Drones record water quality at cm scale

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Today drones are being used in a variety of civil applications, from windmill inspection to film industry, precision agriculture to the delivery of small packages. We present a new application where drones are used to monitor suspended sediments in the water. Suspended sediment concentrations can already be retrieved from satellite and manned airborne images but drones provide a range of new opportunities. The most important one is their ability to collect data below the clouds. The second one is their extremely high spatial detail, up to cm scale, and the high frequency of image acquisitions (e.g. one every minute). And last but not least: their flexibility. With limited training everyone can acquire and fly a drone equipped with a digital camera. Retrieving sediment concentrations from these unmanned systems is however a challenging task. We have equipped an oktokopter drone with a simple off-the-shelf digital camera. A methodology was developed to convert the the raw digital numbers into physically meaningfull values taking into account the atmospheric absorption and scattering and air/water interface interactions. Two demonstrations have been set-up: one at the harbour of Zeebrugge and one at the Scheldt river close to the harbour of Antwerp. In both cases the oktocopter drone was deployed taking images for several hours. A live data stream was used to view the target in real time and to re-orient the data acquisition if needed. Simulataneous water reflectance measurements were made using a field spectrometer, turbidity was measured in the field and water samples were taken and analysed for their concentration of suspended sediments. These field data allow for an in depth calibration of the processing algorithms and validation of the final output products.

In the end this drone based sediment mapping would allow to monitor sediment plumes generated e.g. during dredging. Mid 2016 a final demonstration is planned where the drone will be deployed from a dredging vessel. The suspended sediment maps allow to monitor the concentrations, the extent and direction of the plume but also provide input for the calibration and validation of near field sediment transport modelling.

Keywords: drone; suspended sediment; dredging