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The STRAINS Experiment: on tidal plume fronts, internal waves and shoaling on sediment resuspension in the Rhine ROFI

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Here we investigate the role of freshwater tidal plume fronts on sediment resuspension as they propagate into shallow water. The extensive STRAINS field-data set and radar images show the fronts propagating past the 12 m mooring towards the Dutch coast near the Sand Engine. The STRAINS data were collected 10 km north of the mouth of the Rotterdam Waterway at moorings 2 and 6 km offshore. The dataset consists of temperature, salinity, and velocity data, and at the 12 m site includes high frequency ADV velocity data located 0.25, 0.5 and 0.75 m above the bed. The latter data were used to calculate turbulent stresses. Using an idealised non-hydrostatic model we explore how the fronts can generate high frequency internal waves as they propagate towards the coast. We also show how the fronts and internal waves can break and potentially cause mixing inshore. We present a frontal sediment pumping mechanism due to breaking internal waves nearshore and discuss how this is a potential mechanism for sediment resuspension and offshore transport. We build on previous work of the STRAINS group and show that the fronts can propagate all the way to the coast where they can break and mix, resuspending sediment and transporting it offshore.