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Land Surface Temperature retrieval from Sentinel 2 and 3 Missions: a conceptual framework

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Land Surface Temperature (LST) is one of the key parameters in the physics of land-surface processes on regional and global scales, combining the results of all the surface-atmosphere interactions and energy fluxes between the surface and the atmosphere. Because of the strong heterogeneity in land surface characteristics such as vegetation, topography and soil physical properties, LST changes rapidly in space as well as in time. An adequate characterization of LST distribution and its temporal evolution, therefore, requires measurements with detailed spatial and temporal frequencies. With the advent of the ESA's Sentinel 2 and 3 series of satellites a unique opportunity exists to go beyond the current state of the art of single instrument algorithms. In this work we explore the synergistic use of future MSI instrument on board Sentinel-2 platform and OLCI/SLSTR instruments on board Sentinel-3 platform in order to improve LST products currently derived from the single AATSR instrument on board the ENVISAT satellite. For this purpose, the high spatial resolution data from Sentinel2/MSI will be used for a good characterization of the land surface sub-pixel heterogeneity, in particular for a precise parameterization of surface emissivity using a land cover map and spectral mixture techniques. On the other hand, the high spectral resolution of OLCI instrument, suitable for a better characterization of the atmosphere, along with the dual-view available in the SLTSR instrument, will allow a better atmospheric correction through improved aerosol/water vapor content retrievals and the implementation of novel cloud screening procedures. Effective emissivity and atmospheric corrections will allow accurate LST retrievals using the SLTSR thermal bands by developing a synergistic split-window/dual-angle algorithm. ENVISAT MERIS and AATSR instruments and different high spatial resolution data (Landsat/TM, Proba/CHRIS, Terra/ASTER) will be used as a benchmark for the future OLCI, SLTSR and MSI instruments. Results will be validated using ground data collected in the framework of different field campaigns organized by ESA.