SnT 2025 8 SEPTEMBER ONLINE DAY 9 TO 12 SEPTEMBER AT HOFBURG PALACE, VIENNA & ONLINE
CTBT: SCIENCE AND TECHNOLOGY CONFERENCE

Seismoacoustic Analysis of 13 January 2025, Japan Earthquake

Madu Uchenna Onwuhaka[1]; Bisallah Awwal[1]; Anyaegbu Chad Chinaemelu[1]; Oberafo Eromosele[1]

[1]Nigeria Atomic Energy Commission, Abuja, Nigeria. Corresponding author: uchechi231@gmail.com

INTRODUCTION AND MAIN RESULTS

A 6.6 magnitude earthquake occurred in the Hyuganada Sea off the coast of Kyushu, Japan on 13 January 2025. A 1 m high tsunami was associated with the event triggering the issuance of tsunami advisory by the Japanese government. The underwater eruptions of the Hyuganada Sea generate air waves and pressure waves that were used to study how the application of International Monitoring System (IMS) network data would assist in disaster mitigation. Analysis of the event was done using DTK-GPMCC. The parameters studied and analysed were phase, frequency, spectrum, magnitude, azimuth and slowness. These parameters were observed to be consistent with theoretic values. The results obtained from the seismic, infrasound and hydroacoustic stations were correlated to locate the event. The study concludes that the IMS network is operationally ready to contribute data towards a safer environment.

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Introduction

Kyushu lies within the Kyushu-Palau ridge. The Kyushu-Palau ridge is part of the Nankai Trough subduction zone and Philippine Sea Plate. On 13 January 2025 at 9:19 p.m an earthquake occurred in the Hyuganada Sea off the coast of Kyushu, Japan. The underwater eruptions generated air waves and pressure waves. A tsunami of about 1m high was associated with the event triggering the issuance of tsunami advisory for Miyazaki prefecture. This study examines the operational readiness of International Monitoring System network to contribute data towards a safer environment.

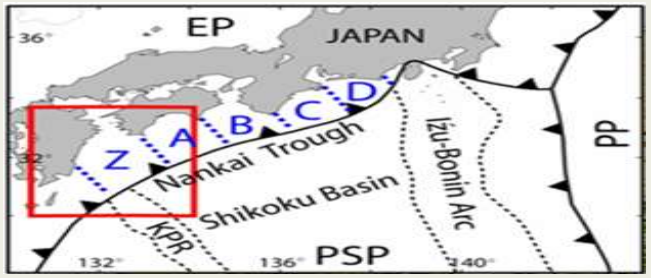

Figure 1: Kyushu-Palau ridge in the Hyuga segment (Z)
Source: J.-O. PARK *et al*. 2009

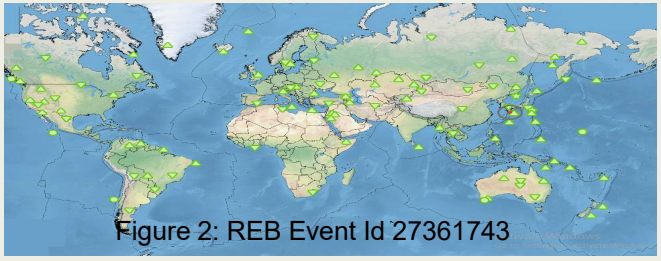

Figure 2: REB Event Id 27361743

Methods/Data

The event was reported in REB (Figure 2). Seismic, hydroacoustic and infrasound stations at local, regional and teleseismic distances from the epicentre recorded the event. The IMS data analysed were obtained from IDC using AutoDRM. Data processing was performed using DTK-GMPCC part of NDC in-a-Box software provided by the CTBTO. Data from BDF and EDH channels of the infrasound and hydroacoustic stations were analysed respectively. GPMCC was used for the analysis because of its ability to detect low-amplitude acoustic waves hidden in incoherent noise.

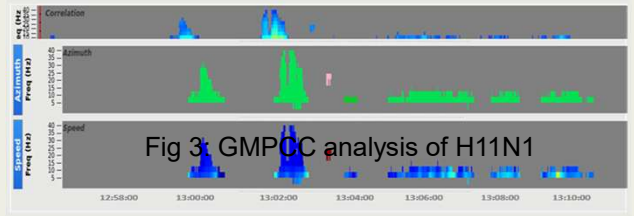

Fig 3: GMPCC analysis of H11N1

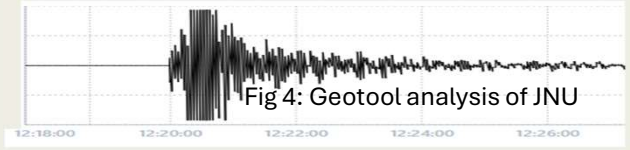

Fig 4: Geotool analysis of JNU

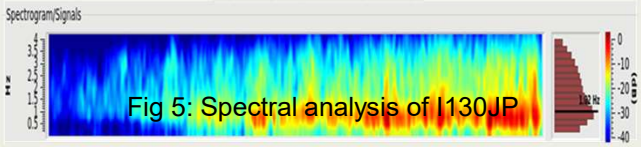

Fig 5: Spectral analysis of I130JP

Results and Discussions

The Kyushu earthquake was recorded by 87 IMS stations of the IMS at local, regional and telesiesmic distances to the epicentre of the event. This represents adequate coverage of the event by the IMS.

Analysis of the event gave S – P time result of 4.1s. A depth of 36 km was gotten for the event. Historically the stress zone in the ridge gives rise to earthquakes with magnitudes of 6 to 7 which is in the range of 6.6 obtained in the study.

Seawater is displaced in different ways when submarine volcanic eruptions occur Terry *et al*. (2022). Interplate earthquakes occurring at Kyushu is in response to subduction of the Philippine-sea plate beneath the Eurasian Plate. When in collision with an overriding plate the Kyushu-Palau ridge due to its excess mass stays buoyant resulting in large tectonic stress.

Conclusion

The thrust-type earthquake suggests a locally large tectonic stress at the contact zone between the subducted ridge and base of the overriding plate. The result of study is a clear indication that the IMS is operational ready to contribute to tsunami warning.