Emplacement and Post-Depositional Alteration of Sedimentary Event Layers: Lessons from the Eel River Margin

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The sedimentary record of active continental margins is created by a complex set of physical and biological processes that occur over a broad range of time and space scales within both the terrestrial and marine realms. Despite (or perhaps because of) this complexity there is much to be gained from a careful reading of margin stratigraphy because it is here that the fidelity of the coupled land-ocean record is likely to be greatest. On northern California's Eel River margin, intense rainfall events result in the episodic discharge of relatively large fine-grained sediment loads (>10's of billion kg/d) into a receiving basin characterized by intense wave events. Variation in the phasing of the discharge and wave events results in the formation of several types of sedimentary event layers, including tempestites, hyperpycnites and deposits of wave-supported gravity flows. Several interrelated factors lead to significant variability in the post-depositional fate of these deposits. First, layer thickness has a first-order impact on the preservation of event deposits, with thin (< 1 cm) tempestites of the mid to outer shelf having little chance of preservation. Second, a decrease in bioturbation intensity with increasing water depths means that hyperpycnites, which are deposited on the upper slope, have a higher preservation potential than deposits formed by wave supported gravity flows. Third, the sequential timing and frequency of events imparts a stochastic nature to margin stratigraphy, such that high magnitude events may not necessarily have the highest preservation potential. Examples, mainly from the Eel margin, will be provided that illustrate these diverse concepts.