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Translation of Salt Sheets by Basal Shear

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The offshore Louisiana outer shelf and upper slope are underlain by numerous allochthonous salt sheets which were laterally emplaced during the late Miocene and early Pliocene. The basal shear model utilizes a two-stage process for lateral salt emplacement. Initially, shallow salt sheets with thin carapaces of deep-water shales flow downdip like glaciers by low-angle gravity spreading. The condensed shale sections are deposited on bathymetrically high salt sheets and are then rafted downdip, resulting in repeated sections below the allochthonous salt. This glacier model explains the repeated sections, but data from recently drilled wells indicate that another mechanism of salt translation becomes dominant after initial emplacement.

Burial and confinement of the salt sheet initiates secondary salt diapirism, salt sheet segmentation, and rafting episodes. Sedimentary loading landward and above the sheet causes salt to flow laterally with shear concentrated at the base of salt. Compressional thrusts at the leading edge of salt sheets can be traced updip to the base of salt, and they continue under the salt as thrust faults. This basal shear zone includes compressional features within the sedimentary layer below salt. The sheared section below the salt is distinct from the suprasalt, rafted condensed-shale sections, and is defined as a highly overpressured interval between 400' and 2000' thick, consisting of a series of thrust faults. The subthrust sedimentary interval below the salt can have overturned and repeated sections defined by paleontological assemblages. The shear zone may also extend into the base of salt and modify the geometry of the salt base, causing chevron or stair-stepped subcrops and sedimentary inclusions at the base of salt. These deformations cause an unusual rock rheology, with pore pressures approaching fracture pressures within the basal shear zone, then diminishing with depth to a more regional pore pressure gradient. ■

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