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A 12-year global gridded dataset of surface bidirectional reflectance and aerosol optical depth from ATSR-2 and AATSR measurements

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Remote sensing can provide the spatial resolution and coverage and, increasingly, the temporal length of observations required to constrain and validate climate models, and to identify seasonal and interannual gobal change. However, satellite radiance measurements require significant processing to retrieve the land-surface and atmospheric parameters useful to climate modelling. Driven by this requirement we are generating a 12-year global gridded dataset of monthly composite surface bidirectional reflectance and aerosol optical depth (AOD) values from top-of-atmosphere (TOA) radiance measurements. The TOA radiances are measured by the AATSR and ATSR-2 satellite instruments. The algorithm used to separate the contributions from surface and atmospheric scattering to TOA radiances utilises both the dual-angle and multispectral capability of the (A)ATSR instruments, is based on a physical model of light scattering, and requires no a-priori knowledge of the land surface. Comparisons with surface-based measurements of AOD, and with estimates of AOD and surface reflectance derived from other satellite instruments have already demonstrated that the model performs well over a variety of land surfaces. An example of the global coverage and resolution retrievable by this implementation is presented, and a 12-year regional-scale analysis focussing on the Amazon where annual periods of biomass burning result in elevated AODs. The seasonal AOD increases are highlighted in a time series movie of retrieved AODs. The retrieval model is able to give an indication of atmospheric aerosol type, which also shows a seasonal cycle dominated by the biomass burning episodes. By way of validation the AOD retrievals are compared with AERONET measurements at 550 nm at two sites within the region, and surface

reflectance measurements are compared with the MODIS BRDF/albedo product.