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Optical dating of late Quaternary deposits preserved beneath the eastern English Channel

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A stratigraphic model detailing the sequence and nature of processes responsible for sculpting the shallow continental shelf in the eastern English Channel has been developed through the interpretation of high resolution sub-bottom seismic records. The seafloor is an erosional unconformity and large sediment bodies are limited to palaeovalley infills and offshore extensions of present day coastal environments. In simplistic terms the stratigraphic model proposes fluvial incision and deposition during sea-level lowstand with periglacial processes operating on the sub-aerially exposed shelf under cold climate conditions. Subsequent sea-level rise triggers reworking of existing deposits and infilling of the palaeovalleys with shallow marine and coastal deposits that migrate in step with sea-level rise. The frequency and magnitude of sea-level changes during the late Quaternary lends to significant reworking of sediments during each glacial/interglacial cycle and remnants of previous cycles are rarely preserved. This study uses OSL dating to test the validity of the proposed stratigraphic model. Samples for OSL dating were taken from vibrocores tied to known seismic stratigraphic units representing fluvial, coastal and colluvial depositional environments. The single-aliquot-regenerative dose protocol was applied to 1 mm aliquots of fine quartz sand and individual aliquots were rejected following the criteria proposed by Wintle and Murray (2006). All samples exhibited low sensitivity and poor recycling ratios necessitating the rejection of up to 75% of all aliquots measured. A total of 40 to 60 aliquots were accepted per sample. For all samples regardless of depositional environment, normal equivalent dose (De) distributions were observed with overdispersion values typically <25% and weighted skewness values of $\sim$0.2 advocating the application of the Central Age Model (CAM) to estimate Des. The OSL chronology places periglacial reworking of existing estuarine deposits at $\sim$18 ka, deposition of fluvial sediments preserved in palaeovalleys at $\sim$15ka and progradation of a shoreface at $\sim$8 ka. The ages are remarkably consistent with the stratigraphic model and provide the first chronological control on the timing of processes responsible for the morphological evolution of the continental shelf. We demonstrate the successful application of OSL dating to fluvial, coastal and colluvial deposits preserved in the eastern English Channel.