An Evaluation of the Use of Atmospheric and BRDF Correction to Standardise Landsat Data

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Atmospheric correction and normalising for land surface bidirectional reflectance distribution function (BRDF) effects are very important in satellite data processing. They are particularly important for standardising time series data and for inter-sensor calibration and comparison. These procedures have been applied successfully on MODIS data products at global scales. However, for Landsat and similar resolution data, the estimation of BRDF effects using internal fitting as for MODIS, may not be appropriate due to the smaller variation of view and solar angles, sun-synchronous view and infrequent revisits. In this study, we explored the potential for developing operational procedures to correct higher resolution sensor data based on combined atmosphere and BRDF models. The process was realised using BRDF parameters (shape functions) derived from MODIS and the MODTRAN 4 radiative transfer model. The method is applied to Landsat data over the Gwydir area, New South Wales, Australia. The retrieved Landsat reflectance had good agreement with ground based spectroradiometer measurements over agricultural land. The root mean square difference (RMSD) between retrieved Landsat reflectance and ground based measurements were 2.6%. The comparison between normalised Landsat and MODIS reflectance shows a strong relationship, indicating that cross-calibration between the two sensors is achievable. The availability of input data, such as, BRDF parameters before MODIS was available, standard estimates of aerosol and water vapour profiles for operational implementation are also discussed in the paper. Various choices that can be made for such an operational system, are discussed in the context of monitoring land cover change

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