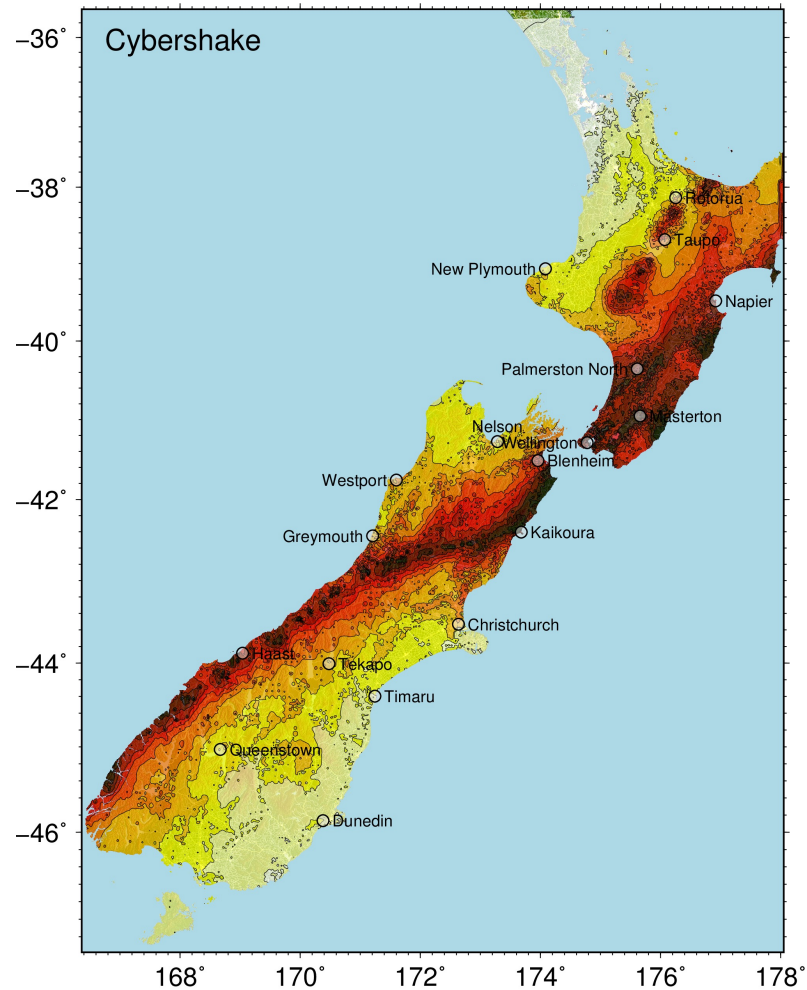
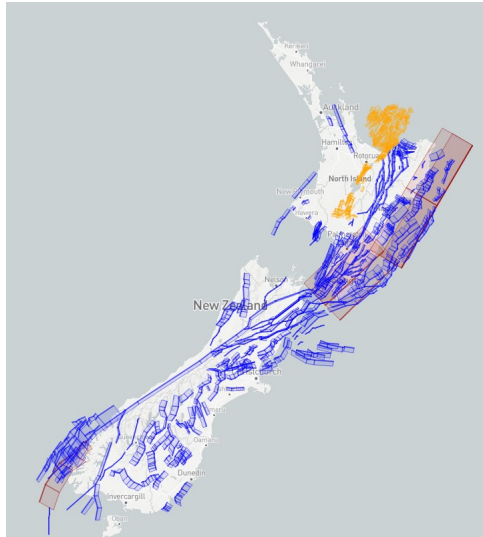


Cybershake NZ 20.4-21.6



Jason Motha

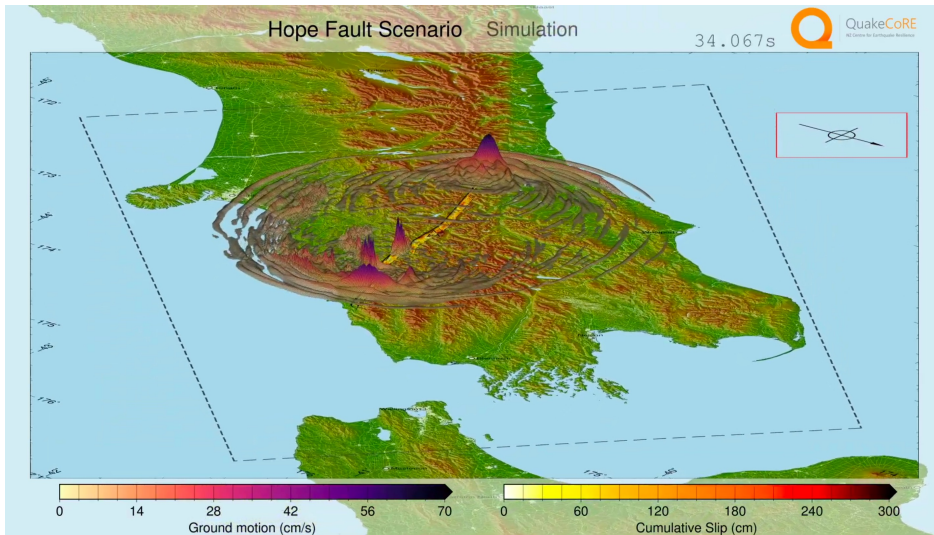
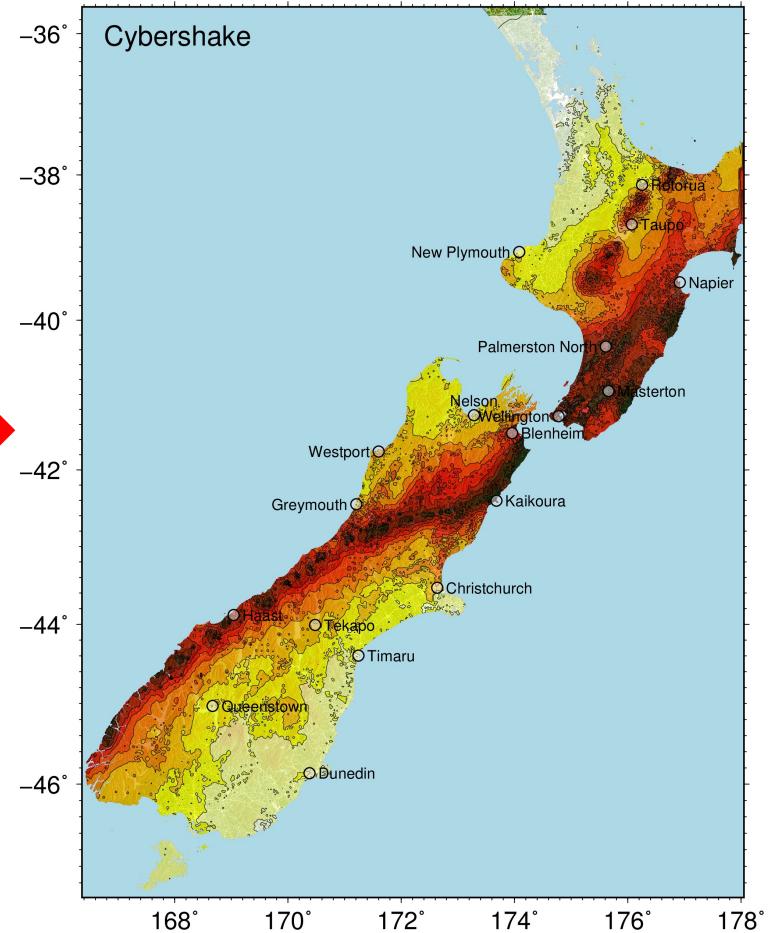
Aim: Cybershake NZ



Earthquake Rupture Forecast



Probabilistic hazard outputs



Ground motion prediction

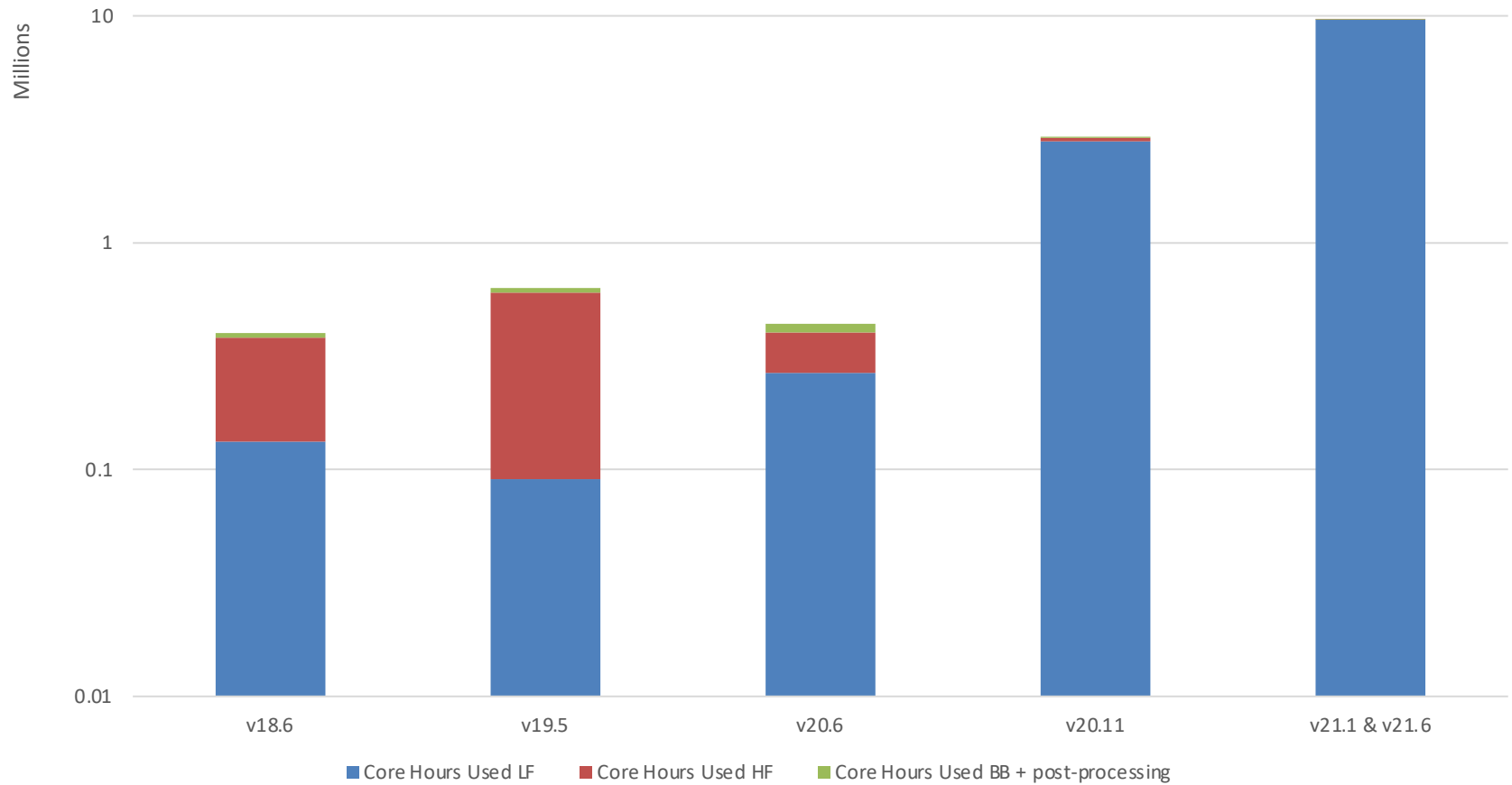
Previous iterations

- CS17.9 – First test implementation (small region). Focus on workflow development
- CS18.6 – First NZ-wide impl. (LF at 400m grid) Further workflow streamlining
- CS19.5 – Some improvements in source modelling. Major improvements to automation of workflow
- CS20.4 – Improvements to velocity model, Vs30, non-uniform grid of outputs, and simulation method based on validation outputs
- CS20.5 – Inclusion of subduction sources
- CS20.6 – Execution of LF calculation with 200m grid (i.e., LF/HF transition frequency increased from $f=0.25\text{Hz}$ to $f=0.5\text{Hz}$).
- CS20.9 – Subduction sources at 200m grid
- CS21.1 – 1Hz Transition Frequency for subsection of South Island
- CS21.6 – Same simulation method as CS21.1. Extending the number of faults that were simulated. RotD50 IM also calculated

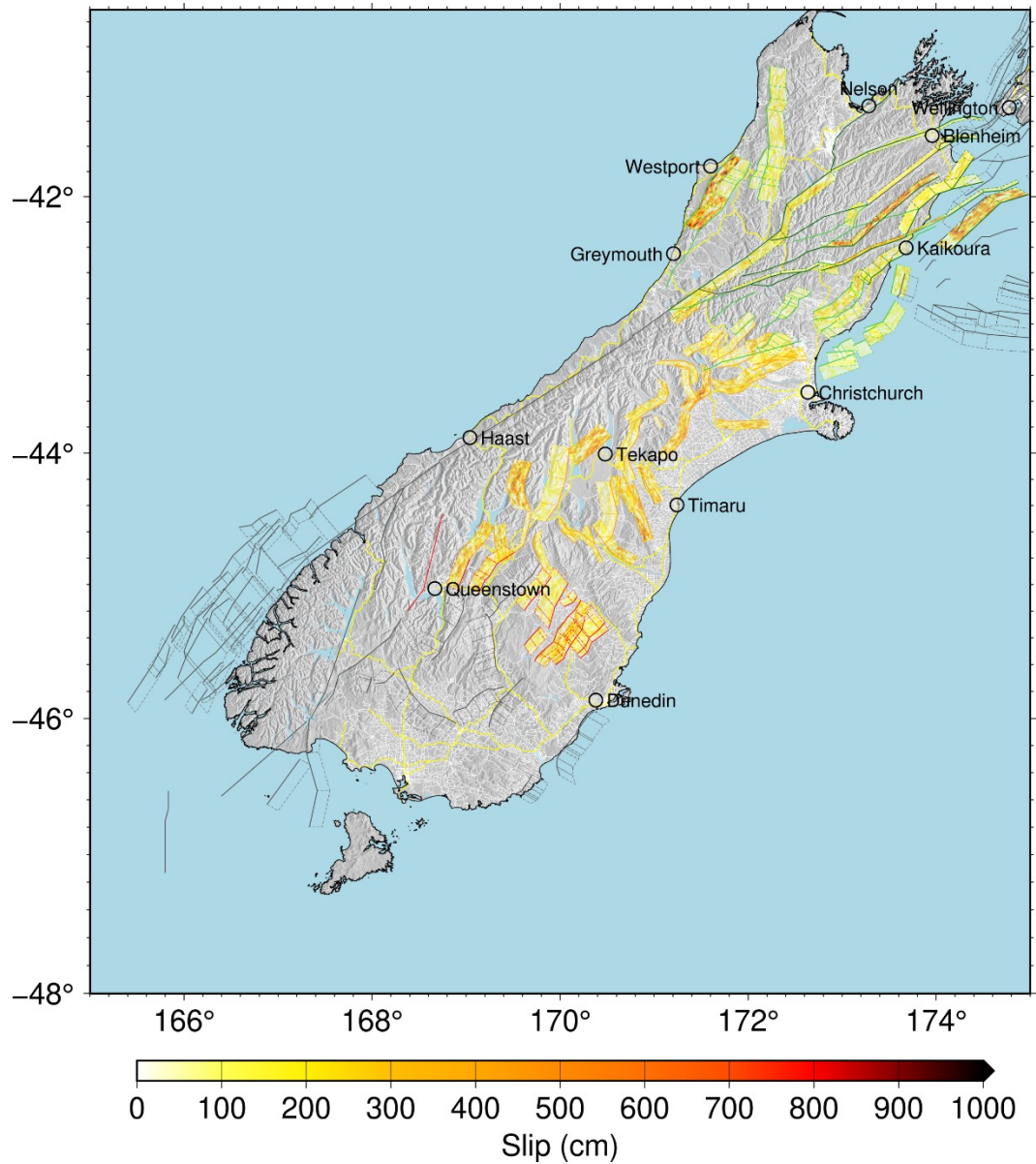
Increasing transition frequency of LF simulations

- In validation calculations we have considered $f_{\max} = 0.25, 0.5,$ and 1.0Hz (even some 2.0Hz scenario events)
- In Cybershake we have previously been computationally constrained to 0.25Hz (400m spatial grid)
- With recent access to Korean KISTI HPC we have been able to extend to 1Hz .

Core Hours Used over Historical Versions of Cybershake



Faults Simulated in Cybershake 21.1/6



NZVM2.07 (Thomson et al., 2019)

Principal inclusion – 14 basins in the South Island

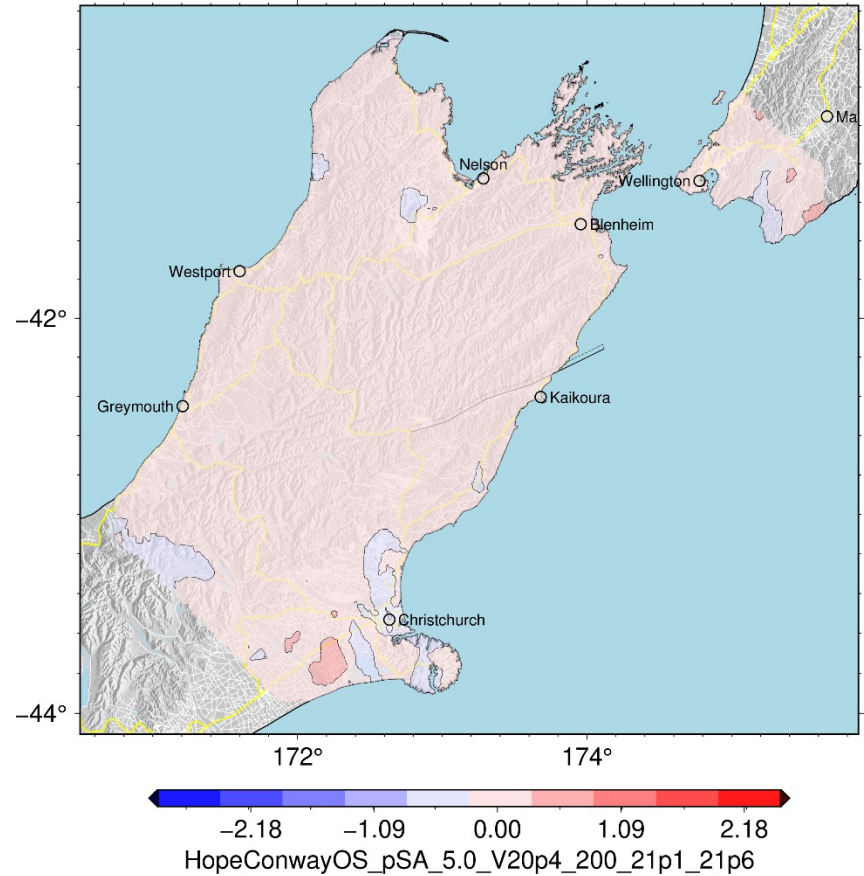
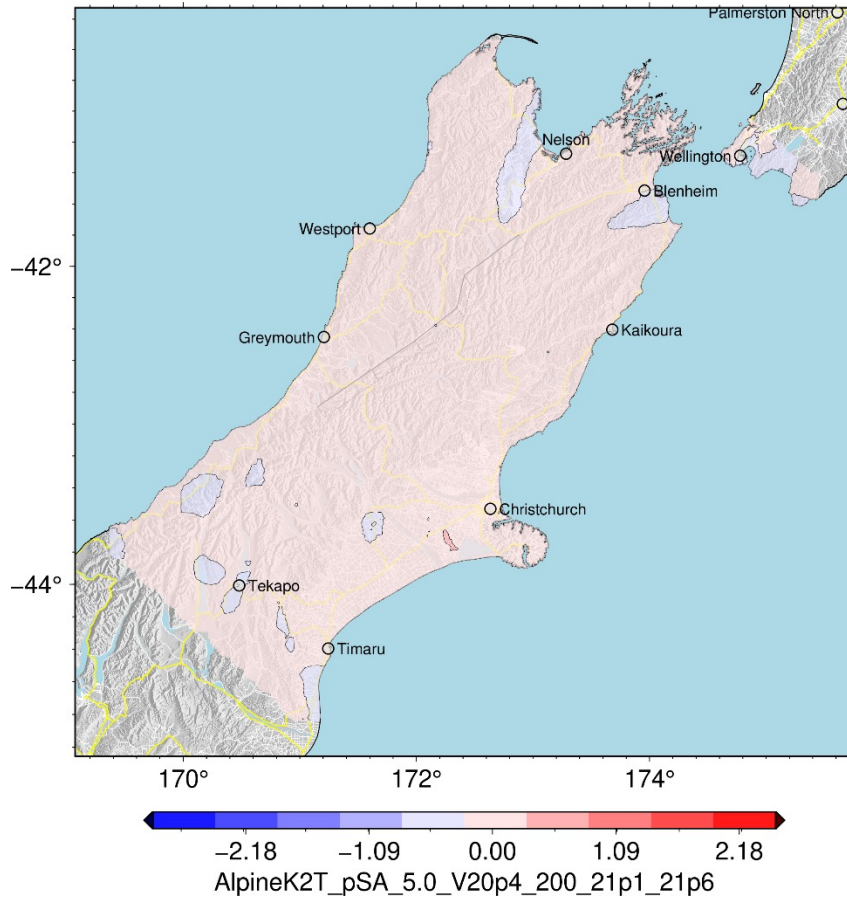


Murchison
Mackenzie
Wanaka
Wakatipu

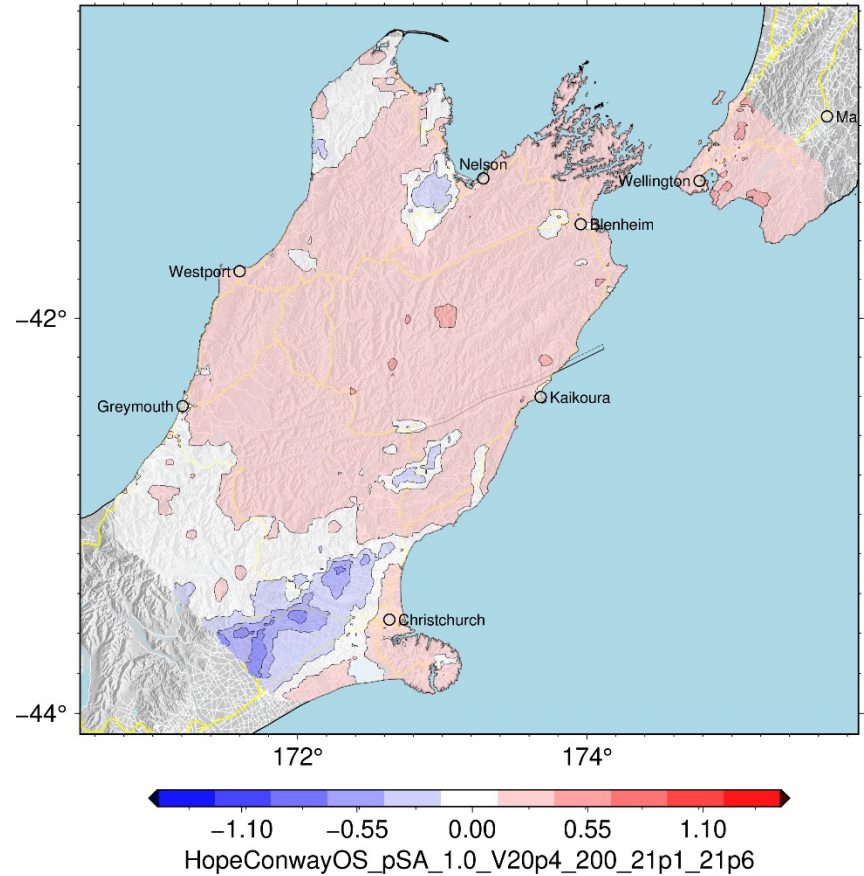
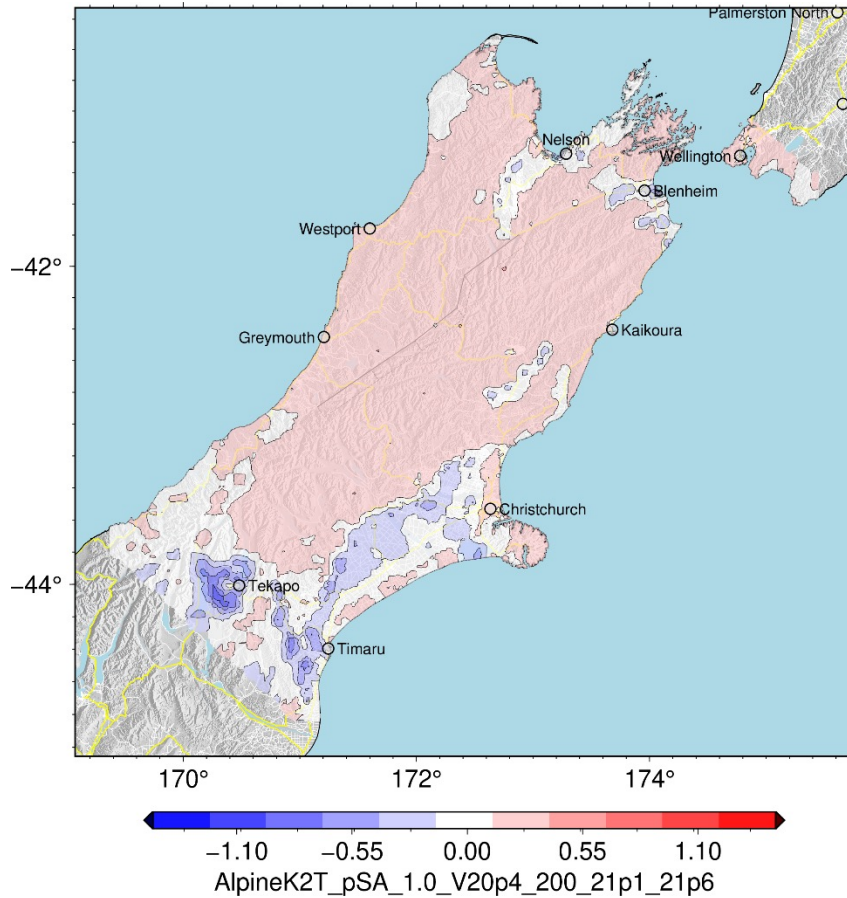
Alexandra
Balclutha
Ranfurly

North Otago
Dunedin
Mosgiel

Increasing the transition frequency

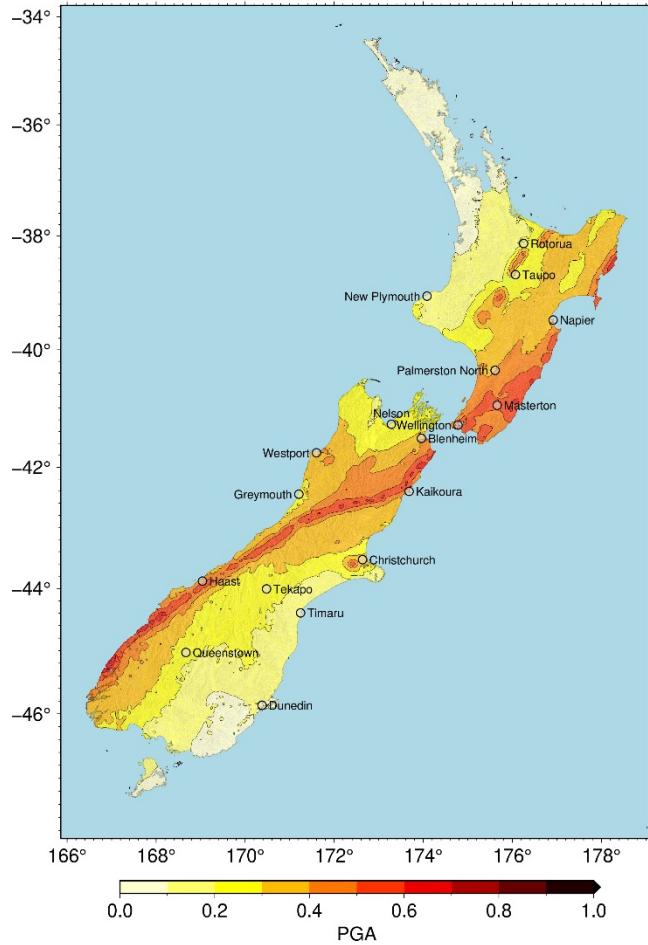


Increasing the transition frequency

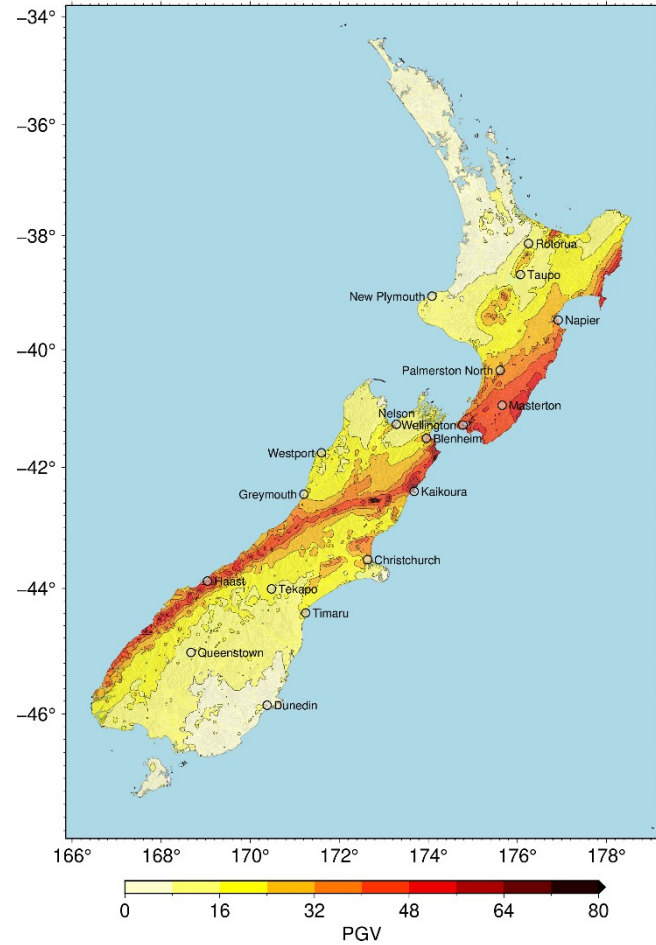


PGA and PGV outputs for 10%/50yrs

v21p6sim_rot50, PGA, 10% in 50 years



v21p6sim_rot50, PGV, 10% in 50 years



Immediate further updates planned

In the next version we plan:

1. Additional basins in NZVM
2. Update to NZVs30 model
3. Potential simulation method improvements from Validation
4. Further treatment of uncertainties
5. Including new faults from the Community Fault Model and the NSHM project.
6. Weighted Distributed Seismicity Model

Vs30 model updates

CS20-21 used NZ Vs30 map of Foster et al (2019)

Foster et al. (2019)

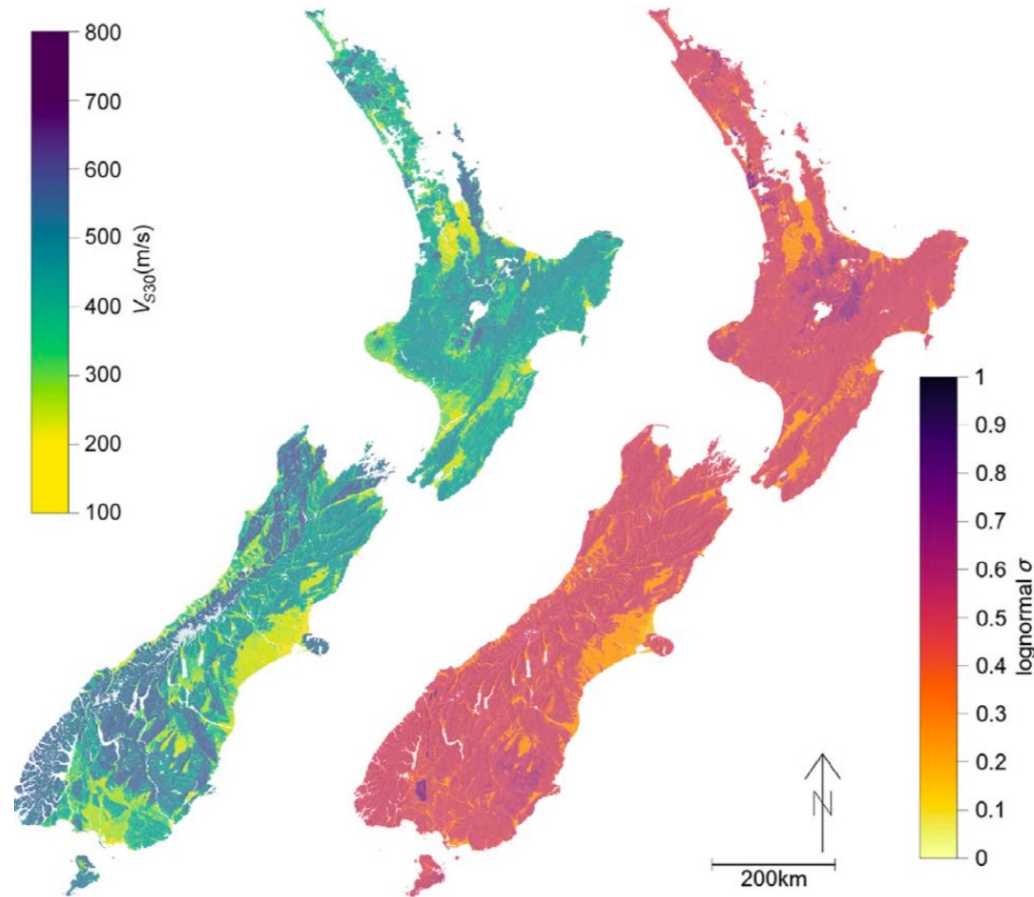


Figure 19. (a) V_{s30} and (b) σ for the final weighted model.