Geophysical Research Abstracts, Vol. 9, 02330, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-02330

Oceanographic currents and the convexity of the uppermost continental slope

Neil C. Mitchell (1) and John M Huthnance (2)

(1) School of Earth, Atmospheric and Environmental Sciences, Manchester University, UK,
(2) Proudman Oceanographic Laboratory, Liverpool, UK (Neil.Mitchell@manchester.ac.uk)

The transition between the continental shelf edge and the uppermost slope in many areas has a smooth, convex-upwards rounded shape in profile, a clinoform "rollover" geometry that arises in general terms from declining energy of the sedimentary environment with water depth. Measured currents due to tides, surface waves and other sources are indeed commonly enhanced at the shelf edge and decline seawards. We develop a model to describe how bedload transport of sands, which are often found around the shelf edge, could contribute to this convexity. If sand lying on a gradient is agitated by oscillating currents or by slope-parallel currents, experiments and theory suggest that a component of the bedload moves down-slope under the influence of gravity with a transport flux proportional to the bed gradient and proportional to the mean current speed uˆn, probably with n=2 to n=3. The sediment topography then obeys a diffusion equation with a mobility constant K locally proportional to uˆn. Using near-bottom current meter data from two margins (USA and Iberian Atlantic), we show that the average decline in mean current speed with depth is remarkably compatible with the local morphology, suggesting that the smooth upper slope could be in near equilibrium with the currents. We also consider other influences on the upper slope, such as how it reflects conditions during the Last Glacial Maximum when tidal and wave currents were enhanced compared with the present day, and effects of mud deposition and bioturbation.