Gravitational Gliding of Allochthonous Salt in an Ultra-Slow Spreading Rift

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Abstract

In the southern part of the ultra-slow spreading rift, the spreading center is clearly visible and shows a very well-defined rift valley with varying volcanic activity along strike and non-transform offsets. The ultra-slow spreading rift is 300 km wide in the south and narrows to 190 km in the north. Present day slip rates are 1.8 mm/yr in the south and 0.8 mm/yr in the north. Rifting initiated around 30 my ago, and during the sag phase in the Miocene, the basin was isolated and large amounts of salt were deposited. These salt deposits are common all along the length of the basin. The rifting process enlarges and deepens the basin. Oceanic spreading splits apart older formations, including the salt. The eastern and western salt formations are clearly separated in the south of the ultra-slow spreading rift. The deepening of the basin along with the uplift of the rift shoulders tilts the sedimentary fill towards the deeper portions of the basin. The thick salt deposits can be tilted up to 9 degrees on the margins of the basin. Gravitational gliding is a common structural feature in passive margins and the presence of salt deposits enhances this situation providing a detachment surface. In the ultra-slow spreading rift, the spreading center is clearly visible and is surrounded by advancing allochthonous salt sheets from the east and west. The newly created oceanic crust extends under the advancing allochthonous salt. In the central part of the ultra-slow spreading rift the advancing salt sheets converge and partially cover the spreading center. The spreading center is visible in only a few places, through windows in the colliding allochthonous salt sheets. The northern ultra-slow spreading rift is narrower than the southern part, and with a slower slip rate of 8mm/yr, it has not been able to keep up with the advancing allochthonous salt sheets. The allochthonous salt and younger Miocene sediments have collided in the axial part of the basin and completely covered the spreading center. The collision of advancing allochthonous salt sheets from opposite sides of the rift exhibits compressional tectonics.