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Operational retrieval of LAI and solar fluxes in the Soil-Vegetation-Atmosphere system from satellite observations.

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We present and evaluate results from the application of an inversion method conducted using both MODIS and MISR derived broadband visible and near-infrared surface albedo products available during a full seasonal cycle over a large European window. This inversion is based on optimal control theory and enables us to assimilate operational remote-sensing flux products into a state-of-the-art two-stream radiation transfer scheme, suitable for Global Climate Models. The occurrence of snow during the winter and spring seasons is based on the analysis of the MODIS snow-products, the assimilation of which by our package translates into an adaptation of the prior values characterizing the soil background conditions of the vegetation canopy. Comparison with in situ data has been done on the basis of data acquired at FLUXNET stations.

Our results illustrate the capability of the inversion package to retrieve operationally the two-stream model parameters (such as the effective LAI and the albedo of the vegetation background) as well as to assess a meaningful partitioning of the solar fluxes between the soil, vegetation and atmosphere layers, along the year, for both sensors and over large geographical regions. Furthermore, this inversion package permits us monitoring and measuring the vegetation responses to different external conditions while delivering a full documentation of the uncertainties associated with the retrievals as a function of time. These uncertainties are essential ingredients for downstream applications involving the assimilation of these retrieved parameter values, such as LAI, in land surface process models.