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Coeval Shortening on Synsedimentary Thrust Systems and Diapirs, Deepwater Gabon

Using high-quality 3-D seismic data from deepwater Gabon, we investigate the formation of a spectacular gravity-driven thrust system detaching on thin Aptian salt. Contraction occurred throughout the postsalt history. Tectonic transport was southward, perpendicular to the present-day westward bathymetric slope, which is controlled by construction of the massive Neogene Congo Fan. The thrust system is dominated by forethrusts, which curve into lateral structures trending southwest. Because they are oblique to the tectonic transport direction, the lateral structures shortened coevally with the forethrusts as oblique thrusts, squeezed diapiric walls, and inverted normal faults. In early Albian time, both forethrusts and lateral structures began to form when the overburden was only ~200 m thick. The oldest thrusts formed at the seaward end of the thrust belt; younger faults formed farther landward. Individual forethrusts propagated along strike to link fault segments. During late Albian to Eocene time, forethrusts and lateral structures became fully linked. Small allochthonous salt extrusions were expelled along forethrusts where shortening and uplift were greatest; these salt sheets were inflated by further squeezing after burial. From Oligocene to Neogene time, contractional anticlines formed by further tightening of Cretaceous contractional structures. Significantly, the present-day bathymetric slope has little effect on the trend of Tertiary anticlines—even though this slope must be driving the tectonic system today—because the anticlines are localized by Cretaceous structures.