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Structure and Evolution of the Tamtsag Basin / NE Mongolia

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The Tamtsag basin in NE Mongolia is part of a widespread basin system in Eastern Asia which formed during Late Jurassic and Cretaceous times. The geodynamic causes for regional extension are discussed controversially and several hypothesis ranging from orogenic collapse via subduction rollback to collision-induced rifting have been put forward. While substantial work has already been published on the East Gobi basin to the south, information on the fill and tectonic evolution of the Tamtsag basin and its northeastward continuation into China, the Hailar basin, is sparse. This is partly due to poor exposure as most of the basin is covered by Cenozoic sediments and surface outcrops of the basin fill occur only locally near the basin-bounding faults. However, recent hydrocarbon discoveries in the Tamtsag and Hailar basins have resulted in intense exploration activity and a strong interest in the area. The present study combines seismic and well data with satellite imagery and surface mapping to gain insights into the structure, fill and geodynamic evolution of the Tamtsag basin.

These data sets reveal the Tamtsag basin as an approximately 300 km long and 80 km wide WSW-ENE trending fault-controlled structure. The basement is formed by metamorphic and intrusive rocks of Devonian to Permian age. The basin fill consists of continental sediments and volcanics which can reach up to 4 km in thickness. Basin subsidence commenced in late Middle Jurassic times leading to the deposition of alluvial fan, fluvial and lacustrine sediments. The Upper Jurassic evolution is characterized by voluminous volcanic deposits with basaltic to andesitic composition and only few interbedded sediments. The Lower Cretaceous basin fill is mainly known from borehole data and consists of fluvio-deltaic conglomerates and sandstones fining upward into lacustrine shales. The boundary to the overlying fluvial to lacustrine

sediments of Upper Cretaceous age is characterized by a pronounced angular unconformity of basin-wide extent. Shale compaction data suggests that up to 800 m of sediments were removed during this Middle Cretaceous phase of uplift and erosion.

Rifting and in particular the Middle Cretaceous inversion event have led to a complex internal structure of the Tamtsag basin. It is characterized by several uplifted fault blocks in the central part and graben-/halfgraben-like structures to the north and south, close to main basin bounding faults. Inversion and structural complexity are most pronounced in the southwestern part of the basin and progressively decrease towards the NE. Finally, the tectonic evolution of the Tamtsag basin is discussed in context of the regional geodynamic framework.