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Shallow and Deep Crustal Seismicity under the Precordilleran Belt, Northern Chile

Joern Kummerow (1), Pablo Salazar (1,2), Peter Wigger (1), Serge A. Shapiro (1), Guenter Asch (1,3)

(1) Freie Universität Berlin, Geophysics, Berlin, Germany (joern@geophysik.fu-berlin.de), (2) Universidad Catolica del Norte, Antofagasta, Chile, (3) GeoForschungsZentrum Potsdam, Germany

We have analyzed crustal and Nazca slab- related seismicity around 21°S in Northern Chile, which has been recorded by a temporary local seismic network in the years 2005-2009. The focus of this study is the high-resolution location of more than 1000 crustal earthquakes in the Precordilleran region with local magnitudes Ml in the range between $-0.5 < Ml < 5.4$. We have applied a largely automized earthquake location algorithm, which includes cluster identification and optimization of arrival times for events within each cluster. Seismicity shows different patterns north and south of 21°S, respectively. It is distributed along several distinct active segments of the West Fissure Fault System at shallow depths ($< 10\,km$). A west-dipping major crustal interface, which has been unrevealed before, can be clearly imaged from a few kilometers depth near the West Fissure Fault system at 69°W down to about $25\,km$ depth. We have also detected two deep crustal earthquake clusters ($35 - 40\,km$ depth). Their position and orientation correlate remarkably well with previously found bands of high seismic reflectivity, supporting the interpretation as being images related to ongoing fluid migration.