

Sedimentary structure of Bohai Bay Basin from teleseismic receiver functions

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We calculated P receiver functions from 895 teleseismic events which were recorded by 70 temporary stations from Sep. 2006 to Sep. 2009. For the stations were located on thick sedimentary structures, it is difficult to identify the P to S converted phases from the Moho discontinuity. The first few seconds after the direct P arrival are mainly controlled by the sedimentary structure response which includes the Ps phase generated by the bottom of the basin and its multiple reverberations in the basin. Based on these characteristics, we used the Neighborhood Algorithm method to invert the data and try to find the best basin velocity model that produces the best fit between the theoretical receiver functions and observed receiver functions in the least-square sense. The results show that there is a series of depressions and uplifts orienting in the NNE direction in BBB. The sedimentary depth in the Jizhong depression is about 3~6 km. There are several secondary depressions and uplifts alternating in the NNE or NE direction in the Jizhong depression. The thickest sedimentary layer is located in the eastern Jizhong depression. The above shows the characteristics of a half rift valley (rift valley)-half horst (horst) structure. The ratio of the P velocity to S velocity in the uplifts is larger than the one of the depressions. It may be caused by the lack of the Paleogene stratum in the uplifts. The proximity of geothermal fields and the high Vp/Vs-ratio depressions shows a close relationship between the high temperatures of the stratum and the large ratios of P velocity to S velocity; The average of S velocity of the sedimentary in the uplift is smaller than the one in the depression, and the thicker sedimentary area always has a higher average S velocity. These characteristics show a relationship of thick sedimentary and high average S velocity. It may be because that the thicker sedimentary area has a thicker Paleogene stratum and the S velocity of the Paleogene stratum is much higher than the ones of the Neogene and Quaternary strata. The sedimentary structure provides a base to determine crustal structure beneath the BBB.

Keywords: Neighborhood Algorithm method, Teleseismic receiver function, Sedimentary Structure