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Estimating time series of fluvial suspended sediment by applying remote sensing techniques

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With existing satellite sensors it is already possible to estimate fluvial water discharges with global coverage on an almost daily basis. For example, for the project River Watch, a cooperative sub project of the Dartmouth Flood Observatory, daily water discharge is estimated for over 2500 selected river sites since 2002, using a method developed for NASA's AMSR-E passive microwave radiometer (http://floodobservatory.colorado.edu). Further development of this and related methods could significantly complement existing in situ river measurements which are potentially more accurate but also less consistent, more costly, and subject to failure during large floods. Extending the River Watch project, our goal is to add suspended sediment concentration (SSC) measurements to a subset of the 2500 river sites as well.

Previous studies have indicated remote sensing can be applied to measure SSC, however, often this involves either Landsat TM or ETM+ data, which has a low temporal resolution (∼16 days), or MODIS data that has been applied to only single river systems. Here we present a technique applying freely available twice-daily Moderate Resolution Imaging Spectroradiometer (MODIS) optical data to determine SSC. The two MODIS instruments aboard the Terra and Aqua satellites provide global coverage at a spatial resolution varying between 250 and 1000 m, depending on spectral band; automated processing and distribution by NASA further provide these data in convenient geocoded raster formats. Cloud cover constrains SSC measurements; therefore, an algorithm is used that ingests four images (the Terra and Aqua images of each day, for two days), in combination with a cloud shadow filter, to provide daily update. USGS gauging stations are used to validate the SSC optical measurements. Presented results will reveal how well suspended sediment concentrations are measured with MODIS.