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A multi-sensor approach for monitoring vegetation biophysical variables

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Monitoring vegetation biophysical parameters at global scale over a climate timescale (25+ years) is needed to understand long-term land surface processes such as desertification and degradation. In order to create a time series capable of capturing the variability of vegetation and ecosystem properties a multi-sensor approach is needed to generate consistent climate data records.

Using observations from different sensors onboard of different platforms requires a consistent treatment in order to combine data and keep track of the uncertainties along the whole processing chain, since not all sensor will have the same characteristics and radiometric accuracy. This communications uses the MODIS (onboard Terra and Aqua) and OLCI (onboard Sentinel-3) sensors to demonstrate the synergistic approach. The synergistic approach uses the Sensor Independent Atmospheric Correction (SIAC) approach applied to MODIS and OLCI data to derive surface reflectance on a set of common spectral bands. Then all the daily observations are used within a optimal estimation framework to derived BRDF descriptors with associated uncertainties. The final step comprises using Data Assimilation techniques to produced different vegetations parameters. The demonstrator product uses one year of MODIS and OLCI data over different geographic areas with heterogeneous vegetation coverage. The results show that using the two sensors the uncertainties in the vegetation parameters are reduced and that the land surface characterisation is better than using a single sensor, nevertheless the synergistic approach can be applied to different Earth Observation coarse resolution data products such as AVHRR, VIIRS and PROBA-V.