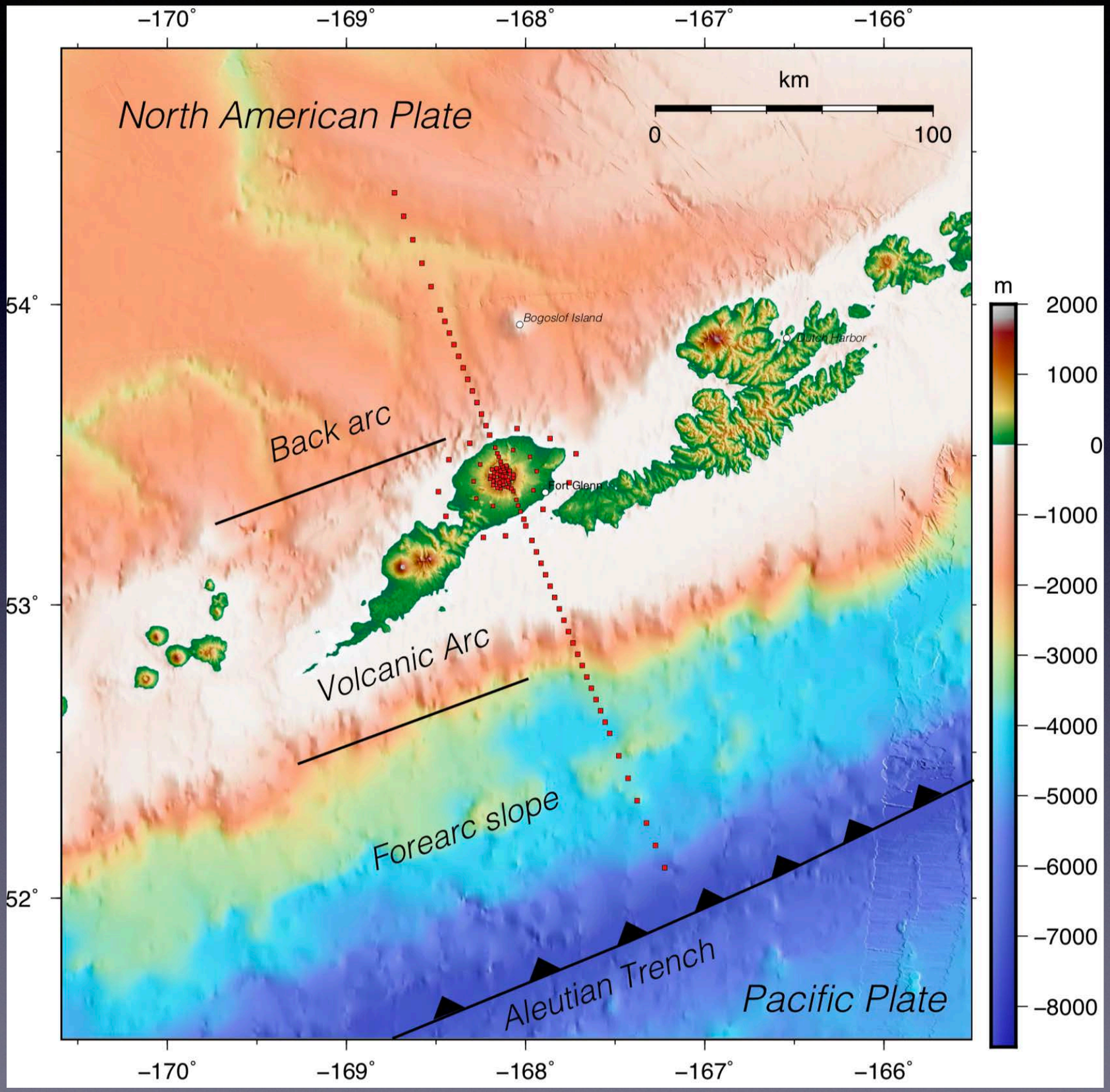
# Updates from the magnetotelluric and seismic investigation of Okmok Volcano





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Objectives:

- Onshore magnetotelluric (MT) and temporary seismic array to map melt storage beneath the volcano
- Offshore MT survey to constrain arc melt generation and delivery to crust

NSF

GeoPRISMS Geodynamic Processes at Rifting and Subducting Margins

# Outreach website:  http://okmok.ucsd.edu

Photos, videos and tales from the offshore and onshore field work

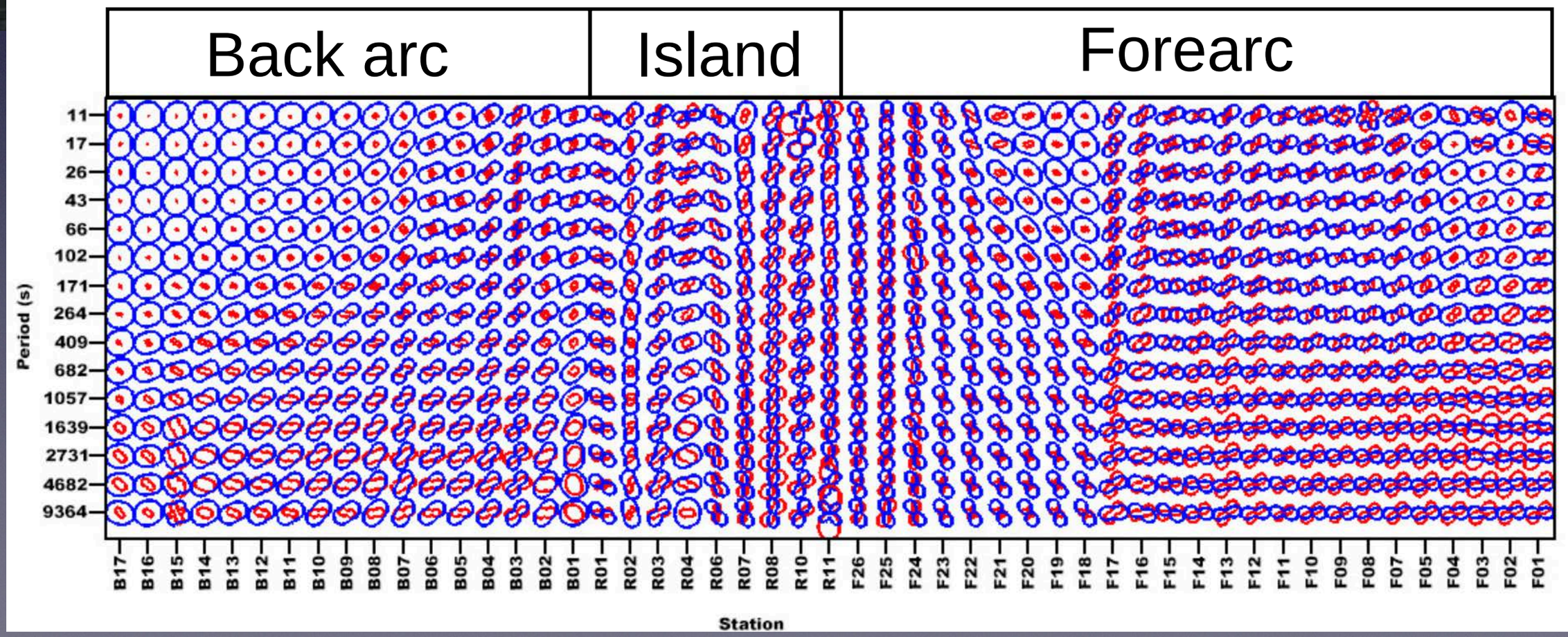

# Offshore Magnetotelluric Array

Deployment cruise (June 2015)

- 4 days on the RV Thompson
- 54 ocean bottom MT/EM receivers deployed

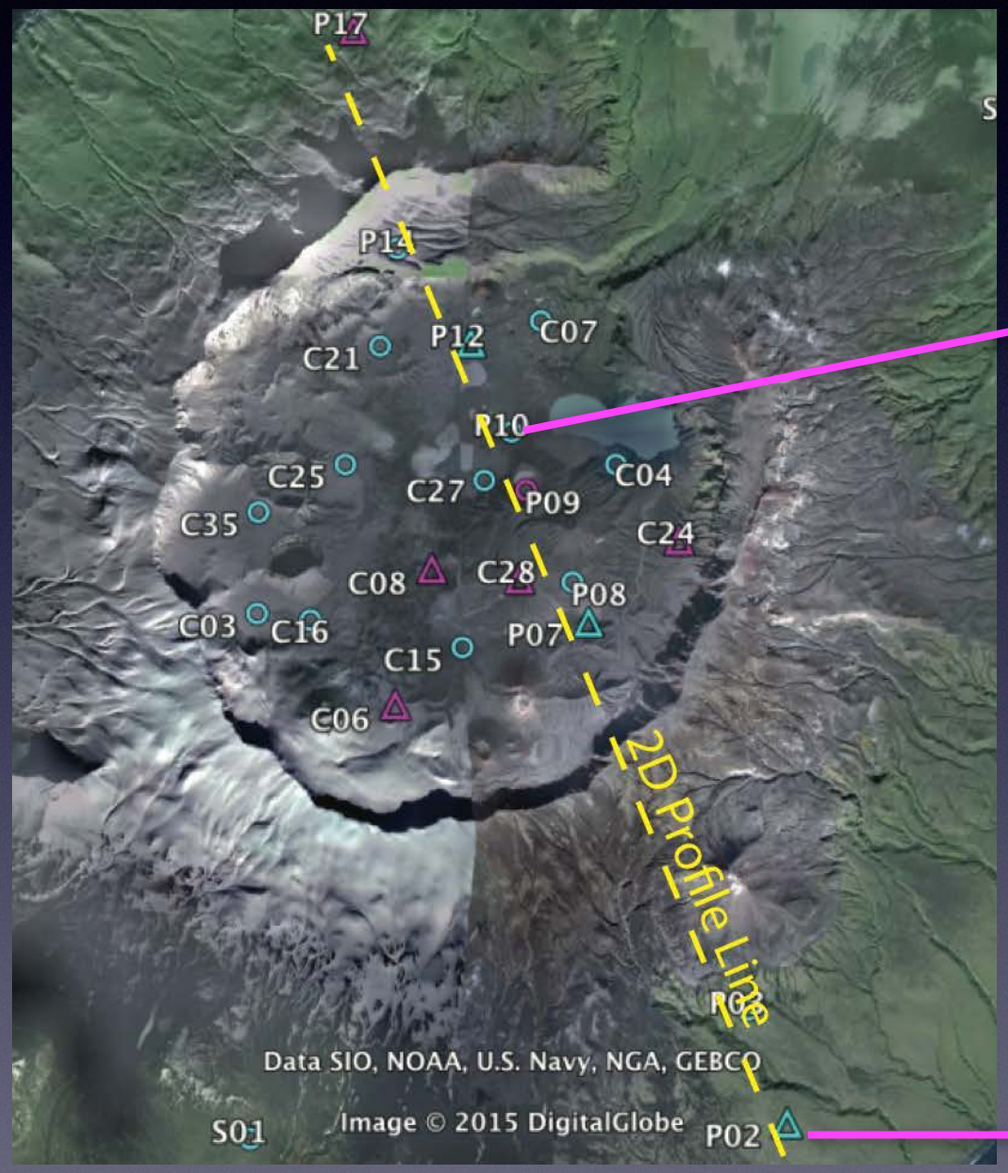
Recovery cruise (July 2015):

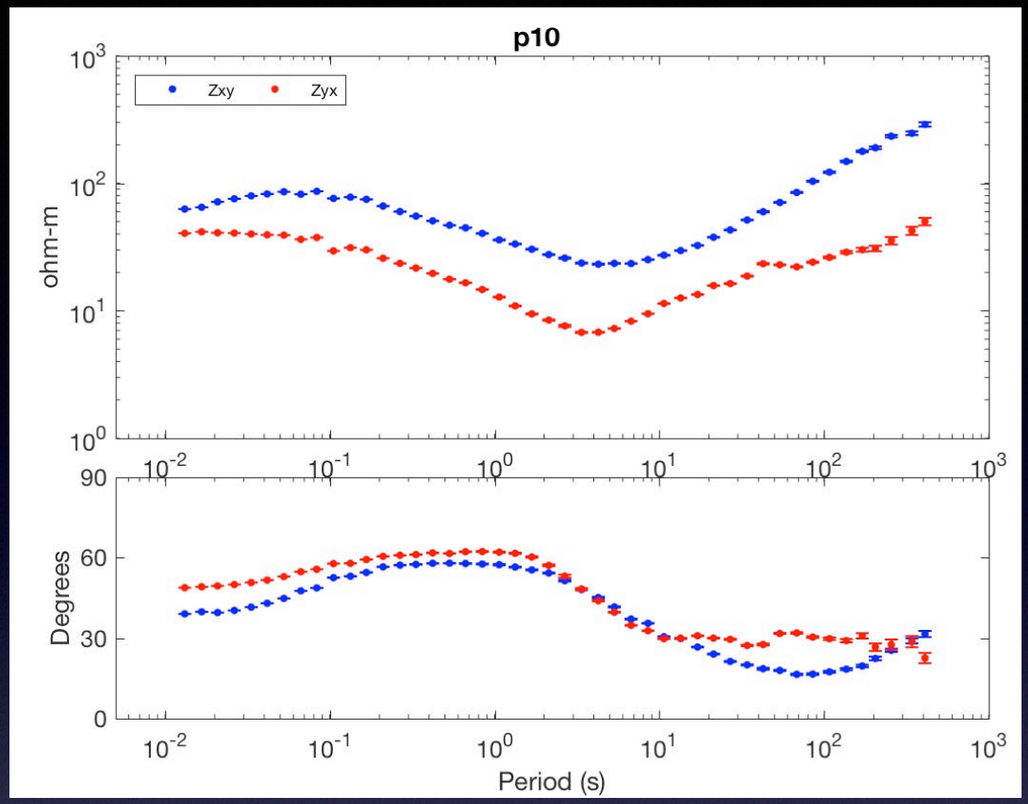
- 6 days on the RV Sikuliaq
- 53 receivers recovered

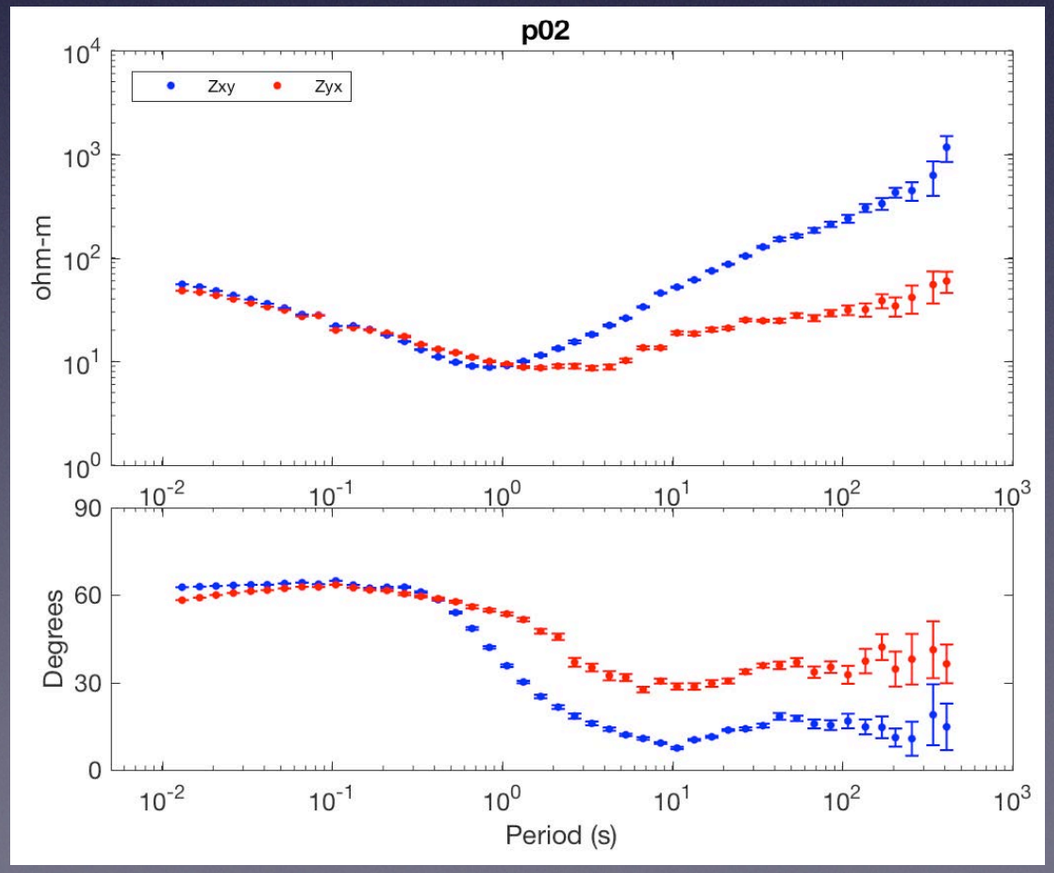


# Example Onshore MT Responses

- 32 stations inside and surrounding Okmok caldera
- Onshore survey between cruises in June 22 - July 7



# Onshore Seismic Deployment (2015-2016)

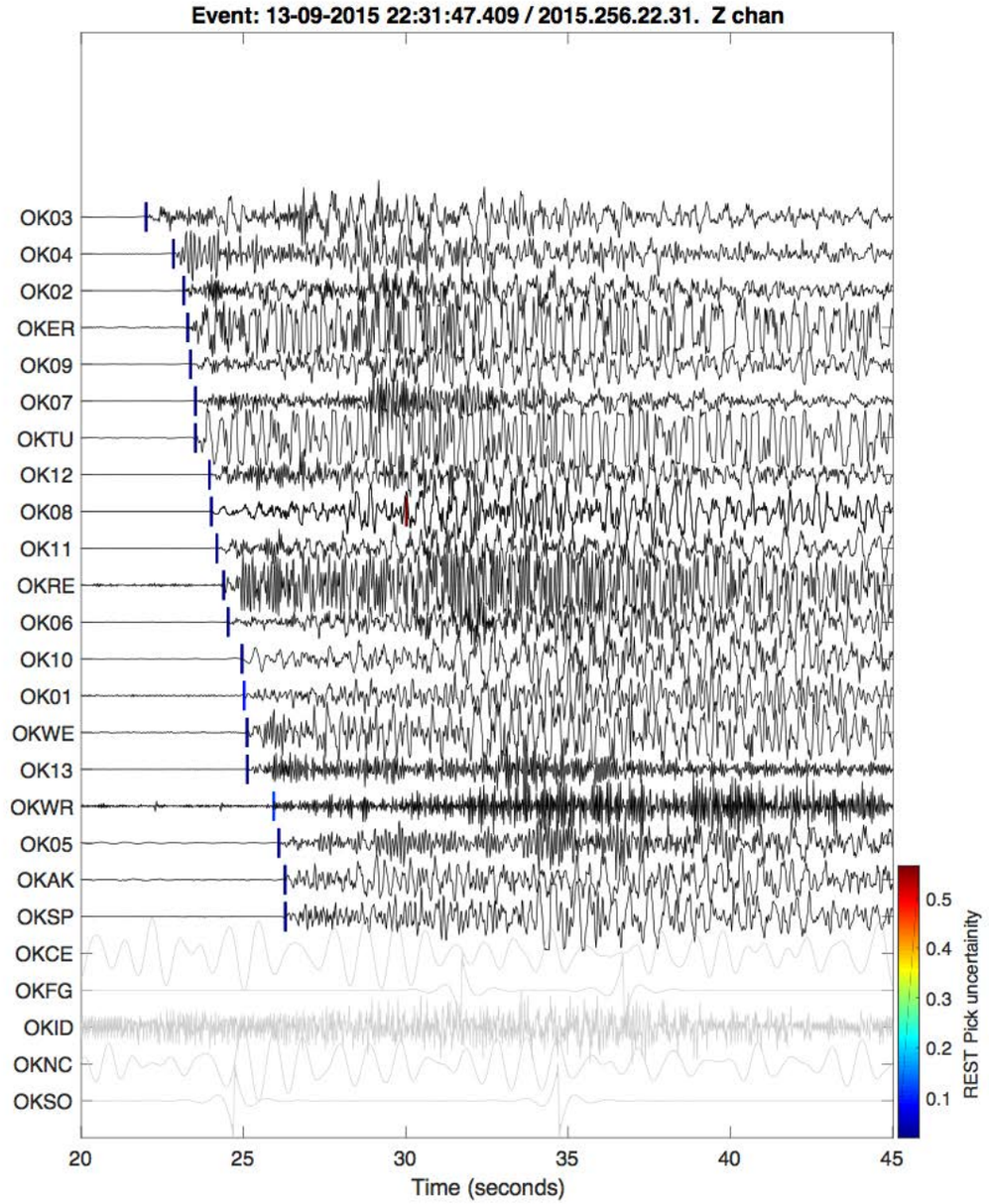
# REST Auto-Picker Results

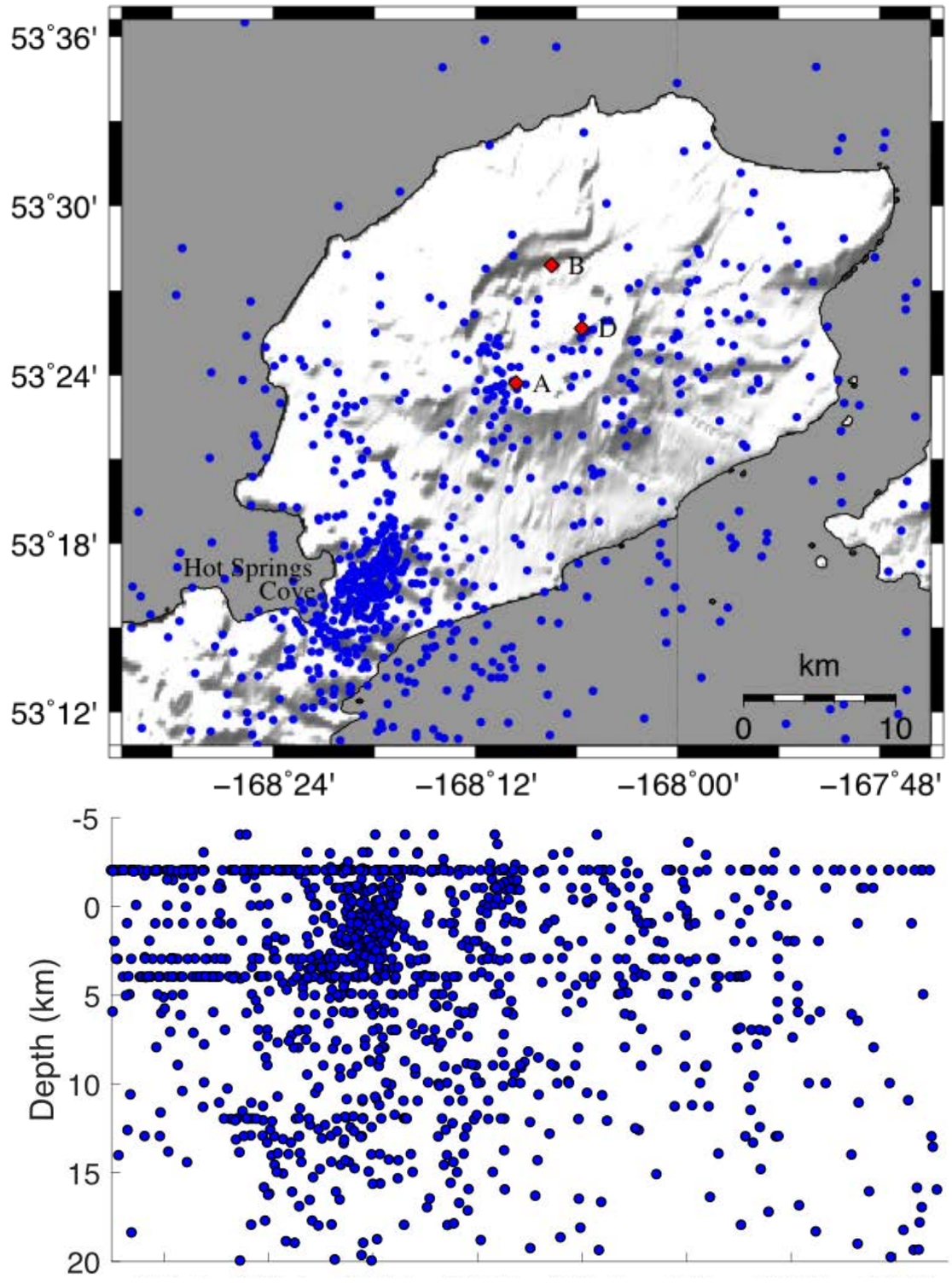
Initial P- and S-wave detections:

- 35,040 P arrivals
- 3,439 S arrivals

Total events: 1,047

- 81% events < M3
- 24% events < M2

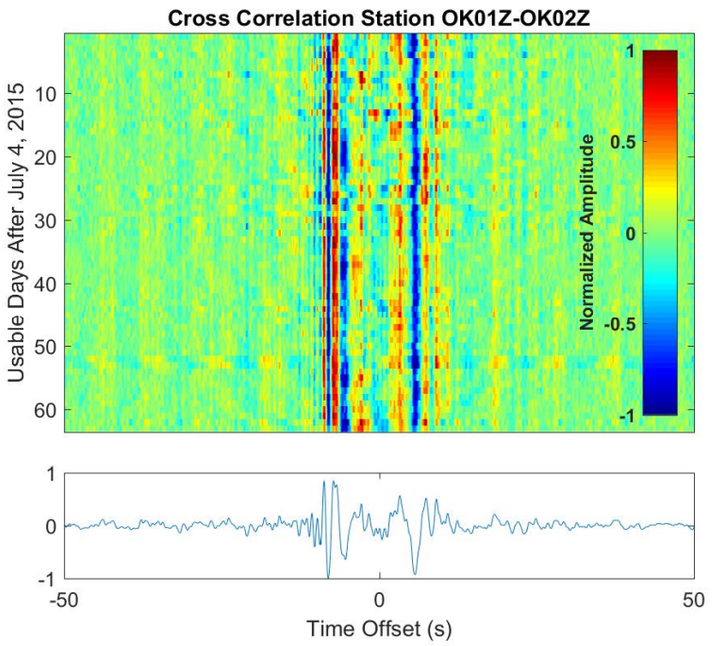



* Results suggest a 68% increase in the total number of events detected at Okmok relative to the earthquake catalog used in the most recent seismic tomography study of the area.

# Ambient Noise Tomography – Okmok Volcano

## Cross-Correlation



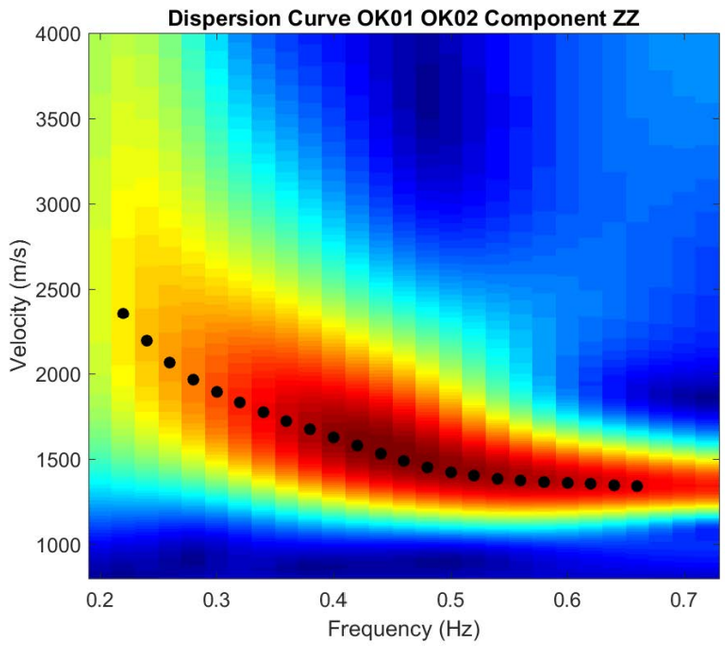

Seismometers:

- 16 broadband
- 9 short period

844 potential Rayleigh wave correlations, 405 possible days available to stack

Stacking selection using the RMS method – remove a day if the SNR is improved

## Rayleigh Wave Group Dispersion

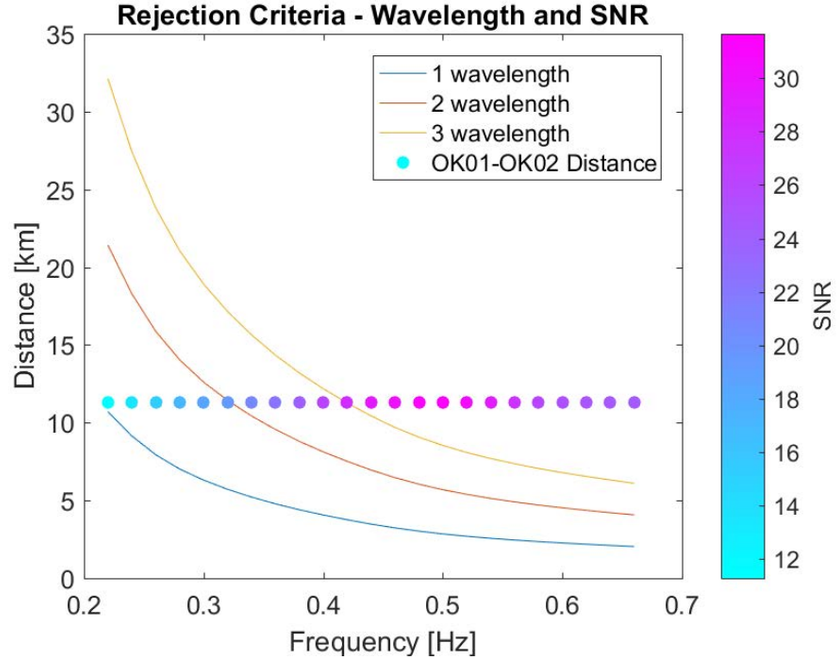



Frequency band of interest – 0.2-0.7 Hz

Imposed smoothness constraints on velocity picks

Frequencies moved from Gaussian center frequency to instantaneous frequency

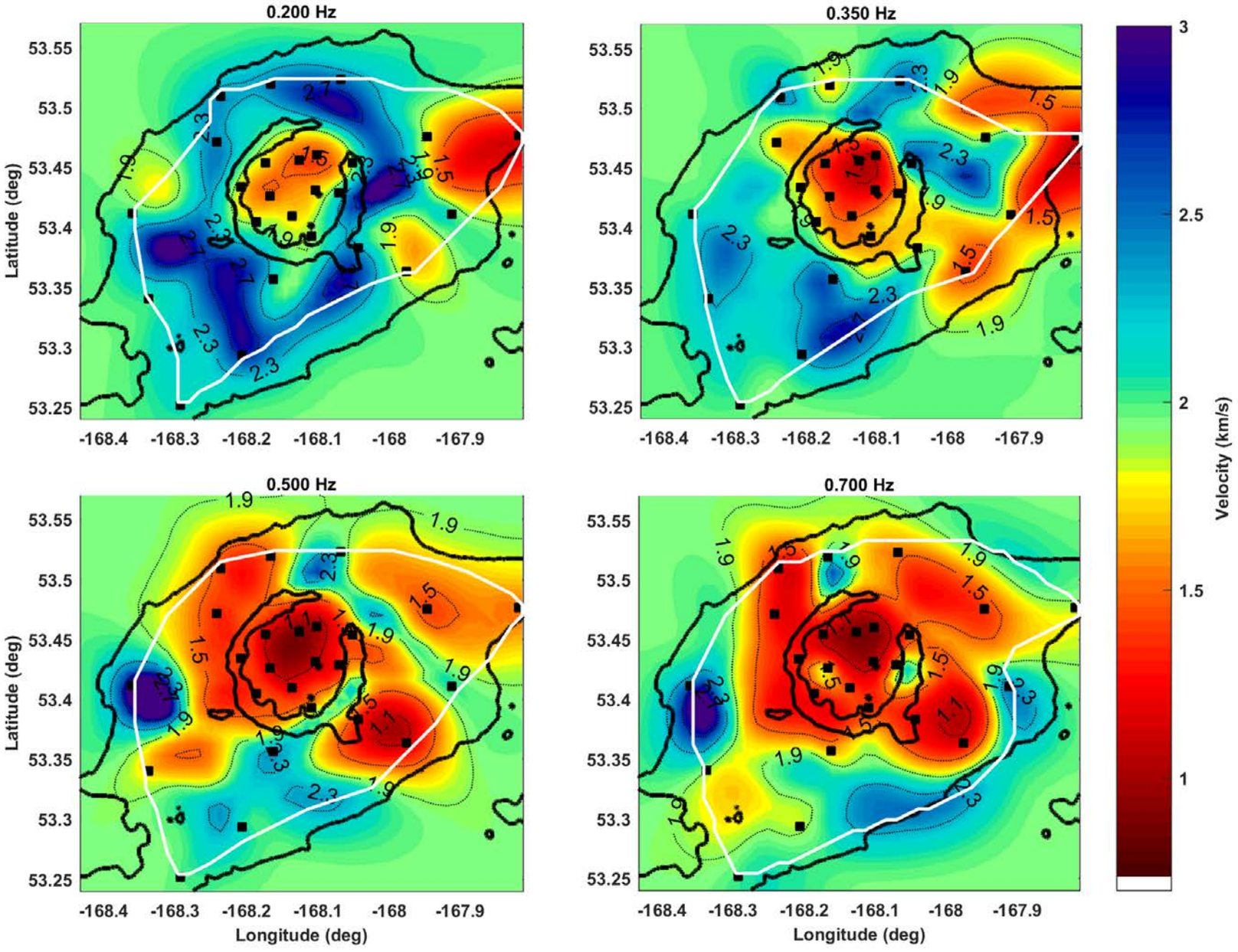
## Quality Control




Velocity picks rejected for:

- low SNR (e.g. SNR < 5)
- Station spacing not satisfying far-field criteria (Distance less than 1 to 2 wavelengths)

# Group Velocity Maps




2-D tomography performed at each 0.02 Hz intervals between 0.2 and 0.7 Hz

Low velocity zone present inside the caldera rim at all frequencies

Pervasive low velocities at high frequencies likely indicative of those waves sampling more of the weathered surface layer

Figure: Heavy black lines show Okmok coast and caldera rim, white lines indicate zone of ray path coverage, dotted black lines show velocity contours