



PhD position: Understanding earthquake sequences using near-fault and on-fault paleoseismology on the western Marlborough Fault System

Central Aotearoa-NZ occupies a zone of complex faulting, known as the “Transition Zone”, which marks the transition between our largest plate boundary faults: the Hikurangi Subduction Zone and the Alpine Fault. There is a high likelihood of a >M8 earthquake on these faults in the next 50 years, which could alter the state of stress in the Transition Zone, potentially triggering decades of large (>M7) earthquakes. We currently lack sufficient understanding of Transition Zone earthquake behaviour to accurately forecast the hazard posed by large (>M7) earthquake sequences. To address this, we seek to determine the pattern and frequency of past large earthquake sequences with unprecedented spatial and temporal resolution, using novel paleo-earthquake records from near-fault and on-fault paleoseismic sites. The past earthquake records will be used in time-dependent hazard models and to test earthquake simulations.

We seek an enthusiastic and highly motivated student for a fully funded PhD project using on- and near-fault paleoseismology on the western Marlborough Fault System as part of our recently funded programme ‘Ngā Ngaru Wakapuke – Building Resilience to Future Earthquake Sequences’.

Background:

Long paleoseismic earthquake catalogues that span tens of large earthquakes are required to understand whether large earthquake sequences are common in the Transition Zone. Our project aims to develop paleoseismic records that have sufficient spatial and temporal precision to resolve how faults interact to produce large earthquake sequences using new paleoseismic approaches focused on lakes and near fault wetlands which produce absolute earthquake ages an order of magnitude more precise than conventional approaches. This PhD project will focus on paleoseismic records from fault-bounded wetlands and possibly on-fault paleoseismology (e.g. trenches) and/or fault-bounded lakes. An aligned PhD project (already filled) will focus on lacustrine paleoseismology and there will be significant collaboration opportunities as the two PhD projects will need to integrate the paleoseismic records to develop a spatially dense, precisely dated paleoseismic catalogue of the western Marlborough Fault System and northern Alpine fault.

About the project: The successful candidate will help to plan and conduct field work involving core collection from a series of wetlands and GPR acquisition at each site. The sedimentary signature of earthquakes will be identified in sediment cores using state-of-the-art physical (GEOTEK Multi-sensor core logging and CT scanning), and chemical (ITRAX micro-xrf scanning) core scanning technologies augmented with traditional high-resolution sedimentology (e.g. grainsize and organic geochemistry). Earthquake signatures will be aged using high-resolution chronology developed from radioisotopes of lead and carbon in combination with the latest Bayesian approaches to age modelling. This paleo-earthquake catalogue contribute to an assessment of physics-based earthquake simulator veracity by quantitatively comparing reconstructed earthquake recurrence statistics and spatial patterns of rupture with those produced by the simulators.

About the candidate: We are seeking a candidate with a background in Quaternary paleoenvironmental reconstruction and/or paleoseismology. The ideal candidate would have previous field experience, familiarity with a range of core analysis techniques, Quaternary chronology methods and radiocarbon age modelling.

What we offer: The successful candidate will be based at Te Herenga Waka – Victoria University of Wellington under the supervision of Associate Professor [Jamie Howarth](#), and Dr Kate Clark (GNS Science). The successful candidate will be integrated into the large, multi-institute research programme “Ngā Ngaru Wakapuke – Building Resilience to Future Earthquake Sequences” and will find collaborative and networking opportunities with a range of other PhD students, postdocs, and researchers at Te Herenga Waka – Victoria University of Wellington, GNS Science, NIWA, University of Canterbury, Massey University and University of Otago. This wider team will support the successful candidate in their fieldwork, laboratory work, and data analysis. We offer a competitive funding package that covers fees and living costs (\$35,000 stipend per year + fees). The successful candidate will be based in Wellington, Aotearoa-New Zealand’s capital city, offering an ideal balance of cultural amenities and a superb natural environment right on your doorstep.

Candidates should apply to Jamie.Howarth@vuw.ac.nz. Please include a complete CV (including academic transcripts) and a letter containing the following information - motivation for applying, research interests and experience, and the name and contact details of two or more academic referees. Applications are open until the 17th of January or until the position is filled. The successful applicant will be expected to take up the position in the first half of 2025.