INTERTIDAL FORM ANALYSIS

For sandy shores there is an extensive body of work to describe the cross-shore form (Dean, 1977; Dean, 1987). Based on the conservation of wave energy, Dean proposed an equilibrium form given by:

$$z(y) = A \cdot y^{2/3}$$

where

$$A = 0.067 \cdot w_s^{0.44}$$

z(y) is the depth at distance y from the shore and w_s is the particle settling velocity in cm/s.

Work on cohesive shores is less extensive. There has been some work on glacial tills around the Great Lakes (Bishop *et al*. 1992) and on intertidal mudflat morphology (Friedrichs, 1993; Lee & Mehta, 1995; Friedrichs & Aubrey, 1996). The work by Friedrichs uses analytical and geometric arguments to link the form of the profile (whether it is concave or convex) to the plan shoreline curvature. He shows that a profile varying to the 2/3rd power applies to a straight shore. However for an embayed shore, the concave form of the profile is reduced and for a strongly embayed shore can become convex. Conversely a lobate, or headland, shore tends to enhance the degree of concavity. Given that most muddy shores are straight or weakly lobate, the expectation is that the profiles should be concave. This however proves not to be the case and Lee and Mehta (1997) show that by including the wave-bottom interactions one obtains a more realistic description of the form. The theoretical form was again derived by considering wave energy dissipation over the intertidal but including the influence of the mud rheology.

$$z(y) = f_s \cdot y \cdot e^{-\beta \cdot y} + z_o \cdot e^{4\kappa(y_o - y)} \cdot \left(\frac{y}{y_o}\right)^2$$

where f_s is the bed slope at y=0, y_o is the distance to the seaward limit of the profile, z_o is the depth at the seaward limit, β is a profile specific coefficient, and κ is the wave attenuation coefficient. Furthermore, the shape of the profile is thought to provide an indication of stability of the shore, with convex-upward profiles being accretionary and concave profiles being erosional (Kirby, 1998; Mehta & Kirby, 2001). Typical parameter values based on fitting 96 profiles to the above equation are as follows:

Parameter	**Reported Range: Mean (st. dev)**	
	Erosional	**Accretional**
Wave attenuation coefficient, κ	0.420 (0.130)	0.016 (0.027)
Foreshore slope, f_s	0.059 (0.083)	0.026 (0.019)
Depth correction factor, β	0.046 (0.054)	0.015 (0.008)

As a further extension to this approach, Mehta and Kirby (2001) have proposed a profile stability number, $S = 1-F_s/F_d$, where F_s represents shore stabilising factors and F_d shore destabilising factors. This gives S=0 for shores that are marginally stable and S>0 for eroding shores and S<0 for accretionary shores. Some values to define F_s and F_d are given in the literature but it is also recognised that extensive data sets would be required in order to use this approach as a predictive tool.

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