HYDRO-METEO INFLUENCE ON SUSPENDED PARTICLE SIZE DISTRIBUTIONS

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In the vicinity of Zeebrugge suspended particulate matter (SPM) concentration and particle size distribution (PSD) have been collected during almost 200 days at about 1km from the shore line. Optical (OBS) and acoustic (ADP) backscatter sensors were used to estimate SPM concentration. The aim of the study was to assess flocculation and particle dynamics during different meteorological events. The PSDs measured with a LISST 100X have been classified using entropy analysis (Mikkelsen *et al.*, 2007) and assembled in three cases based on the low-pass filtered alongshore velocity component (Baeye *et al.*, 2010).

The PSDs during tide dominated conditions showed distinct multimodal behaviour. Multimodal flocculation occurs due to differences in particle bindings between primary and secondary bindings, resulting in more resisting microflocs and fragile macroflocs. The macroflocs were constant in size (350µm), in contrast with microfloc sizes (mode between 30m and 180µm). The microfloc population was characterized by a gradual shift of the PSD towards bigger size classes when turbulence decreases and by the occurrence of two microfloc populations, possibly caused by the heterogeneity of components within the SPM. Microflocs are partially disrupted into primary particles during peak flood velocity.

Analysis of the PSDs together with the interpretation of acoustic and optical derived SPM concentration revealed that storms from SW result in different PSD than storms from the NW. It was astounding to see that during SW storm no primary particles were detected and that the PSD was unimodal with an almost constant D50 of 40µm. The SW storm was characterized by lower SPM concentration derived from OBS than from ADP backscatter suggesting that the flocs where transported away from the measuring location and replaced by sand resuspended by waves. During NW storms the PSD were similar as during flood indicating that most SPM consisted of flocs.

As a conclusion, meteorological events have distinct influences on suspended particle size dynamics. The advection of the coastal turbidity maximum during storms may result in an increase of cohesive SPM concentration, the formation of fluid mud and the armouring of sand (NW storm) or in a decrease of cohesive SPM concentration, no fluid mud formation and increase of sand and silt in suspension (SW storm).

References

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