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Spectral unmixing applied to MERIS images of East Kalimantan coastal waters to separate atmospheric haze from water sediment effects

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This study presents the application of a spectral unmixing approach combined with coupled water-atmosphere radiative transfer modelling to derive Total Suspended Matter (TSM) concentrations of water bodies from ocean colour remote sensing data. This approach is applied to MERIS data of the equatorial tropical waters of Berau estuary, East Kalimantan, Indonesia. The MERIS data were processed to suppress local haze variations and to preserve sediment variations in the image. Next, after the applied spectral unmixing, the MERIS data were corrected from atmospheric distortion, based on the MODTRAN radiative transfer model. The inverse of a semi-empirical water turbidity model, based on Kubelka-Munk theory, was successfully applied to the corrected MERIS data for generating a regional map of TSM concentration. Retrieval of TSM concentrations in relatively clear waters using this approach resulted in overestimated values. In turbid waters however, a lower RMSE and a higher coefficient of determination than those retrieved for clear waters were obtained. This study found that the spectral unmixing combined with radiative transfer modelling improved significantly the TSM concentration retrieval, in terms of the RMSE, from 7.57 mgl-1 (for MERIS L2) to 4.60 mgl-1 for this proposed model.

Keywords: Berau estuary, Kubelka-Munk theory, MODTRAN radiative transfer model, Total Suspended Matter (TSM)