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Sentinel-1 Mission Overview and Implementation Status

M. Davidson, E. Attema, P. Snoeij, and G. Levrini
European Space Agency, ESTEC, Noordwijk, The Netherlands

Sentinel-1 is an imaging radar mission at C-band consisting of a constellation of two satellites aimed at providing continuity of all-weather day-and-night supply of imagery for user services. Special emphasis is placed on services identified in ESA's GMES service elements program and on projects funded by the European Union Framework Programmes. Three priorities (fast-track services) for the mission have been identified by user consultation working groups of the European Union: Marine Core Services, Land Monitoring and Emergency Services. These cover applications such as:
- Monitoring sea ice zones and the arctic environment
- Surveillance of marine environment
- Monitoring land surface motion risks
- Mapping of land surfaces: forest, water and soil, agriculture
- Mapping in support of humanitarian aid in crisis situations.
The Sentinel 1 space segment will be designed and built by an industrial consortium with Thales Alenia Space Italia as prime contractor and EADS Astrium GmbH as C-SAR instrument responsible.

Data products from current and previous ESA missions including ERS-1, ERS-2 and Envisat missions form the basis for many of the pilot GMES services. Consequently Sentinel-1 data maintain data quality levels of the Agency‘s previous SAR missions in terms of spatial resolution, sensitivity, accuracy, polarization and wavelength. Nonetheless, the Sentinel-1 synthetic aperture radar (SAR) constellation represents a completely new approach to SAR mission design by ESA in direct response to the operational needs for SAR data expressed under the EU-ESA Global Monitoring for Environment and Security (GMES) programme. The Sentinel-1 constellation is expected to provide near daily coverage over Europe and Canada, global coverage all independent of weather with delivery of radar data within 1 hour of acquisition – all vast improvements with respect to the existing SAR systems. The continuity of C-band SAR data combined with the greatly improved data provision is expected not only to support the existing key operational services but will also support the evolving user community both for operational and remote sensing science applications.

The Sentinel-1 satellite carries a Synthetic Aperture Radar (SAR) instrument with four standard operational modes: Strip Map Mode, Interferometric Wide Swath Mode, Extra-wide Swath Mode and Wave Mode. Some of their important characteristics are listed below.

MODE ACCESS ANGLE
(DEG.) SINGLE LOOK RESOLUTION
RANGE X AZIMUTH SWATH WIDTH POLARISATION
STRIP MAP 20-45 5 X 5 M > 80 KM HH+HV OR VV+VH
INTERFEROMETRIC WIDE SWATH > 25 5 X 20 M > 250 KM HH+HV OR VV+VH
EXTRA WIDE SWATH > 20 20 X 40 M > 400 KM HH+HV OR VV+VH
WAVE MODE 23 AND 36.5 20 X 5 M > 20 X 20 KM
VIGNETTES AT
100 KM INTERVALS HH OR VV

FOR ALL MODES
RADIOMETRIC ACCURACY (3) 1 DB
NOISE EQUIVALENT SIGMA ZERO -22 DB
POINT TARGET AMBIGUITY RATIO -25 DB
DISTRIBUTED TARGET AMBIGUITY RATIO -22 DB

It is expected that Sentinel-1 be launched in 2011. Once in orbit Sentinel-1 will be operated from two centres on the ground. The Agency‘s facilities in Darmstadt, Germany will command the satellite ensuring its proper functioning along the orbit. The mission exploitation will be managed at the Agency‘s facilities in Frascati, Italy, including the planning of the acquisitions by the SAR instrument according to the mission requirements, the processing of the acquired data and the provision of the resulting products to the users.

he presentation will provide an overview of the Sentinel-1 mission, the user requirements driving the mission, the status and characteristics of the technical implementation. The key elements of the mission supporting the evolving needs of the user community both in operational and remote sensing science applications will be highlighted.