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Deriving albedo maps for HAPEX-Sahel from ASAS data using kernel-driven BRDF models

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Abstract. This paper describes the application and testing of a method for deriving spatial estimates of albedo from multi-angle remote sensing data. Linear kernel-driven models of surface bi-directional reflectance have been inverted against high spatial resolution multi-angular, multi- spectral airborne data of the principal cover types within the HAPEX-Sahel study site in Niger, West Africa. The airborne data are obtained from the NASA Airborne Solid-state Imaging Spectrometer (ASAS) instrument, flown in Niger in September and October 1992. The maps of model parameters produced are used to estimate integrated reflectance properties related to spectral albedo. Broadband albedo has been estimated from this by weighting the spectral albedo for each pixel within the map as a function of the appropriate spectral solar irradiance and proportion of direct and diffuse illumination.

Partial validation of the results was performed by comparing ASAS reflectance and derived directional-hemispherical reflectance with simulations of a millet canopy made with a complex geometric canopy reflectance model, the Botanical Plant Modelling System (BPMS). Both were found to agree well in magnitude. Broadband albedo values derived from the ASAS data were compared with ground-based (point sample) albedo measurements and found to agree extremely well. These results indicate that the linear kernel-driven modelling approach, which is to be used operationally to produce global 16 day, 1 km albedo maps from forthcoming NASA Earth Observing System spaceborne data, is both sound and practical for the estimation of angle-integrated spectral reflectance quantities related to albedo. Results for broadband albedo are dependent on spectral sampling and on obtaining the correct spectral weigthings.

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