DEFINING PARAMETERS IN MARINE DEPOSIT MODELING: ADVANCES AND FUTURE DIRECTIONS

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To model the architecture and internal properties of deposits it is important to: (1) define the key driving forces (climate, hydrology, oceanography) operating outside the model domain, (2) define the key processes operating within the model domain, (3) employ state-of-the-art numerical representations of each process, and (4) define how the processes interact with each other and the ever-changing boundary conditions. Key to understanding geologically-sensible physics is being able to parameterize mean forcing functions (e.g. relative sea level fluctuations, longterm climate trends) from rare but energetic events (e.g. floods, earthquakes, storms). For example, a clastic model must be able to simulate the low-frequency floods that provide important marker horizons. The 1964 Eel River flood in Northern California carried more sediment in three days than the previous 8 years combined. Mean discharge conditions would not do justice to the dispersion of sediment from such a high energy event. Modelers must also contend with sediment transport systems going critical. For example the Eel River might have 80% of its sediment load entering the coastal basin as surface (hypopycnal) plumes, that may or may not hug the coast depending on alongshore wind direction. However during major floods, when the sediment concentration becomes critical, the river's sediment load will enter the ocean as a hyperpycnal current. These turbidity currents carry high volumes of sediment offshore, influenced by both bathymetry and ambient currents. A numerical simulator must detect such criticalities and seamlessly move between these very different states of sediment transport. The presentation will outline such challenges facing geoscientists interested in numerical simulation of strata formation.