Geophysical Research Abstracts
Vol. 15, EGU2013-2683, 2013
EGU General Assembly 2013

On abrupt transpression to transtension transition in the South Baikal rift system (Tunka – South Baikal segment)

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This work addresses to relation of transpression and extension stress-strain conditions in intracontinental rift system. In our investigation we use a new structural, shallow geophysics, GPS geodetic data and paleostress reconstructions.

The surroundings of southern tip of Siberian platform is the region of three Late Cenozoic structures conjugation: sublatitudinal Obruchev fault (OF) controlling the northern boundary of the South Baikal basin, NW trending Main Sayan fault (MSF) as the strike-slip boundary between Siberian platform and East Sayan block and WNW trending eastern segment of Tunka fault (TF) as part of the Tunka basins system northern boundary. A new evidences of superposition of compression and extension fault structures were revealed near the southern extremity of Baikal lake. We've find a very close vicinity of Late Pleistocene - Holocene strike-slip, thrust and normal faulting in the MSF and OF junction zone. The on-land Holocene normal faulting can be considered as secondary fault paragenesis within the main strike-slip zone (Sankov et al., 2009). Active strike-slip, thrust and reverse faulting characterize the MSF and TF junction zone. The transpression conditions are replaced very sharply by transtension and extension ones in eastern direction from zone of structures conjugation – the active normal faulting is dominated within the South Baikal basin. The Bystraya rift basin located in the west shows the tectonic inversion since Middle Pleistocene as a result of the strike-slip movements partitioning between TF and MSF and inset of edition compression stress. The active strike-slip and intrabasin extension conditions are dominated father to the west in Tunka basin.

The results of our GPS measurements show the present day convergence and east movements of Khamar-Daban block and eastern Tunka basins relative to Siberian platform along MSF and TF with NE-SW shortening domination. The clear NW-SE divergence across Baikal basin is documented. Holocene and present-day left lateral relative motions of about 3 mm/yr (Sankov et al., 2004) between of Siberian platform and its mounting frame are accommodated along south-eastern segment of MSF.

We consider two main factors of sharp transition between transpression and transtension to extension conditions in Tunka-South Baikal segment of Baikal rift system. The first one is the influence of geometry of southern tip of Siberian platform as a first order ancient lithosphere heterogeneity in agreement with (Petit et al., 1996). The second factor is the interaction in this region of two tectonic forces driving the Cenozoic geodynamics. The initial opening of the Tunka and South Baikal basins since Oligocene time as well as father Baikal rift system development caused by long lived asthenosphere flow along NW-SE direction (Sankov et al., 2011). The addition NE-SW compression started during Pliocene (Parfeevets, Sankov, 2006) as the result of the Hindustan and Eurasia convergence. The former caused transpression deformations and clockwise horizontal block rotations along south-western boundary of the platform with their SE movements to the "free space" opened by the divergence of Siberian platform and Transbaikal block (Sankov et al., 2002, 2005).