

SIMULATED LATE-GLACIAL AND HOLOCENE RELATIVE SEA-LEVEL AND PALAEOOTIDAL CHANGES ON THE ISLES OF SCILLY: A NEW APPROACH FOR ASSESSING CHANGES IN THE AREAL EXTENT OF THE INTER-TIDAL ZONE

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Human palaeodietary analyses indicate that the Neolithic transition in NW Europe may have been characterised in coastal populations by a shift from a marine-based to a terrestrial diet. In order to test whether this shift was at least partly forced by a reduction in the size of the inter-tidal zone – from which human communities forage for marine resources – we reconstruct the areal extent of the inter-tidal zone on the Isles of Scilly over the last 13,000 years. This novel pilot analysis, which incorporates relative sea-level simulations based on glacial isostatic adjustment model output and palaeotidal simulations, demonstrates the significance of coastal topography/gradient in determining inter-tidal extent. The simulations for Scilly show only very modest changes in the extent of the inter-tidal zone across the Neolithic transition indicating minimal or no physical influence at this location for any palaeodietary change. Nevertheless, these model data contribute to an informed assessment of the changing palaeogeography of Scilly over the last 13,000 years that provides a basis for testing via field observations. Furthermore, the tidal amplitude data can be used to correct the indicative meaning of emerging sea-level index points from Scilly.

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INTRODUCTION, AIMS AND OBJECTIVES

One of the most striking attributes of the European Mesolithic-Neolithic transition (c. 6,000 cal BP) to emerge from recent research is the apparent abandonment of marine resources in favour of terrestrial food sources in coastal populations, i.e. the replacement of fish and shellfish in the human diet by meat and vegetables (Richards and Hedges, 1999; Schulting and Richards, 2001; Richards and Schulting, 2006). Stable isotopic analyses of human bone from some localities provide convincing evidence for this palaeodietary hypothesis. Though there have been significant critiques of the rigidity and rapidity of this postulated change, and an understandable focus on the economic, social, cultural and technological drivers underpinning this transition (Milner *et al.*, 2004, 2006), there were significant changes taking place in the physical environment coincident with the Mesolithic-Neolithic transition that may have influenced the rate of palaeodietary change and its spatial heterogeneity. These include palaeoclimatic changes (Roberts, 1998) and, significantly for an hypothesis involving marine resources, changes in relative sea level (rsl).

It is now widely recognised that as rsl changed during the Holocene, largely as a function of the interplay of glacio-eustatic and glacio-isostatic controls (Lambeck, 1995; Bradley *et al.*, 2011), the tides also changed (Thomas and Sündermann, 1999; Egbert *et al.*, 2004; Uehara *et al.*, 2006; Arbic *et al.*, 2008; Griffiths and Peltier, 2008). The ability to simulate past changes in tides and tide-dependent parameters provides the potential to interrogate what significant changes, if any, have taken place in the coastal marine environment over time. Here we present the results of palaeotidal reconstructions for the Isles of Scilly (Figure 1) covering time-slices from the Devensian Late-glacial

and Holocene in order to test the hypothesis that the extent of the inter-tidal zone – the zone from which prehistoric communities are able to access marine resources – changed in areal extent significantly between the Mesolithic and the Neolithic. It is not the intention of this contribution to test whether any such change had any significant impact on resource access or on the character of the Mesolithic-Neolithic transition on Scilly. Rather, we confine our analysis to a reconstruction of the changes in tidal amplitudes and to the extent of the inter-tidal zone on Scilly through the last 13,000 years, and offer this as a methodological demonstration that palaeotidal simulations have the potential to reveal previously intractable aspects of coastal palaeoenvironmental change that may have significant implications for archaeological and ecological interpretation. We select the Isles of Scilly for this investigation because:

- 1) Island settings are well-constrained geographically and provide closed topographic boundaries that facilitate simulation.
- 2) The Isles of Scilly have a rich archaeological heritage (Johns, 2006), including Mesolithic and Neolithic material, demonstrating human influence across the transition in question.
- 3) The general pattern of Holocene relative sea-level change is reasonably known from sea-level index points from the wider region (Heyworth and Kidson, 1982; Healy, 1995; Massey *et al.*, 2008; Gehrels *et al.*, 2011).
- 4) Archaeological and Holocene palaeoenvironmental investigation are ongoing, including the generation of new sea-level index points (The Lyonesse Project, Cornwall and Isles of Scilly Maritime Archaeological Society, 2013).