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TECTONICS, SURFACE UPLIFT AND RIVER INCISION: GENERAL MODELS, CASE HISTORIES AND APPLICATIONS TO EAST ANGLIA AND SOUTHERN ENGLAND

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INTRODUCTION

Many rivers worldwide have incised into their own alluvial deposits or into bedrock during the Quaternary, some producing spectacular terrace flights as they have done so. Whilst some authors have assumed that tectonic uplift is responsible for incision it is emphasised here that incision has other general causes. In this contribution two causes are discussed that are relevant to incision into older alluvium: 1) non-uniform sediment transport rate according to the sediment continuity equation (SCE); 2) non-uniform transport according to the sediment diffusion equation (SDE). The assumption that surface uplift is generally required for incision and terrace flight formation is thus rejected. SCE and SDE modes of incision are demonstrated and contrasted with reference to the Quaternary history of the Rio Grande, SW USA (SCE incision) and drainages traversing the southern uplifting flank of the Corinth rift, central Greece (SDE incision). In East Anglia, a phase of permanent surface uplift is postulated following severe (up to 100 m) erosion of western Mesozoic scarplands by the southward-flowing Anglian ice sheet that funnelled through the Wash gap between Lincolnshire and Norfolk during Marine Isotope Stage 12 (MIS 12), about 400 ka ago.

This erosional episode, termed the Clayton Event after its first quantifier, was followed by regional uplift and eastward tilting of older (2−0.6 Ma) marine Norwich and Wroxham Crag deposits. The magnitude of uplift and tilting is shown to be commensurate with isostatic response to the Clayton Event: either by local Airy compensation or, more likely, by regional flexural deformation The hypothesis that Quaternary surface uplift and terrace formation over southern Britain and elsewhere are due to isostatic adjustment driven by lower crustal flow is rejected, both on general and particular grounds.

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THE GLACIAL ERRATIC COLLECTION AT NORWICH CASTLE MUSEUM

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ABSTRACT

The glacial erratic collection at Norwich Castle Museum & Art Gallery consists of approximately 1600 individual specimens or groups of related erratics. It contains a number of items of considerable geological interest, as well as several collections that were assembled by amateur geologists who were at the forefront of the development of the subject in Norfolk and farther afield. The erratics have been documented in order to produce a MODES database that is not only searchable but may be examined on-line. Unfortunately many of the existing specimens lack detailed information on the circumstances in which they were found, thus greatly diminishing their research potential. Guidelines are provided in the hope that future collecting is carried out more rigorously.

CLAY MINERALOGY OF CROMER FOREST BED FORMATION SEDIMENTS, WEST RUNTON, NORFOLK

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ABSTRACT

The clay mineralogy of Cromer Forest-bed Formation sediments at West Runton, Norfolk is characterised by; 1) low kaolinite abundance, typically <10%; 2) illite abundance typically in the range 38-66%; and 3), smectite present in all samples (25-90%), either interstratified with illite, or as a discrete mineral. Smectite is most abundant (47-90%) in samples from the West Runton Freshwater Bed (WRFWB) and in the basal Mundesley Member. Smectite clays in the Cromer Forest-bed Formation sediments as a whole are interpreted as mainly detritally sourced. Greater than 50% smectite content in the WRFWB is likely to be from detrital sources or from the early diagenesis of illitc clays in marshy waterlogged sediments. However, a small amount of volcanogenic smectite in the WRFWB cannot be ruled out since a volcanic mineral assemblage has recently been described from the 20-120μm size fraction (Brough et al., in press).

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