Remote sensing observations of ocean colour using the traditional Forel-Ule scale

ABSTRACT

We test a method for calculating the colour of the sea, as measured on the traditional Forel-Ule (FU) scale, from satellite remote sensing measurements of reflectance. Forel-Ule colour scale numbers are calculated from 46 in situ radiometer profiles in the Mozambique channel and Irish Sea and compared to direct measurements of water colour made with the FU scale. There is generally good agreement ($R^2 = 0.79$, RMS difference = 2.7) between observed and calculated values over the range FU2 (blue)-FU18 (greenish brown). The method is applied to map the colour, on the FU scale, of the Irish Sea using 242 in situ radiometer measurements. MODIS satellite data is used to calculate the long-term (2003–2014) average and seasonal variation of sea colour. The colour of the Irish Sea, from both in situ and satellite radiometry, shows patterns which are consistent with the known distribution and seasonal variation of suspended particles. A Forel-Ule colour scale map of western European waters shows that the most coloured waters are found in north-west European seas which are coloured by suspended sediments rather than phytoplankton blooms.