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Remotely estimation of suspended sediment concentration in the Upper Paraguay River Basin, Brazil.

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The estimation of suspended sediment concentration (SSC) by remote sensing is a valuable tool because it allows a systematic monitoring in large watersheds and provides information on variations in SCC and its drivers, such as mining and deforestation. Therefore, this work presents a statistical model for estimating SCC in the Upper Paraguay River Basin from the integration of data collected in situ from hydrological stations and remote sensing data over a series of historical data. The method used was based on the premise that the spectral reflectance varies as a function of SCC. The rise of SSC in water leads to an increase in electromagnetic radiation (EMR) backscatter, which is observed as an increase in the reflectance of the water body in Landsat images. Initially, in situ SSC data were obtained from the National Water Agency databases and the Landsat 5 and 7 System Geospatial Dataset (Tier 1 Surface Reflectance) acquired from the Google Earth Engine platform. Then, a filtering of the pixel values was performed to avoid sampling with reflectance values that did not correspond to the changes of sediments on the water surface, such as clouds and cloud shadows. After collecting the in situ and orbital data, the data were calibrated in the RStudio program. For the model implementation, the spectral reflectance measurements of the water must be almost simultaneous to the SCC measurements at fluviometric stations. Thus, images were chosen that coincided within an interval of 6 days with the date of the SCC collection. Multiple regression analysis was the method used to express the relationship between reflected EMR and SCC, which allows the dependent variable (SCC) to be estimated as a function of one or more independent variables, in this case, spectral bands and bands. Thus, the data obtained in situ and the satellite images made it possible to estimate the distribution of suspended sedimentary load into the main rivers of the Upper Rio Paraguay in the period from 1984 to 2021, resulting in a greater distribution of temporal and spatial sampling quickly, with low cost and simple logistics.