



Use of MODIS/ BRDF albedos to enhance simulated and observed surface albedos

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The latest version of the MODIS BRDF/ Albedo product (version 4), at a spatial resolution of 0.05 degrees, has been compared with other remote-sensed climatologies and the latest version of the ECHAM climate model (ECHAM5). Further, MODIS has been used to validate current albedo parameterizations and to investigate the spatial representativity of in-situ surface albedo measurements.

Major differences are found between the current MODIS BRDF/ Albedo product (version 4) and the previous version 3. The substantial underestimation over sparsely vegetated and snow-covered areas in version 3 has been greatly reduced in the latest MODIS albedo product.

The intercomparison of global remote-sensed albedo climatologies has clearly shown that the ISCCP-FD surface albedo of snow-covered forests is significantly higher than the MODIS and PINKER estimates. Comparisons with ground-based measurements revealed a clear positive bias in the ISCCP-FD data over these regions whereas MODIS and PINKER nicely reproduce the in-situ albedo estimates.

Surface albedo of snow-covered boreal forests is strongly overestimated in both ECHAM4 and ECHAM5. This positive bias in ECHAM5 can be mainly attributed to the neglect of tree trunks and branches in the surface albedo parameterization. The pronounced positive albedo bias, as simulated in ECHAM4 over the Himalayas, has been clearly reduced in the latest ECHAM version.

Black-sky (direct beam) albedo from the MODIS BRDF model capture the diurnal albedo cycle at BSRN sites with sufficient accuracy. The greatest negative biases are generally found at low solar angles.

Finally, the spatial representativity of the albedo has been estimated at several BSRN sites. This was achieved by computing the correlation between the pixel's surface albedo containing the BSRN site and the surrounding pixels. Spatial representativity strongly depends on the station's environment. It is highest for stations in relatively flat and sparsely forested areas with a pronounced seasonal snow cover. The correlation coefficient between the albedo of the station's pixels and its direct neighbours is generally between 0.85 and 0.95, but may drop to 0.5 in very inhomogeneous territories. It can be generally stated that the surface albedo at a specific site is only representative for a rather limited area of a few kilometers.