

Human impacts on coastal suspended sediment concentrations observed with Landsat 8

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We demonstrate the capability for detecting suspended particulate matter concentrations (SPM) in coastal waters using the Operational Land Imager (OLI) on Landsat 8 (L8) (Vanhellemont and Ruddick, submitted). L8 was launched February 13, 2013 and normal operations started on May 30, 2013. L8 has a 16-day repeat track, and offers high resolution imagery: OLI has 8 spectral bands at 30m resolution, and one panchromatic band at 15m.

OLI was designed with a much higher signal-to-noise ratio than the instruments carried on previous Landsat missions, and has a large potential for marine applications. Moreover, L8/OLI data is made freely available by USGS (e.g. <http://earthexplorer.usgs.gov/>). A simple atmospheric correction is performed on the OLI imagery, to remove effects of Rayleigh and aerosol scattering, based on (Gordon and Wang, 1994) and (Ruddick *et al.*, 2000). Estimates of SPM (Nechad *et al.*, 2010) are comparable to those of the well-validated MODIS-Aqua sensor.

The impact on sea surface SPM of various human activities is observed in OLI imagery. Increased SPM is found in boat wakes and in the wakes of offshore constructions, such as wind turbines. Dredging activities, SPM patterns within harbours and around hard structures such as breakwaters are observed. Natural processes can also be studied, such as small-scale eddies on fronts between water masses, and high suspended sediments near shallow sand banks and in river plumes.

Wide-swath medium spatial resolution (0.25 – 1km) polar-orbiting sensors such as MODIS-Aqua will continue to be useful because of the higher temporal coverage: daily imagery at 50° - with variable usability due to cloud cover. This makes their datasets useful for long-term analysis and multi-temporal composite generation (e.g. Vanhellemont and Ruddick, 2011). However, OLI allows the study of small-scale processes that are impossible to observe at moderate resolution as its spatial resolution (30m) is an order of magnitude better. The synergistic combination of optical sensors providing data at different time and length scales (e.g. OLI/MODIS) may prove to be advantageous, as already demonstrated for SEVIRI/MODIS (Vanhellemont *et al.*, 2013).

References

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