Venezuela Earthquake M7.5

Summary of the Requirement

The request for 36 complete portable seismic stations, including triaxial velocity sensors and accelerographs, is based on international experience with rapid-response deployments following strong earthquakes. In Ecuador, for example, after the Mw 7.8 Pedernales event, 55 seismometers and 10 ocean-bottom seismometers were deployed to record aftershocks and produce a scientific catalogue. In Italy, after the 2016 M6.0-M6.5 sequence, 50 stations were installed over 260 km^2 for seismic microzonation and site-response studies. In Chile, after the Mw 8.8 Maule earthquake, a temporary network enabled the detection of more than 30,000 events in two months. In Venezuela, the work of Pérez, Sanz and Lagos (1997) demonstrates that microseismicity can delineate the San Sebastián and La Victoria faults, while studies of Caracas show basin effects and local site amplification that justify the deployment of urban accelerographs (Schmitz et al., 2020). Therefore, the proposed deployment is a scientific requirement for characterising aftershocks, microseismic events, fault segmentation, site response and seismic risk along the La Guaira-Caracas-San Felipe corridor.

Detailed Technical Requirement

Support is requested, as an emergency technical loan, for 36 complete portable seismic systems for the scientific and operational monitoring of the seismic sequence associated with the recently felt magnitude 7.2 and 7.5 events in Venezuela, with particular attention to the La Guaira-Caracas-San Felipe corridor.

The purpose of the deployment is to temporarily strengthen the capacity to locate aftershocks and microseismic events, discriminate the relative activation of the fault systems involved, characterise the propagation of seismicity, record ground accelerations in urban areas and critical infrastructure, and provide verifiable scientific information for decision-making by the national civil protection and disaster management authorities, for building inspections and for the dissemination of findings.

A loan period of at least 120 to 180 days is recommended, extendable according to the evolution of the sequence (see Table 1). The requested configuration is:

1. **24 portable triaxial stations**, broadband or short-period;
2. **Eight Triaxial Strong-Motion Accelerographs**; and
3. **Four Additional backup systems**, including sensors, digitisers, batteries, cables, GNSS antennas, memory cards and installation accessories.

The stations shall record continuously, preferably at 100 samples per second, with 24-bit digitisers, GNSS/GPS timing, local storage and telemetry capability. The accelerographs shall record at not less than 200 samples per second, with selectable ranges of ±0.5 g, ±1 g, ±2 g and ±4 g, so that they do not clip during strong aftershocks. Waveform data shall be exportable in miniSEED and metadata in StationXML, or in an equivalent format compatible with international standards.

These stations would not replace the broadband seismological network operated by Funvisis; rather, they would temporarily complement the permanent network in critical areas. The criteria used respond to four specific arguments: (1) rapid deployment, (2) instrumental density, (3) relevance to the national seismological setting and (4) the need for accelerographs in the affected areas.

Table 1 Summary of the equipment required

Item requested	Quantity	Primary use
Triaxial stations, broadband or short-period	24	Locate aftershocks and microseismic events, improve depth constraint and define active fault segments.
Triaxial strong-motion accelerographs	8	Record ground accelerations in Caracas, La Guaira and San Felipe, as well as at critical infrastructure and soft-soil sites.
Backup equipment, cables, batteries, GNSS, memory cards and modems	4	Immediate replacement in the event of equipment failure, vandalism, theft, humidity, electrical damage or loss of

		communications.
Communications	36 cellular modems 4 portable satellite/VSAT links	Real-time telemetry from critical nodes and backup communications where there is no mobile-network coverage.

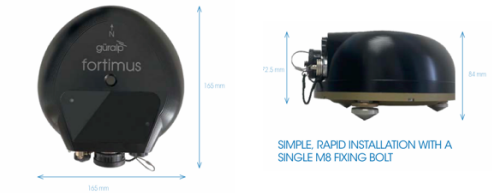
The stations should record at least 100 samples per second; the accelerographs should record at 200 samples per second or higher, ensuring that they do not clip below 3.5 g, in accordance with good practice for rapid aftershock deployments.

Table 2 Detailed technical specifications of the equipment required for deployment in the study area

Component	Minimum specification
Seismometer	Triaxial, broadband or short-period; preferably with a response from 30 s or 20 s to 50-100 Hz; if unavailable, a short-period response of 1-100 Hz.
Digitiser	Minimum 24-bit; dynamic range ≥132 dB; GNSS/GPS timing.
Accelerometer	Triaxial, DC to 100-315 Hz; selectable ranges of ±0.5 g, ±1 g, ±2 g and ±4 g; dynamic range ≥142-165 dB.
Sampling	100 sps continuous for velocity; 200 sps or higher for acceleration; continuous local storage.
Data format	miniSEED for waveforms; StationXML for metadata.
Telemetry	SeedLink, SeisComP, Earthworm, GCF/Scream or equivalent.
Power	12 V battery with a minimum autonomy of 5-7 days; 60-100 W.
Protection	IP67/IP68 enclosure, military-grade or ruggedised connectors, protection against humidity, salinity and vandalism.
Installation	Shallow temporary vault, controlled burial or coupled slab; photographic log, coordinates, local geology and noise sources.

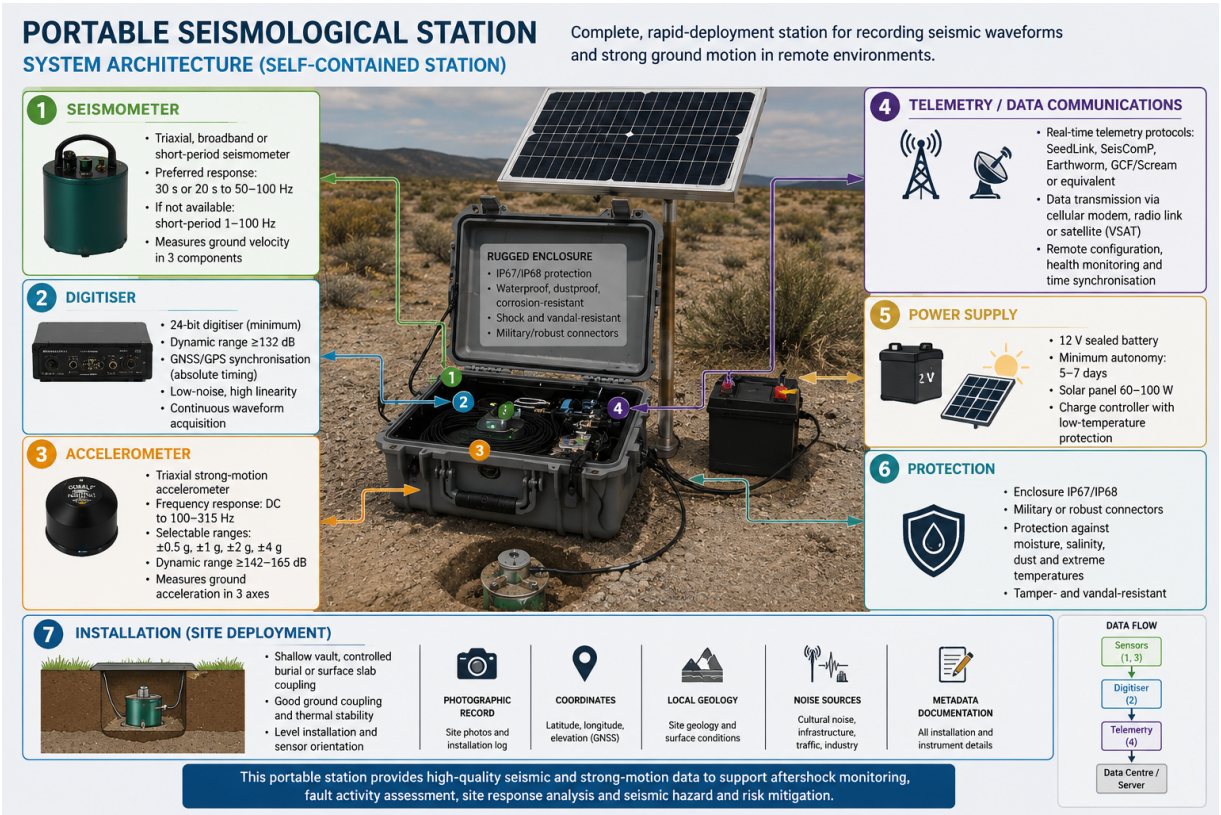
Figure 1 Examples of the seismometer and accelerograph

As a reference, a portable Güralp 6TD unit has a triaxial sensor, integrated 24-bit digitiser, standard response from 30 s to 100 Hz, configurable sampling up to 1000 sps, internal storage and low power consumption; it is suitable for rapid aftershock deployments.



For strong motion, a Güralp Fortimus accelerograph offers a DC-315 Hz response, selectable ±0.5 g to ±4 g range, GNSS timing and formats such as miniSEED/SeedLink, making it appropriate for strong-motion intensity measurements, infrastructure monitoring and urban areas.

Figure 2 Architecture of a self-contained portable seismological station system



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