

The first since 1960: A large event in the Valdivia segment of the Chilean Subduction Zone, the 2016 M7.6 Melinka earthquake

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Abstract

We present results for joint kinematic inversion of high-rate GPS, strong motion and InSAR data for the 2016 M7.6 Melinka earthquake. We show that the source is a compact 35 s long rupture with 5.0 +/- 0.15 m of peak slip. We find the Melinka earthquake occurs inside the slip region for the 1960 M9.5 Valdivia earthquake and within the highly locked portion of the megathrust inferred from inter-seismic velocity analysis. We show that there is very modest post-seismic deformation at a nearby GPS site QLLN and argue that this indicates the Melinka earthquake ruptures within the intermediate portion of the megathrust and is an isolated asperity surrounded by locked velocity weakening material. Further we find that the peak slip observed during this earthquake is larger than what has been accumulated in the intervening 57 years since the 1960 rupture and conclude that, at least in the area of the Melinka earthquake, this indicates that the 1960 Valdivia event might not have used all the slip deficit available on the megathrust. (C) 2017 Elsevier B.V. All rights reserved.

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