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1 Upper Mantle Anisotropy Beneath Central Mongolia

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In 2003, a NS-trending profile of broad band seismic stations has been deployed for 5.5 months from the southern part of the Siberian craton to the Gobi-Altai range and crossing the whole Hangay dome. The aims of the Mongolian-Baikal (MOBAL) experiment were to characterize the upper mantle structure and deformation beneath central Mongolia, the deep signatures of the major lithospheric structures such as the Hangay dome, the Gobi-Altai range, the Siberian platform and the Baikal rift, but also of the large scale EW-trending strike-slip fault such as the Bogd and Bolnay fault on which occurred several events of magnitude larger than 8.0 during the 20^{th} century. Mantle flow is deduced from the splitting of teleseismic shear waves such as SKS phases. Seismic anisotropy beneath the permanent station ULN in Ulaanbatar in eastern Mongolia reveals the presence of two anisotropic layers, the lower one oriented NW-SE, close to the trend of the plate motion and the upper one NE-SW, close to the trend of the lithospheric structures in this area. At the temporary MOBAL stations across the Hangay dome, we observe delay times of 1.5 to more than 2.0 s suggesting a coherent mantle deformation over large thicknesses. The observed NW-SE fast directions are parallel to the trend of lithospheric structures and also close to the di-

rection of plate motion. We propose that both the lithosphere and the asthenosphere may be involved and that they may add their anisotropic effects beneath central Mongolia. In order to interpret the slight clockwise rotation of the fast SKS directions with respect to the HS3-Nuvel1A plate motion vector, we propose that the sub-lithospheric flow beneath Mongolia is deflected by the thick root of the Siberian platform. Since seismic anisotropy reveals the deep and integrated mantle strain, comparing it with GPS velocity vectors that characterize the present crustal motion suggests interesting constraints on crust-mantle coupling: In the Eurasia-fixed reference frame, the SKS splitting beneath central Mongolia shows a rather good parallelism with the GPS vectors (Calais et al., 2003) suggesting that the crust escapes toward the east coherently with the lithospheric and asthenospheric mantle flow. On the other hand, a very different behavior is observed in western Mongolia, where the GPS vectors trend NS while fast SKS directions trend EW, suggesting a complete decoupling between the upper crust moving northwards and the asthenospheric mantle flowing eastwards. Finally, the two southernmost stations deployed on the Bogd fault display fast directions oriented at a large angle to the fault trend, suggesting either a model of block rotations at depth or that the fault-related deep deformation is strongly localized and that we record a preexisting anisotropy.