



Constraining the focal mechanism of the 2015 Illapel earthquake with observations of the Lhasa superconductor gravimeter

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On 16 September 2015, a magnitude M_w 8.3 interplate thrust earthquake ruptured a densely instrumented region of central Chile, the focal mechanism solutions of Illapel earthquake were provided by well-respected international earthquake research institutions based on different data and methods, which were different. We compared free oscillations observed by Lhasa superconductor gravimeter with synthetic normal modes corresponding to 14 different focal mechanisms for the Illapel earthquake, and the focal mechanisms solutions of Illapel earthquake were analyzed and constrained by spherical normal modes in a 2 to 5 mHz frequency band. Based on the best focal mechanisms solution. The results show that the focal mechanism of Illapel earthquake can be estimated by spherical modes in the 2 to 5 mHz frequency band. The synthetic modes corresponding to the focal mechanism determined based on Teleseismic, GPS and strong-motion by Liu et al. showed best agreement to the observed modes, the misfit factors F was 0.04, and the scaling factors was 0.98, which was closest to 1, suggesting that earthquake magnitudes predicted in this way can reflect the total energy released by the earthquake. The comparison indicates that the reasonable seismic moment of the 2015 Illapel earthquake should be $3.0 \pm 0.2 \times 10^{21} \text{Nm}$.