National Implications and Conclusions

Presentation to the Canterbury Earthquakes Royal Commission

October 2011

Photo: P Stalder

Dr Terry Webb
Director, Natural Hazards Division
GNS Science

UC UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

GNS SCIENCE
TE PŪ AO

Programme

1. ~~The Canterbury earthquake sequence~~
2. ~~Active faults and historical earthquakes in the Canterbury region~~
3. ~~Likely future rates of seismicity in Christchurch~~
4. ~~Implications for building design motions~~
5. National implications and conclusions
6. Questions and panel discussion

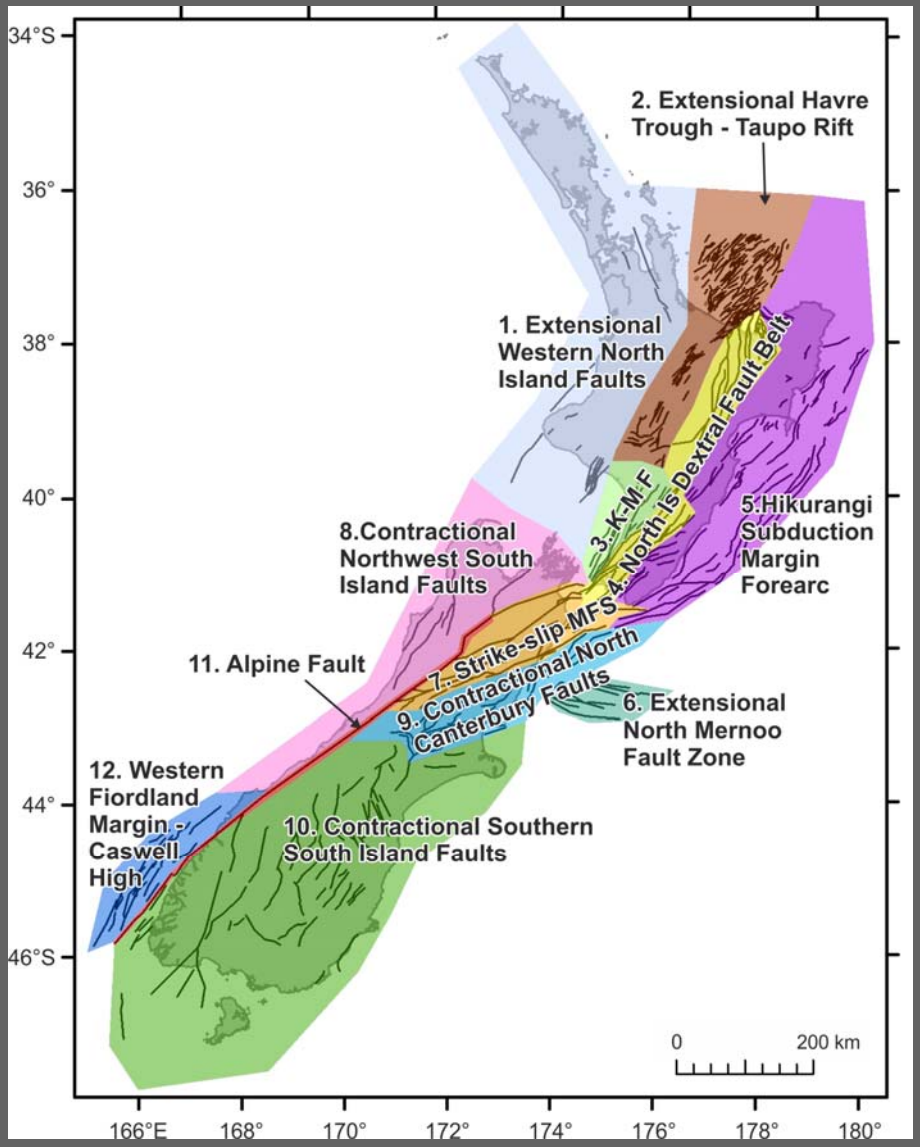
Why this amount of shaking?

A terribly unfortunate scenario in February :–

- Very close to CBD (proximity)
- Shallow
- A combination of related effects:
  - More slip than is usual (high stress drop)
  - Rupture spread across fault surface quickly
  - High directivity towards CBD (Doppler effect)
- Basin effects

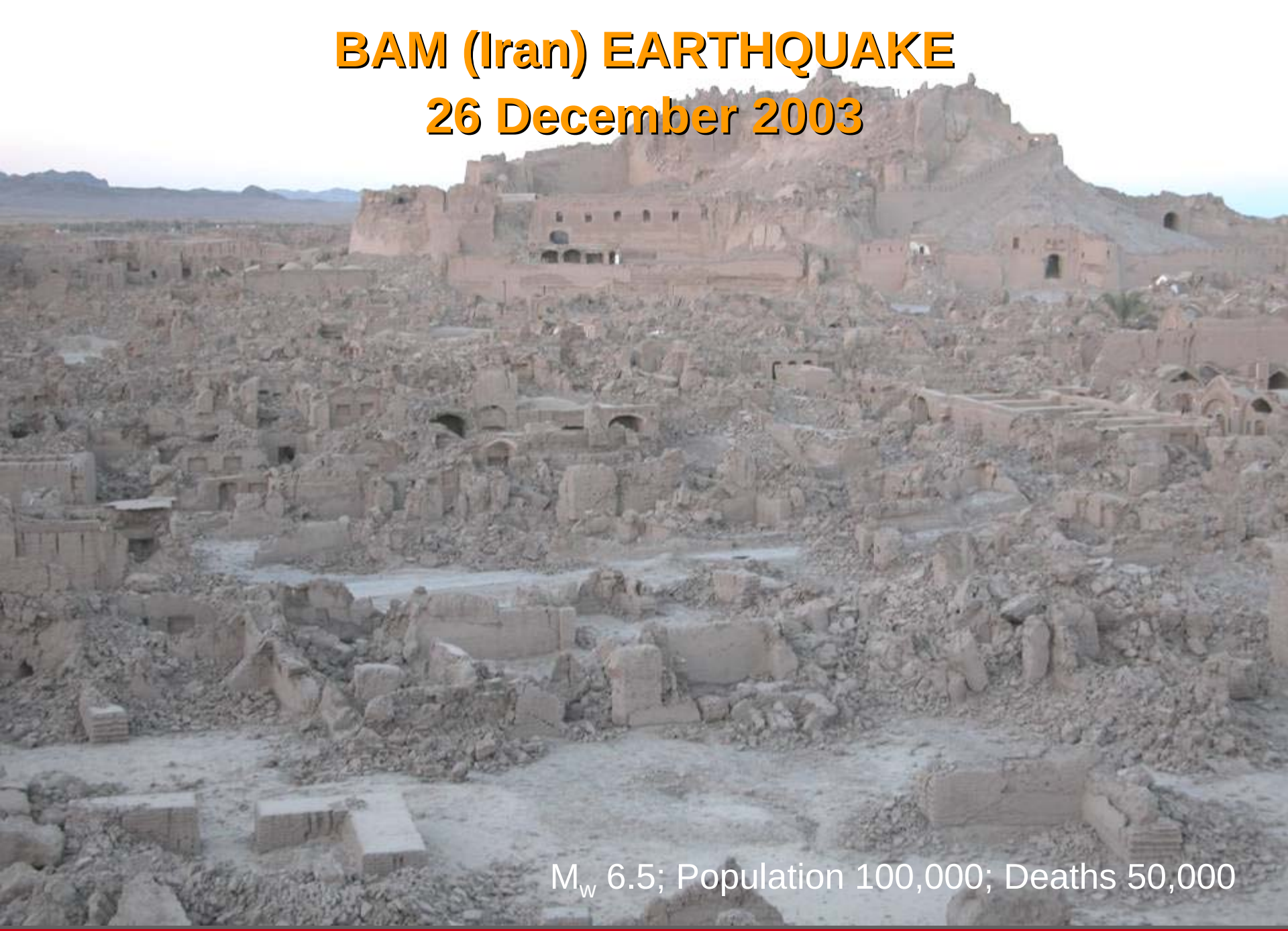
Can this happen unexpectedly elsewhere in New Zealand?

Proximity



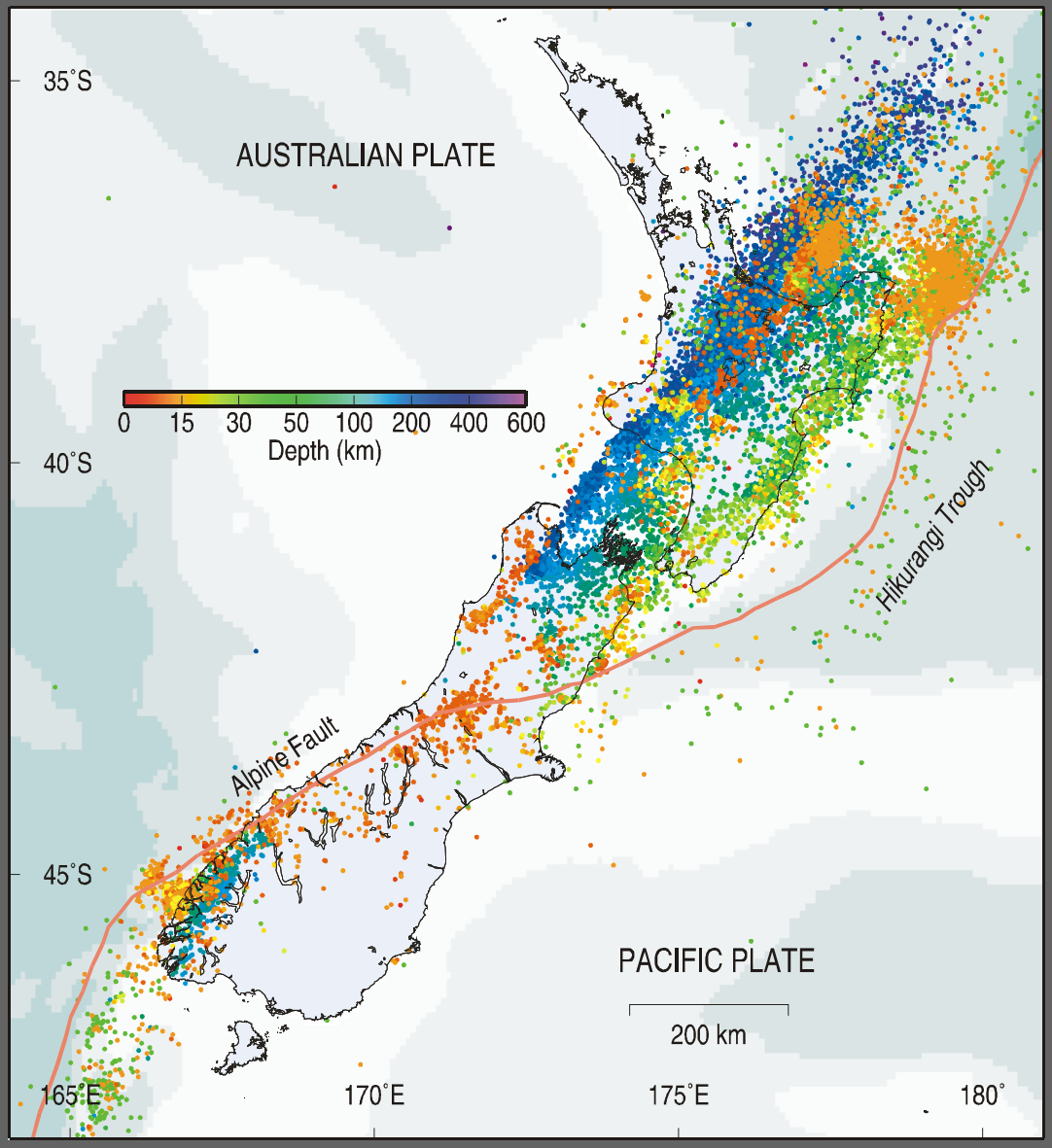
- Many NZ cities are close to known faults; active fault information improves design input.
- Finding ‘blind’ faults is expensive and the results can be hard to utilise. GPS can possibly be used to target detailed investigations.
- ‘Urban’ earthquakes are not unknown:
  - Northridge, California 1994
  - Kobe, Japan 1995
  - Bam, Iran 2003

BAM (Iran) EARTHQUAKE
26 December 2003



M_w 6.5; Population 100,000; Deaths 50,000

Depth


35˚S
AUSTRALIAN PLATE
0 15 30 50 100 200 400 600
Depth (km)
40˚S
Hikurangi Trough
Alpine Fault
45˚S
PACIFIC PLATE
200 km
165˚E
170˚E
175˚E
180˚