing achieving radiometric performance and maintaining stable radiometric gain.

Schedule



Radar Altimeter (SRAL)

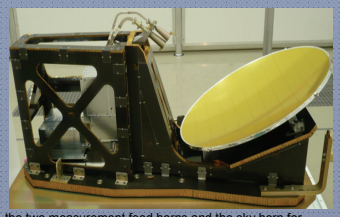


SRAL is a dual-frequency radar altimeter and is the backbone of the Sentinel-3 topography payload.

Its main frequency for surface height measurements is the **Ku-band** with a central frequency of **13.575 GHz** and a total bandwidth of 350 MHz. The secondary frequency, used for ionosphere corrections, is the **C-band** with a central frequency of **5.41 GHz** and a total bandwidth of 320 MHz. These frequency ranges are fully compatible with the latest ITU regulations.

The altimeter is made of a nadir looking antenna assembly, externally mounted on the Earth facing panel of the satellite and electronic units that are mounted inside the satellite body on the cold panel.

Microwave Radiometer (MWR)

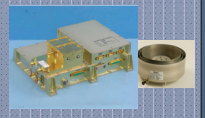


The MWR observes the brightness temperature in two frequency bands at **23.8 GHz and 36.5 GHz**. This provides information for the correction of the path delay of the altimeter signal by **tropospheric humidity**. The MWR is designed as a balanced Dicke radiometer. The balanced condition is achieved by noise injection. The main components are the main reflector, the Radiometer Processing Module (RPM), the Radio Frequency Front End (RFFE) and the antenna assembly including the main reflector, the two measurement feed horns and the sky horn for calibration purposes. The MWR has its own thermal control system and is operated continuously. The calibration is expected to be performed once or twice per orbit.

Precise Orbit Determination package

The Precise Orbit Determination is a key for a topography mission. Sentinel-3 will embark an outstanding set of units for the most Precise Orbit Determination on ground:

Dual-frequency GPS receiver including an enhanced navigation onboard solution



Laser Retro-Reflector Array (LRR) for Earth laser ranging

Doppler Orbitography and Radiopositioning Instrument (DORIS) provided by the French Space Agency (CNES)