Geophysical Research Abstracts
Vol. 20, EGU2018-19804, 2018
EGU General Assembly 2018

Modelling of ecosystem respiration with proximal sensing data and meteorological measurements

Bruna Oliveira (), Oscar Perez Priego (2), Micol Rossini (3), Markus Reichstein (2), Gerardo Moreno (4), Jinhong Guan (2), Tarek El-Madany (2), and Mirco Migliavacca (2)

(1) CESAM – Center for Envirtonmental and Marine Studies, Department of Environment and Planning, University of Aveiro, 3810-193 Aveiro, Portugal, (2) Max Planck Institute for Biogeochemistry, Postfach 10 01 64, 07701 Jena, Germany, (3) University of Milano Bicocca, Piazza della Scienza 1, Milan 20126, Italy, (4) INDEHESA-Forest Research Group, Universidad de Extremadura, Plasencia 10600, Spain

Respiration of terrestrial ecosystems (RECO) is the second largest flux in the global carbon cycle and its responses to environmental conditions are important in understanding climate–carbon cycle interactions. The processes and complex interactions controlling RECO are still incompletely understood and the associated uncertainty continues to hamper bottom-up scaling to larger spatial scales (e.g. regional and continental). Empirical evidences for the link between gross primary production (GPP) and RECO are reported for most, if not all, ecosystems. Remote and proximal sensing information are widely used to upscale GPP, while only few studies explore the possibility to use remote sensing to predict RECO.

The objective of this study is to combine proximal sensing data and meteorological measurements to model RECO and to get insight into what the strengths and limitations of these approaches are, and to explore the relationship of basal respiration with structural vegetation indices and vegetation indices related to physiological activity. The data used is from the SMANIE – Small-scale Manipulation Experiment – project, running in a Mediterranean savannah in Majadas de Tietar, Spain, where the effects of nitrogen; phosphorous; and nitrogen plus phosphorous addition on RECO are monitored using chambers. By combining hyperspectral measurements of canopy reflectance and sun induced fluorescence and measured RECO we tested the performance of a variety of empirical models.

The RECO could be successfully predicted using vegetation indices related to canopy structure, but also with a combination of land surface temperature and vegetation indices related to physiology (i.e. Photochemical reflectance index). Further, we model diurnal course RECO using midday remote sensing data (to constrain the seasonality of GPP, a crucial driver of RECO) and meteorological drivers. Results showed that model based on NDVI and PRI result in the best performance to reproduced the diurnal cycle of RECO (EF=0.62). Further tests on parameters and models have to be performed with varying datasets before consolidating the conclusions.