Waveform cross-correlation-based earthquake detection applied to microseismicity near the central Alpine Fault, New Zealand

Konstantinos Michailos$^{1,2}$, Calum J. Chamberlain$^2$, and John Townend$^2$

$^1$Institute of Earth Sciences, University of Lausanne, 1015 Lausanne, Switzerland  
$^2$SGEES, Victoria University of Wellington, PO Box 600, Wellington 6140, New Zealand

The Alpine Fault is a major plate boundary oblique strike-slip fault, known to fail in large M 7-8 earthquakes, posing a significant seismic hazard to southern and central New Zealand. The central part of the Alpine Fault exhibits low seismic activity when compared to adjacent areas. We have examined the smaller-magnitude earthquake activity occurring along the central portion of the Alpine Fault using data from five temporary seismic networks from late 2008 to early 2017.

We have created the most complete and accurate earthquake catalog at the central Alpine Fault to date (9,111 earthquake locations with magnitudes ranging from $M_L$ -1.2 to 4.6). We used this catalog as templates with a matched-filtering earthquake detection method and further extend the earthquake catalog. This even more comprehensive earthquake catalog will provide more definitive evidence for the seismicity characteristics observed and better insights into the fault zone’s geometry.

Taking advantage of this extensive earthquake catalog, we also aim to examine whether there are any repeating highly similar seismic signals (repeating earthquakes). These repeating earthquakes can potentially help better determine the locked and creeping sections of the Alpine Fault and possibly quantify the total amount of creep taking place with respect to seismic deformation.