Land Biosphere Essential climate variable product from Copernicus Climate Change Service (C3S): Surface albedo, LAI, fAPAR, Land Cover and Fire

Iskander Benhadj iskander.benahdj@vito.be, Joaquin Munoz-Sabater' <Joaquin.Munoz@ecmwf.int>, Bart Deronde bart.deronde@vito.be, Carsten Brockmann <carsten.brockmann@brockmann-consult.de>, grit kirches <grit.kirches@brockmann-consult.de>, martin.boettcher@brockmann-consult.de, Celine Lamarche <celine.lamarche@uclouvain.be>; Pierre Defourny <Pierre.Defourny@uclouvain.be>; Roselyne Lacaze (rl@hygeos.com); Didier Ramon <dr@hygeos.com>; Florian Pinault <florian.pinault@meteo.fr>; CARRER Dominique <dominique.carrer@meteo.fr>; Fernando Camacho <fernando.camacho@eolab.es>; Jorge Sánchez (jorge.sanchez@eolab.es); Leon Tavares Jonathan <jonathan.leontavares@vito.be>; Toté Carolien <carolien.tote@vito.be>; Lewis <ucfalew@ucl.ac.uk>; emilio.chuvieco@uah.es; Lizundia Loiola Joshua <joshua.lizundia@uah.es>; Pettinari María Lucrecia <mlucrecia.pettinari@uah.es>; mathias.disney@ucl.ac.uk; Ralf Giering <Ralf.Giering@fastopt.de>; Simon Blessing <simon.blessing@fastopt.de>; Xu, Weidong weidong.xu@kcl.ac.uk

The Copernicus Climate Change Service (C3S) is one of the six thematic information services provided by the Copernicus Earth Observation Programme of the European Union (EU). C3S will provide past, present and future Climate Data Record (CDR) and information on a range of themes, freely accessible through the Climate Data Store (CDS). It benefits from a sustained network of in-situ and satellite-based observations, re-analysis of the Earth climate and modelling scenarios, based on a variety of climate projections.

Within the Land Biosphere component of C3S, satellite-based observations will be used to provide the longest possible, consistent and mature products at the global scale for the following Essential Climate Variables (ECVs): Surface albedo, Leaf Area Index (LAI), the fraction of Absorbed Photosynthetic Active Radiation (fAPAR), Land Cover (LC), Fire, Burnt Areas (BA), and Fire Radiative Power (FRP). State-of-the-art algorithms that respond to GCOS requirements will be used and the products will be quality assured following the protocols, guidelines and metrics defined to be consistent with the Land Product Validation (LPV) group of the Committee on Earth Observation Satellite (CEOS) for the validation of satellite-derived land products.

To reach this goal, the following approach is proposed.(i) consolidate the CDR and secure continuation of the products by moving towards Copernicus mission Sentinel-3 as primary

data source,(ii) make an important steps towards cross-CDR consistency by harmonizing the pre-processing for all CDRs and implement operational tools to monitor the quality of the CDRs and their cross-consistency (iii) apply an extensive quality assessment of the delivered CDRs and benchmark with other existing datasets.

The surface albedo products will be extended in time to obtain the single-sensor CDRs for the period 1982 until present. In addition, the surface albedo CDR will be further consolidated by moving towards a multi-sensor approach to derive a fully consistent CDR. We propose to change the algorithm to derive LAI and fAPAR using a physically-based approach (Two-stream Inversion Package TIP method), that ensures cross-consistency with surface albedo. The TIP model derives the LAI and fAPAR from the surface albedo dataset. For Land Cover and Fire Burned Areas, maximization of the exploitation of the scientific expertise from the ESA CCI Land Cover and Fire projects was one of our primary goals. This will be achieved by (i) brokering the already existing BA and Land Cover CDRs from these projects, (ii) adapting them to Sentinel-3 SLSTR and OLCI sensors, and (iii) bringing these processing chains into fully operational and agile production lines. The Land Cover maps of the ESA CCI project will be further extended from 2016 until 2019 in this proposal. Likewise, the Burned Areas products from ESA CCI derived from MODIS will be brokered. These CDRs will be extended in time using the same approach adapted to Sentinel-3A and B satellite. Finally, the Fire Radiative Power product will be introduced in the service using only Sentinel-3 data as input. A strategy towards its further evolution within C3S will be prepared to include possibly also other FRP datasets and extend it to the past.