

Deformation, Mud Diapirism, and Petroleum Systems in the Barbados/Trinidad Prism and Forearc Basin

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Abstract

During its relative eastwards migration, the Caribbean plate first ‘scooped up’ (accreted) parts of a pre-existing Eocene subduction-accretion complex which had formed about 30my earlier during underthrusting of Proto-Caribbean crust beneath South America. The Caribbean Plate and this accreted older prism then went on to incorporate additional sedimentary section now found in the greater prism east of Barbados. Long seismic sections enable us to see sections through the whole system from the Lesser Antilles Arc in the west, through the Tobago Trough forearc basin, across the old (Palaeogene) Barbados accretionary prism, and the younger Neogene-Present (and still active) accretionary prism at the eastern limit of the system above the subducting Atlantic plate. The whole system is very clearly imaged on several ION CaribSpan and other lines, and average velocity plots of the data allow a clear image of the top of the subducting slab. All this is the regional setting for our talk, which concentrates particularly on the mud province of the eastern forearc basin with its upright folds and shortened mud diapirs. We speculate on the petroleum system of this basin, look at the geometry and dynamics of the mud diapirs in it, and attempt to explain the relative lack of success of exploration there. Related arguments suggest that the exploration potential of the young accretionary complex also carries considerable risk, though the older Barbados prism has clearly generated oil, and has to be considered as a very serious exploration opportunity.