

ALBEDOMAP: MERIS land surface albedo retrieval using data fusion with MODIS BRDF and its validation using contemporaneous EO and in situ data products

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Abstract:

A representative albedo is required by ESA* for the improved retrieval of atmospheric products, such as water vapour, from the ENVISAT-MERIS instrument. This albedo is required at 13 of the 15 spectral channels of MERIS.

An algorithm is described which has been applied to the generation of a global albedo for these 13 spectral bands of MERIS over 16-day time periods at a resolution of 0.05° for the time period from June 2002 to December 2006. Inputs to this algorithm include improved cloud and snow detection, aerosol correction using the MERIS data itself and derived Spectral surface Directional Reflectances, SDRs (Schröder et al., Preusker et al., at the ESA MERIS workshop 2005, http://envisat.esa.int/workshops/meris_aatsr2005/).

Owing to the lack of sufficient directional samples for most of the Earth's land surface, even for a monthly compositing time period, direct inversion of BRDF parameters for MERIS are not possible worldwide. Instead the 16-day Collection 4 MODIS BRDFs at 0.05° resolution (derived using either full inversions or magnitude inversions from the MODIS values) were employed in a magnitude inversion scheme for the 4 common MERIS (490 ± 5 [b3], 560 ± 5 [b5], 665 ± 5 [b7], 865 ± 10 [b13]) bands with MODIS (459-479 {b3}, 545-565 {b4}, 620-670 {b1}, 841-8766 {b2}). As far as was feasible, Terra+Aqua-combined BRDF were employed as demonstrated by Muller et al. (IGARSS07). In keeping with previously reported results, there are larger numbers of full MODIS inversions (and consequently better MERIS albedos) for the combined BRDF but the total number of MODIS BRDF retrievals remains stubbornly similar and significantly <100% coverage.

Spectral interpolation to the remaining 9 MERIS bands and to 3 broadband regions ($0.4-0.7\mu\text{m}$, $0.7-3\mu\text{m}$, $0.4-3\mu\text{m}$) is then performed using polynomial look-up tables derived by Dr

Shunlin Liang (University of Maryland). As spectral albedo data is required on monthly time-steps for most applications, a simple-minded weighting function based on the fractional time-period of each 16-day time period within a month was adopted for creating monthly products from 16-day products at 10km and 0.1°.

Global products on a 16-day time-step were generated for the whole time period using both Terra+Aqua-combined and where not available, Terra-only, Collection 4 MODISBRDFs.

These EO products have been compared against Collection 5 contemporaneous MODIS spectral albedos (over 16-days) as well as gap-filled (Moody et al., 2005), where available. Satellite intercomparisons have also been performed for monthly products of the monthly MERIS spectral albedo products for common bands against MISR level-3 as well as for a subset of MISR level-2 instantaneous products and the results and interpretation will be shown here. Inter-comparisons are shown of these EO products against ground-based albedometer measurements for a site in Finland and for a number of worldwide sites available through the CAVE taking into account, where necessary issues associated with land cover heterogeneity. Assessments were made of the impacts of heterogeneity within the expected FoV of the albedometer using other data sources at higher resolution and the results will be shown.

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