Geophysical Research Abstracts
Vol. 14, EGU2012-4808, 2012
EGU General Assembly 2012

Albedo mapping from remote sensing data

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Land surface albedo plays an important role in climate change research. It is a key parameter controllingthe regional andglobal radiation energy budge.In current general circulation models (GCMs), land surface albedo is one important source of radiative uncertainties. Satellite remote sensing offers the only realistic ways ofmonitoringsurface albedo in a regional or global sense by providing spatiallyvariable and temporally dynamic observations.Regional surface albedos with an absolute accuracy of 0.02–0.05 unitsfor snow-free and snow-covered land are required by climate. However, the accuracy of albedo retrieved from remote sensing data is still under the requirement. The main limitation is the accuracy of aerosol retrieval over land, especially over bright land. In this paper, a new method was developed to retrieve aerosol optical depth (AOD) and albedo synchronously. Based on a solution of the radiative transfer equation and by integration of a kernel-drivenBidirectional Reflectance Distribution Function (BRDF) modeland thesynergy retrieval of aerosol properties from MODIS data (SRAP-MODIS) model, we have developed a new model for considering the surface BRDF effects in aerosol optical depth and surface albedo remote sensing quantitative retrieval. Anoperationalalgorithm was developed to retrieve AOD and albedo by using 3 bands of Terra plus Aqua Moderate Resolution Imaging Spectroradiometer (MODIS) data. This new algorithmnot only can estimateaerosol optical depth suitable for almost all land surfaces, but also can obtain the surface albedo simultaneously. We applied this algorithm to the HeiheRiver Basin of China for mapping albedo there. The retrieved surface albedo from MODIS is consistent with ground-based albedomeasurements from two Kipp and Zonen CMP3 albedometers, and the Root Mean Squared Error (RMSE) is lower than 0.05.MODIS BRDF/Albedo Product (MCD43) was also used to compare with the retrieved albedo. The R-squared (R2) value reveals a good agreement between MCD43 albedo products and retrieved albedo.