

# River discharge estimation of mountainous river basins using NIED Hi-net data

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## Point

- Interdisciplinary research between hydrology and seismology.
- Establishment of a method to estimate the flow rate using seismic noise data.
- Discharge data development during disaster events.

## Overview 概要

Understanding the flow rate of rivers during extreme events is essential for preventing flood disasters around river basins. However, several mountainous river basins in Japan do not have a consistent hydrological record due to their complex environment and remoteness, as discharge measurements are not economically feasible. On the other hand, there are a number of available seismic stations in these mountainous regions. They can detect seismic noise excited by the nearby river flow and it is understood that the noise power has a high correlation with discharge.

The National Research Institute for Earth Science and Disaster Resilience (NIED) deployed a dense and high-sensitivity seismograph network (Hi-net) that covers several ungauged mountainous river basins in Japan with the station-to-station distance interval of about 20 km (Fig). Discharge observations near existing Hi-net stations are rarely available. In this research, an attempt has been made to establish a method for predicting flow rates using seismic noise data distributed in mountainous river basins in Japan. As a case study, the Mogami River Basin in Northeastern Japan was selected as a target area to compare the seismic noise data of two Hi-net stations with the hydrological response of a nearby river. The results indicated that seismic noise data in the frequency range of 1–2 Hz exhibited a similar trend to the simulated discharge values (P.C. and Sawazaki, 2021).

This is an interdisciplinary research between hydrology and seismology. Hence, further research will be carried out in close collaboration with Dr. Kaoru Sawazaki of NIED.

## Prospects 今後の展望・方向性

The proposed idea is promising for river discharge prediction in basins far from hydrological stations. According to this case study, seismic data can be used to estimate river discharge time-series data, particularly the size and timing of peak discharge. Such monitoring is crucial for flood disaster prevention and management during heavy rain events.

The performance of the discharge prediction may differ on a case-by-case basis. Hydrological simulations of several river basins using past years data and validation process will be continued. Then, comparative analysis will be performed between those simulated discharge data of rivers and seismic noise data from nearby stations to establish the steady relationship for rivers of Japan.

## 研究の領域

予防	応急対応	復旧・復興
● 予測・情報力		
防災基礎力		

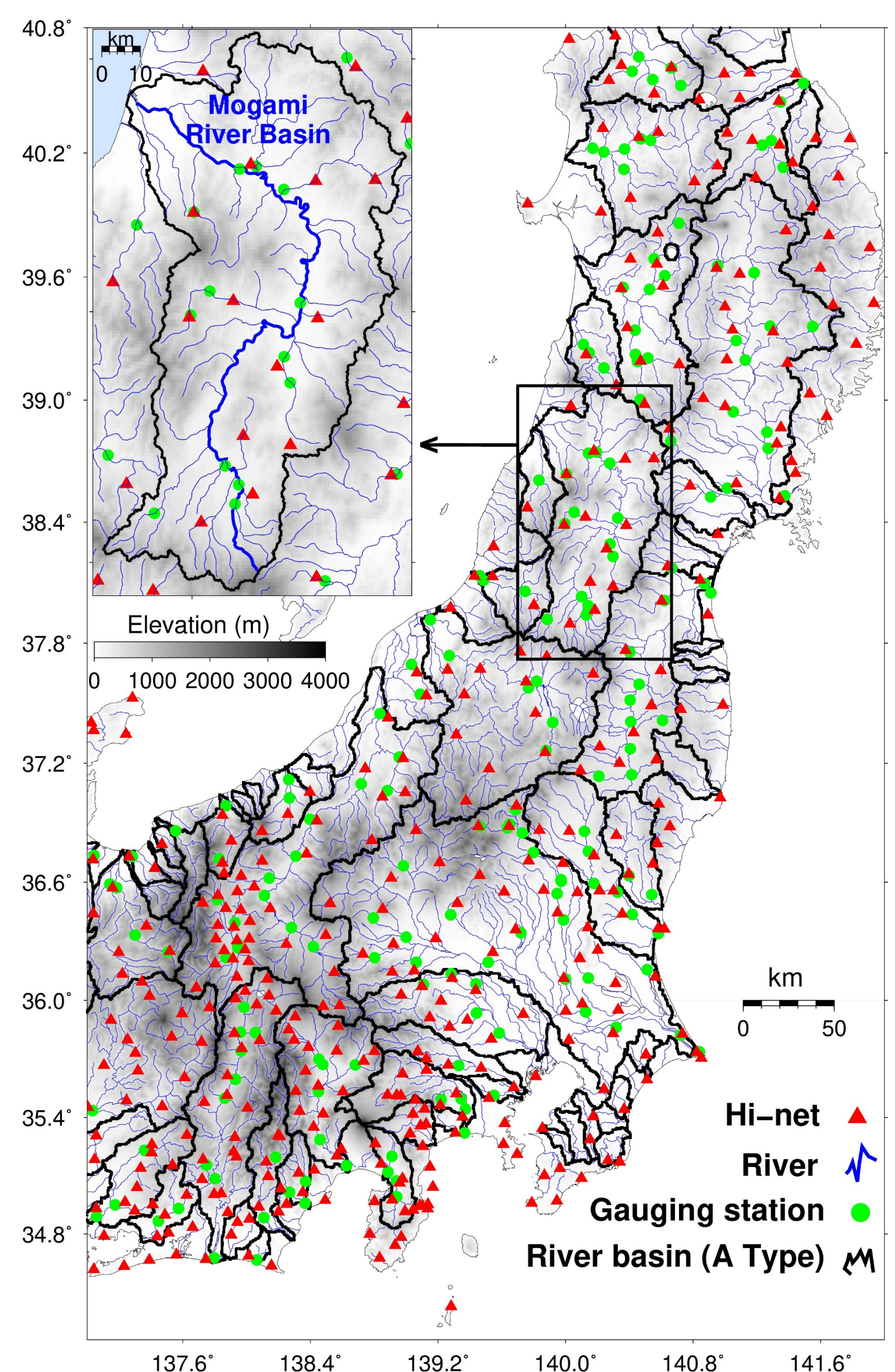


Fig. Hi-net and gauging station networks over river basins in Japan.

