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Suspended particulate matter in a submarine canyon: What are we looking at?

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Throughout the world's oceans, water layers with increased suspended particulate matter concentrations, so called nepheloid layers, play an important role in the lateral transport of sediment, organic matter and pollutants. Nepheloid layers are persistent features in submarine canyons, where they are formed under influence of energetic hydrodynamics. To evaluate their importance it is crucial to properly quantify the amount and type of material that is transported. However, interpretation of turbidity data is not straightforward, since the detected signal is not only dependent on the concentration of particles, but also on the physical characteristics. Therefore we investigated how turbidity fluctuations induced by internal tides in the Whittard Canyon (northern Bay of Biscay, NE Atlantic Ocean) are reflected in time series data, recorded by different types of commonly used optical and acoustic sensors. Results show that in the surface water the transmitted light signal is strongly affected by the chlorophyll-bearing phytoplankton, whilst only a modest response is found in backscattered light. If left unaccounted for, this would result in an overestimation of the suspended particulate matter concentration in this layer. At the bottom of the canyon optical and acoustic sensors responded differently during one tidal cycle, interpreted as cyclic resuspension, whereby different phases of disaggregation, reaggregation and settling of particulate matter were observed. The differences in the records have important implications on the estimation of mass fluxes of suspended particulate matter, which are vital for understanding for instance carbon transport processes in the bottom boundary layer.