GeoNet Networing Overview

Toitu te whenua Land Information New Zealand

EQC EARTHQUAKE COMMISSION Kōmihana Rūwhenua

GNS SCIENCE TE PŪ AO

An Overview of GeoNet

- **GeoNet provides timely and accurate geohazard monitoring and relevant data with an open source policy.**

- **Established in 2001 to provide information for reinsurance industry.**

- **Over time GeoNet has:**
  - Expanded our instrument network and data processing capabilities
  - Evolved how we respond to geologic events with duty officers
  - Grown public interest

Our contribution to New Zealand

1

Support

We are a trusted cornerstone of the four Rs

2

Engage

We help New Zealanders live with their natural hazards

3

Connect

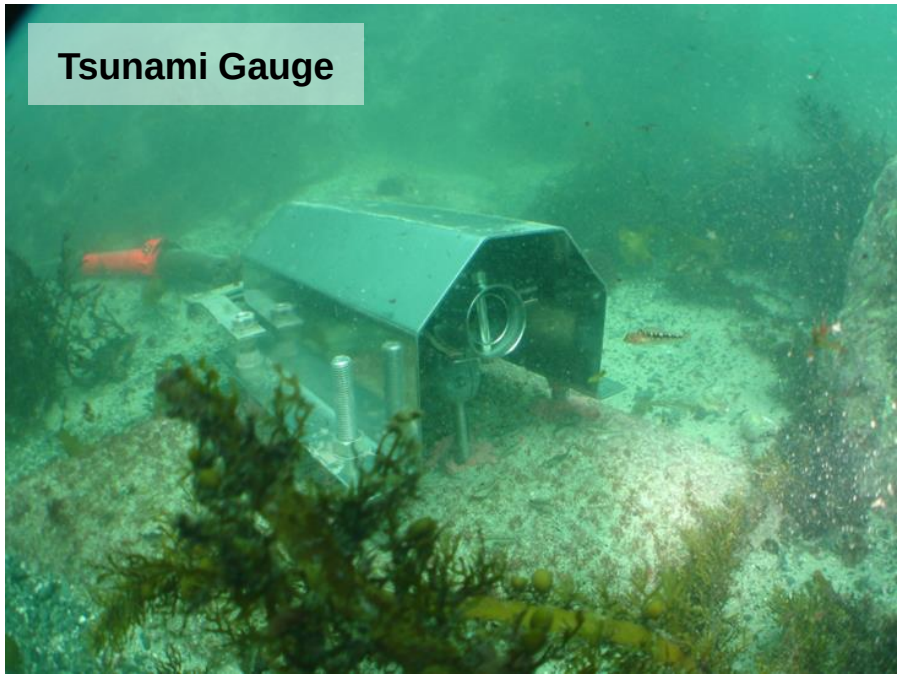
We connect our data to those who create new knowledge

Talk Focus

- **Where are we at (sustain):**
  - Our network, our data
  - Diverse communities
  - Geologic event response

- **Where we are heading (EGM: GeoNet 2.0):**
  - Strong foundations for the future
  - Enhanced Geohazards Monitoring (EGM)

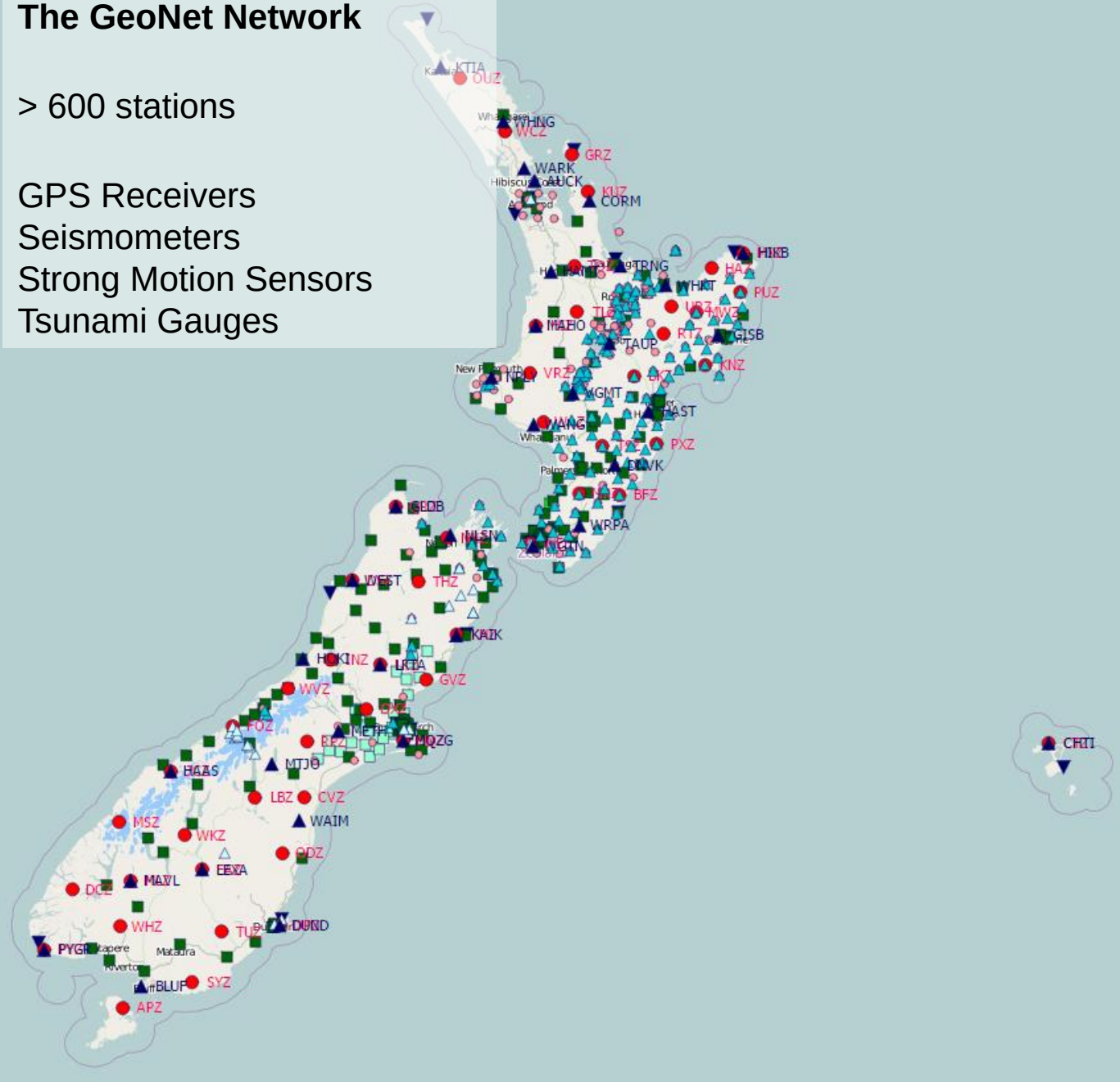
Instrumentation and Data Collection



The GeoNet Network

> 600 stations

GPS Receivers
Seismometers
Strong Motion Sensors
Tsunami Gauges



Earthquakes

Volcanoes

Tsunami

Landslides

In the weeks following the Kaikōura event our technicians were busy installing new instruments in the region to help us better locate the many aftershocks, and see how the land was behaving/ moving. This included adding both temporary and new permanent stations to our national network.

NEW SITES

GNSS with strong motion

GLOK	GLOS	Glen Orkney
LOOK	LOKS	Mt Lookout
SEDD	SDNS	Seddon
WRAU	WRAS	Wairau Valley

GNSS with weak and strong motion

CLRR	CRSZ	Clarence River Middle Hill

NEW TEMPORARY SITES

Temporary GNSS with strong motion

TEN2	TENS	Lake Tennyson (will be made permanent)
MUL1	SM1F	Muller Station
GDS1	SM2F	Gladstone Station
LOK1	SM3F	Glen Orkney (temporary station)

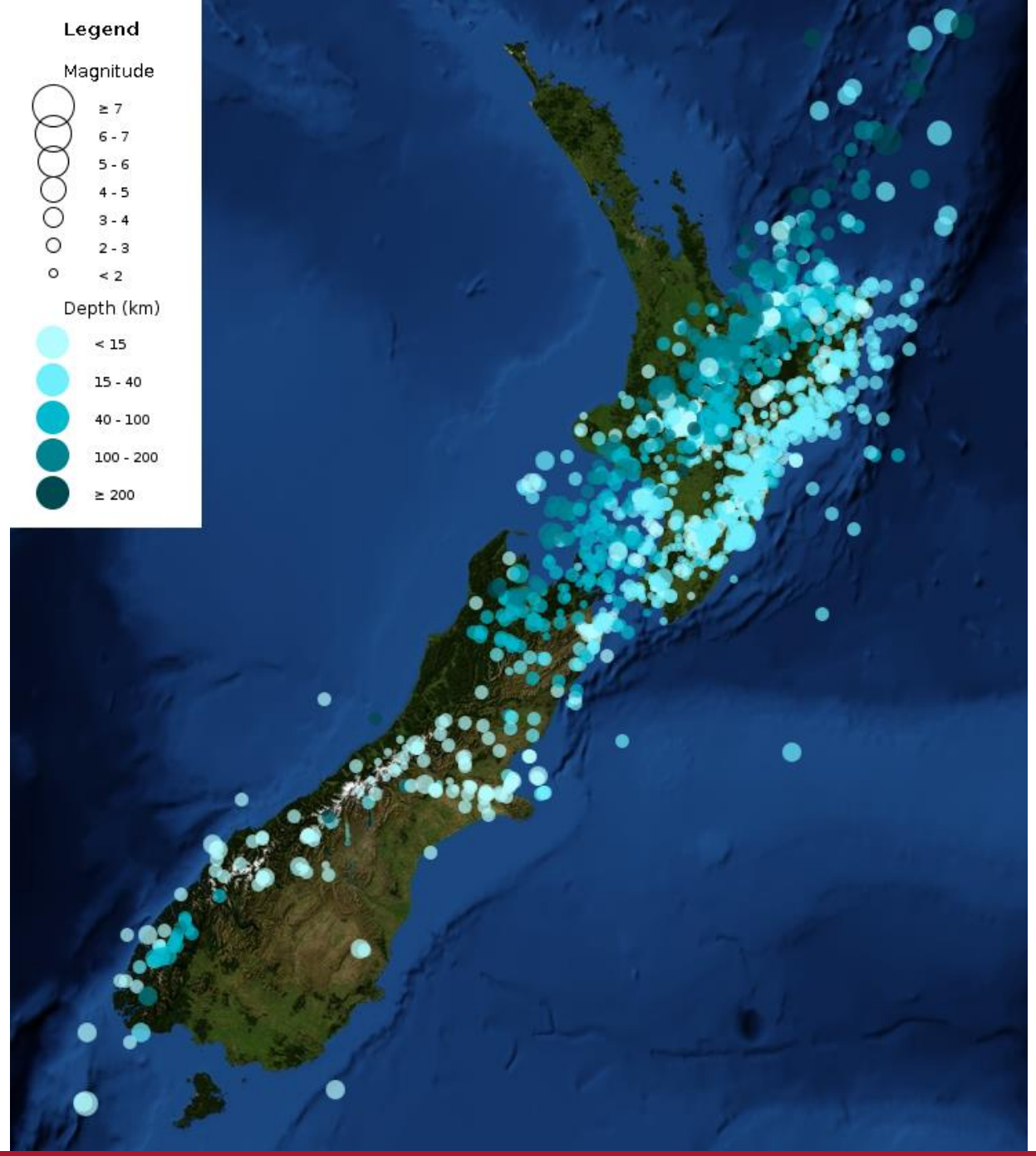
ADDITIONS TO EXISTING SITES

Strong motion added to regional seismic and sites upgraded

TUWZ		Tuamarina
BSWZ		Blackbirch Station
CMBL	CMWZ	Cape Campbell

Temporary weak motion added to strong motion

KEKS		Kekerengu



We locate + 20,000 quakes a year

Most are too small to be felt

All available on GeoNet website

New Zealand Earthquake Report

Magnitude 5.7, Sun, Feb 14 2016, 1:13:43 pm (NZDT)

Share Tweet +1

Quake Details

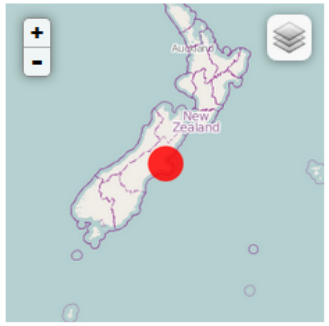
Felt it?

Information about this earthquake and historical location data.

Public ID	2016p118944
Intensity	severe
Universal Time	February 14 2016, 0:13:43
NZ Daylight Time	Sun, Feb 14 2016, 1:13:43 pm
Depth	8 km
Magnitude	5.7
Location	10 km east of Christchurch
Latitude, Longitude	-43.50, 172.75
Agency	WEL(GNS_Primary)
Type	earthquake
Status	reviewed
Quality	best

Quake Map

Interactive map showing quake location.



View Larger Map | Show Felt Reports

Copyright.

Quake History

Location history for this earthquake:

Interval Since Event	Origin Time	Latitude	Longitude	Depth	Magnitude	Status	Quality
005 03:19:43	2016-02-14T00:13:43.988Z	-43.50	172.75	8	5.7	reviewed	best
000 00:13:53	2016-02-14T00:13:43.363Z	-43.50	172.83	15	5.7	reviewed	best
000 00:13:53	2016-02-14T00:13:43.204Z	-43.51	172.79	30	5.9	automatic	good
000 00:11:00	2016-02-14T00:13:43.204Z	-43.51	172.79	30	5.9	automatic	good
000 00:06:23	2016-02-14T00:13:43.177Z	-43.51	172.79	30	5.9	automatic	good
000 00:02:57	2016-02-14T00:13:43.315Z	-43.51	172.81	31	5.9	automatic	good
000 00:01:58	2016-02-14T00:13:42.935Z	-43.51	172.74	19	5.6	automatic	good
000 00:01:07	2016-02-14T00:13:42.935Z	-43.51	172.74	19	5.8	automatic	caution
000 00:01:06	2016-02-14T00:13:42.935Z	-43.51	172.74	19	5.7	automatic	caution
000 00:01:03	2016-02-14T00:13:43.075Z	-43.51	172.72	17	5.8	automatic	caution
000 00:01:01	2016-02-14T00:13:43.075Z	-43.51	172.72	17	5.7	automatic	caution
000 00:00:51	2016-02-14T00:13:43.075Z	-43.51	172.72	17	6.0	automatic	caution

Data Requirement: Earthquake Location

Automatic location:

less than one minute

Reviewed by duty officer:

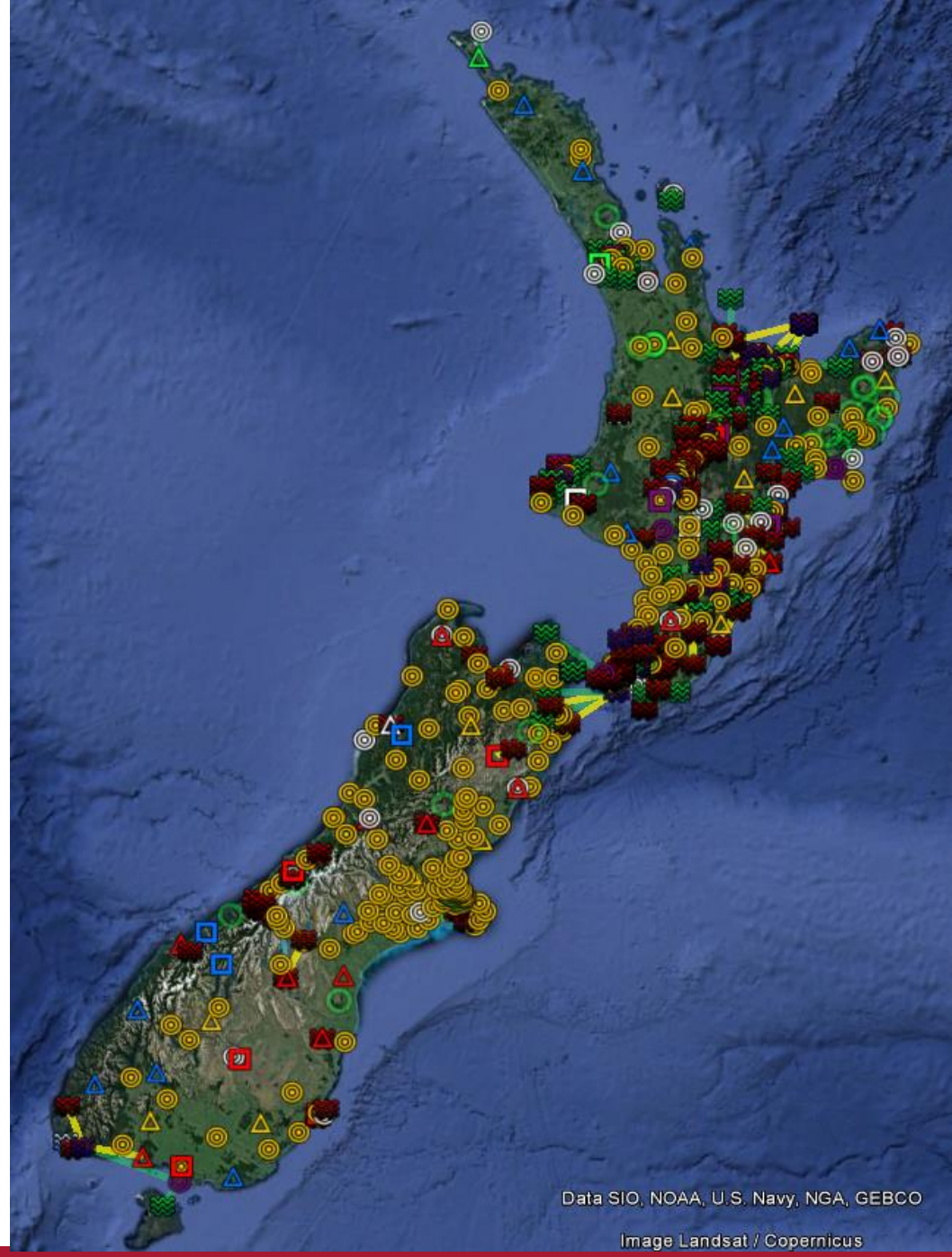
~ 15 minutes

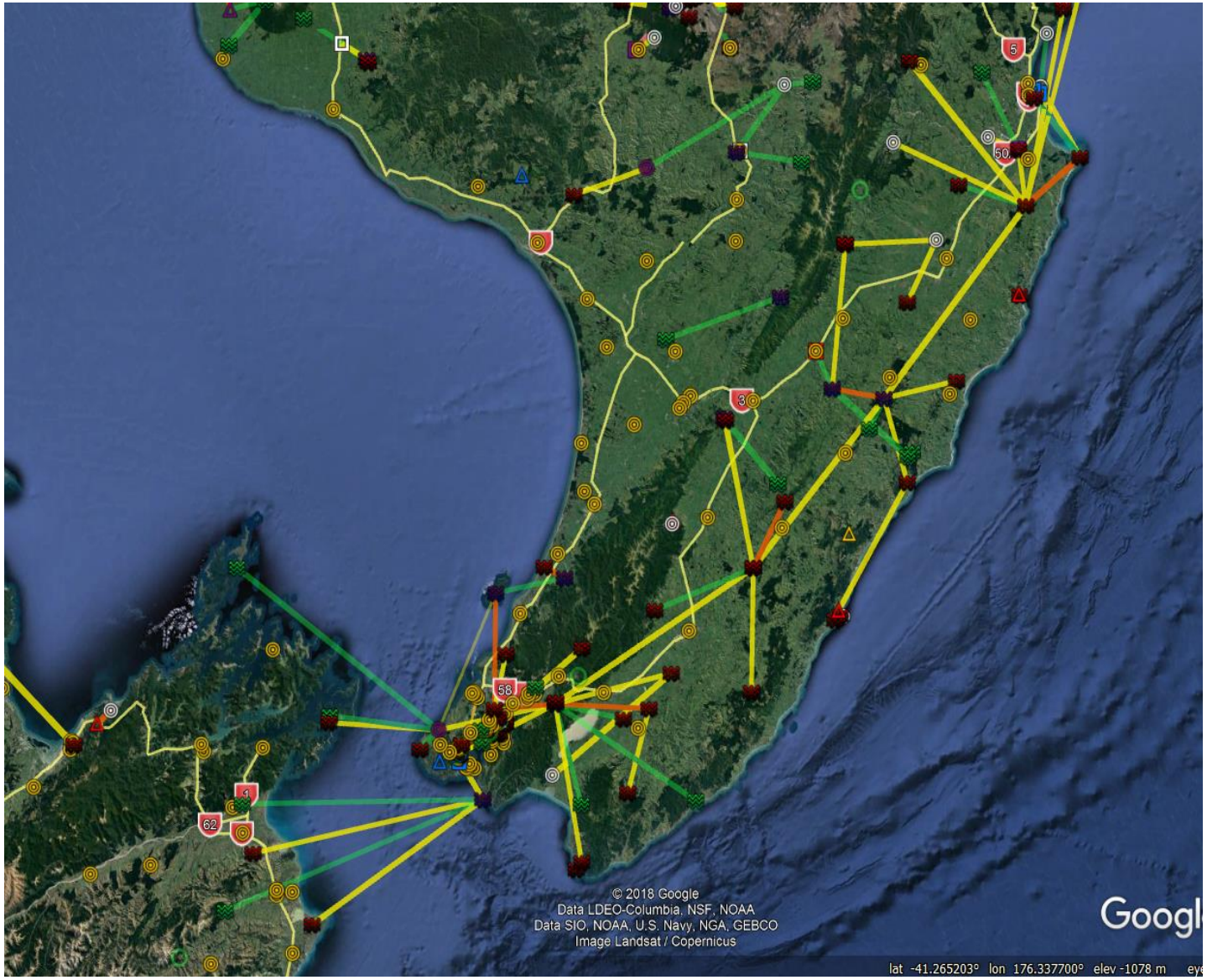
GeoNet and Technology - Currently Producing, Analysing and Making Available:

- Data from 52 broadband and 126 regional seismograph stations
- Data from 180 GPS receivers
- Data from >250 strong ground motion stations and 20 strong motion building and borehole arrays
- Data from 18 tsunami (sea level) gauges
- A number of medium to low data-rate data streams (chemistry, landslide monitoring)
- A total of ~10 Gigabytes of data a day
- Total archive currently 50+ Terabytes
- ALL DATA freely available

GeoNet network “technologies” in numbers

• Sites	720
• Devices	~ 2 400
• MikroTik Routers	276
• MikroTik Radios / Radios	398/532
• Cellular Modems	369
• DSL Modems	28
• VSAT Modems	59
• BGAN Modems	3
• Scientific Equipment	~1 100





Lower North Island Comms Network

GeoNet Installations

Pukeatua Road

Raoul Island Boat Cove

GeoNet Installations

Battery Hill

Kahuranaki

GeoNet Installations

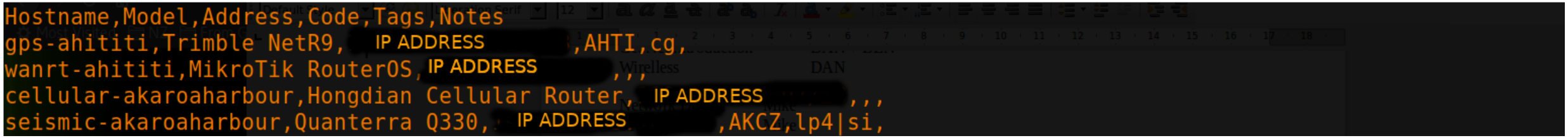
Castlepoint Hub

Victoria University Cotton

IP managenet

- (D)VCS – GitHub

- IaC
- Tests
- Pull Requests (Review)
- Design
- Processing
- Generating kml, Vodafone radius, etc.
- Router auto setup (future)



Routing NZ - OSPF

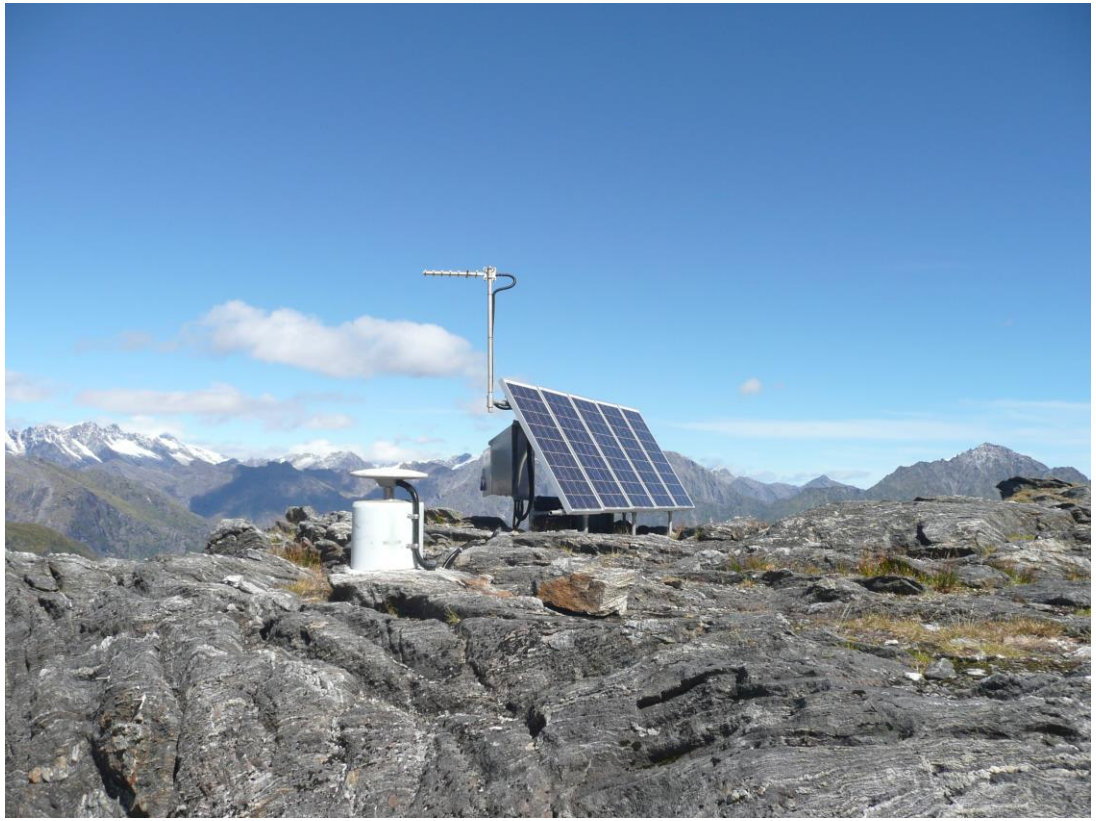
```
:for i from=0 to=10 do={
    :set State [/routing ospf neighbor get $i value-name=state];
    :put "\nNetwork state: $State";


    :if ($State = "Init" || $State = "Down") do={
        :put "Condition met";
# read some working variables
        :set Interface [/routing ospf neighbor get $i value-name=interface];
        :set Address [/routing ospf neighbor get $i value-name=address];
        :put "OSPF neighbor interface:                $Interface";
        :put "OSPF neighbor address:                  $Address";
        :set helpAdd ($Address&255.255.255.0);
        :put "OSPF neighbor addres without last octet:  $helpAdd";
# find all networks in ip addresses matching OSPF neighbor address without last octet - Intermediate Step
        :set ipNetAdd [/ip address find where (network&255.255.255.0)=$helpAdd];
        :put "Where is OSPF neightbor matching address without last octet: "
        :put $ipNetAdd;
# find the only network in ip addresses matching OSPF neighbor address and interface
        :set help1 [/ip address find where interface=$Interface && (network&255.255.255.0)=$helpAdd ];
        :put "Item matching network AND interface:       $help1";
# find ospf network to be resetet
        :set Network [/ip address get $help1 value-name=network];
        :put "Which OSPF network should be reseted:      $Network";
# find ospf network item to disable + enable
        :set help0 [/routing ospf network find where network~"$Network/*"];
        :put "Item nubmer of OSPF network to be reseted: $help0";

        /routing ospf network set $help0 disabled=yes;
        :put "Network has been disabled";
        /routing ospf network print;
        [/routing ospf network set $help0 disabled=no];
        :put "Network has been ENABLED";
        :log info "OSPF network $Network has been RESTARTED";
        /routing ospf network print;
    } else={
        :put "Condition NOT met";
      }
}
```

GeoNet Challenges - Weather

From This…



…To This!

GeoNet Challenges - Weather

From This…

…To This!

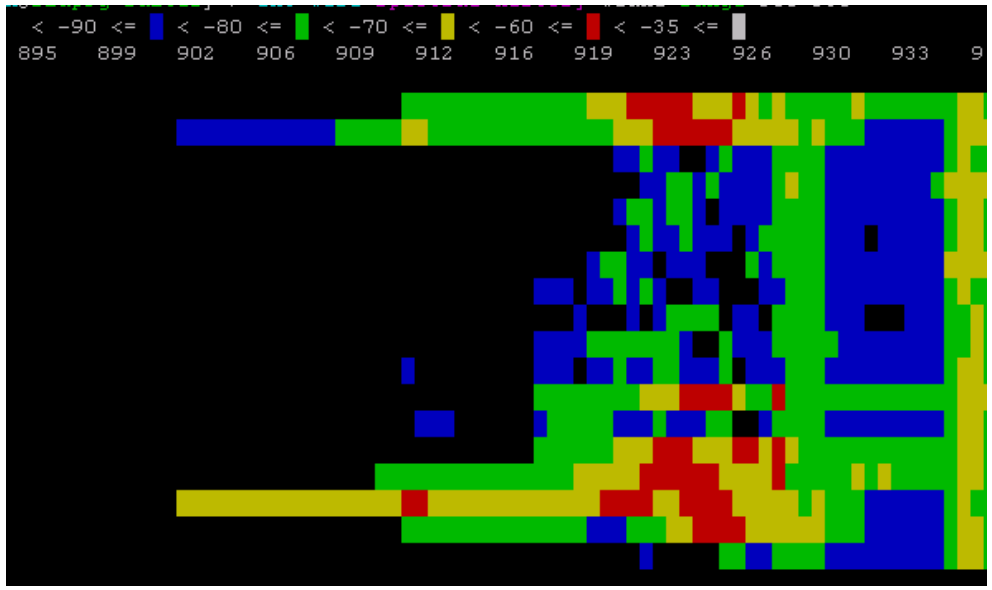
GeoNet Challenges - Critters

Kea…

GeoNet Challenges - Undesirables

GeoNet Challenges – 900MHz Band

NOISE!



- 900MHz Band being used more
- Spill over from Cell Sites
- Filters only do so much!
- MikroTik Stopped making the Metal9…