

The Mw5.9 Woods Point earthquake and aftershock sequence

Dee Ninis¹, Elodie Borleis², Mark Quigley³, Wayne Peck⁴ and Jake Wilcox⁵

1. Corresponding Author. Earthquake Geologist, Seismology Research Centre, 141 Palmer Street, Richmond, Victoria 3121, Australia.
Email: dee.ninis@src.com.au
2. Hazard Seismologist, Seismology Research Centre, 141 Palmer Street, Richmond, Victoria 3121, Australia.
Email: elodie.borleis@src.com.au
3. Earthquake Geologist, School of Earth Sciences, University of Melbourne Parkville, Victoria 3010, Australia
Email: mark.quigley@unimelb.edu.au
4. Senior Seismologist, Seismology Research Centre, 141 Palmer Street, Richmond, Victoria 3121, Australia.
Email: wayne.peck@src.com.au
5. Seismologist, Seismology Research Centre, 141 Palmer Street, Richmond, Victoria 3121, Australia.
Email: jake.wilcox@src.com.au

Abstract

On 22 September 2021, a ML 5.8 (Mw 5.9) earthquake occurred near Woods Point, Victoria — the largest onshore earthquake in Victoria in at least 180 years. Over 45,000 felt reports were received including from Hobart, Adelaide and Sydney, from distances up to and exceeding 750 km from the epicentre. Analysis of the mainshock waveform data located the event ~15 km NE of Woods Point (~130 km east of Melbourne), at a depth of ~12.7 km. Focal mechanism solutions suggest the rupture involved left-lateral strike-slip displacement on a north-northwest – south-southeast trending, steeply dipping fault. Damage was reported from several sites across Melbourne, including the collapse of unreinforced masonry; there was minimal to no structural damage of buildings close to the epicentre. In the 24 hours that followed the mainshock, more than 300 aftershocks were recorded — nearly 100 within the first two hours. The largest aftershocks — ML 4.2 and ML 3.3 — both struck within an hour of the mainshock and were felt locally. Mainshock and aftershock locations delineate an approximately north-south trending, steeply east dipping fault, in line with the focal mechanism data and previous estimates of maximum horizontal stress in the region. While this orientation approximates previously mapped local faults, these do not extend to the depths of the mainshock and aftershock sequence.

Keywords: Earthquake, Victoria, southeast Australia, damage, strike-slip, fault, aftershock.