Extreme values of Suspended Particulate Matter concentration and their relation to wave systems along the Belgian inner shelf

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SPM concentration is a key parameter to describe the environmental status, and to evaluate and understand the impact of human activities in nearshore areas. Long-term measurements are needed in order to resolve all variations in SPM concentration. Processes affecting SPM concentration are turbulence, tides, neap-spring cycles, meteorological events, season, and other long-term fluctuations. SPM concentration has been measured since 2005 at the MOW1 site, situated at about 5km northwest of Zeebrugge in the high-turbidity zone off the Belgian-Dutch coast. The measurements have been carried out using a benthic tripod that allowed measuring during all meteorological conditions, including storms.

Storm effects on sediment re-suspension and SPM concentration have been investigated using meteorological and wave data from IVA MDK (afdeling Kust - Meetnet Vlaamse Banken). SPM concentration data from MOW1 (51°22.04'N 3°6.95'E) were estimated using the backscatterance from a 3MHz acoustic Doppler profiling current meter. Because of the large amount (~1220 days) of SPM concentration data, an automatic detection algorithm for identifying extreme events was developed. A low-pass filter was run on the SPM concentration time-series in order to remove the tidal signal. A polynomial de-trending of the low-pass filtered data was then accomplished to filter out the spring-neap signal. A peak detection function of these processed data allowed eventually cataloguing the extreme SPM concentrations and relating them to storm events and wave system data. The method used allows identifying and understanding the controlling factors, i.e. influence of wave systems on the SPM concentration. It is a promising method that could also be used to analyse and classify the surface SPM concentration maps derived from polar orbiting or geo-stationary satellites.