Geophysical Research Abstracts
Vol. 21, EGU2019-8732, 2019
EGU General Assembly 2019

MULTIPLY: A Operational Data assimilation framework for consistent land monitoring using of multiple satellite datasets

Joris Timmermans (1), Peter Van Bodegom (1), Leon Hauser (1), Amie Corbin (1), Ester Philips (1), Philip Marzahn (2), Thomas Weiss (2), Thomas Ramsauer (2), Philip Lewis (3), Jose Gomez-Dans (3), Feng Yin (3), Tonio Fincke (4), Carsten Brockmann (4), Grit Kirches (4), Jon Styles (5), Nicola Pounder (5), Gerado Saldana (5), Lea Hallik (6), Daniel Kindridge (7), and Philippe Peylin (8)

(1) Leiden University, Institute for Environmental Studies, Environmental Biology, Oegstgeest, Netherlands (j.timmermans@ucl.ac.uk), (2) Ludwig Maximilian University, Munchen, Germany, (3) University College London, London, United Kingdom, (4) Brockmann Institute, Geesthacht, Germany, (5) Assimila, Reading, United Kingdom, (6) Tartu Observatory, Tartu, Estonia, (7) ADAS, United Kingdom, (8) Laboratoire des Sciences du Climat et de l'Environnement, Paris, France

Human society increasingly depends on information derived from Earth Observation data. In particular, there is an growing demand for information facilitating agriculture, forestry, and hydrology. To this purpose the number of space-borne satellites and small cube-sat constellations are projected to increase dramatically over the next years. This increase provides enormous challenges in terms of retrieving actual information from this big data. The current general trend is to create individual land surface products for each satellite mission. This approach originates from the fact that satellites are usually has singular research-mission, that require only a specific number of land surface products to be created. As such, the majority of available products are created using a bespoke single-sensor approaches. This production-heterogeneity severely limits the advancement of research fields due to inconsistencies in the combinations of such land surface variable.

Land surface parameter retrieval suffers from illposedness: the fact that there are fewer observables than the amount of desired parameters (required for accurate retrieval). By only considering observations from singular satellites, this illposedness is worsened especially considering that varying spectral-sensitivities of different land surface parameters. A multi-sensor approach capable of integrating such sensitivities, by accurately modelling the physical radiative processes, resolves these limitations. Furthermore, such a multi-sensor approach also allows to benefit from synergies of using multi-scale/heterogeneous observation types/varying temporal frequencies of different sensors.

In this view, within the MULTIscale SENTINEL land surface information retrieval PLatform (MULTIPLY) project, the main objective was to create a framework to integrate observations from different sensors in order to obtain the best possible estimate of the land surface state, taking into account the different characteristics of different sensors and data streams. The MULTIPLY framework is developed from the original idea's implemented in the EOLDAS system but with emphasis on operationally, enhanced consistency (across sensor types) and improved gap-filling. Specifically: MULTIPLY aims to
1) Combine data from SAR and Optical remote sensing data using compatible radiative transfer models
2) Design a data assimilation platform incorporating as many information sources (observational, multi-temporal) to optimally retrieve satellite gap-free information.
3) Deliver a set of internally consistent data products at different resolutions with quantified uncertainties.
4) Explore potential applications that demand consistent land products, such as agriculture and forestry .

At present, the prototype of the MULTIPLY has been implemented as a cloud-service and is currently undergoing expert-user-evaluations.
During the presentation we present the operational MULTIPLY framework (http://www.multiply-h2020.eu/), the detailed methodology, as well as the results of our evaluation activities. In the presentation, specific emphasis will be put on the consistent coupling of Sentinel-1 (SAR) observations together with Sentinel 1&3 (optical) observations (together with auxiliary ecological information) in order to jointly and consistently retrieve soil parameters as well as vegetation traits and b) elaborate on the results of the fieldwork validation efforts.