

Evaluation of the MERIS Terrestrial Chlorophyll Index

P. Curran¹ and J. Dash¹

¹ *University of Southampton, Dept. Of Geography
Highfield, SO17 1BJ Southampton, United Kingdom
E-mail: p.curran@soton.ac.uk*

The Medium Resolution Imaging Spectrometer (MERIS) has fine spectral resolution, moderate spatial resolution and a three day repeat cycle. This makes MERIS a potentially valuable sensor for the measurement and monitoring of terrestrial environments at regional to global scales. The red edge, which results from an abrupt reflectance change in red and near-infrared (NIR) wavelengths, has a wavelength location that is related positively to the chlorophyll content of vegetation. A new index, called the MERIS terrestrial chlorophyll index (MTCI) uses data in three red and NIR wavebands centred at 681.25nm, 705nm and 753.75nm (bands 8, 9 and 10 in the MERIS standard band setting) to locate the relative position of the red edge. The MTCI is easy to calculate and can be automated. Preliminary indirect evaluation using model, field and MERIS data suggested the sensitivity of MTCI to chlorophyll content, notably at high levels and its insensitivity to spatial resolution and atmospheric effects. As a result this index is now an ESA level-2 product. Three data sets were used for direct evaluation of the MTCI/chlorophyll content relationship. First, MERIS data and a surrogate of chlorophyll content for sites in southern Vietnam; second, MERIS data and actual chlorophyll content for sites in the New Forest, UK and third, field spectroradiometer data and actual chlorophyll content for plots in a greenhouse. Forests in southern Vietnam were contaminated with Agent Orange during the 1960s/70s. The level of contamination was spatially very variable with high levels of contamination associated with lowered levels of chlorophyll content, even within forests that have long since regained full canopy cover. The amount of Agent Orange sprayed onto the forest between 1965 and 1971 was used as a surrogate for contemporary chlorophyll content and was related to current MTCI at selected forest sites. The resulting relationship was, as expected, negative and significant. Further per-pixel investigation of the MTCI/Agent Orange concentration relationship is underway for larger forest areas. For the second and third data sets MTCI was related directly to chlorophyll content at two scales and the resulting relationships were, as expected, positive. Further plans involve evaluation of the MTCI in relation to the MERIS Global Vegetation Index (MGVI) at local, regional and eventually global scales.