EGU2020-4051
https://doi.org/10.5194/egusphere-egu2020-4051
EGU General Assembly 2020

Seismic rate change as a tool to investigate remote triggering of the 2010-2011 Canterbury earthquake sequence, New Zealand

Yifan Yin[1], Stefan Wiemer[1], Edi Kissling[1], Federica Lanza[1], and Bill Fry[2]
[1]ETH Zürich, Institute of Geophysics, Department of Earth Sciences, Switzerland (yifan.yin@sed.ethz.ch)
[2]GNS Science, Lower Hutt, New Zealand

Crustal earthquakes in low deform rate regions are rare in the human life span but bear heavy losses when occurring. Limited observations also hinter robust earthquake forecasts. In this study, we use a high-resolution catalog to investigate the triggering of the 2010-2011 Canterbury earthquake sequence, New Zealand. The seismic sequence occurred in the North Canterbury Plains, a low-stress, low-seismicity region relatively close to active plate boundaries where large earthquakes are frequent, such as the 2009 M_W 7.8 Dusky Sound Earthquake. To map the post-seismic stress transfers of remote large events acting in the region, we calculate the temporal and spatial seismic rate changes in the crust from 2005 to the 2010 Mw 7.1 Darfield Earthquake, the first mainshock of the Canterbury sequence. We use template matching analysis to obtain a new high-resolution seismic catalog that includes events previously undetected by routine network monitoring. Detection quality is further established through the usage of a Support Vector Machine classifier. Using the new catalog, we observe a seismic quiescence on the North Canterbury Plain between Dusky Sound Earthquake and the Darfield Earthquake. The quiescence is accompanied by a reduced rate in micro-seismicity, suggesting a lowered b-value in the region primed for the Canterbury sequence. The lack of proof of dynamic or static triggering suggests that complex fault interactions lead to the onset of the Darfield Earthquake.