

GeoNet – Monitoring Our Geological Hazards

An update

Ken Gledhill

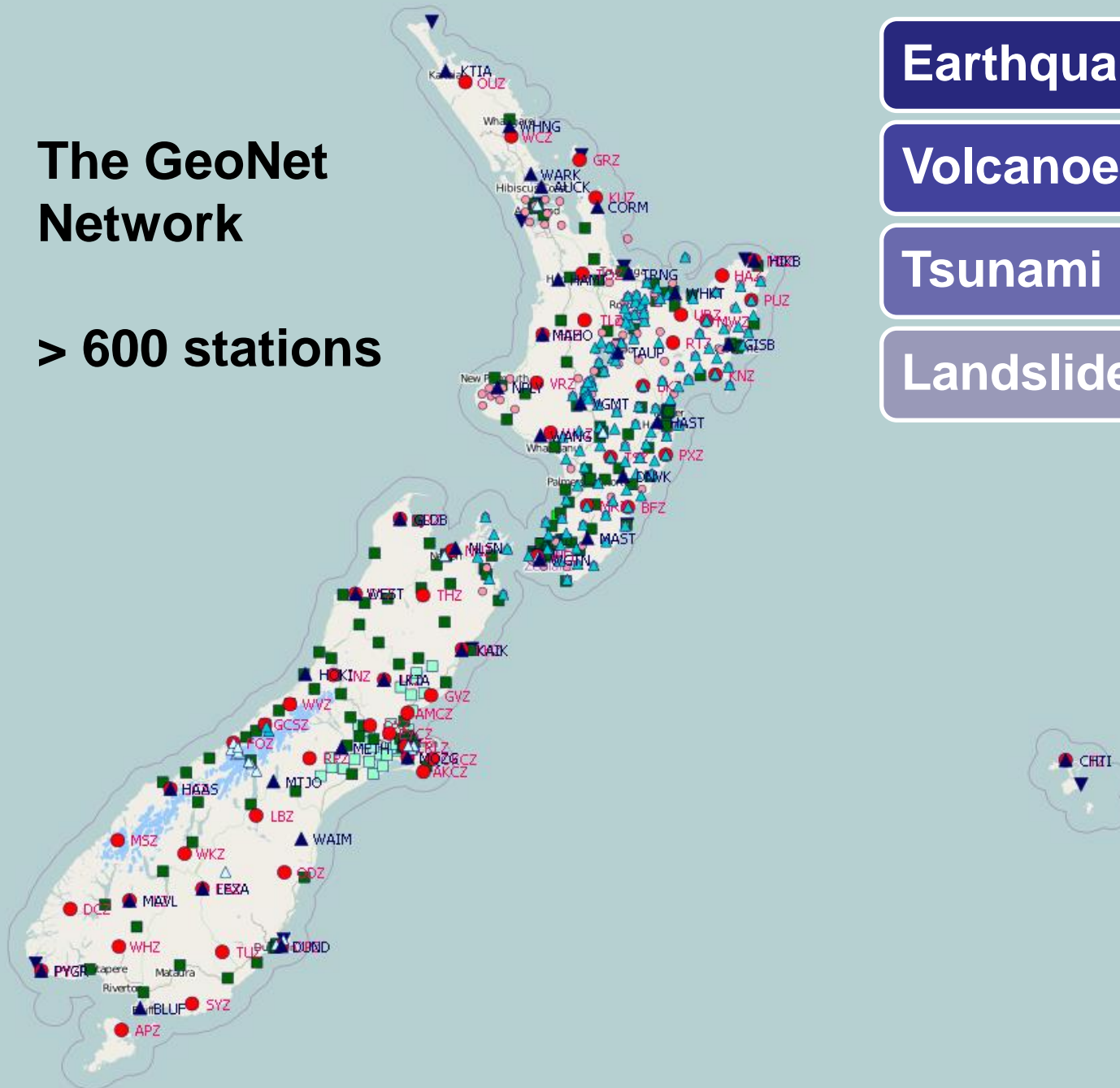
GeoNet Project Director, *GNS Science*

Chair, Intergovernmental Coordination Group, Pacific Tsunami Warning and Mitigation System



The GeoNet Network

> 600 stations



Earthquakes

Volcanoes

Tsunami

Landslides

M 6.2, Eketahuna Earthquake, 20 January 2014

Quake Detail

Information about this

Public ID

Intensity

Universal Time

NZ Daylight Time

Depth

Magnitude

Location

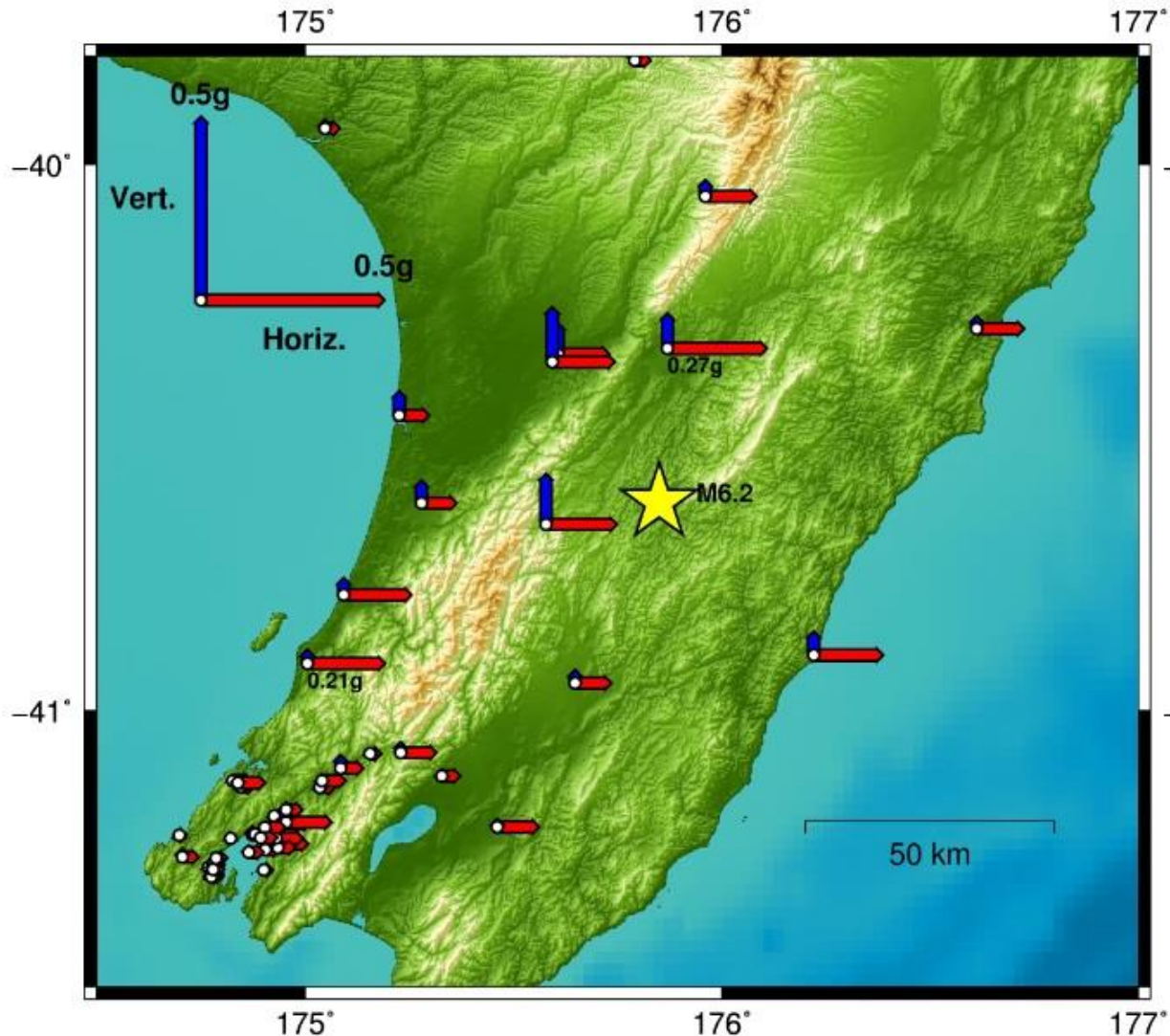
Latitude, Longitude

Agency

Type

Status

Quality



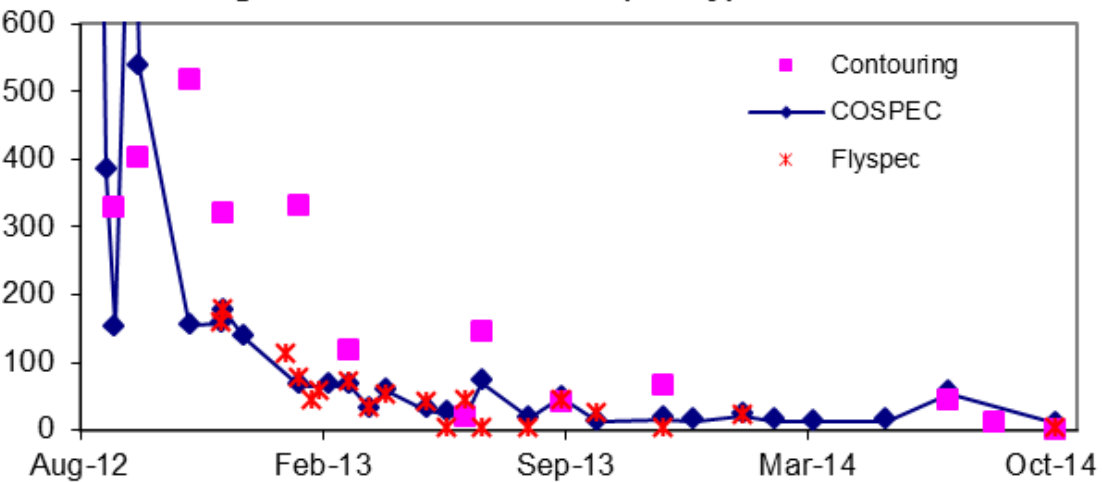
location.



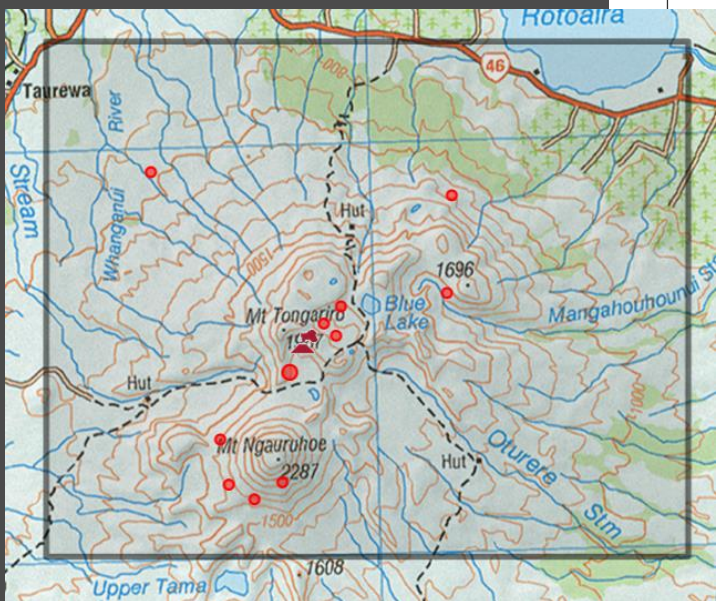
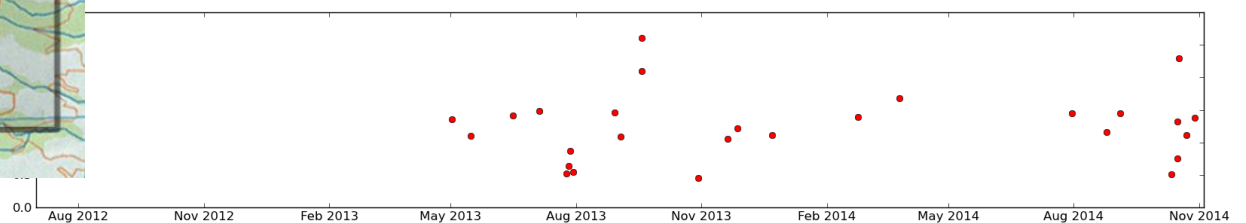
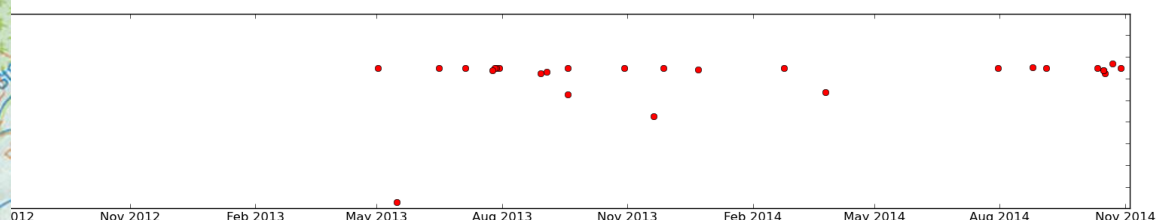
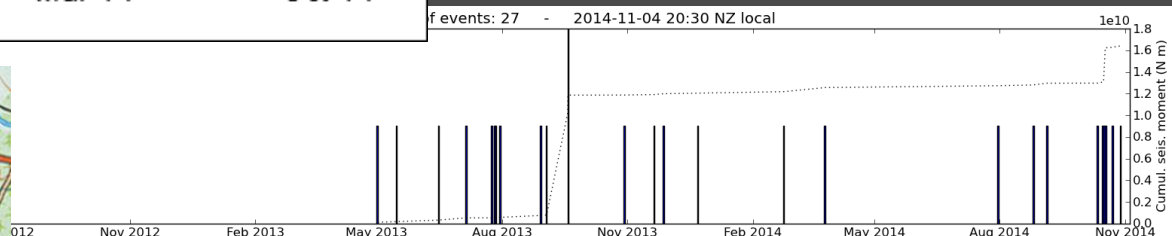
Felt Reports

Tongariro

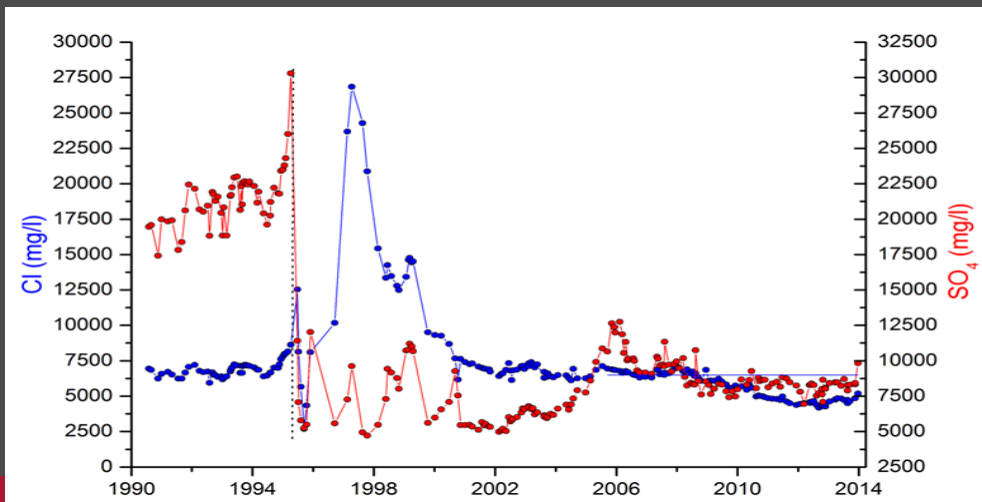
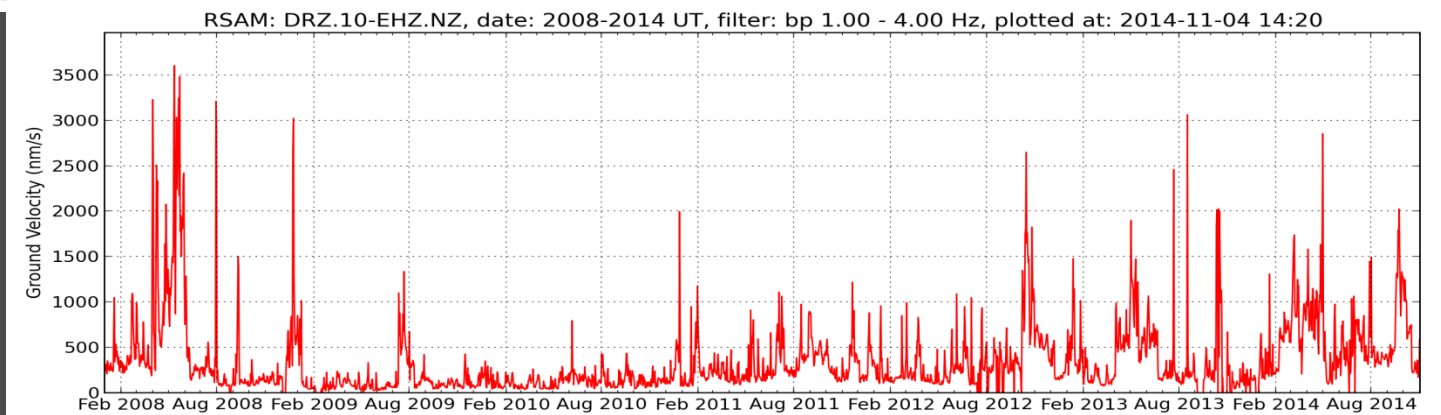
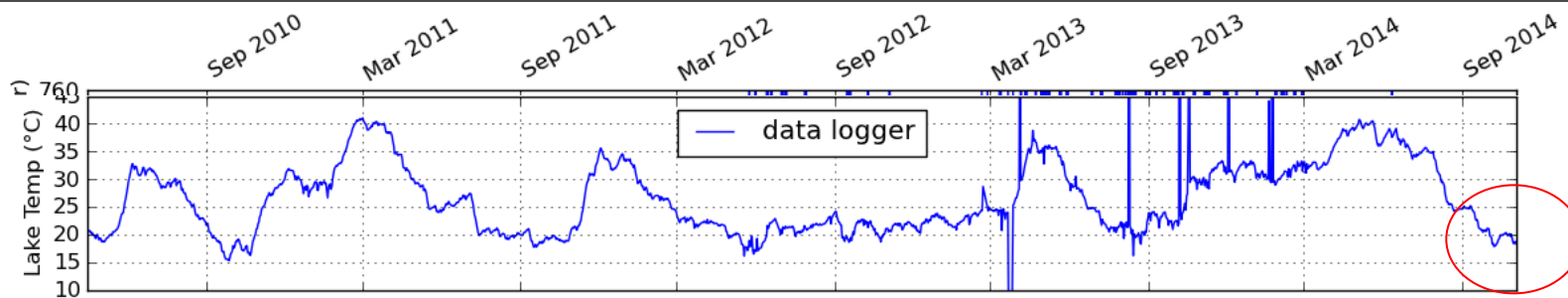
Tongariro - SO₂ Emissions (T/day)



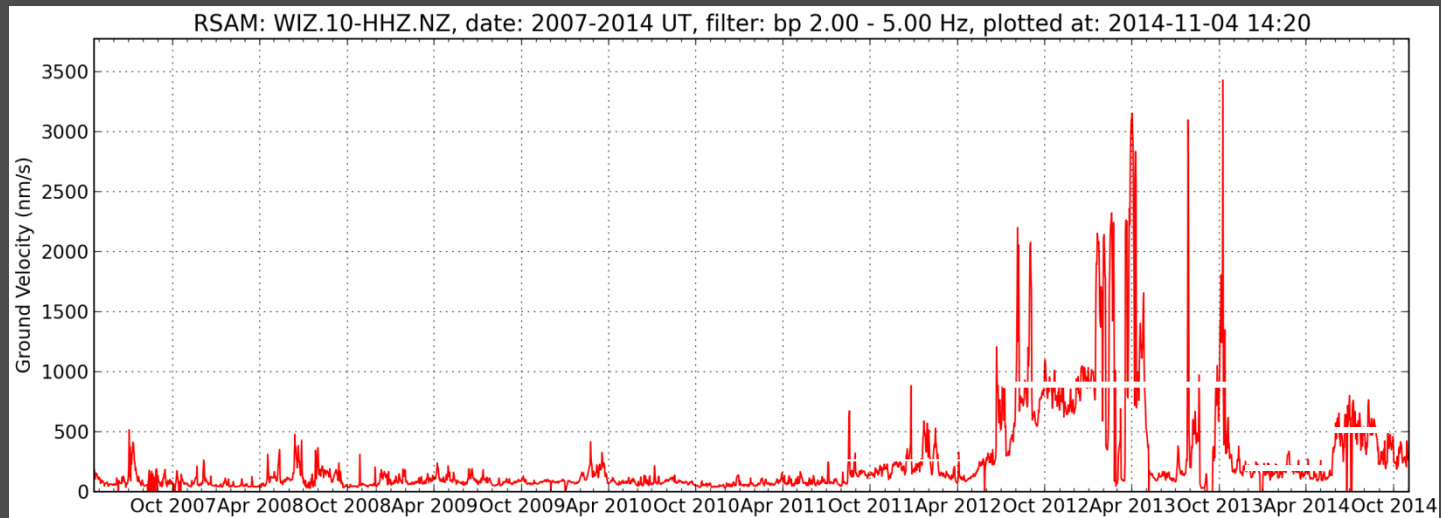
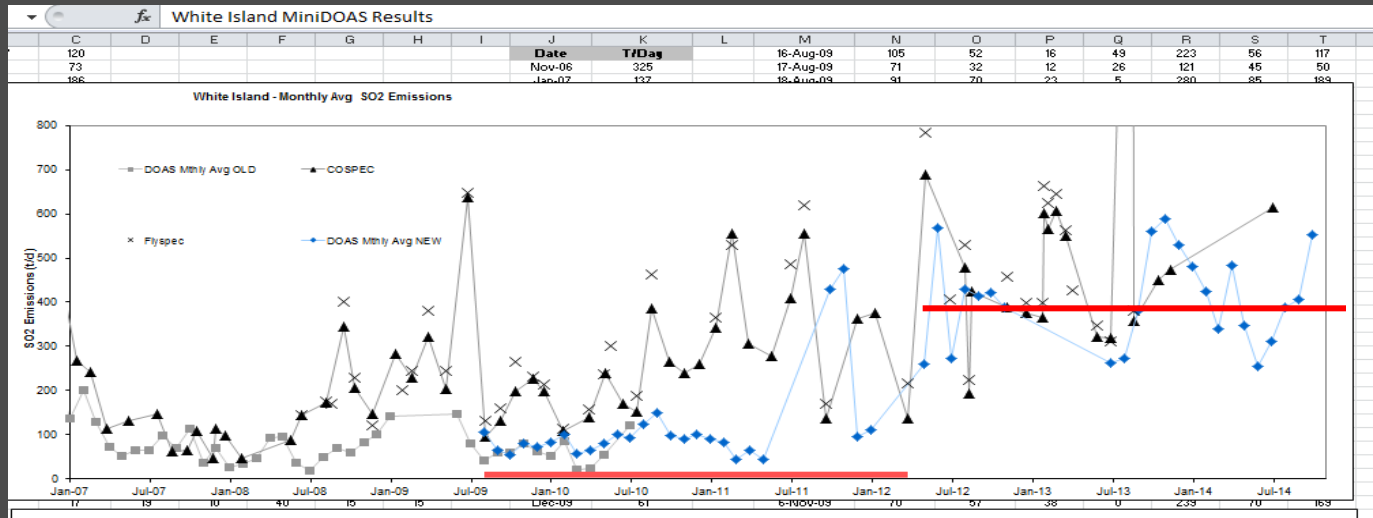
f events: 27 - 2014-11-04 20:30 NZ local



Ruapehu Crater Lake



White Island: Unrest-Eruptive episode



Revised Volcanic Alert Level System

- One system for all of NZ's volcanoes
- Still based on currently occurring phenomena
- Replaced indicative phenomena with hazards
- Two levels of unrest
- Retained 6 levels, flipped it over
- Simplified wording
- Included sources of further information

New Zealand Volcanic Alert Level System			
	Volcanic Alert Level	Volcanic Activity	Most Likely Hazards
Eruption	5	Major volcanic eruption	Eruption hazards on and beyond volcano*
	4	Moderate volcanic eruption	Eruption hazards on and near volcano*
	3	Minor volcanic eruption	Eruption hazards near vent*
Unrest	2	Moderate to heightened volcanic unrest	Volcanic unrest hazards, potential for eruption hazards
	1	Minor volcanic unrest	Volcanic unrest hazards
	0	No volcanic unrest	Volcanic environment hazards

An eruption may occur at any level, and levels may not move in sequence as activity can change rapidly.

Eruption hazards depend on the volcano and eruption style, and may include explosions, ballistics (flying rocks), pyroclastic density currents (fast moving hot ash clouds), lava flows, lava domes, landslides, ash, volcanic gases, lightning, lahars (mudflows), tsunami, and/or earthquakes.

Volcanic unrest hazards occur on and near the volcano, and may include steam eruptions, volcanic gases, earthquakes, landslides, uplift, subsidence, changes to hot springs, and/or lahars (mudflows).

Volcanic environment hazards may include hydrothermal activity, earthquakes, landslides, volcanic gases, and/or lahars (mudflows).

***Ash, lava flow, and lahar (mudflow) hazards may impact areas distant from the volcano.**

This system applies to all of New Zealand's volcanoes. The Volcanic Alert Level is set by GNS Science, based on the level of volcanic activity. For more information, see geonet.org.nz/volcano for alert levels and current volcanic activity, gns.cri.nz/volcano for volcanic hazards, and getthru.govt.nz for what to do before, during and after volcanic activity. Version 3.0, 2014.

Examples

VAL 5: Tarawera, 1886

- Large eruption/s

VAL 4: Ngauruhoe, 1975

- Eruption column 12 km high

VAL 3: White Island, early August 2012

- Ashfall travelled 4-6 km from vent

VAL 2: White Island, late July 2012

- Ballistics (flying rocks) up to 3 km from vent

VAL 1: Ruapehu, now

- Heightened unrest

VAL 0: Tararaki, now

- High gas output
- No signs of unrest or shallow seismicity (tremor)
- (the main flows) travelled 3-5 km from vent

- Volcanic gases

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GeoNet Quake App

- iPhone and Android
- Over 150,000 users
- Push notifications – up to the minute quake alerts



GeoNet Quake App Update

Quakes

Light+

Intensity	Light	19 hours ago
NZDT	Sun, Nov 2 2014, 07:54:34 pm	
Magnitude	2.7	
Depth	13 km	
Location	5 km east of Seddon	

Notified

Intensity	Moderate	19 hours ago
NZDT	Sun, Nov 2 2014, 07:45:29 pm	
Magnitude	3.7	
Depth	13 km	
Location	30 km south-east of Twizel	

Notified

Intensity	Light	19 hours ago
NZDT	Sun, Nov 2 2014, 07:28:26 pm	
Magnitude	3.1	
Depth	16 km	
Location	60 km south-west of Whanganui	

Intensity	Moderate	1 day ago
NZDT	Sun, Nov 2 2014, 04:00:06 am	
Magnitude	3.9	

Notification rules

- SEVERE** (Red bar)
All locations
- LIGHT AND ABOVE** (Blue bar)
Wellington
- MAGNITUDE 5 AND ABOVE** (Brown bar)
Depth less than 15 km

New

News

Otago region, with more than 1,300 felt reports received by GeoNet. This earthquake may have been a bit of a surprise to some people as earthquakes simply aren't that common in this part of the South Island.

But these have happened before. We dug through our earthquake files to find out more about Dunedin's shaky past.

Earthquakes in the Dunedin area since 1960

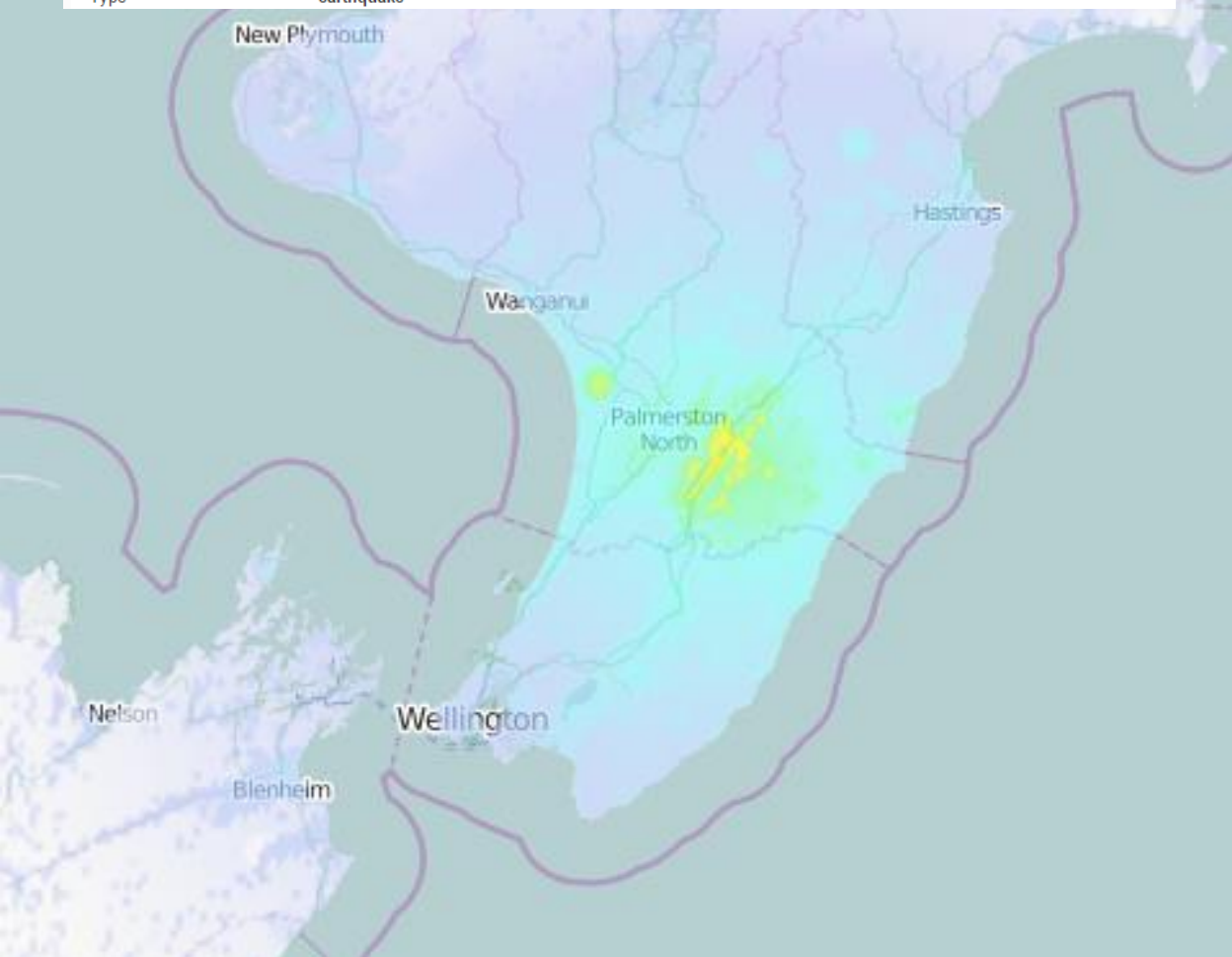
Information about this earthquake and historical location data.

Public ID	2014p715168
Intensity	severe
Universal Time	September 22 2014, 14:41:38
NZ Standard Time	Tue, Sep 23 2014, 2:41:38 am
Depth	11 km
Magnitude	5.2
Location	20 km west of Pongaroa
Latitude, Longitude	-40.50, 175.94
Agency	WEL(GNS_Primary)
Type	earthquake

Interactive map showing quake location.



The "ShakeMap" (beta testing) showing the shaking intensity as determined by GeoNet instruments and modelled against ground conditions.



Events During the Last Few Years

- 2009 (July): Dusky Sound Earthquake (M_W 7.6)
- 2009 (September): Samoan Islands Tsunami
- 2010 (February): Chile Tsunami
- 2010 (September): Darfield Earthquake (M_W 7.1)
- 2011 (February): Christchurch Earthquake (M_W 6.2)
- 2011 (March): Japan Tsunami
- 2011 (June): Canterbury Earthquake (M_W 6.0)
- 2011 (December): Canterbury Earthquakes (M_W 5.8, 5.9)
- 2012 (August, November): Tongariro Eruptions
- 2013 (July, August): Cook Strait Earthquakes (M_W 6.5, 6.6)
- 2014 (January): Eketahuna Earthquake (M_W 6.2)

GeoNet Status and Future

- Has been operating since 2001 (10 year contract with EQC)
- Contract renewed in 2010 follow negotiation during Global Economic Crisis (and just before the start of the Canterbury earthquake sequence)
- Performed very well during the events of recent years, BUT
- Managed the response to the recent events by diversion of resources (no extra funding)
- In the fifth year of 10 year contract with EQC; renegotiation of funding for next 5 years required by 1 July 2015
- Continuing growth in **expectation** with reviews and events
- Sustainability of current level of operation an issue, AND
- Expectation of a move from event to **impact reporting**

Tomorrow = Future Technology Trends

- Many more and better sensors (including multi-parameter) possible
- Data communications will be available EVERYWHERE
- Everything will be in the cloud AND it will be a very mobile world
- Handling of much larger data volumes possible
- Offshore and borehole sensors possible
- More extensive structural monitoring possible
- Fully distributed data centre very resistant to failure
- The data archive and delivery electronically close to users
- Early warning possible for some hazards
- Very fast impact reporting possible following events

GeoNet and Lifelines

- What more/better/extra can GeoNet do for Lifelines?
- Individually?
- Collectively?

