



Using webcam images for monitoring and modeling phenological and functional dynamics of a subalpine grassland

Mirco Migliavacca and the Working Group Team

European Commission, Joint Research Centre, IES, Ispra (VA), Italy (mirco.migliavacca@jrc.ec.europa.eu)

The automatic retrieval of canopy phenology is of increasing scientific interests for the multiple implication of vegetation dynamics on the ecosystem carbon and energy fluxes. For this purpose we evaluated the applicability of the use of webcam images collected during the 2009 and 2010 for monitoring and modeling phenology and physiology of a subalpine grassland.

We tested the relationship between the vegetation indices extracted from repeated digital images (webcam VIs) against field measurements of green and total biomass, leaf area index (LAI), greenness visual estimation (GVE), vegetation indices computed from continuous spectroradiometric measurements and CO₂ fluxes observed with the eddy covariance technique. A strong relationship was found between webcam VIs and i) structural parameters (LAI) and ii) observed carbon fluxes and derived variables (i.e. Gross Primary Production, GPP). Webcam VIs were also well correlated with vegetation indices typically used for monitoring phenology from satellite, suggesting that webcams might provide high-quality ground data for evaluation of satellite phenology products.

We demonstrated that by combining webcam VIs and models we were able to refine phenological models (Growing Season Index, GSI) in describing canopy development and to grasp the role of ecological factors in controlling subalpine grassland phenology for the growing seasons 2009 and 2010. Moreover, we showed that webcam VIs combined with an estimation of radiation use efficiency (RUE), through the use of remotely sensed indices related to photochemistry (i.e. scaled Photochemical Reflectance Index) or the use of meteorology (MOD17 RUE model), can be used effectively for the prediction of GPP. These results show the usefulness of automated, near-surface remote sensing of canopy phenology and point towards an extension of the proposed methodology to the dataset collected within PhenoCam Network.

* Working Group Team: Marta Galvagno, Edoardo Cremonese, Micol Rossini, Michele Meroni, Sergio Cogliati, Giovanni Manca, Fabrizio Diotri, Lorenzo Busetto, Alessandro Cescatti, Roberto Colombo, Francesco Fava, Umberto Morra di Cella, Emiliano Pari, Consolata Siniscalco and Andrew D. Richardson