Deep-shallow interactions in the 2024 Acari sequence (South Peru)

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Résumé

The southern Peru subduction zone is a complex region, marking the transition between the flat slab associated with the Nazca Ridge subduction in the North and a much steeper subduction in the south. The area has been affected by several large earthquakes over the past 20 years, like the Mw 7.2 earthquake that occurred on June 28th 2024 close to the city of Acari, in an area that already ruptured in 2013 and 2018. Here we use data from 26 seismic stations active from March 2022 to December 2024 as part of the DEEPTrigger project, along with 16 permanent Peruvian stations and 15 permanent Chilean stations, to create a 3-year seismicity catalogue of South Peru. Using PhaseNet for the detection and picking of phases and PyOcto for their association, we obtain a total of 154645 events. These earthquakes are located with NonLinLoc using a new 3D P and S-wave velocity model of the region obtained from full-waveform inversion. They are then relocated using double difference methods with cross-correlation times to obtain precise locations. This allows us to image seismic structures along the subduction zones, thus demonstrating the influence of interseismic coupling and of bathymetric features like the Nazca Ridge on seismicity patterns. We focus in particular on the Acari sequence, which occurred at the edge of the Nazca Ridge. The Mw 7.2 mainshock was preceded by a Mw 6 foreshock on June 16th 2024, with both earthquakes seemingly occurring at the plate interface. We show that both the foreshock and the mainshock activated intraslab seismicity along the whole edge of the ridge down to 100 km depth, thus providing a good example of far-field interactions between deep and shallow regions of the subduction.

Mots-Clés: Pérou, Subduction, Sismicité, Aftershocks

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