Pleistocene Shelf-Margin Delta: Intradeltaic Deformation and Sediment Bypass, Northern Gulf of Mexico

Grigoriy Perov

Department of Earth and Atmospheric Sciences, University of Houston,
312 Science & Research 1, Rm. 312, Houston, Texas 77204

ABSTRACT

3D seismic data allow evaluation of soft-sediment deformation features in a Pleistocene shelf-margin delta within a salt dome minibasin, offshore Louisiana. The delta consists of a series of offlapping sandy clinoforms, interpreted as being associated with a prolonged forced regression and ensuing lowstand of sea level, associated with oxygen isotope stage 6, which lasted for about 20 thousand years. The lowstand delta is onlapped by a transgressive mud wedge, and is underlain and capped by regionally persistent highstand mudstones. The central part of the delta shows severe disruption, suggestive of soft-sediment deformation. Two types of deformation are observed. Synsedimentary intra-deltaic deformation is indicated by a series of slumps and growth faults. The central part of the delta also shows post-depositional extradeltaic deformation caused by a shallow-water mass transport complex (MTC) that remobilizes the deltaic deposits. The MTC shows well defined pressure ridges and forms two lobate complexes that show clear truncation of the older clinoform delta deposits. Mapping of the MTCs shows that sediment transport was almost perpendicular to the direction of the regional delta progradation that it replaces. The shallow mass transport complex is interpreted to have formed in water depths of around 100 m (~330 ft) and was likely induced by the uplift of the adjacent western salt dome. Tributive channels downdip of the delta front are interpreted as submarine slope channels, some of which are connected with distributary channels, probably forming near the end of the prolonged lowstand. These channels have a high potential for transporting coarse-grained sediment down the slope and onto the basin floor.

We hypothesize that the high degree of syn- and post-depositional deformation, as well as the well developed shelf-edge channel network, are related to the prolonged nature of the lowstand. In contrast, shelf-edge deltas formed during shorter-term eustatic drops seem to lack the deformation features.

Perov, G., 2009, Pleistocene shelf-margin delta: Intradeltaic deformation and sediment bypass, northern Gulf of Mexico: Gulf Coast Association of Geological Societies Transactions, v. 59, p. 603.