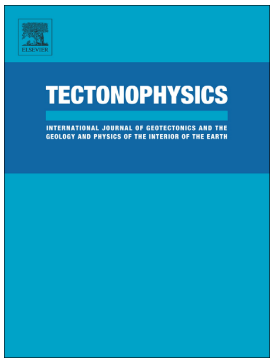

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Complicated 3D mantle flow beneath Northeast China from shear wave splitting and its implication for the Cenozoic intraplate volcanism

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Abstract: We obtained shear wave splitting measurements from XKS (SKS and SKKS) phases recorded by the NECESSArray project consisting of 127 seismic stations in Northeast China (NEC). The most salient feature of the anisotropy in NE China is the alignment of subduction-parallel fast direction, which can be explained by the background upper mantle flow in the big mantle wedge (BMW). However, the geographical variations of fast direction and delay time, which closely follow the geometry of subducting Pacific slab, suggests that the slab morphology controls the geometry of 3-D mantle flow in the BMW. The most significant finding of this study is the complex anisotropic pattern with most nulls observed in the Changbaishan mountain region (CBM) and southern Songliao basin. At the southern Songliao basin, the small delay times as well as null measurements of shear wave splitting are coincident with the high velocity in the upper mantle down to ~300 km from previous studies. The observed anisotropy likely arises from the combination of BMW convection and more localized upper mantle convection, that is, a plume-like mantle upwelling from the mantle transition zone beneath the Changbaishan region triggers the down-welling beneath the southern Songliao basin.

Keyword: seismic anisotropy, big mantle wedge convection, small-scale convection, intraplate volcanism, Songliao basin, Changbaishan volcano

1. Introduction

Northeast China (hereafter NEC), suited between the North China Craton (NCC) to