Geophysical Research Abstracts, Vol. 8, 06402, 2006
SRef-ID: 1607-7962/gra/EGU06-A-06402

The cause of Early Oligocene increase in North Sea sedimentation rate: climatic or tectonic?

M. R. Thorsen, D. L. Hansen and S. B. Nielsen

Department of Earth Sciences, University of Aarhus, Denmark (marianne.thorsen@geo.au.dk / Phone: +45 89 42 43 34)

The relative roles of tectonics, eustasy and climate in the Cenozoic evolution in northwest Europe is a matter of ongoing debate. The Eocene/Oligocene "greenhouse-icehouse" transition is associated with a major global cooling event and glacioeustatic lowering. This boundary also correlates with a marked increase in sediment supply to the North Sea area as well as globally. This is traditionally interpreted as evidence for simultaneous tectonic uplift of the surrounding mainland areas. We address the question whether this period of increased sedimentation rates in the North Sea area may in fact be a consequence of the distinct climatic and eustatic changes occurring at the Eocene/Oligocene transition, additionally giving rise to the illusion of tectonic uplift due to the positive feedback between enhanced continental incision and passive isostatic uplift. The development of numerical surface process models in recent years has made it possible to simulate large-scale landscape evolution over geologic timescales and hence, to track variations in source area erosion rates through time and space. We employ a surface process model in order to assess how changes in climate-related parameters may affect long-term changes in drainage basin topography. The model combines long-range fluvial transport and short-range hillslope processes hereby quantifying erosion of source areas and deposition in surrounding basin areas. Results from simulating the response of a drainage basin to a fall in eustatic sea level and an increase in surface runoff/precipitation rate are presented. Both scenarios result in large pulses in mainland denudation and thereby in offshore sediment flux. These general considerations are applied to the North Sea area by discussing mechanisms for changes in surface runoff and bedrock erodibility at the Eocene/Oligocene transition. We propose that the increase in North Sea sedimentation rate and basin margin erosion at the Eocene/Oligocene transition may in fact be triggered by global

climatic deterioration and glacioeustatic lowering rather than by tectonic uplift.