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Controls on saltmarsh stratigraphy and evolution, northwest Ireland

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Saltmarsh sediments are problematic as sea-level indicators because sediments can accumulate by tidal, wave, aeolian, and overwashing processes at a range of elevations within the tidal frame. In addition, saltmarsh sediments often have low preservation potential due to wave/tide erosion and sediment reworking, and sequences that are preserved can show erosional hiatuses that condense the record and give undue prominence to high magnitude events. Aggradational saltmarsh sequences may be preserved, however, where there is rapid coseismic subsidence, or where sediments become trapped within a bedrock basin. The Atlantic-facing coastline of northwest Ireland provides a good example of the latter case, where bedrock headlands and an archipelago of small offshore islands has provided accommodation space for aggradational saltmarsh sequences which regionally are of mid to late Holocene age. At Burtonport (55°00.13'N, 8°27.02'W, County Donegal, northwest Ireland) individual saltmarsh sediment packages (20-80 cm thick) are bounded by undulating erosional unconformities, and the total saltmarsh sequence (2.8 m thick) develops upwards from in situ *Pinus* stumps (located within the upper foreshore) overlying beach gravels and weathered granite bedrock (Figure 1). Above this base, organic-rich saltmarsh sediments are interbedded with laterally continuous sandy layers (<1 cm thick) which generally increase in thickness upwards at the expense of the organic layers. The succession is transitional to an overlying palaeosol (20 cm thick) and 60 cm of recent dune sand.

Through this stratigraphy, in situ magnetic susceptibility was measured at 5 cm intervals and sediments (1-cm thickness) were removed for grain size analysis using a Malvern Mastersizer, and analysed for combustible organic carbon content, $CaCO_3$ content, and microfossil assemblages (mainly diatoms). Five samples were also removed for AMS ^{14}C dating.

Results show initial organic accumulation at c. 4420 yr BP, but that sedimentation was episodic, as evidenced by stratigraphic unconformities throughout, which may correspond to storms or flood events. Differences in $CaCO_3$, organic content and grain size reflect the relative and evolving role of tidal overwashing and/or aeolian deposition during emergence of the saltmarsh succession, during an unsteady late Holocene climate.

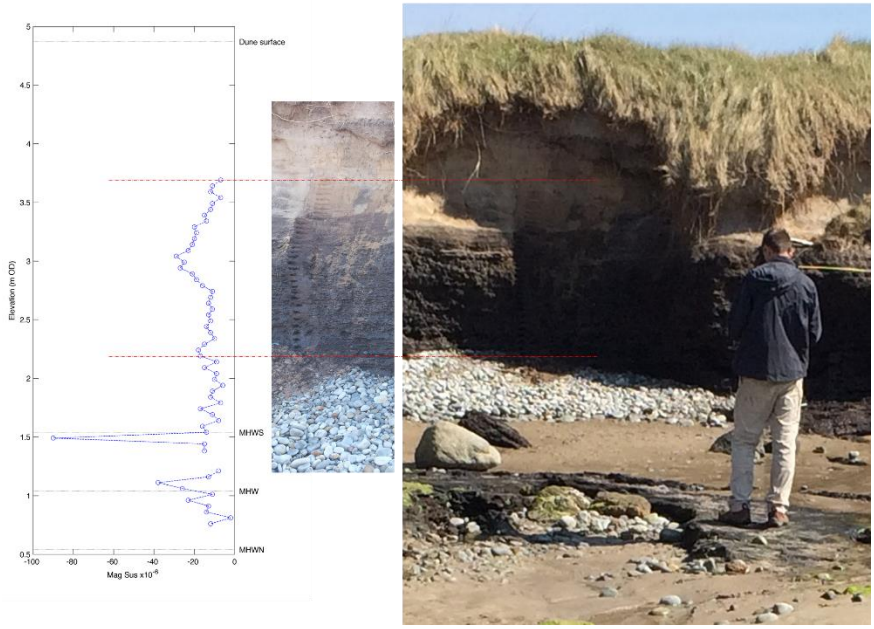

Figure 1: Illustration of saltmarsh stratigraphy, relationship to MHSW, and magnetic susceptibility results (left panel) that clearly reflect position of the tidal frame.