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On the importance of interpolation schemes for albedo data from local to global grid

Swantje Preuschmann (1), Daniela Jacob (1), and Alexander Löw (2)

(1) Climate Service Center, Climate System Department, Hamburg, Germany (swantje.preuschmann@hzg.de), (2) Max Planck Institute for Meteorology, Land in the Earth System, Hamburg, Germany

Surface albedo has a key role in Earth's radiation balance. As vegetation cover is influencing the albedo of solid surfaces, it is clear that land cover changes are leading to changes in the radiation balance and further are influencing the whole Earth's energy budget. It is obvious, that a forested area reflects sunlight differently compared to a sparsely vegetated area of shrubs. Different studies have shown, that certain land cover types (even compounds) have a characteristic annual cycle of the albedo (Moody et al. 2005 and Preuschmann, 2012). An annual cycle for one land cover type might vary in a year about 2%. The difference of the surface albedo of a forested area in summer to an agricultural area at the same time is only about 0.5%.

A major question in climate modelling under future conditions is to analyse the impact of land cover changes onto climate. Nevertheless for different reasons it is not easy to describe surface albedo changes due to land cover changes within a climate model. One reason is that differences in the albedo of different surfaces are comparatively small. Another reason is based in the spatial resolution of a climate model. Climate models are operating on grids with horizontal resolutions of 10x10 km^2 for regional models up to about 200x200 km^2 for global models with a spectral resolution of T63. This means, that spatial (and also temporal) mean values of surface albedo are taken into account. Therefore one grid box of a climate model is representing a composition of different surface albedos. For model validation, it is of interest to compare the modelled albedo data with observed albedo data, but a comparison is not as trivial as it looks in the first sight. One problematic is the necessity of comparing different data types in the same horizontal and temporal resolution. Commonly used satellite based albedo data are available in 0.05° horizontal resolution, which is about 5 km at the equator, for several-day means and monthly means

In order to compare high resolved observation data to low resolved modelled albedo data, different remapping methods are used. Depending on the method, this might evoke levelling or enhancing of extreme values in the annual cycle of albedo and additionally shifts in the temporal accuracy e.g. the date of the albedo maximum within one cycle. Here, three remapping methods will be discussed: bilinear, nearest neighbour, and conservative remapping. Recently, in some albedo standard products simple remapping methods as Nearest Neighbour are preferred, as they are of low computational cost and coherent with additional data flags. Neglecting the flags, it will be shown, that the differences in the pure albedo data between the different remapping methods are higher as differences in characteristic annual cycles of the albedo for specific land cover types. Therefore one danger in comparing remapped data is that the error by remapping is technically in the same amount as a land cover change.

This work wants to point out, that especially for the surface albedo the methods for data comparing should be done by including other aspects. It is proposed, to concentrate whether the dates for reaching the minimal and maximal albedo values are kept by a model, and if the levels of the extremes of mean annual cycles of the albedo are comparable.

References:

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