



## Fact sheet

# Copernicus to observe the oceans with Sentinel-3

On 16th February 2016, the European Space Agency (ESA) will launch the third satellite in a series of missions which, combined, will form the space component of Copernicus, Europe's Global Monitoring for Environment and Security system. Sentinel-3A will collect data for the large-scale observation of land and sea areas, for instance to ascertain surface temperatures, currents and pollution levels. Switzerland's participation in ESA's programme to develop Sentinel satellites allows Switzerland to secure procurement contracts and gain access to scientific data. In addition, because Switzerland is a member of ESA, it is able to work with international partners and share in decision-making at the intergovernmental level. Swiss companies were actively involved in the development of Sentinel-3A.

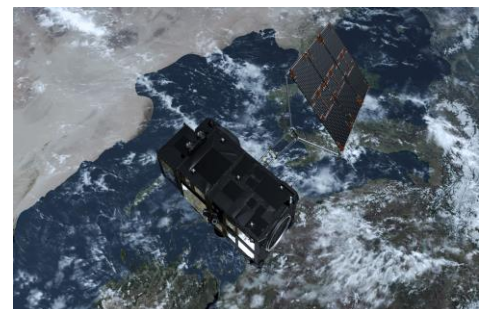
### ***Sentinel missions for Europe's Global Monitoring for Environment and Security system***

In addition to the Earth observation satellites used for meteorology and scientific research, ESA is currently planning a series of missions for the Copernicus programme – formerly known as Global Monitoring for Environment and Security (GMES). The European Commission is responsible for overall coordination of the programme, whose aim is to provide Europe with its own Earth observation capabilities for environmental applications. At the same time, the programme will enable Europe to develop and operate geoinformation services for the environment, climate protection, sustainable development and humanitarian aid. Earth observation from space will help to produce a comprehensive range of data. The space component in Copernicus involves infrastructure for observing Earth from space. It uses both existing national and international systems and develops its own special space missions, the Sentinels. ESA is responsible for developing Sentinel satellites. The corresponding programme began in 2005. A total of five missions are planned, each devoted to monitoring a specific environmental aspect (e.g. oceans, land, vegetation, atmosphere) and each having to meet different technical specifications. Switzerland has supported this programme from the beginning and considers space to be a means of analysing and solving global challenges such as climate change, environmental protection and disaster prevention.

### ***Sentinel-3 – protector of the sea***

The main purpose of the Sentinel-3 mission is to provide data for observing the oceans. High-precision instruments will globally measure water temperatures with an accuracy of over 0.3 Kelvin; they will measure sea levels and currents and document water colouration and algae bloom. This data will be used to obtain information on and monitor changes in sea level, pollution and the biological productivity of the sea as an important ecosystem. With almost no time delay, this data can also be used to make ocean prognoses and to map sea ice and maritime traffic. Sentinel-3 will also observe changes in land-use to assess the state of vegetation and monitor forest fires.

The Sentinel-3 payload comprises of four instruments. A multispectral, optical camera, which takes photos of the Earth's surface from the visible to the infrared region of the spectrum, will measure ocean and land vegetation colour. Its spatial resolution is up to 300 metres. A radiometer with a spatial resolution of 500 metres will determine surface temperatures with extreme precision. Furthermore, a radar altimeter and a microwave radiometer will provide exact measurements of sea surface height and the presence of sea ice. The Sentinel-3 mission is actually made up of two satellites (Sentinel-3A



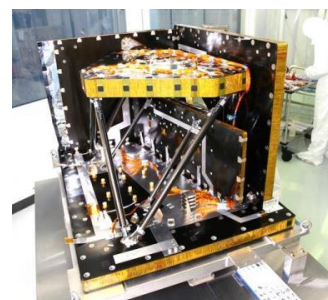
Artistic representation, Sentinel-3 © ESA

and 3B), which means that the whole planet Earth can be covered within a few days. Sentinel-3A is due to be launched on 16<sup>th</sup> February 2016 (at 18:57 Swiss time) from the Plesetsk Cosmodrome in Russia. A Rockot launch vehicle will transport the satellite, weighing 1.1 t, to a polar orbit at an altitude of 814 km. Following a test phase, Sentinel-3A will be operative for seven years. The launch of Sentinel-3B is planned for 2017.

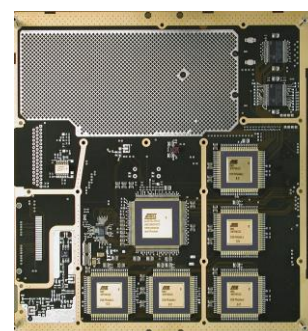
### Swiss involvement in Sentinel-3

Thales Alenia Space (FR) is the prime contractor responsible for the development of the Sentinel-3 satellites. Airbus Defence and Space (ES) is responsible for the Radiometer Selex ES (IT) and the microwave radiometer. The following private Swiss companies contributed as follows:

- APCO Technologies SA delivered the structure including components for the thermal control of the multispectral camera, and was responsible for the design and production of thermal control elements for the radiometer. Additionally, APCO developed a special set of mechanical equipment for safe handling, integration and transport of the satellite and microwave instrument.
- RUAG Space developed the satellite structure for Sentinel-3 and the drive mechanism that aligns the solar arrays with the sun and ensures power supply to the satellite. This is key to powering the satellite and must be totally reliable.
- Syderal SA built all boards for the electronic processor unit and the frequency unit for the radar altimeter. Along with the antenna, these are the central units of the instrument.
- CSEM SA developed the calibration mechanism for the multispectral camera's in-flight calibration unit. During calibration, specific calibration targets are positioned in the field of view of the sensor by a rotation table. Precise calibration is a key factor in achieving high data quality.
- Clemessy Switzerland was responsible for special electronic support and testing equipment for the multispectral camera and for creating a test environment for simulating and testing the electrical subsystems of the satellite.
- Swissoptics AG developed the coating for the multispectral camera's optical units.



Sentinel-3: Structure of the OLCI instrument. @APCO



Sentinel-3: Digital processor unit. @Syderal

Thanks to this involvement – made possible by Switzerland's contribution to ESA's Earth observation programme – and to the experience and expertise gained, Swiss science and industry will be able to play an active role in future development activities in the ESA Earth observation programme.

The Agency has 22 member states with Canada as associated member and its budget for 2016 is 5.3 billion Euros. ESA has more than 70 satellites in orbit, 17 ongoing missions including Rosetta and is responsible for the development of 6 launchers. Switzerland's participation to ESA's programmes amounts to about 140 million Euros per year. Such investment enables our research institutes and our industry to competitively access international projects and markets as well as promote their excellent scientific and technological competences. Since 2012, Switzerland is co-president of the ESA Ministerial Council, and will mark the end of this successful co-presidency period by hosting the 2016 Ministerial Council in Luzern next December.

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