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A quantitative study of the red-shift effect for turbid water dominated by suspended sediment using radiative transfer model

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The concentration of suspended sediments (CSS) in rivers plays a crucial role for the management of environment. When the heavy rain occurs, the debris flow and mudslides are usually flushed from the areas of steep terrain to the reservoir, resulting in a dramatic increase in turbidity and the shortage in supplying the use of domestic water. It is therefore necessary to develop an efficient approach to monitor the temporal and spatial variations of CSS. Remote sensing of water color from space has been widely used to retrieve the information of water constituents. Success of this technique relies on the accurate description of the optical properties for each constituent. Comparing to the other constituents, however, very few works on studying the relationship between optical properties and CSS were reported in the past. The regression analysis is usually employed to estimate CSS from various combinations of spectral ratios. Recent studies indicate that the wavelength of peak reflectance increases with the turbidity of water, namely the ąşred-shiftţĺ effect. This effect might be a good index for quantitatively retrieving CSS from water color. This research attempts to study the red-shift effect for turbid water dominated by suspended sediment using radiative transfer model. The monthly CSS of Kao-Ping River were collected from 2001 to 2006 using the water sampler instrument. Based on the range of these in situ measurements, a comprehensive simulation of surface reflectance for various CSS is conducted by using the radiative transfer model. With the simulated dataset, a quantitative relationship between the red-shift effect and various CSS is established. This research suggests that CSS can be accurately obtained from the measurements of hyperspectral reflectance. Results of this research might be of help in specifying the spectral characteristics of instruments for studying the inland water from remote sensing of water color.