

## L-VOD vegetation index capabilities for monitoring the dynamics of above-ground biomass: results and perspectives

Jean-Pierre Wigneron, Xiangming Xiao, Yuanwei Qin, Philippe Ciais, Rasmus Fensholt, Martin Brandt, Lei Fan, Ana Bastos, Hui Yang, Frédéric Frappart, Xiaojun Li

The VOD vegetation index is an estimate of the extinction effects affecting the microwave radiations as they propagate through the vegetation layer. Initially, many studies have analyzed VOD over a variety of vegetation types as VOD should be accurately estimated when monitoring soil moisture in vegetated areas. However, VOD by its own is a very interesting index to monitor the vegetation dynamics. VOD is a proxy of the vegetation water content. The lower the frequency, the higher the penetration capabilities of the microwave radiations within the vegetation canopies. So, VOD at low frequencies (for instance L-VOD at L-band) will be more sensitive to the vegetation water content of the whole canopy, while C- and X-VOD (at C- and X-band) will be more sensitive to the features of the top layer of the canopy.

The vegetation water content (VWC) can be related to the vegetation biomass (AGB) and to its moisture status, which can be parameterized by the gravimetric moisture content  $M_g$  (%). So, VODs and particularly L-VOD can be used to monitor both the dynamics in the vegetation biomass and in the vegetation water status. Decoupling these two effects is not straightforward but a number of strategies can be used. For instance, during the wet season and full water availability in the root zone, it can be assumed that the vegetation moisture content fully recovers to its maximum value, a value which is constant from year to year. Thus, L-VOD estimated during the wet season ( $L-VOD_{wet} \sim L-VOD_{max}$ ) will be mainly dependent on the inter-annual changes in AGB.

Considering these properties and the fact that the L-band radiations are not impacted by atmospheric effects and cloud coverage and in spite of its coarse resolution (25 km x 25 km), L-VOD is increasingly used to monitor the dynamics of AGB at continental scales. This communication will (i) present a rapid overview of some main results based on L-VOD retrieved from the ESA/SMOS observations (ii) discuss challenges in decoupling biomass/moisture status effects and (iii) conclude on perspectives.

### Affiliations:

1Department of Microbiology and Plant Biology, University of Oklahoma, Norman, OK 73019, USA

2ISPA, UMR 1391, INRA Nouvelle-Aquitaine, Bordeaux Villenave d'Ornon, France

3Laboratoire des Sciences du Climat et de l'Environnement, LSCE/IPSL, CEA-CNRS-UVSQ, Université Paris-Saclay, 91191 Gif-sur-Yvette, France

4Department of Geosciences and Natural Resource Management, University of Copenhagen, Copenhagen, Denmark

5 Collaborative Innovation Center on Forecast and Evaluation of Meteorological Disaster, School of Geographical Sciences, Nanjing University of Information Science and Technology, Nanjing 210044, China

6 College of Atmospheric and Geographic Sciences, University of Oklahoma, Norman, OK, 73019, USA

7 Department of Earth and Environmental Engineering, Columbia University, New York, NY 10027, USA.

8 Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing 100101, China

9 College of Life and Environmental Sciences, University of Exeter, Exeter EX4 4RJ, UK