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2010年高雄地震震源参数的近远震波形联合反演

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Joint inversion with both local and teleseismic waveforms for source parameters of the 2010 Kaohsiung earthquake

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摘要 本文改进了传统基于近震波形数据的点源震源参数反演的Cut And Paste(CAP)方法,实现了近震Pnl波、面波和远震P波、SH波的联合反演的CAPjoint算法.对2010年3月高雄地震,分别进行单独反演以及联合反演,获得各自的震源机制解及深度,其中联合反演所得的最佳双力偶机制解参数为,节面1:走向317°,倾角36°,滑移角52°,节面2:走向181°,倾角62°,滑移角114°,深度为21 km.并对不同震中距波形对本次地震以及几种典型机制解断层几何参数的敏感性进行测试.为验证联合反演方法的可靠性,本文采用重抽样思想发展而来的Bootstrap方法,对近震数据的子集及其与远震数据的联合反演所得的参数进行统计,验证了在稀疏近台条件下联合反演中添加远震数据对地震震源参数约束的作用.

关键词 震源机制解, 深度, 波形反演, 重抽样, Bootstrap

Abstract: We improved the traditional Cut and Paste (CAP) method in inverting point source parameters by combining local Pnl, surface waveforms and teleseismic P and SH waveforms, and then applied the method (CAPjoint)to study the source parameters of the 2010 Kaohsiung earthquake. The result shows that the best double-couple solution of the event is: 317°, 36°, 52° for strike, dip and rake, respectively. The other nodal plane is 181°, 62°, 114° with 21km focal depth. We tested the sensitivities of several parameters for data at different distances with typical mechanisms. Then we applied the bootstrap method to make statistics and verified that the joint inversion method is effective for constraining source parameters of moderate earthquakes, and the effect is especially good when the distribution of local seismic stations is sparse.

Keywords Focal mechanism, Focal depth, Waveform inversion, Resampling, Bootstrap

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