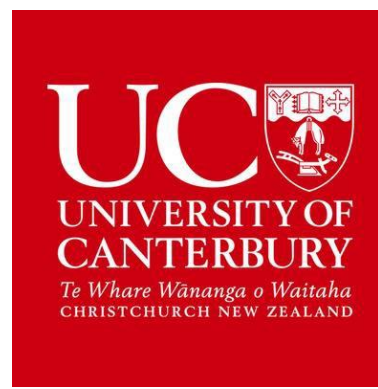


Use of Felt Rapid Reports as a reliable data source in the production of Earthquake Intensity Maps



What is a Felt Rapid Report?

Felt an earthquake? Fill in a **Felt Rapid** report. Open the **app** or the **Geonet website** and choose from a series of cartoons to indicate the intensity with which you experienced the quake. This is converted to a value on the **Modified Mercalli Intensity (MMI)** scale and used to calculate a mean value for communities across the country.

1,158,111 reports received between Sept 2016 and Oct 2020

5531 Communities across the country

Up to 60,000 reports received for one event

Mitigating the issues

- Development of a rigorous **event assignment** process
- Choice of **mean or median** based on distribution of data
- Choice of **minimum reports per community** needed to produce reliable data

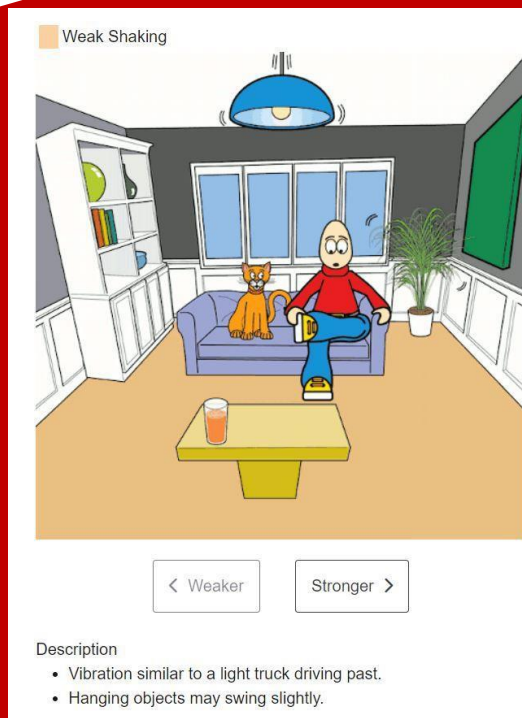
What are the pros and cons of Felt Rapid data?

Pros:

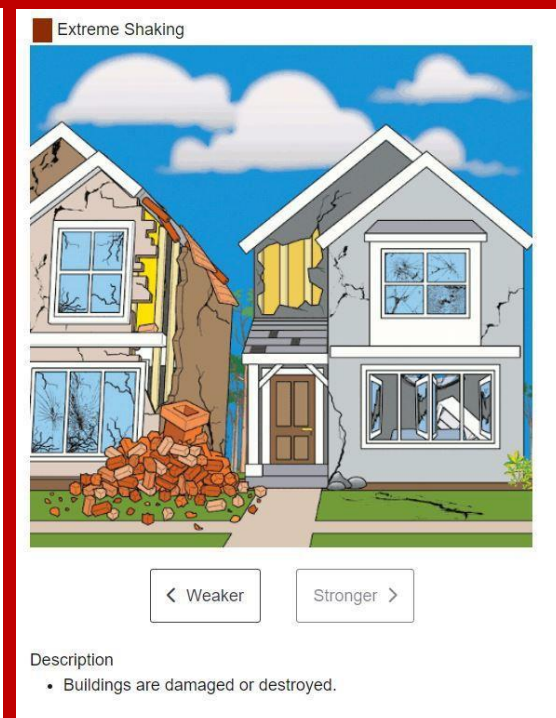
- **Quantity of data**
- **Coverage**
- **Speed**

Cons:

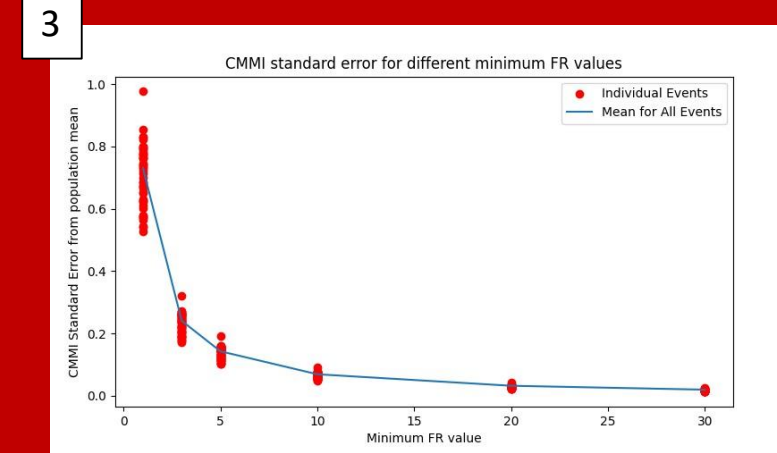
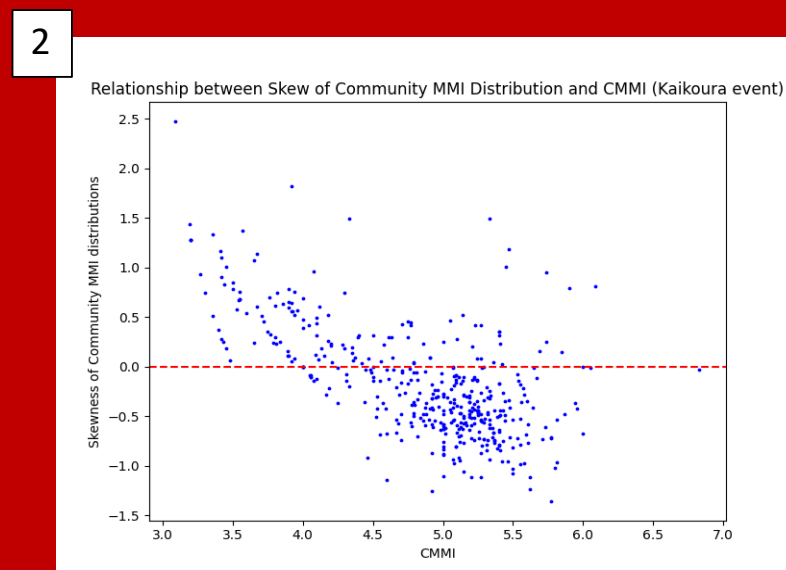
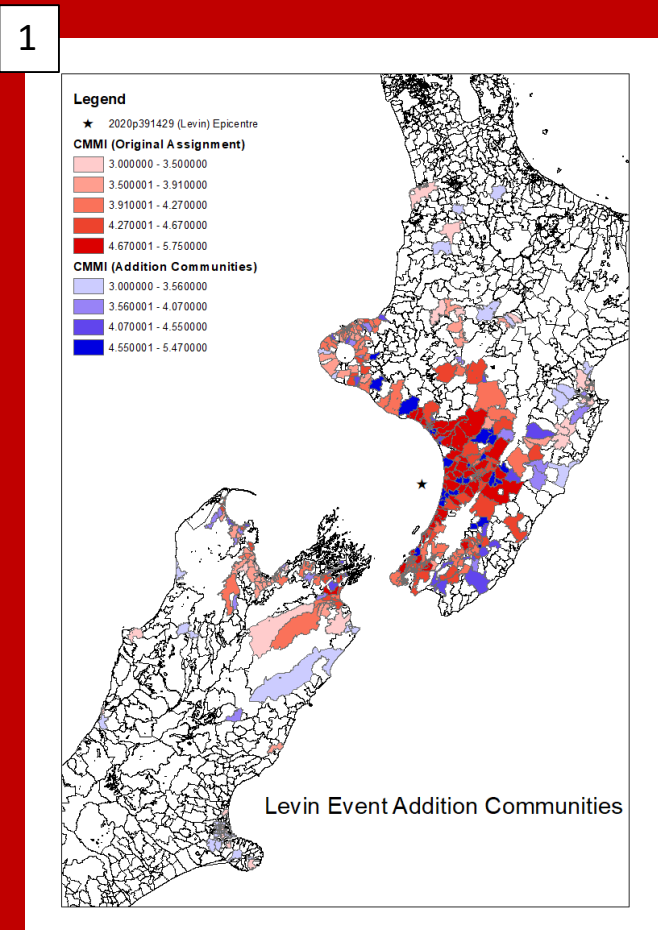
- **Assignment of a report** to a particular earthquake
- **Variability and potential bias** in the reported intensities due to **human-generated data** source
- Defining the **'best'** measure of central tendency to use to represent data



Description
• Vibration similar to a light truck driving past.
• Hanging objects may swing slightly.



Description
• Buildings are damaged or destroyed.



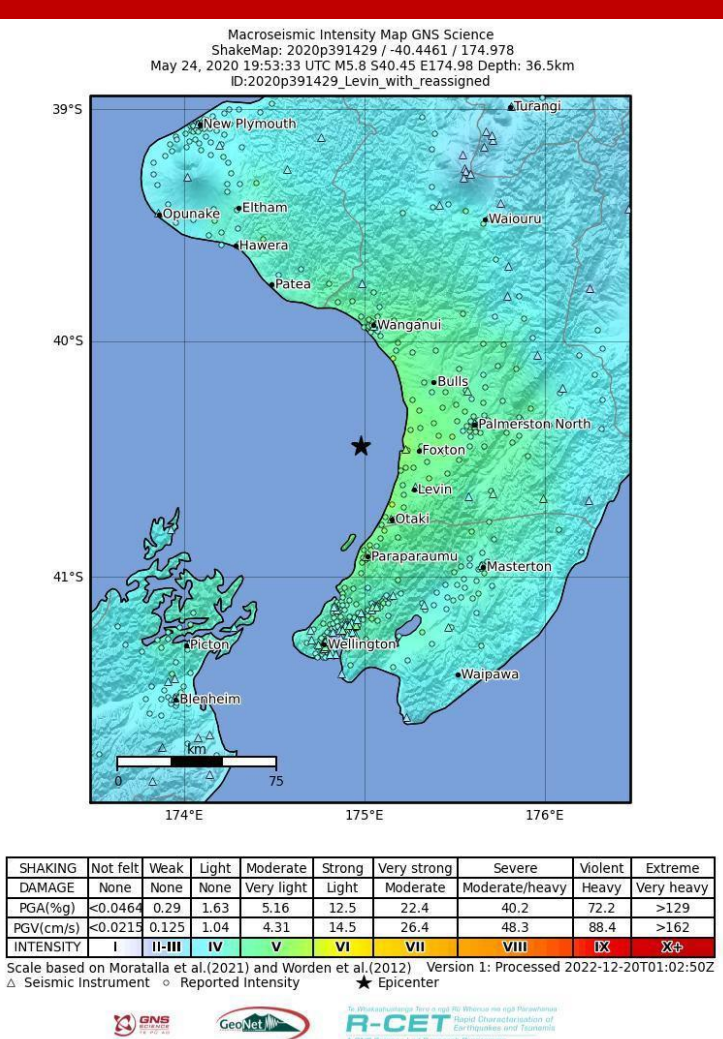
What did we find?

Extra data was gained through the event reassignment process

Censored data produces a **change in skew above and below MMI 4**, so the choice of **mean or median** to represent a community intensity is important

Balancing coverage with data variability indicated that a **minimum of 5 Felt Rapid reports (FR5)** was the 'best' choice

Felt Rapid reports provide **good coverage** in areas far from Strong Motion Stations (SMS), improving the intensity maps

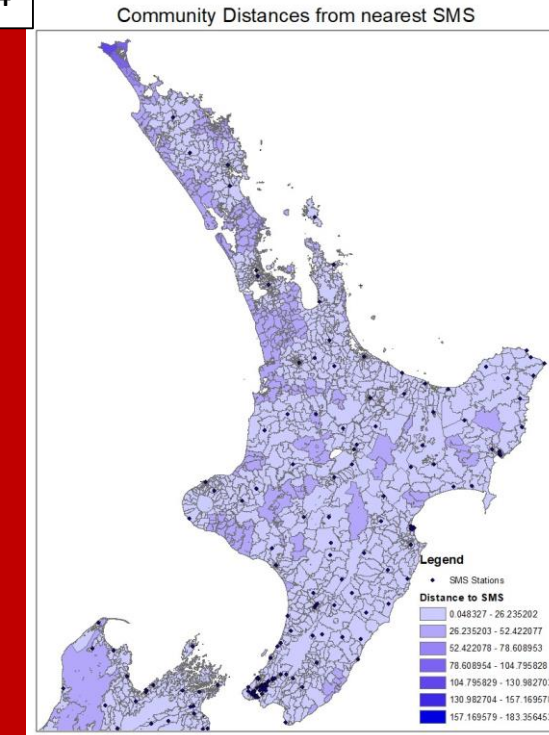
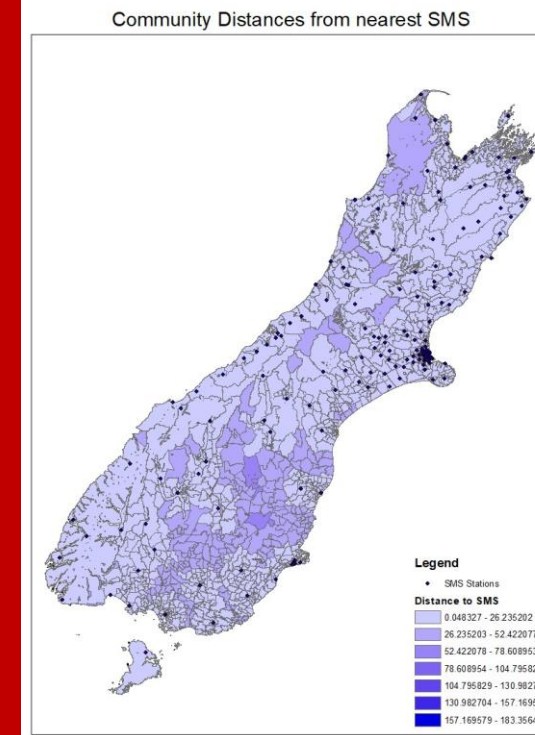


What is a ShakeMap?

An illustration of the **spatial distribution of shaking intensity** that has been caused by an earthquake. It is created using a **predictive model** based on the location, depth and magnitude of the earthquake to which can be added **seismic data** from Strong Motion Stations and **MMI values** from Felt Rapid reports.

Why is this important?

Shaking Maps can be used by **emergency managers, decision makers and the general public** to make decisions following a major earthquake. **Felt Rapid data** received in the **immediate aftermath** of an earthquake, **decreases the uncertainty** of intensity predictions in areas which do not have good coverage by the Strong Motion Station network, **improving the information** provided.



Where to next?

- Mapping the raw data – does it show the pattern we would expect?
- What are the uncertainties for the reported MMI's for individual reports? For Community MMI's?
- What is the optimal number of reports vs spatial aggregation units for different areas of the country (population densities)?
- How does the ShakeMap model combine Felt Rapid Data and Strong Motion Station data?

This project has been supported by the AI Department of GNS. It is a collaboration between Hazel Fraser, Tatiana Goded and the Shaking Layers Team at GNS Science and Geonet, Nick Ward and Caorlyne Hultquist. GNS Science. (2015). GeoNet Aotearoa New Zealand Felt Rapid Dataset [Data set]. GNS Science. <https://doi.org/10.21420/RS7F-VE53>