Neogene Current-Modified Submarine Fans and Associated Bed Forms in Mexican Deep-water Areas

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ABSTRACT

In the southwestern Gulf of Mexico, new and recently reprocessed seismic data has revealed a series of large seaward dipping accretion sets (SDAS), with set thicknesses of 130 to 250 meters. These exhibit hummocky, oblique and shingled to parallel seismic clinoform reflections. These Miocene to Pleistocene seismic packages (geobodies) have an estimated paleo water depth exceeding 400 meters. Within these sets, we observe bedforms with internal accretion surfaces that dip seaward and internal beds that climb toward land, roughly analogous to supercritical flow structures observed in experimental and modern data. These seismic packages were identified on older 2D seismic data, but the interior bed forms are better imaged and interpreted on new 2D seismic data.

There are two hypotheses of the origin of those shingled seismic reflections in offshore east Mexico. First, these may be related to strong ocean bottom currents that modified submarine fans and transported sediment to the north creating large contourite drifts. Another formative mechanism considered is cyclic steps of bedforms related to unconfined turbidity flow deposition or levee-overbanking flows.

Throughout the Miocene, several submarine fans systems were formed by the sediment input related to orogenic activity in Mexico. Trans-Mexican volcanic processes in the continent, narrow shelf and slope frequently seismically triggered slope failures. This continued into the Early Pliocene as unconfined flows cascaded down the steep gradient shelf and slope and onto the basin floor area where the cyclic step bedforms are best developed.

In this thesis, I use 2D seismic calibrated against available well data to map out and investigate the origin and extent of these SDAS bodies bed forms that extend over a large area of the southern Gulf of Mexico. The source to sink regional controls on the initiation of the associated high density turbidity flows are also considered. This research is important to understand more about the Gulf of Mexico and also for the Miocene-Pliocene timeframe that is a key transitional phase in the earth's history.

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