

# Identification of surface waves generated in a sedimentary basin in Japan



Kristel Meza-Fajardo<sup>1</sup>, Hideo Aochi<sup>1</sup> & Apostolos Papageorgiou<sup>2</sup>

<sup>1</sup>Bureau de Recherches Géologiques et Minières. [k.mezafajardo@brgm.fr](mailto:k.mezafajardo@brgm.fr), [h.aochi@brgm.fr](mailto:h.aochi@brgm.fr)

<sup>2</sup>University of Patras. [papaga@upatras.gr](mailto:papaga@upatras.gr)



## Overview

In this work we investigate the generation of surface waves in the basin of Nagoya (Nobi plain) in Japan, from seismograms of the K-net network, including recordings of the Mw 9.0 2011 Tohoku earthquake. The basin characteristics are retrieved from the 3D national deep structure model of the National Research Institute for Earth Science and Disaster Resilience (NIED).

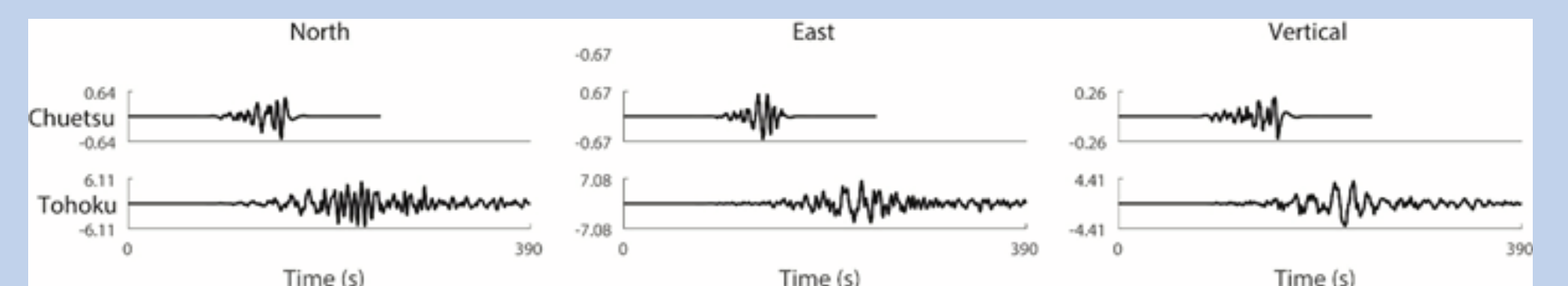
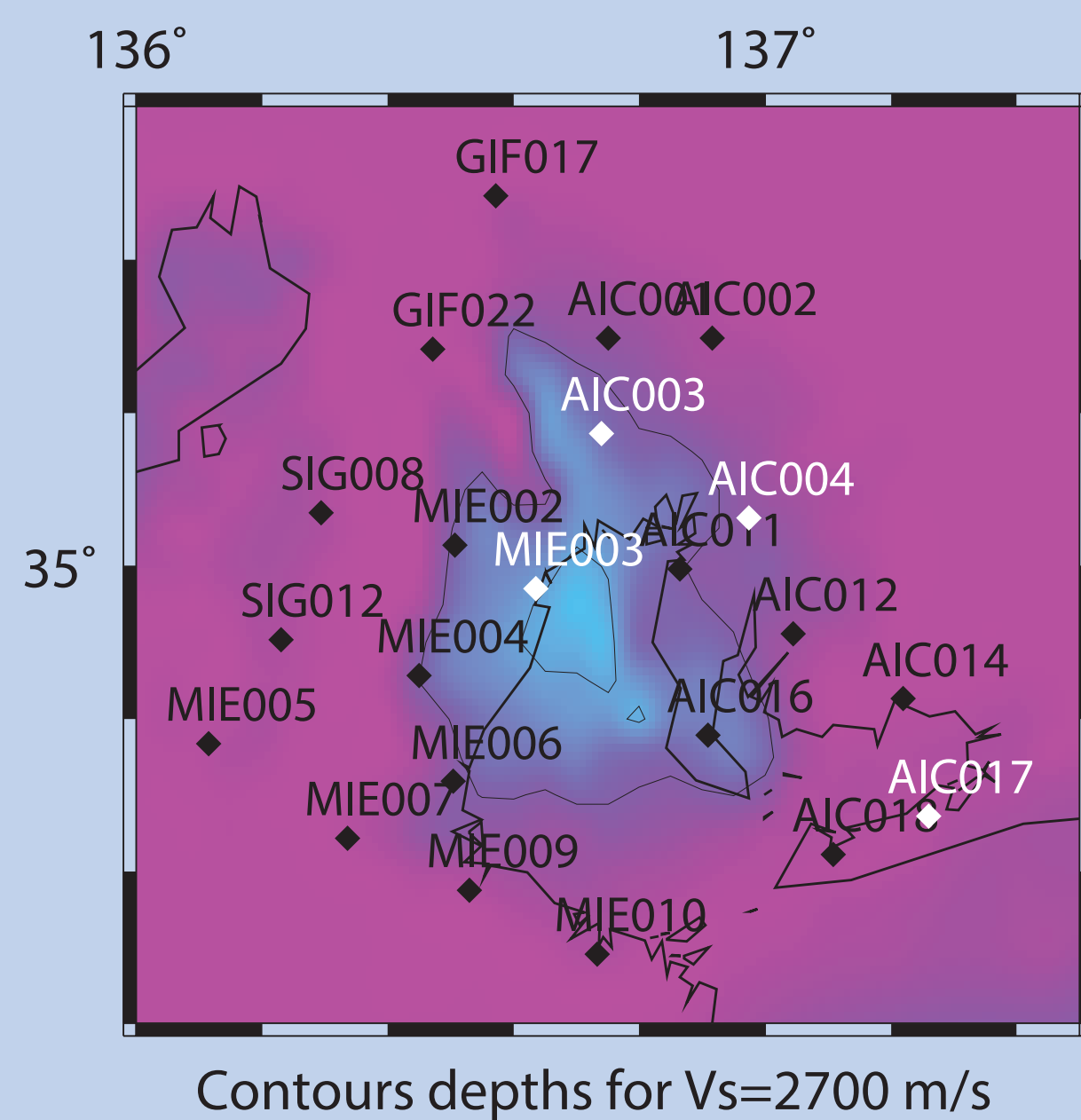
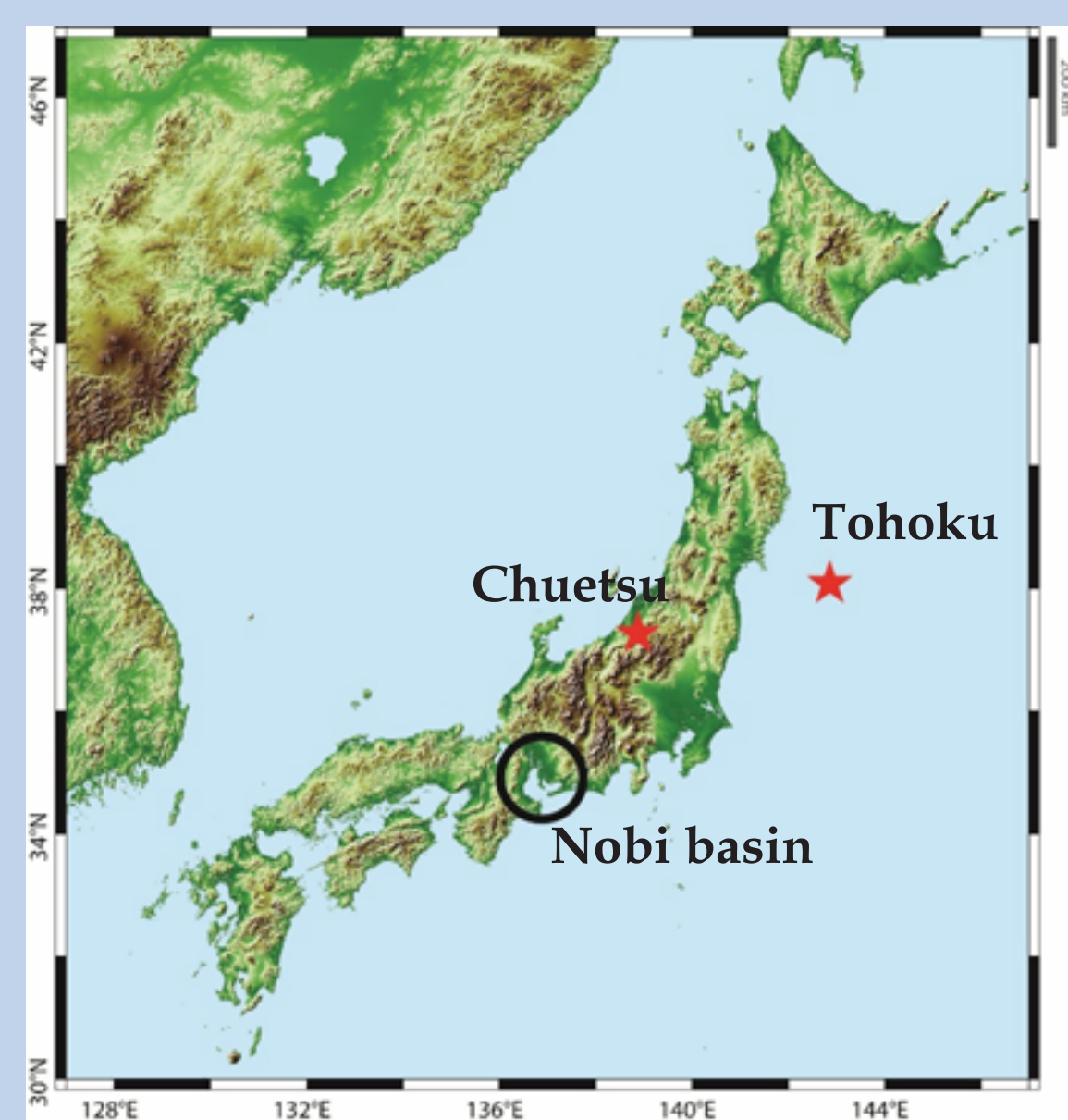
The Nagoya basin (also called Nobi plain) in Japan is a sediment filled valley with a complex structure and a superficial area of about 1300 square kilometers. The city of Nagoya, being the fourth-most-populous urban area in Japan with more than 2 million people, is located on the basin.

## Data

The Nobi plain, located in the central part of Japan is a deep, complex plain composed of Alluvial, Pleistocene and Tertiary strata. We analyze the Chuetsu and Tohoku earthquakes, two events with different magnitudes and focal mechanisms.

Table 1. Earthquake informations are based on the catalogue of Japan Meteorological Agency. Time is local time (JST).

Name	Event time	Magnitude $M_{JMA}$	Latitude	Longitude	Depth (Km)	Note
Chuetsu	2004/10/23 17:56:00	6.8	37.291	138.867	13	Crustal reverse faulting
Tohoku	2011/03/11 14:46:00	9.0	38.103	142.86	24	subduction



Displacement waveforms at station MIE003

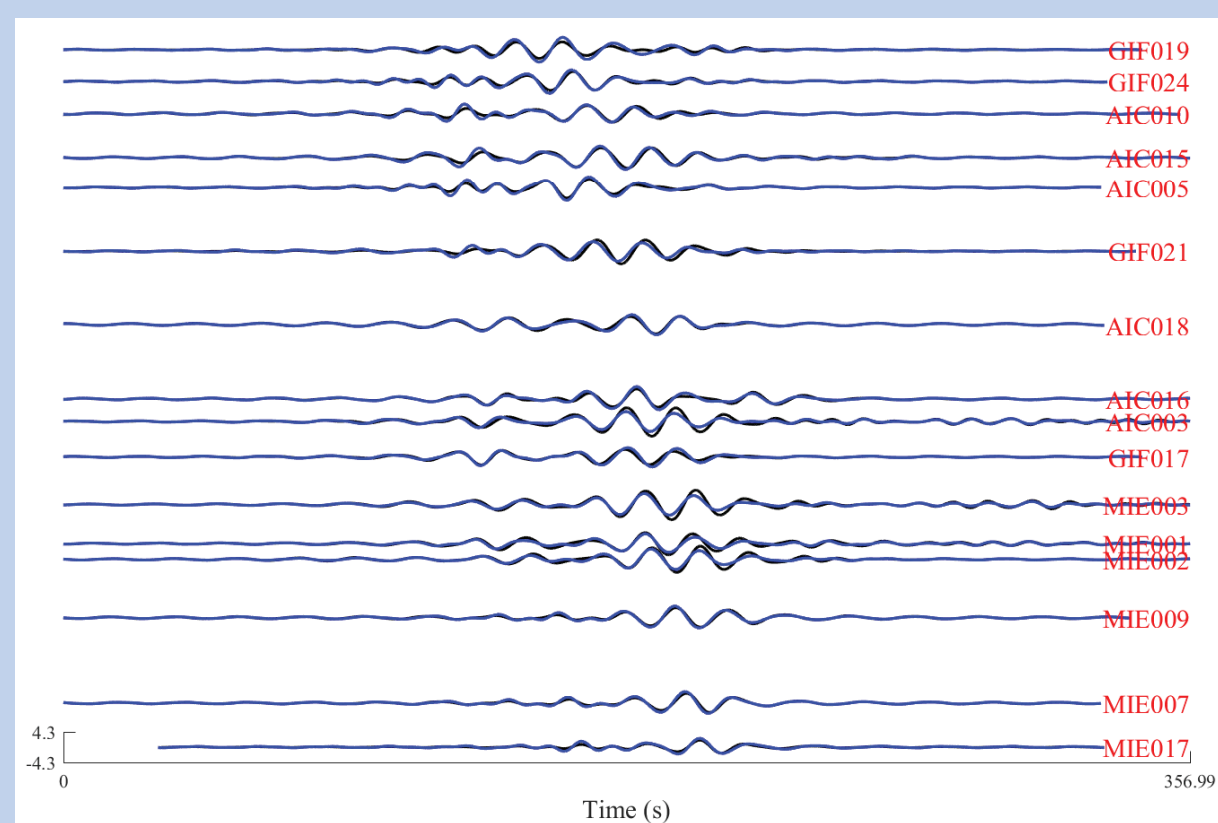
The displacement waveforms are derived from the recorded acceleration histories, by band-pass filtering between 0.05 and 20 Hz, and then integrating in time twice. Different amplitude, frequency content and duration of the time histories registered during the two events can be observed.

## Surface wave analysis

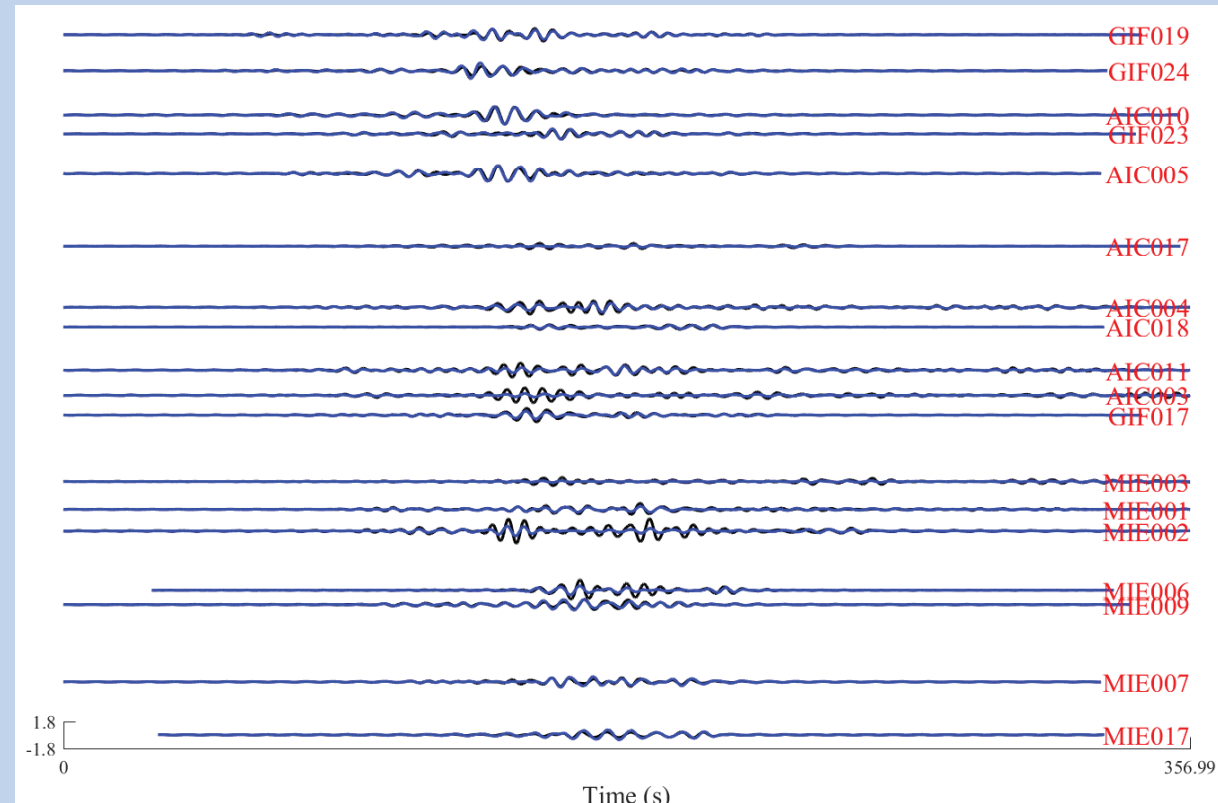
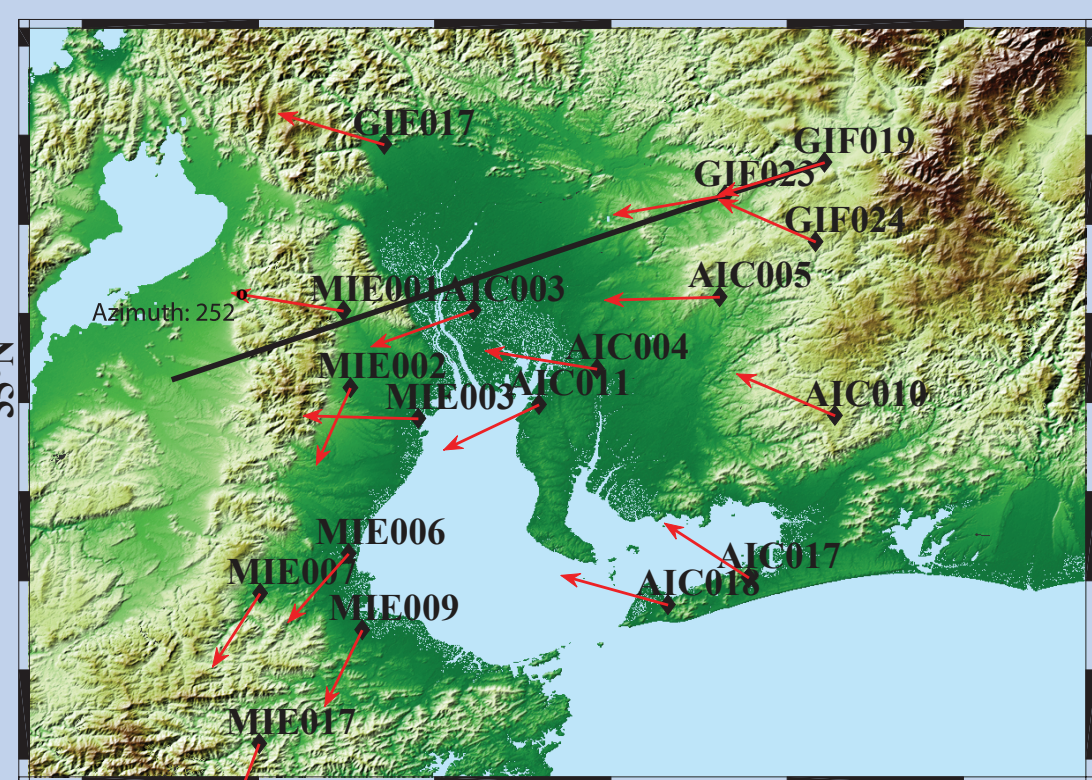
Rayleigh waves are extracted from seismograms using time-frequency polarisation analysis:

### Tohoku earthquake

Frequency band: 0.05-0.12 Hz

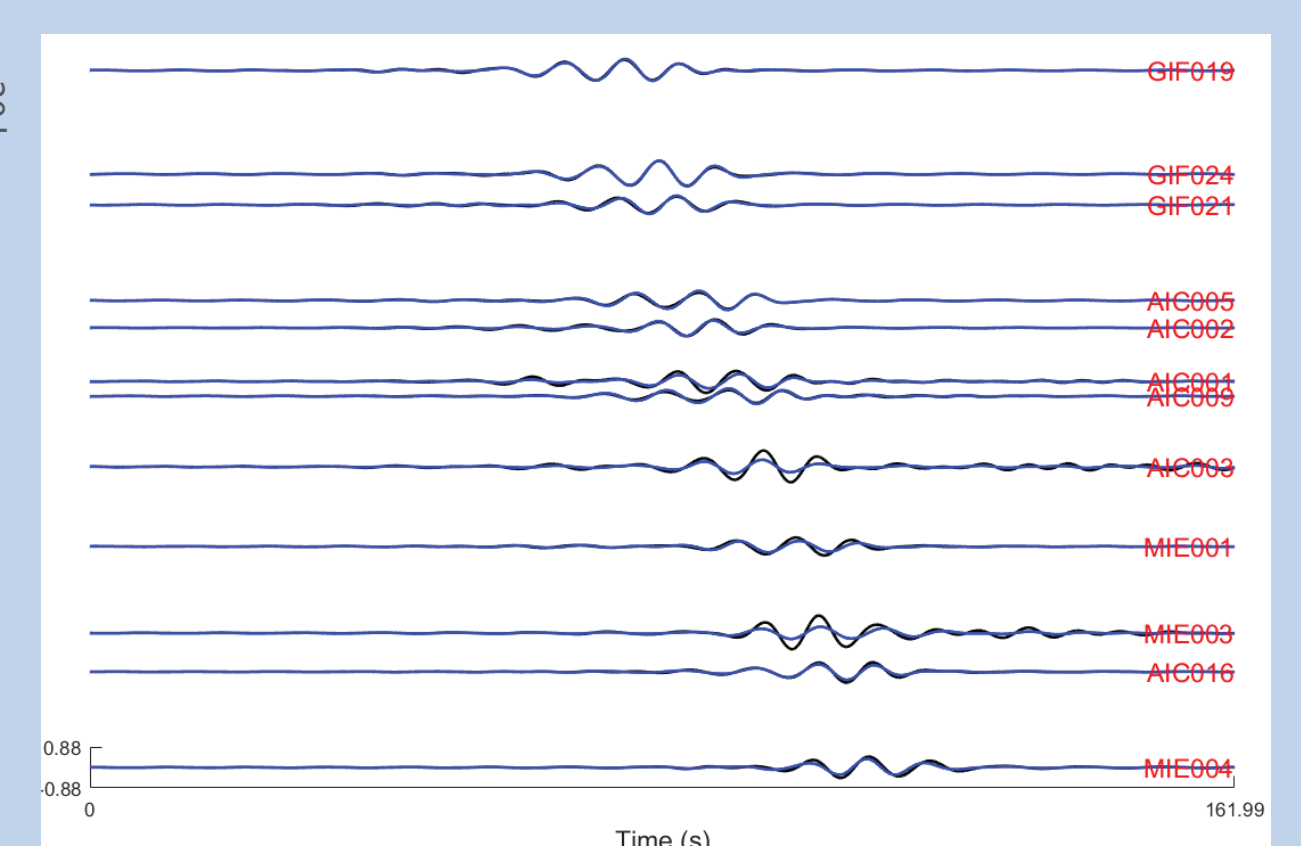
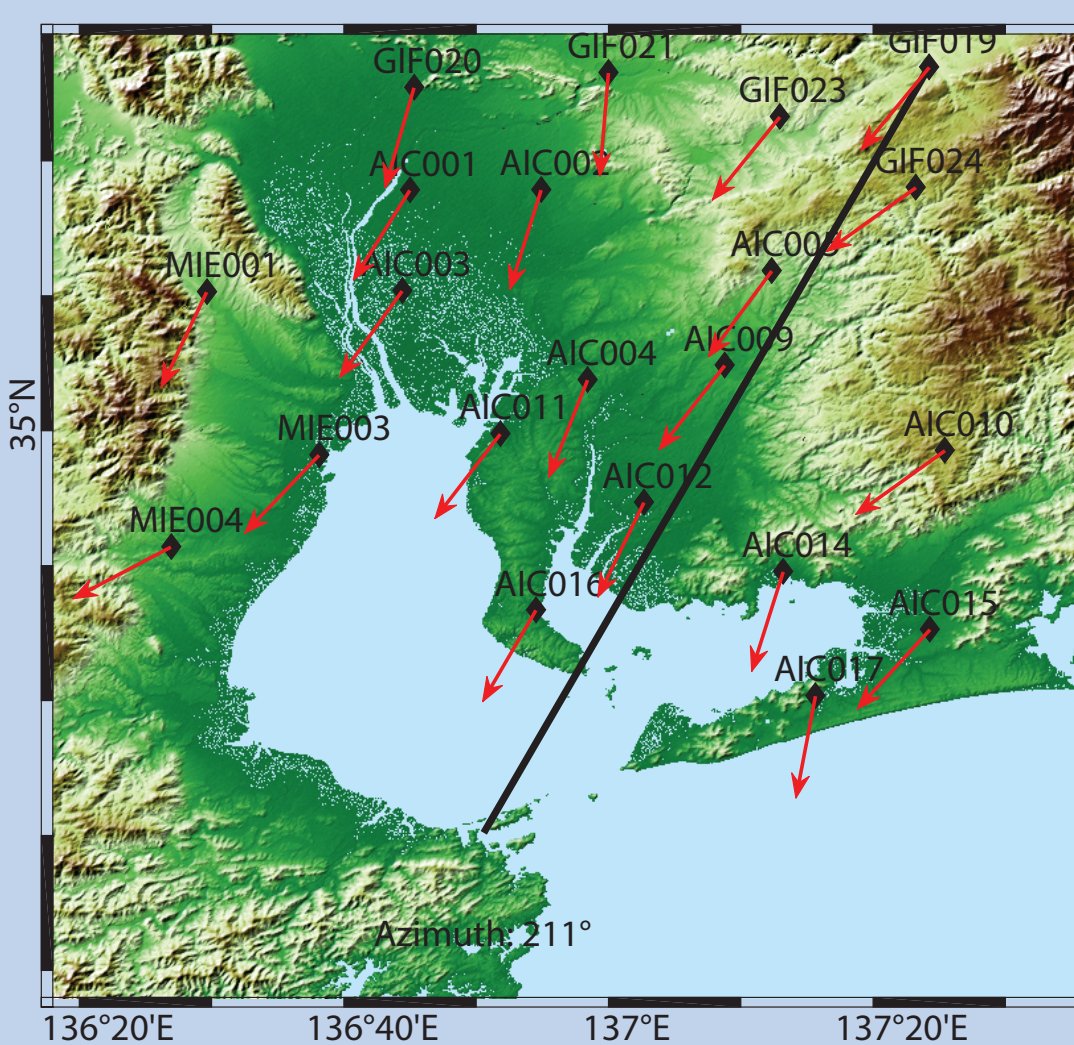


Frequency band: 0.12-0.25 Hz



### Chuetsu earthquake

Frequency band: 0.12-0.25 Hz



## Acknowledgements

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## Discussion

-Very low frequency (<0.12 Hz) surface waves were generated outside the basin during Tohoku earthquake. They appear to not interact with the basin.

-Important amplification and elongation of Rayleigh waves are observed at higher frequencies (0.12-0.25 Hz) during Tohoku earthquake. They change direction as they travel through the basin.

-During Chuetsu earthquake Rayleigh waves were also generated outside the basin but at higher frequencies (~0.12 Hz). They are only slightly amplified at the deeper stations on the basin.