



Subsidence in Gorontalo Bay, Sulawesi (Indonesia) and metamorphic core complex exhumation on land

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Gorontalo Bay is a semi-enclosed sea between the North and East Arms of Sulawesi. It is surrounded by land on three sides, separating a northern volcanic province from metamorphic rocks to the south and west, and ophiolites to the southeast. In the western part of Gorontalo Bay there are two sub-basins: the northern Tomini Basin and the southern Poso Basin, which have different histories. This study presents a new geological interpretation of western Gorontalo Bay, based on recent multibeam and 2D seismic data and field observations on land.

In Tomini Basin six major seismic sequences (Units A to F) have a total thickness of more than 5 sec TWT. Ages are based on correlation with events on land. A major unconformity above Basement Unit A is interpreted to be the result of an Early Miocene collision. Unit A subsided from the Early Miocene, with deposition of Units B and C largely in a deep marine environment. There was regional uplift in the Middle Miocene followed by renewed subsidence resulting in shallow marine depositional environments in which carbonate platforms developed (Units D-E). Subsidence accelerated during the deposition of Unit E, causing back-stepping of the shelf edge, formation of pinnacle reefs and then drowning of the carbonate platforms, leading to the present depths of 2 km in the basin centre with a thin clastic cover (Unit F).

North of Tomini Basin, the Malino Metamorphic Complex exposes strongly deformed mid-crustal rocks which record Middle Miocene extension accommodated by low angle shear zones. A second phase of rapid uplift and extension recorded in these rocks occurred in the Pliocene–Pleistocene, and was accommodated by high angle normal faulting.

Poso Basin is younger than Tomini Basin and it occupies the southern part of western Gorontalo Bay. The deeper part of its sedimentary sequence is probably the time equivalent of Unit D in Tomini Basin. Immediately south of Poso Basin, on land, is a large metamorphic core complex. Seismic data suggest that the northern flank of the complex continues under the basin, linked to a potential low-angle normal fault under the basin. Similar structures have been identified in the Palu Metamorphic Complex to the west of the bay. Strongly deformed mid to lower crustal rocks are exposed in high mountains along the Neck of Sulawesi and were rapidly exhumed along mylonitic shear zones due to northward extension associated with development of the North Sulawesi Trench during the Pliocene. We propose that the rapid subsidence of the Poso and Tomini Basins is related to extension associated with the exhumation of metamorphic core complex on land.