Geophysical Research Abstracts
Vol. 20, EGU2018-13769, 2018
EGU General Assembly 2018

Influence of the Rhine river fronts on the suspended particulate matter

Zeinab Safar (1), Sabine Rijnsburger (), Claire Chassagne (1), Andy Manning (2), Julie Pietrzak (1), Alex Souza (3), Alex Horner-Devine (4), Raul Flores (4), and Maggie McKeon (4)

(1) Delft University of Technology, (2) Plymouth University, (3) CINVESTAV Mérida, (4) University of Washington

Here we present unique results of flocs measured in the Rhine ROFI during a 13 hour field campaign carried out off the Dutch coast near the Sand Engine on September 17 2014. The aim of the study was to understand the influence of the river plume on SPM dynamics. The data were recorded on a neap tide, 10 km south of the river mouth. The ROFI switches between well mixed and stratified periods when the fresh water front arrives at our location. We show how the switch between well mixed and stratified water column conditions changes the size, shape, density and settling velocity of SPM particles (flocs). Samples were taken with a van Dorn water sampler every half hour at 0.6 m above bed (mab) during the 13 hour field survey in order to measure during a complete tidal cycle. These samples were analysed within a settling column to which a digital camera is attached (LabsFLOC-2 camera [1]). In addition a second floc camera (mounted on the van Dorn water sampler) was also deployed into the water at 0.6 mab in order to take videos of samples without disturbing the flocs by sampling. In addition to these two cameras floc sizing, LISST, OBS and water velocity data were obtained from the longer term 12 m mooring deployed as part of the STRAINS II project close to the ship sampling site. CTD profiles for temperature, salinity and pressure were measured to determine the water column stratification. The flocs size and settling velocity is compared with the hydrodynamic conditions from the mooring data to characterize the influence of Rhine river plume on the flocculation and settling dynamics of SPM. Here the LISST and OBS data were used in addition to the digital camera system to study the influence of the Rhine River fronts on the size and shape of the flocs. After the frontal passage the flocs are very large and fragile, this indicate that a lot of organic matter is available after the frontal passage, as it was a calm day re-suspension is probably not the mechanism of transport and the high SSC is not likely to be due to bed erosion. In this case the suspended sediment is transported by the Rhine river front. Other evidence for this is the presence of the algae after the frontal passage, Skeletonema costatium, which is one of the abundant algae living in coastal areas. As it can flocculate with itself as well as with sediment particles, it can form the large aggregated structures that we observe. Flocs can also undergo differential settling and grow during their journey to the bottom, or they might be already flocculated in the river, as the Rhine water is organic matter rich.

[1] Manning, A.J. (2006). LabSFLOC – A laboratory system to determine the spectral characteristics of flocculating cohesive sediments. HR Wallingford Technical Report, TR 156.