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Aquatic applications of (very) high resolution satellite imagery

In the last few years, novel applications of high spatial resolution satellite imagery in coastal and inland waters have emerged. The main drivers for this evolution are the availability of data for free from the space agencies or at reasonable cost from private companies, as well as the improvement of the imaging sensors themselves. In contrast to the traditional ocean colour missions with pixel sizes of 250 m to 1 km, high resolution missions with pixel sizes from <1 m to 100 m, can be used for monitoring turbidity and algal blooms in smaller water bodies, estuaries, and in the near-shore coastal zone. Studies have also shown the use of this type of imagery for monitoring of offshore constructions such as wind farms, regular dredging activities, and even the detection of shipwrecks. Here we present some applications and the processing of high resolution satellite imagery, with a focus on the Pléiades mission and its complementarity to the Landsat and Sentinel-2 missions. Pléiades is a constellation of two identical satellites, which have on board a five band imager with four spectral bands (blue, green, red, and near-infrared) at 2.8 m spatial resolution, and a panchromatic band across a part of the visible and near-infrared at 70 cm resolution. The mission allows for turbidity mapping within ports and estuaries and can aid in understanding of small scale sediment dynamics and dredging efforts. Pléiades shows potential for detection of algal blooms, and in waters dominated by phytoplankton, the concentration of chlorophyll a may even be retrieved. A fourfold improvement of the spatial resolution can be achieved using the panchromatic channel, allowing for the mapping of sub-metre scale structures.

Keywords: water quality, turbidity, dredging, sediment transport, chlorophyll a concentration, remote sensing, ocean colour