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Exploiting surface albedos products to constrain land surface processes in climate models

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We present results from the application of an inversion method conducted using MODIS derived broadband visible and near-infrared surface albedo products. This contribution is an extension of earlier efforts to optimally retrieve land surface fluxes and associated two-stream model parameters based on the Joint Research Centre Two-stream Inversion Package (JRC-TIP). The discussion focuses on products (based on the mean and one-sigma values of the Probability Distribution Functions (PDFs)) obtained from the analysis of year 2005. The spatial and seasonal changes exhibited by the model process parameters namely, the effective Leaf Area Index (LAI), the background brightness and the scattering efficiency of the vegetation elements, agree with common knowledge and underscore the richness of the high quality surface albedo data sets. The opportunity to generate global maps of new products, such as the background albedo, underscores the advantages of using state of the art algorithmic approaches capable of fully exploiting accurate satellite remote sensing datasets. The detailed analyses of the retrieval uncertainties highlight the central role and contribution of the LAI, the main process parameter to interpret radiation transfer observations over vegetated surfaces. The posterior covariance matrix of the uncertainties is further exploited to quantify the knowledge gain from the ingestion of MODIS surface albedo products. The estimation of the radiation fluxes that are absorbed, transmitted and scattered by the vegetation layer and its background is achieved on the basis of the retrieved PDFs of the model parameters. The covariance matrix of posterior parameter uncertainties is propagated to the radiation fluxes via the model's Jacobian matrix of first derivatives. A definite asset of the JRC-TIP lies in its capability to control and ultimately relax a number of assumptions that are often implicit in traditional approaches.