Geophysical Research Abstracts
Vol. 12, EGU2010-6805, 2010
EGU General Assembly 2010

Land science with Sentinel-2 and Sentinel-3 data series synergy

Jose Moreno, Luis Guanter, Luis Alonso, Luis Gomez, Julia Amoros, Gustavo Camps, and Jesus Delegido
IPL - Faculty of Physics, University of Valencia, Spain - Jose.Moreno@uv.es

Although the GMES/Sentinel satellite series were primarily designed to provide observations for operational services and routine applications, there is a growing interest in the scientific community towards the usage of Sentinel data for more advanced and innovative science. Apart from the improved spatial and spectral capabilities, the availability of consistent time series covering a period of over 20 years opens possibilities never explored before, such as systematic data assimilation approaches exploiting the time-series concept, or the incorporation in the modelling approaches of processes covering time scales from weeks to decades.
Sentinel-3 will provide continuity to current ENVISAT MERIS/AATSR capabilities. The results already derived from MERIS/AATRS will be more systematically exploited by using OLCI in synergy with SLST. Particularly innovative is the case of Sentinel-2, which is specifically designed for land applications. Built on a constellation of two satellites operating simultaneously to provide 5 days geometric revisit time, the Sentinel-2 system will providing global and systematic acquisitions with high spatial resolution and with a high revisit time tailored towards the needs of land monitoring. Apart from providing continuity to Landsat and SPOT time series, the Sentinel-2 Multi-Spectral Instrument (MSI) incorporates new narrow bands around the red-edge for improved retrievals of biophysical parameters. The limitations imposed by the need of a proper cloud screening and atmospheric corrections have represented a serious constraint in the past for optical data. The fact that both Sentinel-2 and 3 have dedicated bands to allow such needed corrections for optical data represents an important step towards a proper exploitation, guarantying consistent time series showing actual variability in land surface conditions without the artefacts introduced by the atmosphere. Expected operational products (such as Land Cover maps, Leaf Area Index, Fractional Vegetation Cover, Fraction of Absorbed Photosynthetically Active Radiation, and Leaf Chlorophyll and Water Contents), will be enhanced with new scientific applications. Higher level products will also be provided, by means of mosaicking, averaging, synthesising or compositing of spatially and temporally resampled data.
A key element in the exploitation of the Sentinel series will be the adequate use of data synergy, which will open new possibilities for improved Land Models. This paper analyses in particular the possibilities offered by mosaicking and compositing information derived from Sentinel-2 observations in high spatial resolution to complement dense time series derived from Sentinel-3 data with more frequent coverage. Interpolation of gaps in high spatial resolution time series (from Sentinel-2 data) by using medium/low resolution data from Sentinel-3 (OLCI and SLSTR) is also a way of making series more temporally consistent with high spatial resolution.
The primary goal of such temporal interpolation / spatial mosaicking techniques is to derive consistent surface reflectance data virtually for every date and geographical location, no matter the initial spatial/temporal coverage of the original data used to produce the composite. As a result, biophysical products can be derived in a more consistent way from the spectral information of Sentinel-3 data by making use of a description of surface heterogeneity derived from Sentinel-2 data. Using data from dedicated experiments (SEN2FLEX, CEFLES2, SEN3EXP), that include a large dataset of satellite and airborne data and of ground-based measurements of atmospheric and vegetation parameters, different techniques are tested, including empirical / statistical approaches that builds nonlinear regression by mapping spectra to a high dimensional space, up to model inversion / data assimilation scenarios. Exploitation of the temporal domain and spatial multi-scale domain becomes then a driver for the systematic exploitation of GMES/Sentinels data time series. This paper review current status, and identifies research priorities in such direction.