Kaikoura Earthquake GeoNet Update

Engineering Clearinghouse Meeting 1 December 2016

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EQC
EARTHQUAKE COMMISSION
Kōmihana Rūwhenua

GeoNet

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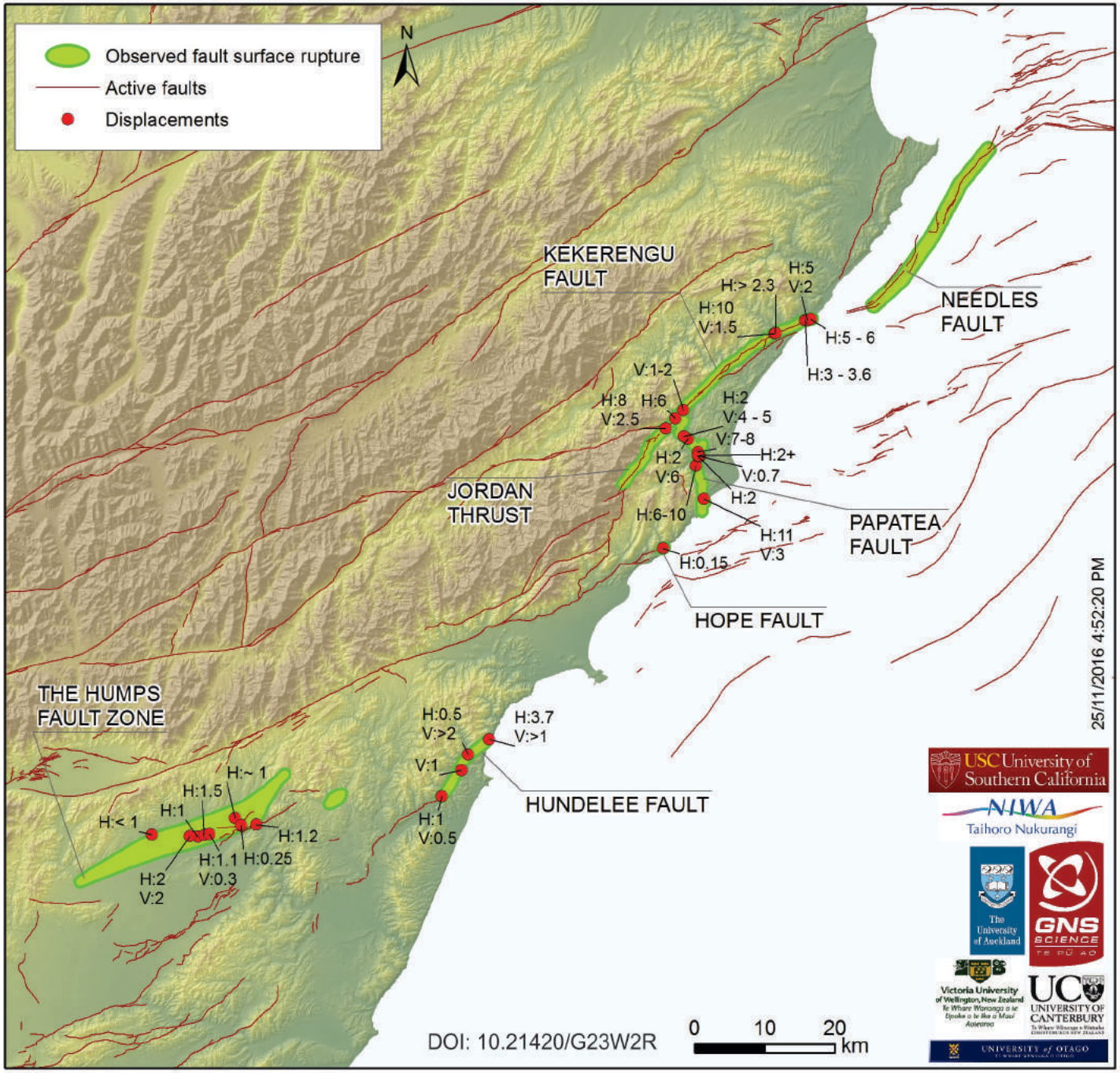
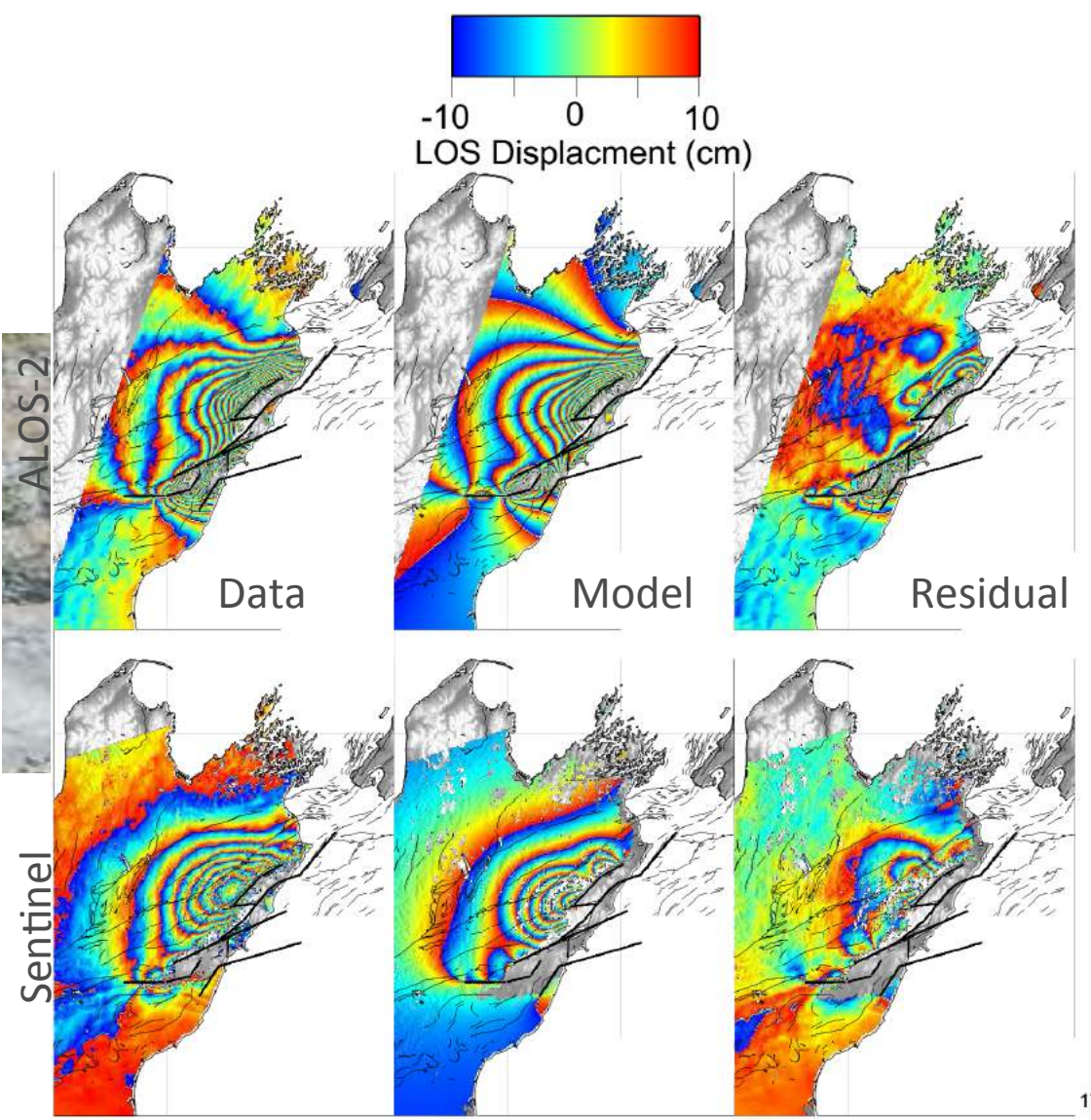
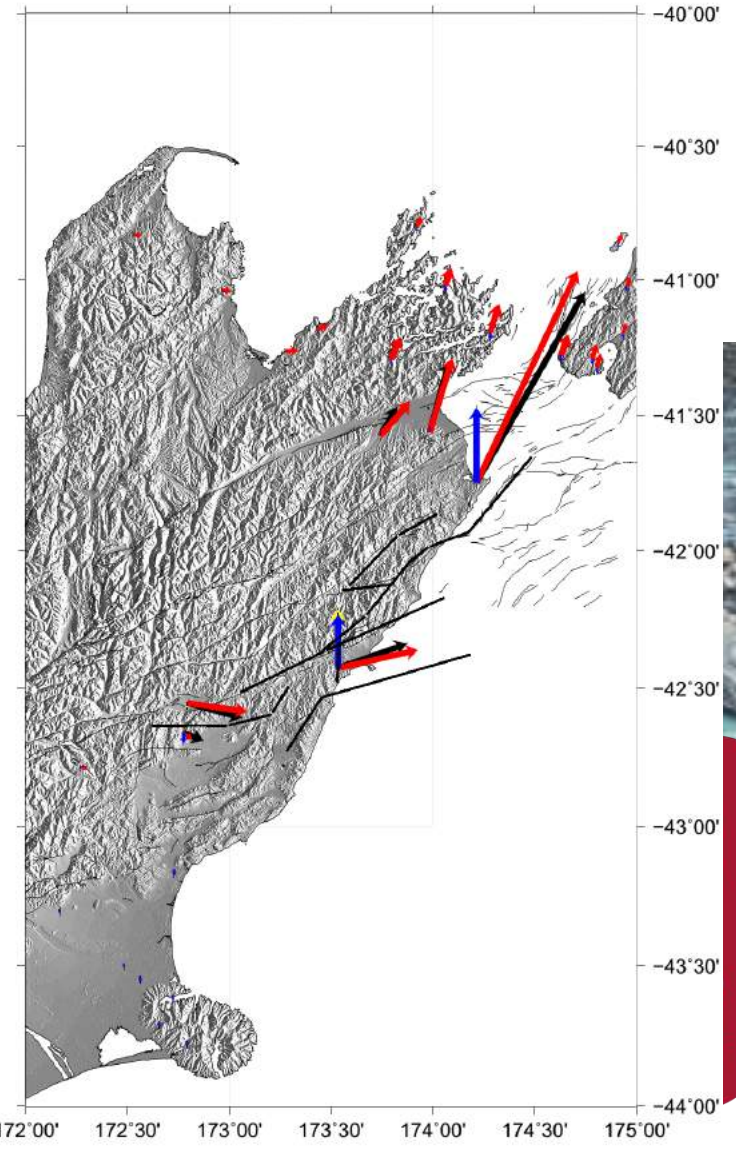
Image © 2016 DigitalGlobe
Image © 2016 TerraMetrics
2002
Imagery Date: 3/2/2009
lat -41.285915°


Observed fault surface rupture
Active faults
Displacements
N
KEKERENGU FAULT
NEEDLES FAULT
JORDAN THRUST
PAPATEA FAULT
HOPE FAULT
HUNDELEE FAULT
THE HUMPS FAULT ZONE
H:> 2.3
H:5
V:2
H:10
V:1.5
H:5 - 6
H:3 - 3.6
V:1-2
H:8
H:6
V:2.5
H:2
V:4 - 5
V:7-8
H:2
V:6
H:2+
V:0.7
H:2
H:6-10
H:11
V:3
H:0.15
H:0.5
V:>2
H:3.7
V:>1
V:1
H:1
V:0.5
H:~ 1
H:1.5
H:1
H:< 1
H:1.2
H:1.1
V:0.3
H:0.25
H:2
V:2
25/11/2016 4:52:20 PM
DOI: 10.21420/G23W2R
0
10
20
km
USC University of Southern California
NIWA
Taihoro Nukurangi
The University of Auckland
GNS SCIENCE
Victoria University of Wellington, New Zealand
UC UNIVERSITY OF CANTERBURY
UNIVERSITY of OTAGO

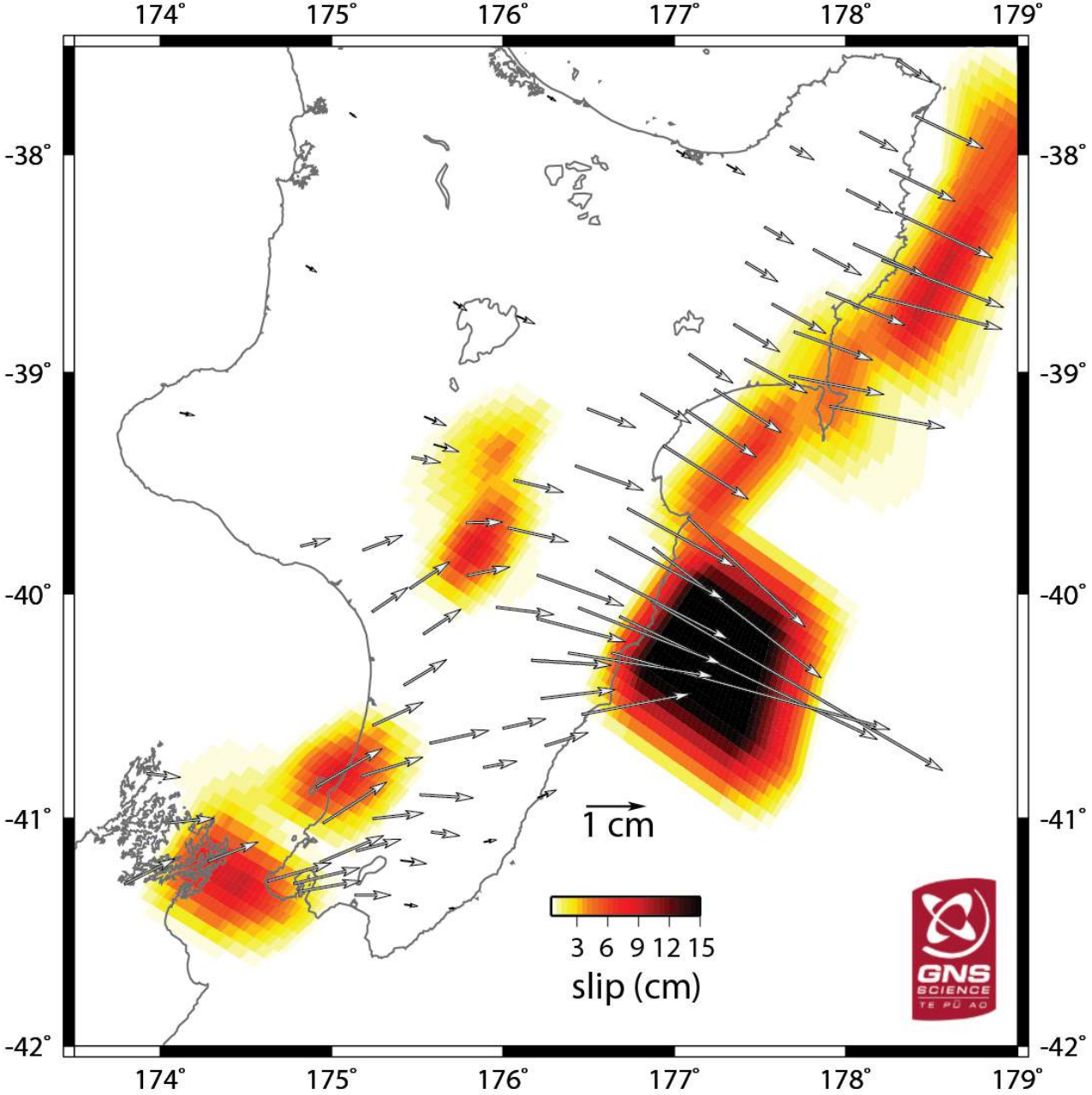
Preliminary slip model derived from InSAR and GPS data.

Despite the current model explaining 94% of the total data variance, significant residuals remain further highlighting the complexity of the rupture.





Slow Slip Event



Patches of slip on the Hikurangi subduction plate boundary beneath the North Island This is recorded by the GeoNet and PositioNZ GPS stations. GPS station movements are denoted by the arrows.

Aftershock Probabilities – as of 30 Nov 2016

	Average number of M5.0-5.9	Range* of M5.0-5.9	Probability of 1 or more M5.0-5.9	Average number of M6.0-6.9	Range* of M6.0-6.9	Probability of 1 or more M6.0-6.9	Average number of M≥7	Range* of M≥7	Probability of 1 or more M≥7
within 7 days	5.1	0 - 13	97%	0.47	0 - 2	38%	0.05	0 - 1	5%
within 30 days	14.5	5 - 26	>99%	1.4	0 - 4	74%	0.14	0 - 1	13%
within 1 year	42.9	26 - 62	>99%	4.0	1 - 8	98%	0.37	0 - 2	31%

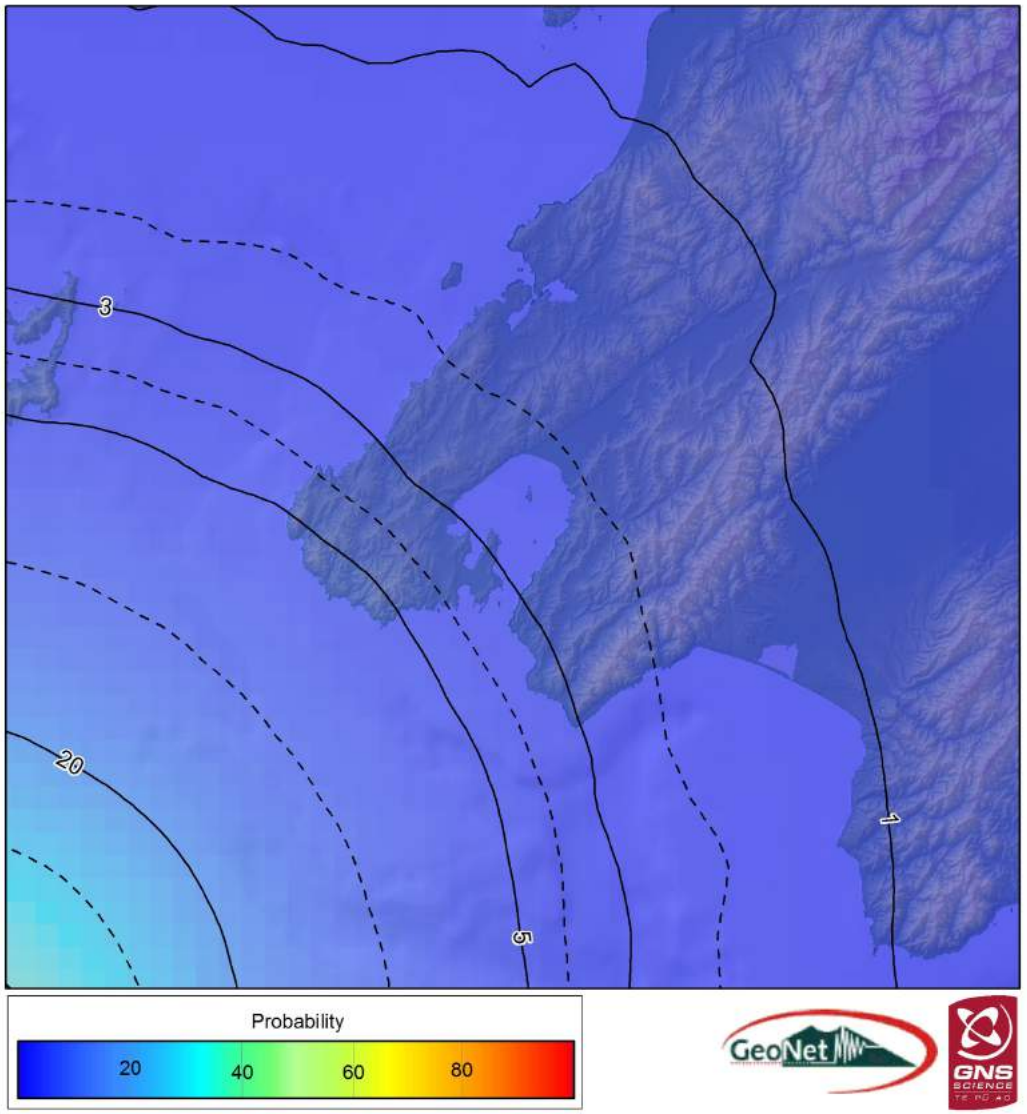
Aftershock Probabilities – as of 15 Nov 2016

	M5.0-5.9			M6.0-6.9			M ≥7.0		
	Average number	Range	Probability of one or more	Average number	Range	Probability of one or more	Average number	Range	Probability of one or more
Within 1 day	5	1 - 9	>99%	0.4	0 - 2	37%	0.05	0 - 1	4%
Within 7 days	15	8 - 24	>99%	1.4	0 - 4	76%	0.15	0 - 1	14%
Within 30 days	26	17 - 36	>99%	2.4	0 - 6	91%	0.22	0 - 2	22%

MMI7+ in 30 days from 25 Nov 2016

Probability of damaging shaking (MM7) in the next 30 days

As at 25/11/2016

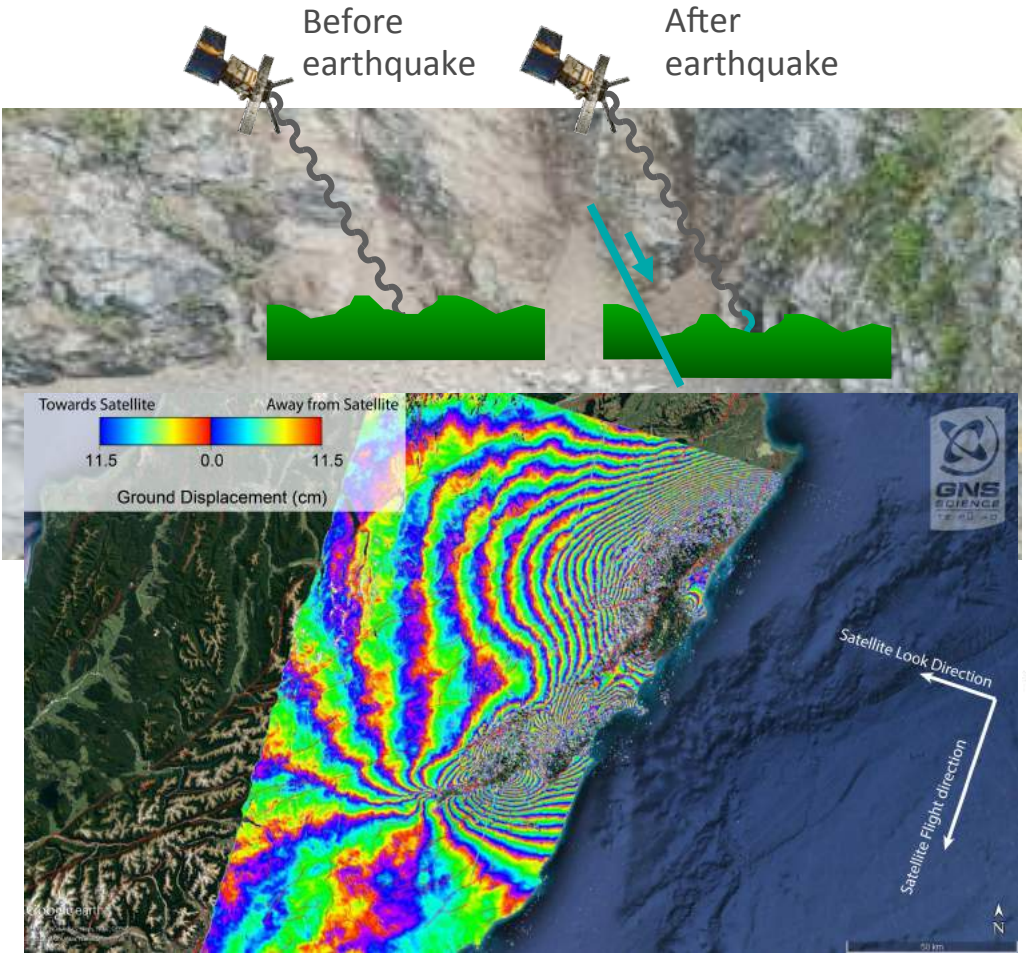


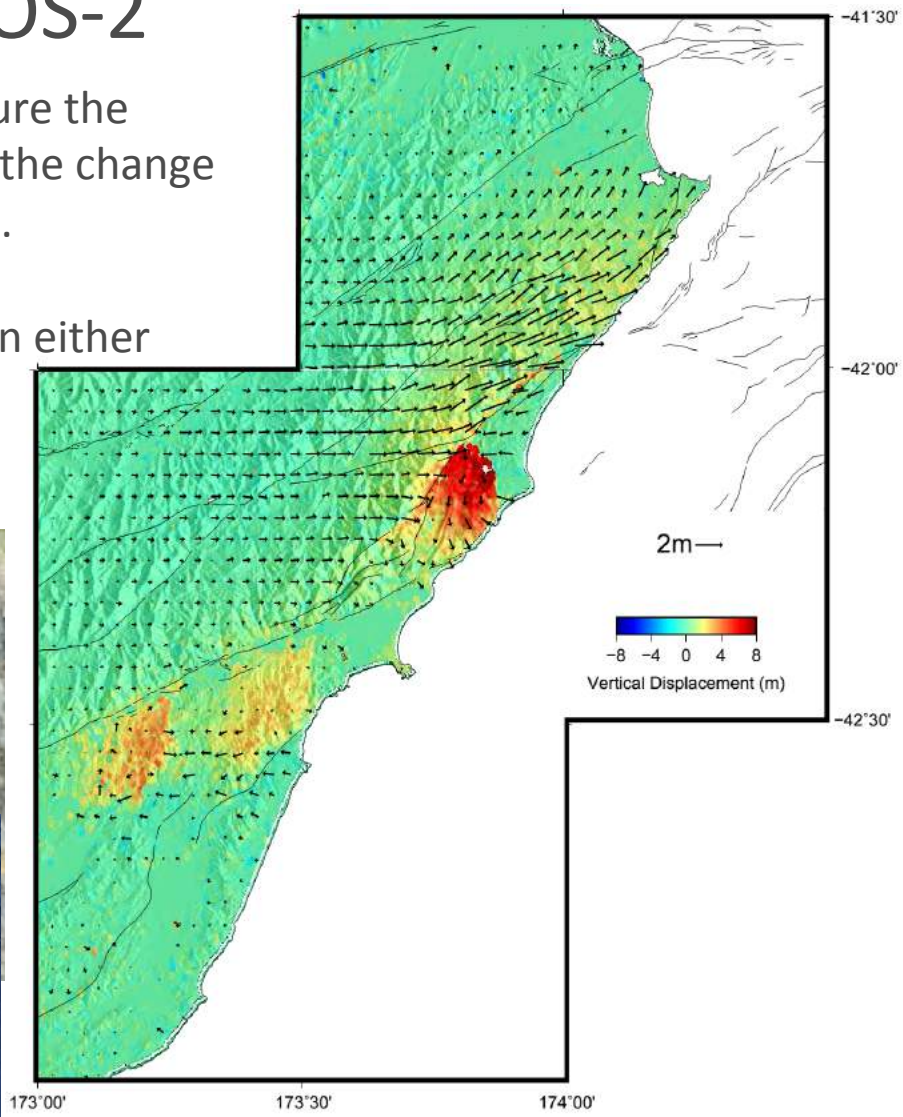
MM7 shaking corresponds with internal building damage, structural damage to a few weak buildings, and will be alarming to affected people

InSAR observations from ALOS-2

Using radar satellites orbiting at 700 km we measure the displacement of the Earth's surface by measuring the change in the path length between two radar acquisitions.

Each contour represents 11.5 cm of ground motion either towards or away from the satellite





3D Dispalcement field derived from Sentinel-1 radar amplitude images acquired before and after the earthquake.

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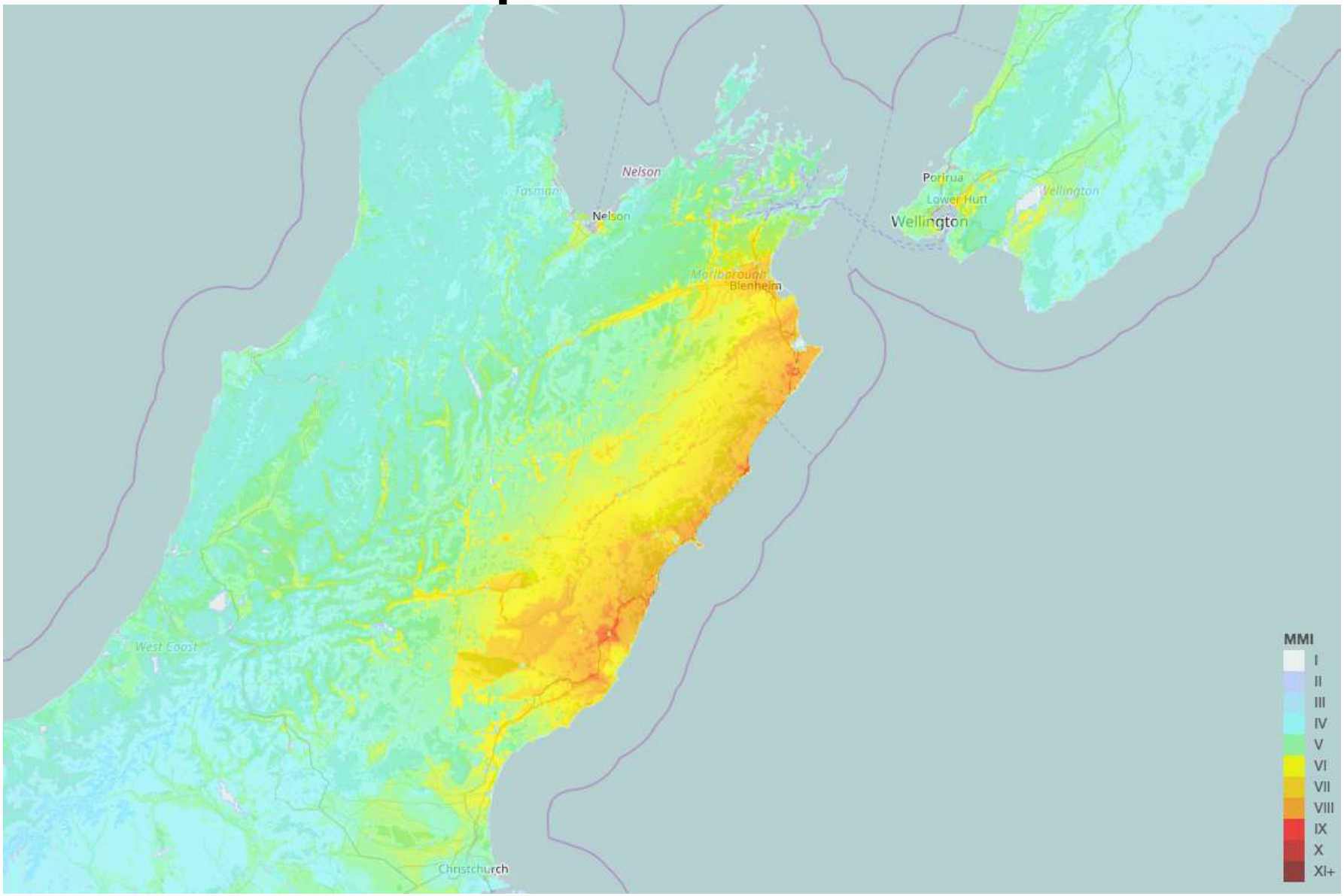
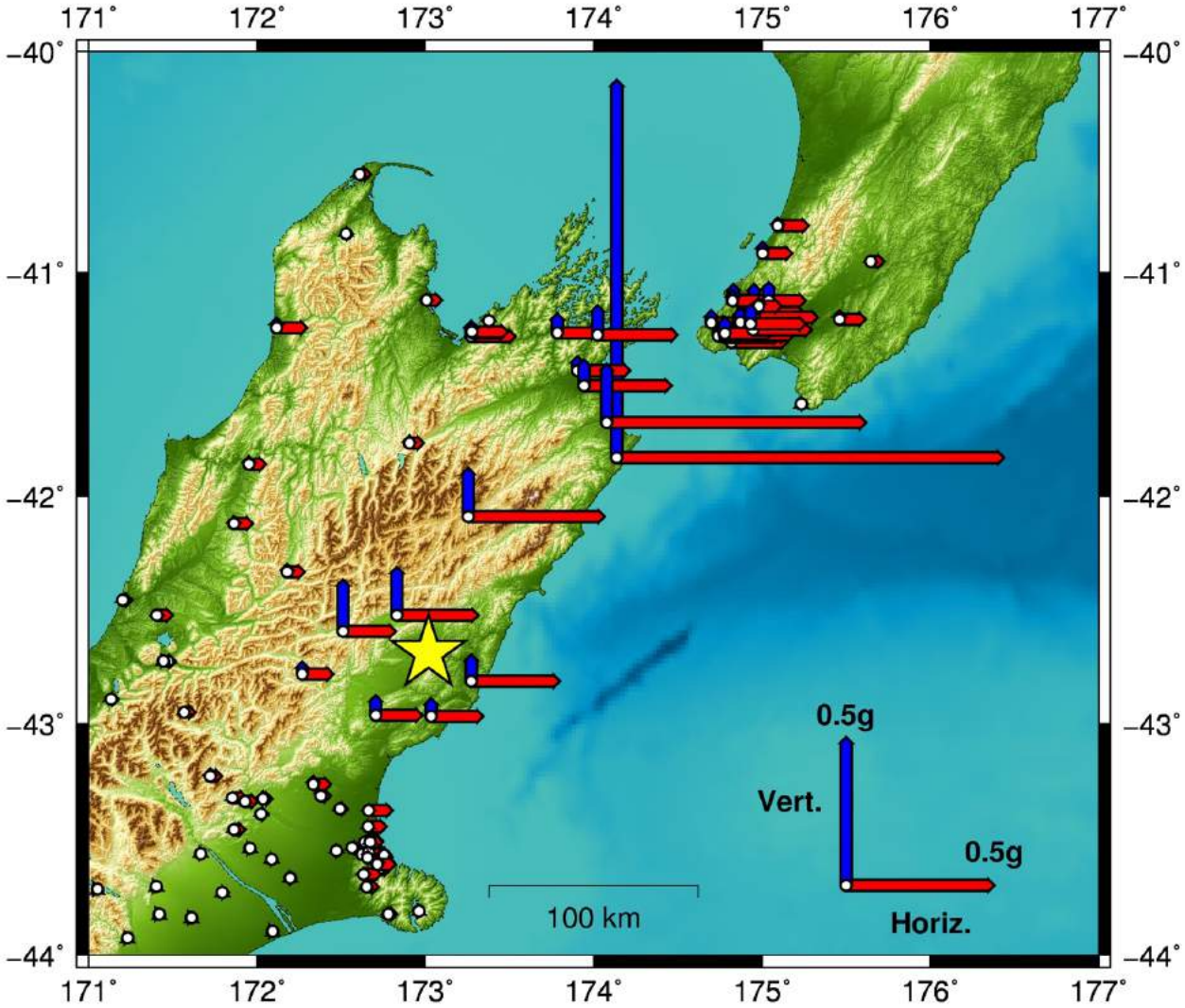
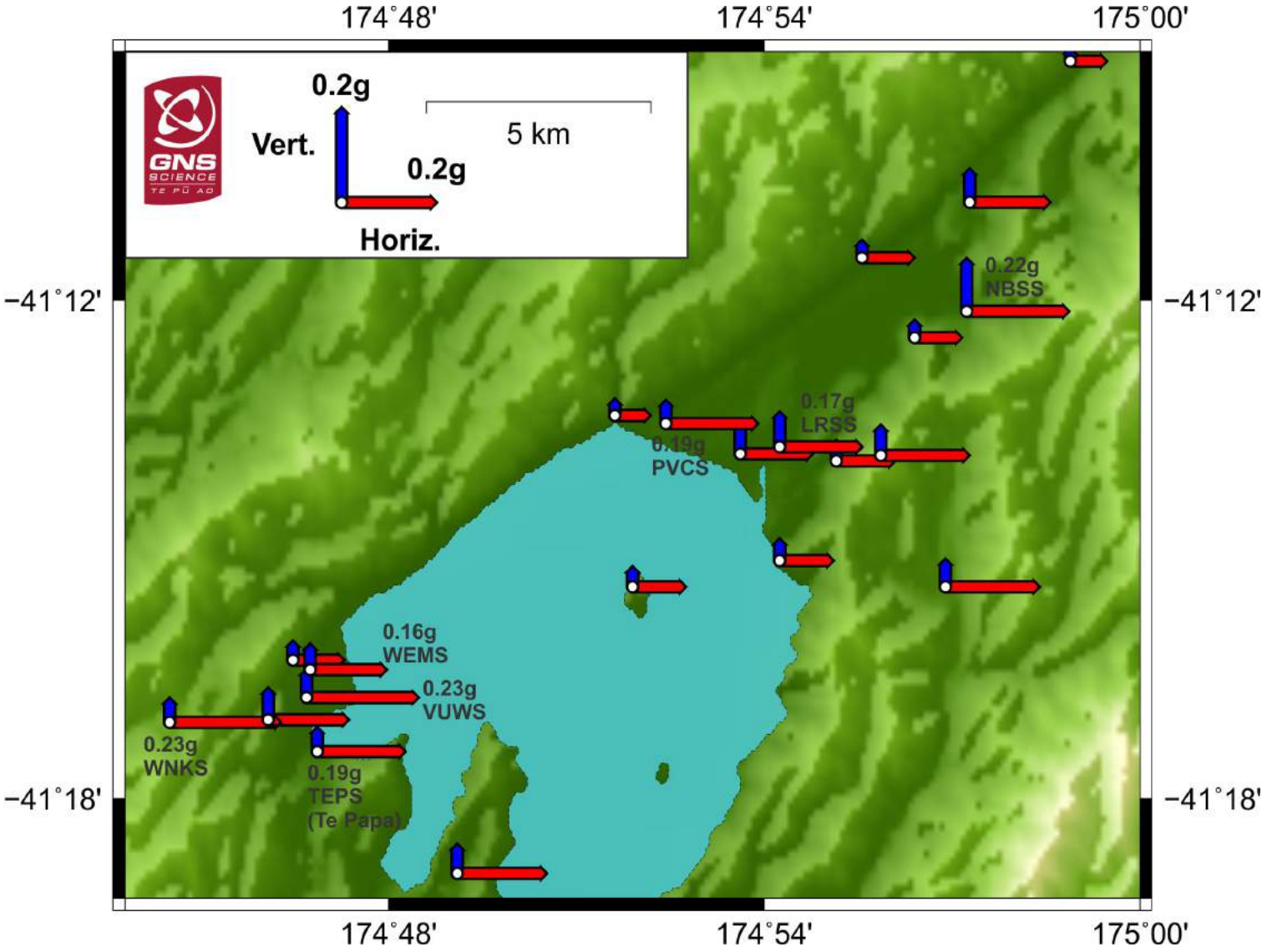
GeoNet ShakeMap



PGAS


171°
172°
173°
174°
175°
176°
177°
-40°
-41°
-42°
-43°
-44°
0.5g
Vert.
0.5g
Horiz.
100 km

PGAs


174°48'
174°54'
175°00'
−41°12'
−41°18'
0.2g
Vert.
0.2g
Horiz.
5 km
0.22g
NBSS
0.17g
LRSS
0.19g
PVCS
0.16g
WEMS
0.23g
VUWS
0.23g
WNKS
0.19g
TEPS
(Te Papa)