Evolution of the Tamtsag Basin / NE-Mongolia — part I: basin fill *Poster*

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Introduction

The Tamtsag Basin in NE Mongolia is part of a widespread basin system which formed during Late Jurassic and Cretaceous times (Graham et al. 2001, Qing-Ren et al. 2003). It is filled with continental sediments and volcanics which can reach up to 4 km in thickness. Rifting and subsequent basin inversion led to a complex basin geometry characterized by several horst and graben structures. The geodynamic causes for regional basin formation are discussed controversially and several hypothesis ranging from orogenic collaps via subduction rollback to collision-induced rifting have been put forward. Scientific research on the Mesozoic basins in Mongolia has so far concentrated on the East Gobi Basin to the south (Graham et al 2001, Prost 2004, Johnson 2004) and some work has also been published on the Hailar Basin (Qing-Ren et al. 2003), the northeastward continuation of the Tamtsag Basin into China. Fundamental data on the fill and tectonics of the Tamtsag Basin in between is still missing. This is partly due to poor exposure as most of the basin fill is covered by Cenozoic sediments and only locally, near the bordering faults, rocks are accessible for surface investigations. However, recent discoveries of oil in the Tamtsag and Hailar Basins have resulted in intense exploration activity and a strong interest in the area. This contribution describes the results of a field campaign in fall 2005 focusing on the basin fill while a companion paper (Davaa et al. this volume) deals with the basin structure and hydrocarbon potential of the Tamtsag Basin.

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Basin fill

So far little has been published on the stratigraphy of the Tamtsag Basin. A comparative synopsis of the Mesozoic stratigraphy in the adjacent basins is given by Qing-Reng et al. (2003).

Basement rocks consist of metamorphics and intrusives of Permian to Devonian age. Triassic strata is missing. Basin subsidence commenced in the Lower-Middle Jurassic with sedimentation of alluvial/fluvial conglomerates, sandstones and intercalating coalbeds. Voluminous Upper Jurassic volcanics with sedimentary interbeds are known from the Tamtsag Basin and also found in the Hailar and Erlian Basins. Using mainly borehole data, Neves (2000) identified a Lower Cretaceous, clastic, continental rift-fill with fluvio-deltaic conglomerates and sandstones. Volcanics occur. A general fining upward-trend leads into deep water, lacustrine mudstones and shales overlain by Upper Cretaceous fluvial-lacustrine mudstone-sandstone facies. Clastic Cenozoic deposits of conglomerates, sandstones, and mudstones cover most parts of the basin, concealing the Mesozoic units.

At the western margin the filling of the Tamtsag Basin is accessible at surface and two areas have been mapped in detail to get an insight view of the lithologies and depositional environments of the basin fill.

In one of the areas mapped the pre-rift

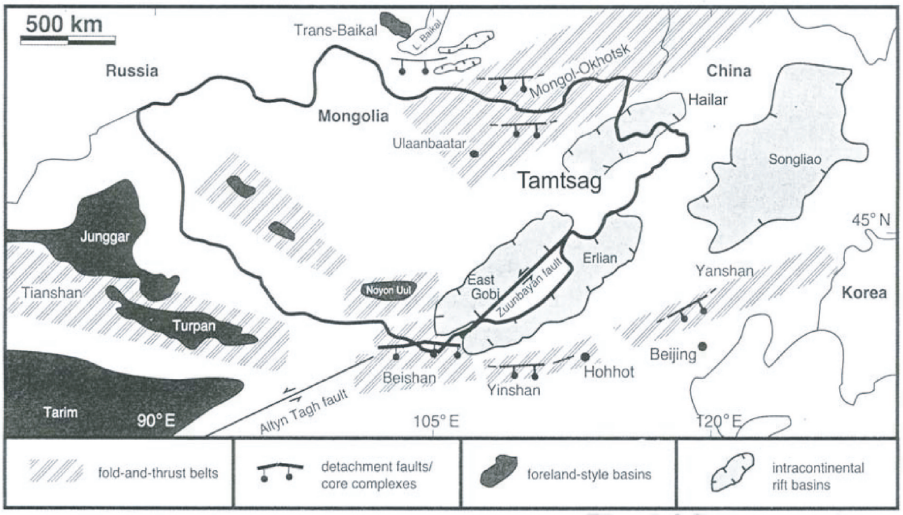

Figure 1: Location of the Tamtsag Basin and adjacent Mesozoic basins (Graham et al. 2001)

basement rocks of the Tamtsag Basin are exposed. They consist of low- to high-grade contact-metamorphic schists and turbidites with basaltic interlayers of presumably Devonian to Permian age. Contact metamorphism was caused by voluminous granitic intrusions. The syn-rift sequence in the area can be divided into a volcano-sedimentary and an effusive volcanic unit. The former consists of large scale, proximal ignimbrite deposits which are overlain by terrestrial, fluvial and lacustrine sediments (conglomerates, breccias, sand- / silt-/ mudstones), frequently interfingering with volcanic rocks (tuffs, ignimbrites). There is a strong lateral lithologic change in this unit across the mapping area. It is conformably overlain by lavas of basaltic-basaltic to andesitic composition, presumably indicating a time of enhanced basin extension. K/Ar-dating of this unit is in preparation to provide a radiometric age and exact stratigraphic position, respectively. The effusive volcanics are concordantly followed by units of terrestrial-sedimentary origin, with conglomerates, sand-, silt-, and mudstones rich in plant fossils and containing a unit of black shale that could serve as a potential source rock. Furthermore, volcanics (rhyolithe, tuffites) are found in this unit.

The second mapping area covers more than 70 square kilometers and is located southeast of the one described above, closer to one of the main basin-bounding faults. Most of the area is covered by Cenozoic sediments. The central part is an uplifted structure providing good outcrops. It comprises no basement rocks, but a thick volcanic sequence of rhyolite, andesite and two basalt generations, possibly of Late Jurassic to Early Cretaceous age. Field observations show that the rhyolitic volcanics are overlain by andesite. Basalts cross-

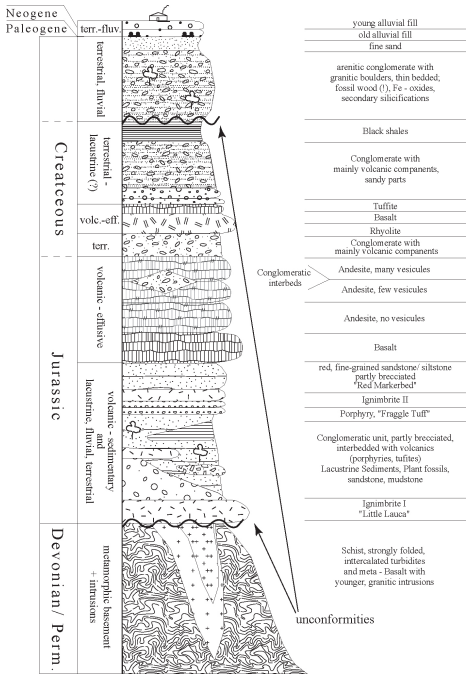

Figure 2: Preliminary stratigraphic column of mapping area 1.

cut the rhyolite and andesite and, hence, are of younger age. The center of the ridge is formed by a dome-like structure of rhyolitic composition. The magmatic units are overlain by a well rounded, possibly basal conglomerate. The second, younger basalt overlies the conglomerate. This indicates two separate stages of volcanic activity. A lens of marine carbonate sediment with crinoidal fossils was found intercalating with the basalt. The stratigraphic position of this unit remains unclear and requires further investigations as so far no marine sediments have been described from the Tamtsag Basin.

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