



An ephemeral estuarine turbidity maximum generated by resuspension of biological material in a macrotidal estuary.

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An ephemeral estuarine turbidity maximum (ETM) occurs at high water in the macrotidal Taf estuary (SW Wales, UK). A new mechanism of ETM formation, due to resuspension and advection of material by flood tidal currents, is observed that differs from classical mechanisms of gravitational circulation and tidal pumping. The flood tide advances across intertidal sand flats in the main body of the estuary, progressively entraining material from the rippled sands. This material consists of large flocs, not the fine quartz sands of the intertidal flats. Resuspension creates a turbid front which has suspended sediment concentrations (SSC) of c. 4,000 mg l⁻¹ by the time it reaches its landward limit which is also the landward limit of salt penetration. This turbid body constitutes the ETM. Deposition occurs at high slack water but the ETM retains SSC values up to c. 800 mg l⁻¹, 1-2 orders of magnitude greater than ambient SSC values in the river and estuarine waters on either side. The ETM retreats down the estuary during the ebb; some material is deposited thinly across emergent intertidal flats and some is flushed out of the estuary. A new ETM is generated by the next flood tide. Both location and SSC of the ETM scale on Q/R^3 where Q is tidal range and R is river discharge. Large flocs (250-500 μm) constitute a minority of the volume concentration in the ETM on average tides but a majority on spring tides. Particles in the ETM have low mean effective density (120-160 kg m⁻³), c. 4 times less than suspended particles in the main body of the estuary. High chlorophyll concentrations in the ETM suggest that the larger flocs are probably of biological provenance and originate from biological production in the estuary, including production on the intertidal sand flats.