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Joint inversion of receiver function and gravity data for crustal thickness and velocity ratio

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The H-κ stacking technique in receiver function analysis is popular for estimating parameters of crustal thickness (H) and velocity ratio (κ), and has been widely applied in many areas. However, ambiguities occur in the result of this technique when the phases of multiple waves are not clear, or the structure beneath the station is complicated, resulting in difficulty for picking out optimum H and κ parameters from the H-κ stacking map. In this paper, based on the previous studies, we simplified and improved the algorithm of joint inversion of receiver function and gravity data, to decrease the ambiguities and enhance the precision and efficiency. Herein, the Bouguer gravity anomaly is considered to be composed of the Moho gravity anomaly and the crustal gravity anomaly, in which the former one is related to the crustal thickness and the latter is closely related to the crustal density and velocity ratio. According to the relationship between the gravity anomaly and the H and κ, the Bouguer gravity anomaly can be inverted by using the likelihood estimation approach to obtain the H and κ parameters. The gravity inversion utilizes the initial H and κ parameters from both the gravity interface inversion and the H-κ stacking of receiver function, while its inverted results are used to constrain the H-κ stacking of receiver function. The principle and work flow of the joint inversion between receiver function and gravity data are presented in details in the paper. Tests on both the synthetic data and the real data from the northeastern margin of the Tibetan Plateau demonstrated that the presented approach could effectively decrease the ambiguities with high precision and efficiency.