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Including the climate impacts of changes in surface albedo in land management: The importance of good albedo measurements and a good atmospheric transfer model

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Changes in surface albedo have been shown to be significant in estimating the climate impacts of changes in land management and land use. In areas with clear skies and snow in winter, the climate impacts of different surface albedos can approximately counterbalance the impacts of changes in carbon stocks (e.g. afforestation). However, a consistent methodology for combining both effects has not been developed. In a previous paper (Schwaiger and Bird, 2010) we demonstrated, using a complicated atmospheric transfer model (Fu-Liou, 2005) and interpolated cloud cover information (ISCCP, 2012), that the combined impacts are extremely sensitive to assumptions of surface albedo. As well, simplified atmospheric transfer models based on interpolated surface measurements of transmitted solar energy (ISCCP, 2012) have been proposed (Bright et al, 2012). In this paper, we propose a methodology for the estimation of surface albedo on the basis of MODIS - Surface Reflectance BRDF/Albedo Parameter combined with different land cover types provided by CORINE and a refined simplified atmospheric transfer model. The implications of these improvements on the combined climate impacts of land use change will be demonstrated using a case study in central-eastern Europe.