

Estimation of daily land surface albedo based on historical long-term MODIS data record

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Abstract:

MODIS BRDF/Albedo products provide the first high spatial resolution BRDF/albedo parameter for climate research. Each MODIS observation contains only single angle information. To get enough angle samples to drive the Ross-Li BRDF model, MODIS products use 16 days observations as input to produce 8 days products with the assumption of land surface reflectance remaining nearly unchanged during this period. However, in some regions, such as south Asia in summer, it is a prominent problem to find nine clear observations during 16 days though their surface reflectance can remain unchanged in a long period. But in others regions, such as semi-arid regions, although it is easy to find enough clear sky observations, the land surface reflectance may change drastically with vegetation growth and leaf withered. These problem may be resolved if a daily BRDF/Albedo can be produced from single scene data.

In this poster, we provide a new method to estimate BRDF/albedo from single scene MODIS data. During the past nine years, MODIS (terra plus aqua) has observed each earth site more than 5000 times. If only 20% of which are under clear sky, more than 1000 clear observations should have been acquired at each site. If the land cover type at a site didn't change drastically during these years, a similar BRDF/albedo would correspond to more than 100 clear observations, which should be enough to meet the angle samples requirement for Ross-Li model. We assume the similar vegetation (or snow) condition correspond to similar BRDF profile at a site, all observations with a similar land condition during past years were used to drive Ross-Li model to retrieve model profile parameters. These BRDF profile can be used to estimate BRDF/albedo from single scene data. The LAI or geometric normalized NDVI and NDSI are used to represent land vegetation/snow conditions. We assume all observations with similar NDVI or NDSI have same BRDF profile, regardless which year they acquired. Following steps are taken to estimate daily BRDF/albedo parameter: (1) Construct a long term land surface reflectance database from past 9 year TERRA and 7 years AQUA data; (2) Use NDVI/NDSI to divide these data to different classes; (3) The land surface reflectances in the same class are used to drive Ross-Li model to retrieve BRDF profile parameter. (4) Estimate BRDF and albedo based on BRDF profile database and single observation. (5) Use temporal interpolation to estimate daily albedo. This method has been applied to produce historical BRDF profile from MODIS MOD09 data and to estimate daily albedo. The CERN observations were used to validate the results.

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