



Analysis of water dynamics in the soil-plant-atmosphere continuum using a multi-sensor approach

David Chaparro¹, Thomas Jagdhuber², Dara Entekhabi³, María Piles⁴, Anke Fluhrer², Andrew Feldman³, François Jonard⁵, and Mercè Vall-Ilossera¹

¹Universitat Politècnica de Catalunya, CommSensLab & IEEC/UPC, Jordi Girona 1-3, E-08034 Barcelona, Spain
(david.chaparro@tsc.upc.edu)

²German Aerospace Center (DLR), Microwaves and Radar Institute, 82234 Weßling, Germany

³Massachusetts Institute of Technology, Cambridge, MA02139, USA

⁴Image Processing Laboratory (IPL), Universitat de València, Catedrático José Beltrán, 2, 46980, Paterna, València, Spain

⁵Forschungszentrum Jülich GmbH, Institute of Bio-and Geosciences-Agrosphere, Jülich 52425, Germany

Changing climate patterns have increased hydrological extremes in many regions [1]. This impacts water and carbon cycles, potentially modifying vegetation processes and thus terrestrial carbon uptake. It is therefore crucial to understand the relationship between the main water pools linked to vegetation (i.e., soil moisture, plant water storage, and atmospheric water deficit), and how vegetation responds to changes of these pools. Hence, the goal of this research is to understand the water pools and fluxes in the soil-plant-atmosphere continuum (SPAC) and their relationship with vegetation responses.

Our study spans from April 2015 to March 2019 and is structured in two parts:

Firstly, relative water content (RWC) is estimated using a multi-sensor approach to monitor water storage in plants. This is at the core of our research approach towards water pool monitoring within SPAC. Here, we will present a RWC dataset derived from gravimetric moisture content (mg) estimates using the method first proposed in [2], and further validated in [3]. This allows retrieving RWC and mg independently from biomass influences. Here, we apply this method using a sensor synergy including (i) vegetation optical depth from SMAP L-band radiometer (L-VOD), (ii) vegetation height (VH) from ICESat-2 Lidar and (iii) vegetation volume fraction (d) from AQUARIUS L-band radar. RWC status and temporal dynamics will be discussed.

Secondly, water dynamics in the SPAC and their impact on leaf changes are analyzed. We will present a global, time-lag correlation analysis among: (i) the developed RWC maps, (ii) surface soil moisture from SMAP (SM), (iii) vapor pressure deficit (VPD; from MERRA reanalysis [4]), and (iv) leaf area index (LAI; from MODIS [5]). Resulting time-lag and correlation maps, as well as analyses of LAI dynamics as a function of SPAC, will be presented at the conference.

References

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