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3D Gravity Spreading of Passive Margins: insights from Analogue Modeling and Particle Image Velocimetry Analysis

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Deformation of supra-salt units associated with gravity spreading on a viscous salt substrate has previously been investigated by geophysical surveys and analogue and numerical models.

The large scale 2D evolution of genetically linked extensional – compressional systems is fairly well documented; however, the 3D temporal evolution of these systems is less well studied.

Deformation of brittle-ductile scaled model experiments was evaluated with a high-resolution optical particle image velocimetry (PIV) system. Experimental PIV data include 3D surface displacement monitoring and deformation analysis whereby incremental and finite values of subsidence, displacement and strain are used to quantify the spatial and temporal evolution of structures and sedimentation patterns.

These data were used to monitor deformation in simulated passive margin settings influenced by gravity-driven salt mobilization. Specifically, 3D interpretation of sections from physical models incorporates PIV or temporal information pertaining to the complete evolution of the model system.

Recent experiments show complex arrays of extensional and compressional structures with highly variable orientations in 3D. The 3D structural development appears strongly correlated with the mobilization (i.e. extension) rates and sedimentary input.

Data from these new experiments and the novel application of PIV analysis give improved insights into the nature and mechanics of brittle-ductile coupling and potential

influences of salt mobilization on the 3D development of passive margins.