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Continuous micro-earthquake catalogue of the central Southern Alps, New Zealand

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The Alpine Fault is one of the most prominent tectonic features in the South Island, New Zealand, and is inferred to be late in its seismic cycle of M∼8 earthquakes based on paleoseismological evidence. Despite this, the Alpine Fault displays low levels of contemporary seismic activity, with little documented on-fault seismicity. This low magnitude seismicity, often below the completeness level of the GeoNet national seismic catalogue, may inform us of changes in fault character along-strike and might be used for rupture simulations and hazard planning. Thus, compiling a micro-earthquake catalogue for the Southern Alps prior to an expected major earthquake is of great interest.

Areas of low seismic activity, like the central part of the Alpine Fault, require data recorded over a long duration to reveal temporal and spatial seismicity patterns and provide a better understanding for the processes controlling seismogenesis. The continuity and density of the Southern Alps Microearthquake Borehole Array (SAMBA; deployed in late 2008) allows us to study seismicity in the Southern Alps over a more extended time period than has ever been done previously. Furthermore, by using data from other temporary networks (e.g. WIZARD, ALFA08, DFDP-10) we are able to extend the region covered.

To generate a spatially and temporally continuous catalogue of seismicity in New Zealand's central Southern Alps, we used automatic detection and phase-picking methods. We used an automatic phase-picking method for both P- and S- wave arrivals (kPick; Rawles and Thurber, 2015). Using almost 8 years of seismic data we calculated about 9,000 preliminary earthquake. The seismicity is clustered and scattered and a previously observed seismic gap between the Wanganui and Whataroa rivers is also identified.