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REPORT ON ACTIONS CARRIED OUT BY INOCAR DURING THE MONITORING AND SURVEILLANCE OF THE KAMCHATKA EARTHQUAKE AND TSUNAMI ON JULY 29, 2025

1. Introduction

Ecuador's geodynamic location, on the convergent margin of the Nazca and South American plates, places it in one of the most active subduction zones on the planet—the Eastern Pacific. This configuration has produced high-magnitude earthquakes with the potential to generate tsunamis, such as those in 1906, 1958, 1979, and 2016. Although only the 1906 event generated a large-scale tsunami, others with minor sea-level disturbances affected docks and vessels. These precedents highlight the need for constant monitoring, as evidenced by the recent Kamchatka earthquake on July 29, 2025, at 18:24:50 local time in Ecuador (Petropavlovsk-Kamchatsky, Russia), which triggered a tsunami warning along Pacific coasts, with waves reaching Ecuadorian shores 16 hours after the event.

2. Development

The Oceanographic and Antarctic Institute of the Navy (INOCAR), as the national focal point for the Pacific Tsunami Warning System, led the real-time monitoring of the Kamchatka earthquake and all related procedures in accordance with the Technical Protocol for Tsunami Alert Evaluation and Definition V.4.0 for Ecuador's continental and insular coasts.

Below is a timeline of operational actions during this event:

EC Time, date	UTC Time, date	Action
18:25, 29 jul	23:25, 29 jul	Earthquake occurrence.
18:32, 29 jul	23:32, 29 jul	Preliminary information from PTWC: Mwp 8.2 received by email.
18:34, 29 jul	23:34, 29 jul	Activation of CNAT Ecuador. Monitoring tide status and arrival times for Ecuador's continental and insular coasts.
18:35, 29 jul	23:35, 29 jul	PTWC Bulletin No. 1 received, tsunami threat Mw 8.0: Possible tsunami.
18:39, 29 jul	23:39, 29 jul	SNAM Chile Informative Bulletin No. 1 received: Mw 8.0 earthquake under evaluation.

18:40, 29 jul	23:40, 29 jul	IGEPN (Geophysical Institute - Ecuador) report: Mw 7.8.
18:41, 29 jul	23:41, 29 jul	DIMAR Colombia Informative Bulletin No. 1: No tsunami.
18:47, 29 jul	23:47, 29 jul	CNAT Ecuador Observation Bulletin No. 1 issued: Mw 8.0 earthquake under evaluation and monitoring.
19:17, 29 jul	00:17, 30 jul	PTWC Bulletin No. 2 received, tsunami threat Mw 8.7: Updated forecast, Ecuador not included.
19:21, 29 jul	00:21, 30 jul	DIMAR Colombia Informative Bulletin No. 2 received: No tsunami.
19:25, 29 jul	00:25, 30 jul	SNAM Chile Informative Bulletin No. 2 received: Mw 8.7 earthquake under evaluation.
19:29, 29 jul	00:29, 30 jul	CNAT Ecuador Observation Bulletin No. 2 issued: Mw 8.7 earthquake under evaluation and monitoring.
20:09, 29 jul	01:09, 30 jul	PTWC Bulletin No. 3 received, tsunami threat Mw 8.7: Updated forecast, includes Ecuador with wave heights over 3 meters (insular region).
20:23, 29 jul	01:23, 30 jul	SNAM Chile Threat Bulletin No. 3 received: Mw 8.7 earthquake, tsunami threat.
20:28, 29 jul	01:28, 30 jul	SNAM Chile Threat Bulletin No. 4 received: Mw 8.7 earthquake, tsunami threat.
20:47, 29 jul	01:47, 30 jul	CNAT Ecuador Warning Bulletin No. 3 issued: Mw 8.7 earthquake, likelihood of a tsunami for the insular coast; observation maintained for the continental coast; suspension of maritime activities recommended.
20:51, 29 jul	01:51, 30 jul	TWC Bulletin No. 4 received, tsunami threat Mw 8.7: Updated forecast, includes Ecuador with wave heights over 3 meters (insular region) and arrival time at 09:20 local insular time.
21:26, 29 jul	02:26, 30 jul	SNAM Chile Threat Bulletin No. 5 received: Mw 8.7 earthquake, tsunami threat.
21:42, 29 jul	02:42, 30 jul	CNAT Ecuador Warning Bulletin No. 4 issued: Mw 8.7 earthquake, likelihood of a tsunami for the insular coast, predicted height 1.4 m; arrival time starting

		from 09:00 insular time on July 30. Observation maintained for the continental coast.
22:11, 29 jul	03:11, 30 jul	PTWC Bulletin No. 5 received, tsunami threat Mw 8.7: Updated forecast, includes Ecuador with wave heights over 3 meters (insular region) and arrival time at 09:20 local insular time; continental arrival time at 10:20 local continental time in Ecuador.
23:02, 29 jul	04:02, 30 jul	SNAM Chile Threat Bulletin No. 6 received: Mw 8.7 earthquake, tsunami threat.
23:12, 29 jul	04:12, 30 jul	DIMAR Colombia Surveillance Bulletin No. 3 received: Tsunami under evaluation.
23:39, 29 jul	04:39, 30 jul	PTWC Bulletin No. 6 received, tsunami threat Mw 8.7: Updated forecast; includes Ecuador with wave heights over 3 meters (insular region) and arrival time at 09:20 local insular time; continental arrival time at 10:20 local continental time in Ecuador. Also includes Dart buoy records.
23:40, 29 jul	04:40, 30 jul	DIMAR Colombia Surveillance Bulletin No. 4 received: Tsunami under evaluation.
00:01, 30 jul	05:01, 30 jul	SNAM Chile Threat Bulletin No. 7 received: Mw 8.7 earthquake, tsunami threat.
01:01, 30 jul	06:01, 30 jul	SNAM Chile Threat Bulletin No. 7 received: Mw 8.7 earthquake, tsunami threat.
01:25, 30 jul	06:25, 30 jul	PTWC Bulletin No. 7 received, tsunami threat Mw 8.8: Updated forecast, includes Ecuador with wave heights over 3 meters (insular region) and arrival time at 09:20 local insular time; continental arrival time at 10:20 local continental time in Ecuador. Also includes Dart buoy records.
01:43, 30 jul	06:43, 30 jul	CNAT Ecuador Alert Bulletin No. 5 issued: Mw 8.8 earthquake, tsunami danger for the insular coast, predicted height 1.5 m, arrival time starting from 09:00 insular time on July 30. For the continental coast: heights of 1.0 m, arrival time starting from 10:20 continental time on July 30.
01:50, 30 jul	06:50, 30 jul	DIMAR Colombia Alert Bulletin No. 5 received: Tsunami alert.

01.50, 30 jul	06:50, 30 jul	CNAT Ecuador monitored tsunami propagation through sea-level stations and Dart buoys. Analysis of PTWC and regional center bulletins continued, along with assessment of ComMIT model results.
10:20, 30 jul	15:20, 30 jul	First disturbances recorded on the Santa Cruz tide gauge.
10:28, 30 jul	15:28, 30 jul	First disturbances recorded on the Baltra tide gauge, with slight changes in sea behavior observed via surveillance cameras in Isabela and Santa Cruz.
11:40, 30 jul	16:40, 30 jul	From the Baltra and Santa Cruz sea-level station records, maximum heights of 1.3 m and 0.4 m, respectively, were observed.
11:42, 30 jul	16:42, 30 jul	CNAT Ecuador Alert Bulletin No. 6 issued: Mw 8.8 earthquake, tsunami danger for the insular coast; maximum height recorded by the Baltra and Santa Cruz sea-level stations was 1.3 m; warning status maintained for the continental coast of Ecuador.
12:20, 30 jul	17:20, 30 jul	First disturbances recorded on the tide gauges of Esmeraldas, La Libertad, Puerto Atún, Puerto López, and Bahía de Caráquez.
13:45, 30 jul	18:45, 30 jul	Sea-level station records analyzed, verifying heights of up to 0.5 m.
14:00, 30 jul	19:00, 30 jul	Based on sea-level station records and the low tide condition, the alert status for the entire Ecuadorian territory was lifted.

3. Forecast of Arrival Times and Wave Heights

Predicted arrival times for Ecuador's insular and continental coasts were calculated using the Tsunami Travel Time (TTT) program, as detailed in the following table:

Location	Continental local time (GMT-5)	Longitude	Latitude
* PTO.VILLAMIL	Wed 30 July 2025 09:48:00	-90.9676	-0.9647
* PTO.IBARRA	Wed 30 July 2025 09:50:00	-90.4938	-1.2771
* PTO.SEYMOUR	Wed 30 July 2025 09:51:00	-90.2841	-0.4389
* PTO.BAQUERIZO	Wed 30 July 2025 10:08:00	-89.6147	-0.8971
* PTO.AYORA	Wed 30 July 2025 10:11:00	-90.2987	-0.7537

GALERAS	Wed 30 July 2025 10:50:00	-80.0446	0.8197
MUISNE	Wed 30 July 2025 10:55:00	-80.0343	0.5996
SAN.LORENZO-MAN	Wed 30 July 2025 10:58:00	-80.9111	-1.0708
ESMERALDAS	Wed 30 July 2025 11:00:00	-79.6605	0.9952
JAMA	Wed 30 July 2025 11:05:00	-80.2986	-0.1811
ROCAFUERTE	Wed 30 July 2025 11:06:00	-79.4234	1.0773
LAS.PENIAS	Wed 30 July 2025 11:06:00	-79.1644	1.1016
MANTA	Wed 30 July 2025 11:06:00	-80.7193	-0.9254
PUERTO.LOPEZ	Wed 30 July 2025 11:07:00	-80.8164	-1.5558
SALANGO	Wed 30 July 2025 11:08:00	-80.8479	-1.5921
COJIMIES	Wed 30 July 2025 11:08:00	-80.0534	0.3629
CANOA	Wed 30 July 2025 11:11:00	-80.4638	-0.4639
CRUCITA-SAN.JACINTO	Wed 30 July 2025 11:12:00	-80.5374	-0.8123
SAME	Wed 30 July 2025 11:14:00	-79.9262	0.8519
BAHIA-SAN.VICENTE	Wed 30 July 2025 11:16:00	-80.4242	-0.5878
SALINAS	Wed 30 July 2025 11:16:00	-80.9794	-2.1947
PEDERNALES	Wed 30 July 2025 11:18:00	-80.0647	0.0783
AYAMPE	Wed 30 July 2025 11:19:00	-80.8174	-1.6811
OLMEDO-LA.TOLA	Wed 30 July 2025 11:20:00	-79.0512	1.2251
LIBERTAD	Wed 30 July 2025 11:20:00	-80.9181	-2.2118
ATACAMES-SUA	Wed 30 July 2025 11:23:00	-79.844	0.8817
MONTANITA-OLON	Wed 30 July 2025 11:23:00	-80.7671	-1.8188
ANCONCITO	Wed 30 July 2025 11:23:00	-80.8701	-2.3368
MACHALILLA	Wed 30 July 2025 11:32:00	-80.7708	-1.4688
SAN.PABLO	Wed 30 July 2025 11:32:00	-80.7812	-2.1371
PUERTO.CAYO	Wed 30 July 2025 11:35:00	-80.7491	-1.3471
AYANGUE	Wed 30 July 2025 11:37:00	-80.7595	-1.9863
MONTEVERDE	Wed 30 July 2025 11:38:00	-80.7436	-2.0509
PALMA.REAL	Wed 30 July 2025 11:46:00	-78.8757	1.4598
CHANDUY	Wed 30 July 2025 11:50:00	-80.6819	-2.4147
ENGABAO	Wed 30 July 2025 12:03:00	-80.4974	-2.5839

Wave height forecasts were based on PTWC data and TSUCAT results.

For further information, the ComMIT-MOST model was run separately for insular and continental coasts, obtaining the following results:

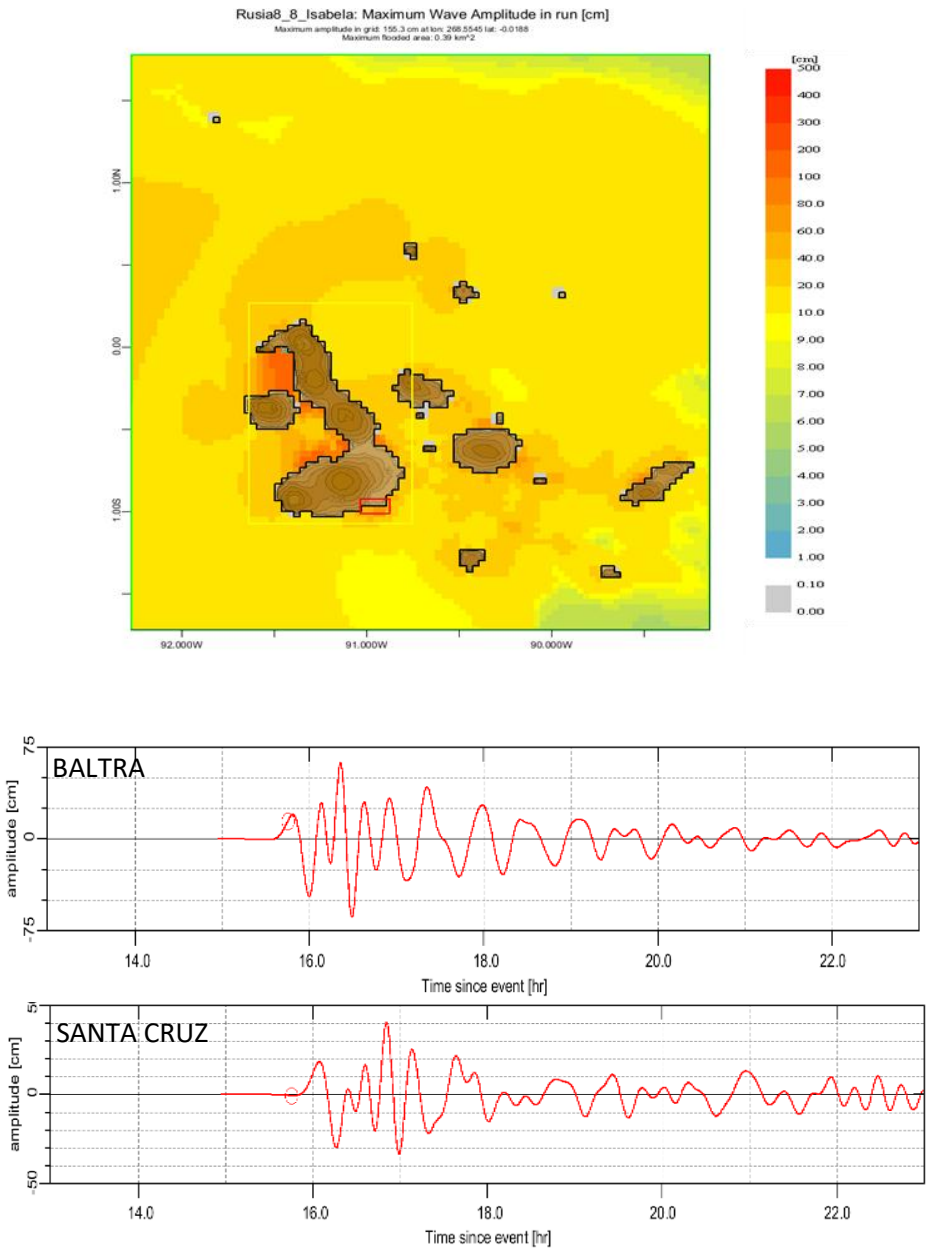


Fig. 1 ComMIT-MOST model results for the insular region, forecast for Baltra and Santa Cruz, wave amplitudes exceeding 1 m.

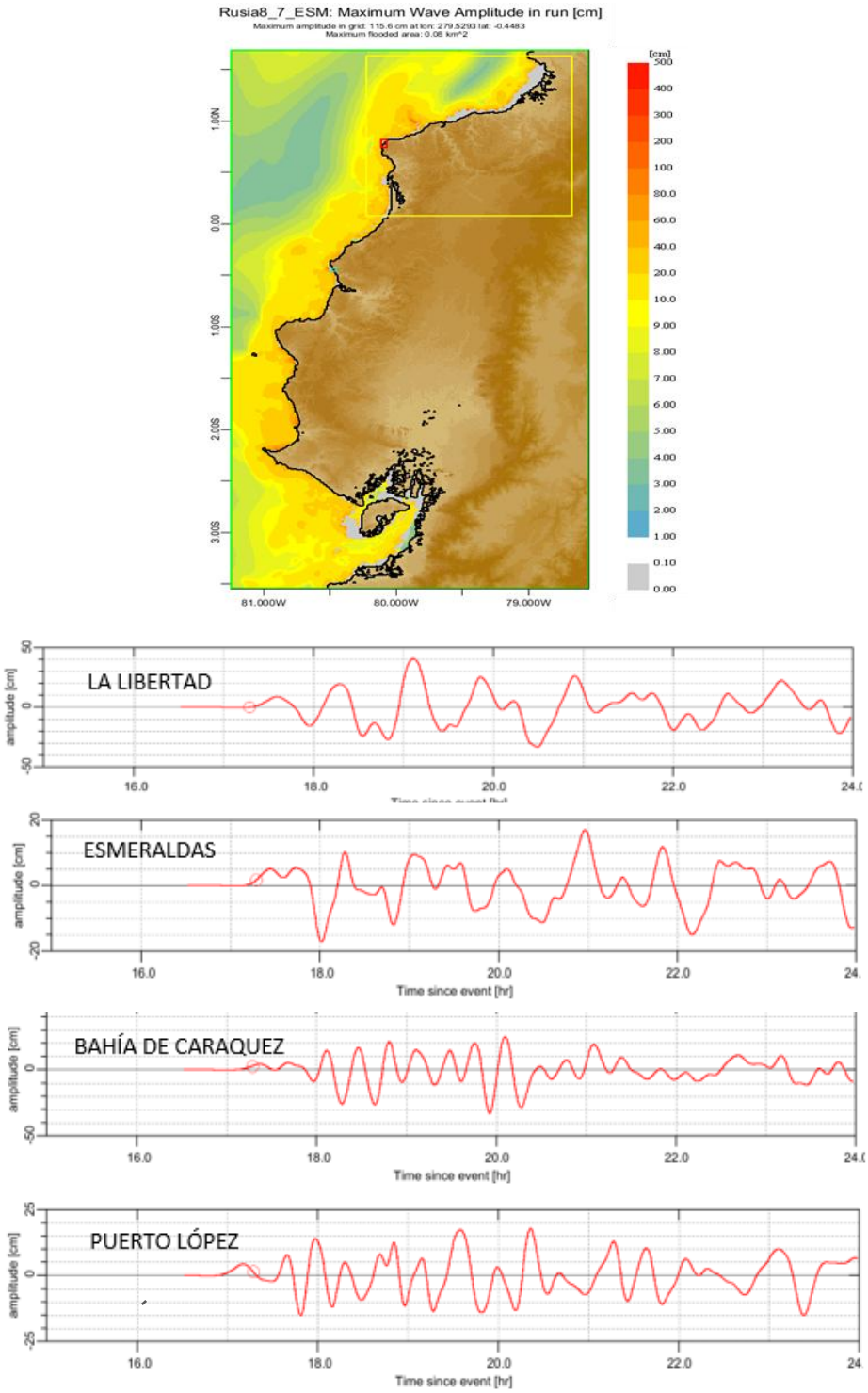


Fig. 2 ComMIT-MOST model results for the continental coast, forecast for La Libertad, Esmeraldas, Bahía de Caráquez, and Puerto López, maximum wave amplitude 1 m.

4. Sea Level Station Records

The sea-level station network recorded the following disturbances:

INSULAR REGION

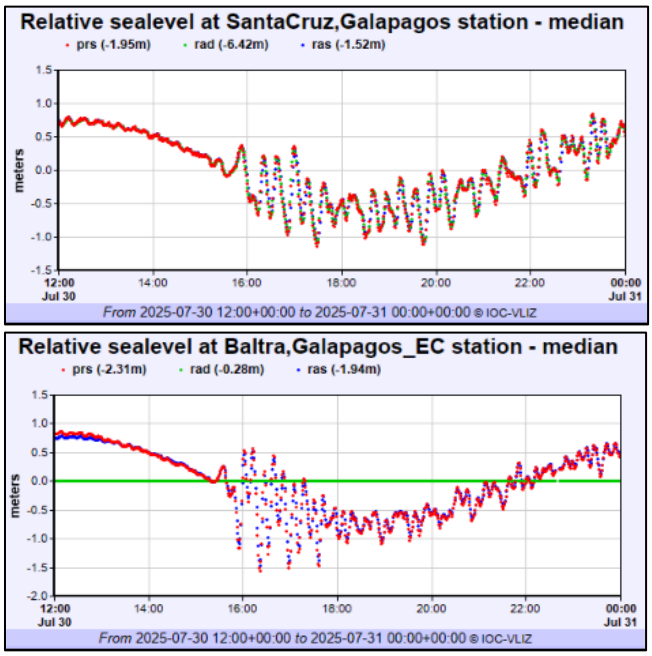
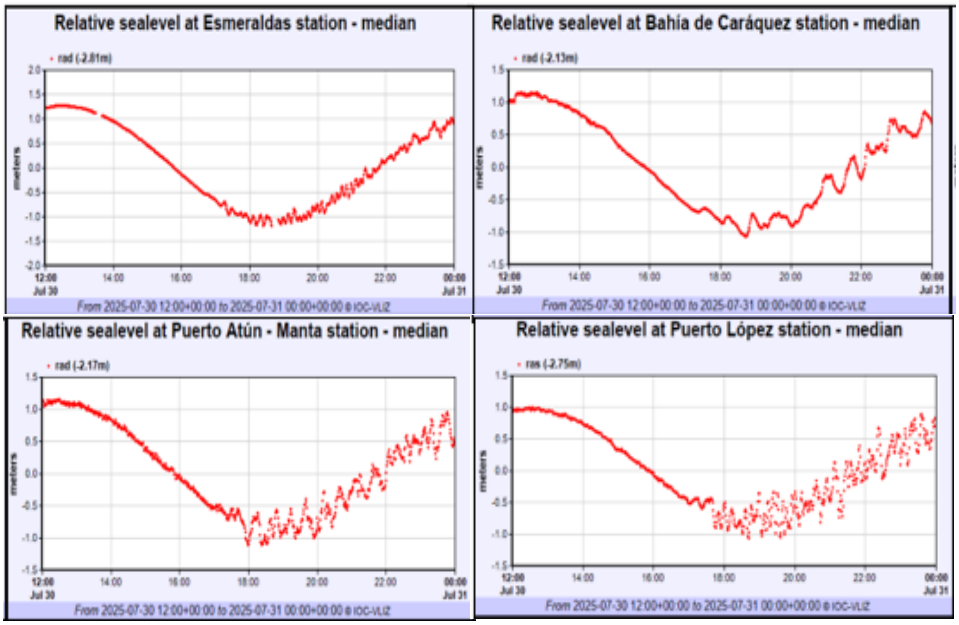


Fig.3 Records from Santa Cruz and Baltra stations, maximum wave amplitude 1.1 m.

CONTINENTAL REGION



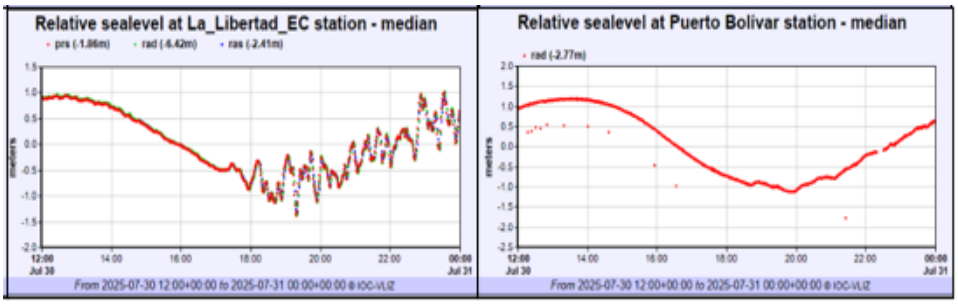


Fig. 4 Records from Esmeraldas, Bahía de Caráquez, Puerto Atún, Puerto López, La Libertad, and Puerto Bolívar stations, maximum amplitude 0.6 m.

EBM24-TSU BUOY

The EBM24-TSU tsunami buoy, managed by INOCAR and part of the global buoy system, located southeast of San Cristóbal Island, Galápagos, recorded a maximum disturbance of 0.01 m.

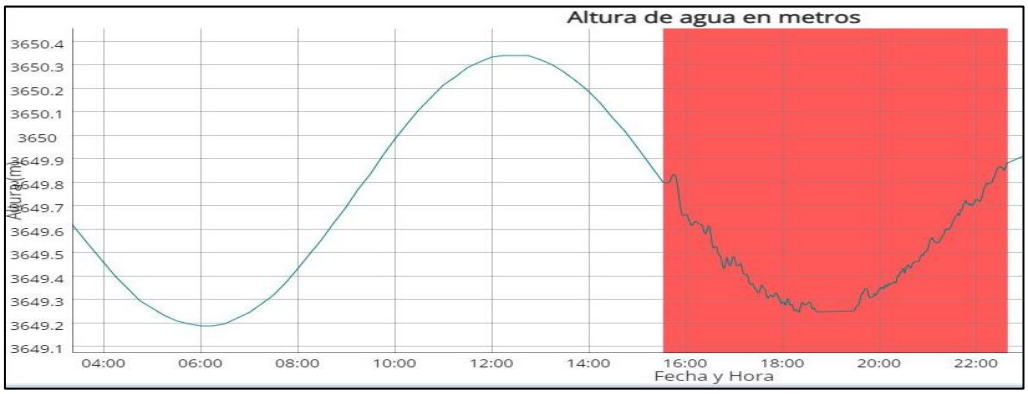


Fig. 5 Record from EBM24-TSU tsunami buoy SE, Galápagos.

Guayaquil, August 13, 2025

Firmado electrónicamente por:
NELSON ANDRES PAZMINO MANRIQUE
Validar únicamente con FirmaEC
Razón:
Localización:
Fecha: 2025-08-13T11:12:43.275320711-05:00

Nelson Andrés Pazmiño Manrique
CAPTAIN
EXECUTIVE DIRECTOR OF INOCAR

Reviewed by: LCDR (Sel.) Leonardo Alvarado García Director of Oceanography and Marine Meteorology	Firmado electrónicamente por: LEONARDO ALBERTO ALVARADO GARCIA Validar únicamente con FirmaEC

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Prepared by: SGOS-HI Rubén Caba Satama Tsunami Management Technician	Firmado electrónicamente por: RUBEN DARIO CABA SATAMA Validar únicamente con FirmaEC
Prepared by: SP-Oc. Sharl Noboa Terán Tsunami Management Technician	Firmado electrónicamente por: SHARL NARVET NOBOA TERAN Validar únicamente con FirmaEC