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Integrating proximal and satellite optical data for the analysis of ecosystem carbon uptake and plant phenology at the European larch Specnet site

Marta Galvagno (1), John Gamon (2), Edoardo Cremonese (1), Steven Garrity (3), K. Fred Huemmrich (4), Gianluca Filippa (1), Umberto Morra di Cella (1), and Micol Rossini (5)

(1) Environmental Protection Agency of Aosta Valley, Climate Change Unit, Aosta, Italy(m.galvagno@arpa.vda.it), (2) Center for Advanced Land Management Information Technologies (CALMIT), School of Natural Resources, University of Nebraska, Lincoln, NE, USA, (3) Decagon Devices, Inc., Pullman, WA, USA, (4) NASA Goddard Space Flight Center, University of Maryland, Baltimore County, Greenbelt, MD, USA, (5) Earth and Environmental Sciences Department, University of Milano-Bicocca, Milano, Italy

Automated canopy-level optical sampling in tandem with ecosystem-atmosphere flux observations is continuously carried on at a variety of ecosystems through the Specnet network (http://specnet.info/). Specifically, 9 sites within US and Europe were selected since 2015, to investigate the use of novel NDVI and PRI low-cost sensors for the analysis of ecosystem functioning and phenology. Different plant functional types, such as grasslands, deciduous, and evergreen forests belong to the network, here we present specific data from the larch (Larix decidua Mill.) forest Italian site. Three automated NDVI and three automated PRI spectral reflectance sensors (Decagon Devices Inc.) were installed in 2015 on the top of the 20-meters eddy covariance tower, pointing toward the west, north, and east orientations. An additional system, composed by one NDVI and PRI system was installed to monitor the understory component. The objective of this analysis is the comparison between these in-situ inexpensive sensors, independent NDVI and PRI sensors (Skye Instruments) previously installed on the 20-meters tower and satellite-derived NDVI. Both MODIS and Sentinel NDVI data were used for the comparison. Moreover, the newly derived chlorophyll/carotenoid index (CCI, Gamon et al. 2016), computed as the normalized difference between the NDVI red band and PRI 532 nm band, was tested to estimate the seasonal pattern of daily Gross Primary Productivity (GPP) of the larch forest. Results showed that the seasonality of NDVI was comparable among in-situ sensors and satellite data, though orientation-specific differences were observed. Both NDVI and CCI tracked daily GPP, but with different sensitivity to its seasonality. Future analysis will be directed toward a comparison between this site-based results with the other sites within the Specnet network.