

Levels of background seismic noise in Venezuela with an emphasis in the AS117 and AS118 IMS stations

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POSTER

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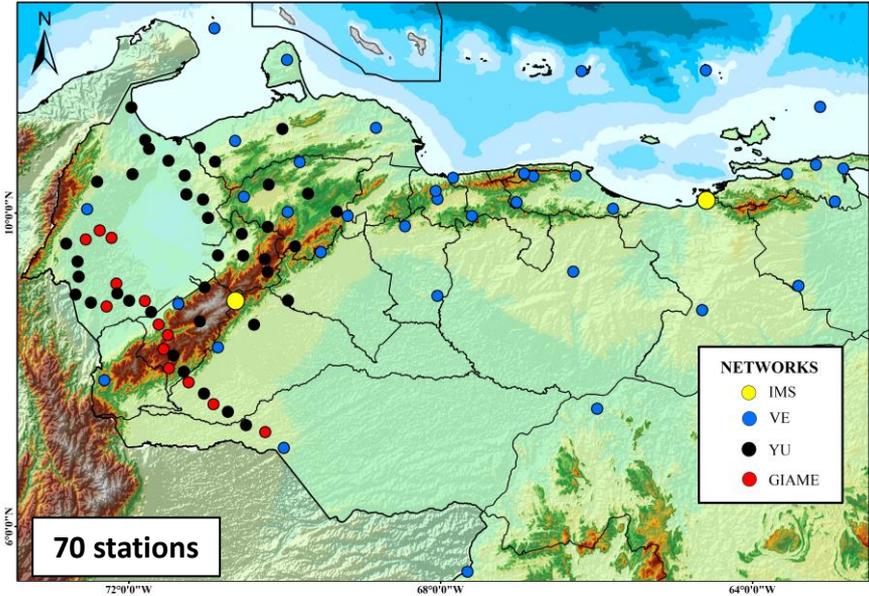
Purpose: study the behaviour of seismic noise sources in Venezuela with an emphasis in the **AS117** (SDV in the Andes) and **AS118** (PCRV in Eastern Venezuela) IMS stations.

Method: **power spectral analysis** of seismological records using the methodology presented by McNamara and Buland (2004).

Results:

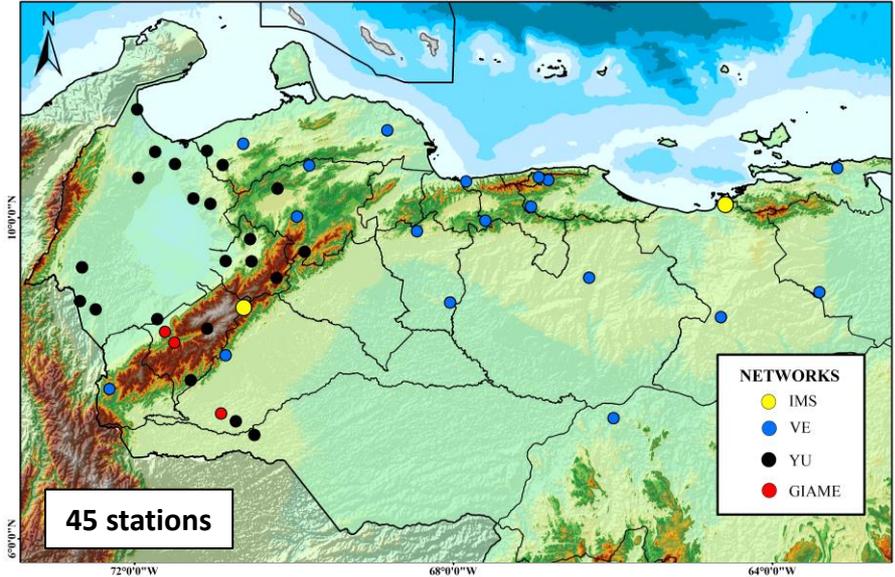
- **For periods lower than 1 s**, the **AS118** station shows values of -131.5 dB with a increase of 1 dB between day and night, while **AS117** shows values of -121.5 dB throughout the entire day.
- **For periods longer than 30 s**, the horizontal components of **AS117** present a sharp increase in noise values with respect to the vertical component. The opposite behavior occurs in station **AS118**.
- The behavior of the **double frequency peak (4–8 s)** in Venezuela shows high noise values in stations located in basins and low values in mountain ranges.

- First characterization of seismic noise sources (Cultural noise and double frequency peak microseism) across Venezuela using records of multiple seismological networks.
- Important for detecting station failures and for the future location of seismological stations in areas with low influence of seismic noise sources.
- Networks with records available:
 - Permanent networks:
 - **VE** (2000- present). Aprox. **20 stations**.
 - Temporary networks:
 - **YU** (CARMA network 2016-2018). **40 stations**.
 - **GIAME** (2015-2018). **10 stations**.
- Networks VE, YU and GIAME **working together between 2016 and 2018**.



Stations with records available at the beginning of the study.

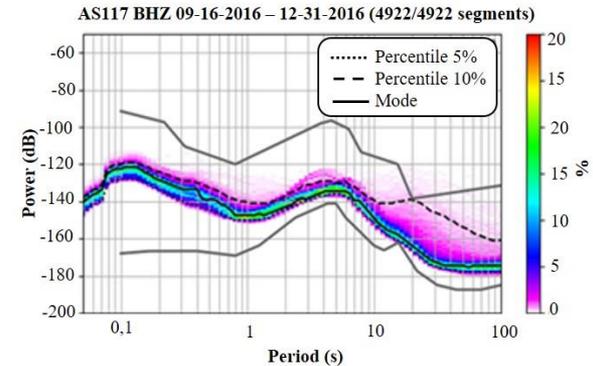
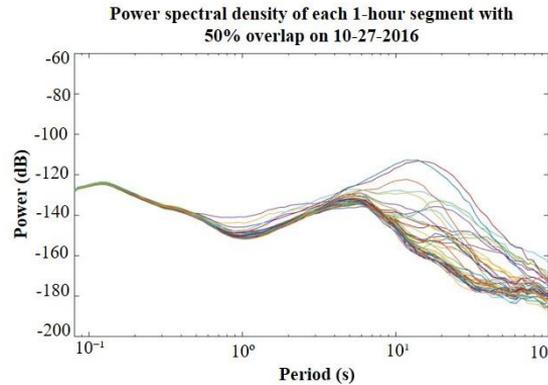
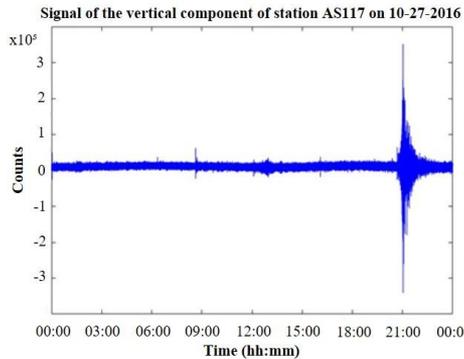
- Low availability of seismological records for VE permanent network between 2016 and 2018.
- To avoid the results being affected by information gaps, a time window where the **largest number of available stations** had recorded on **continuous days** was chosen.
- Time window of the study between **September 16, and December 31, of 2016.**
- **45 stations used** to calculate ambient seismic background noise with the majority located in western Venezuela.



Stations used to study the behavior of seismic noise throughout Venezuela and recorded on consecutive days during September 16 and December 31, 2016

McNamara and Buland (2004) method to calculate ambient seismic background noise using ObsPy Python library

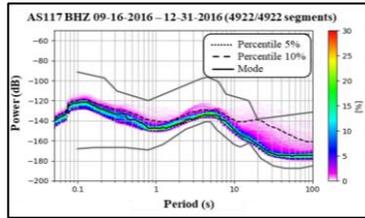
METHODS



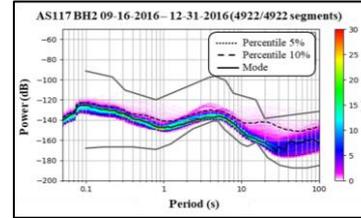
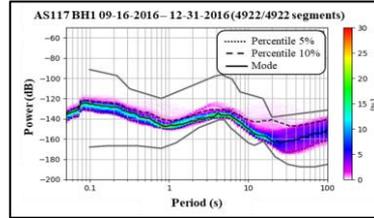
- Example of a seismological record of station **AS117** used to calculate de power spectral density.
- **Power spectral density (PSD)** of 1-hour segments with 50% overlap of station AS117.
- **Probability density function (PDF)** of station AS117 using records from September 16 to December 31, 2016.

AS117 AND AS118 NOISE BEHAVIOR

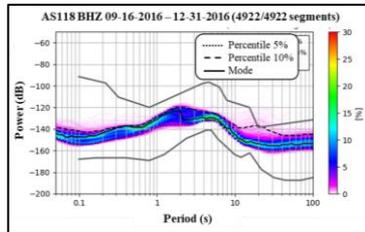
AS117 VERTICAL COMPONENT



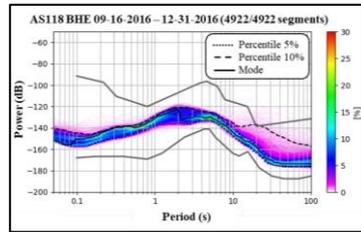
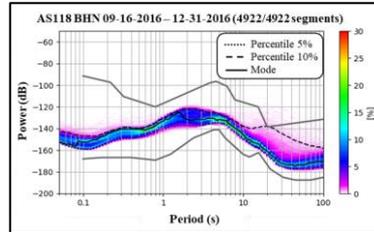
AS117 HORIZONTAL COMPONENTS



AS118 VERTICAL COMPONENT



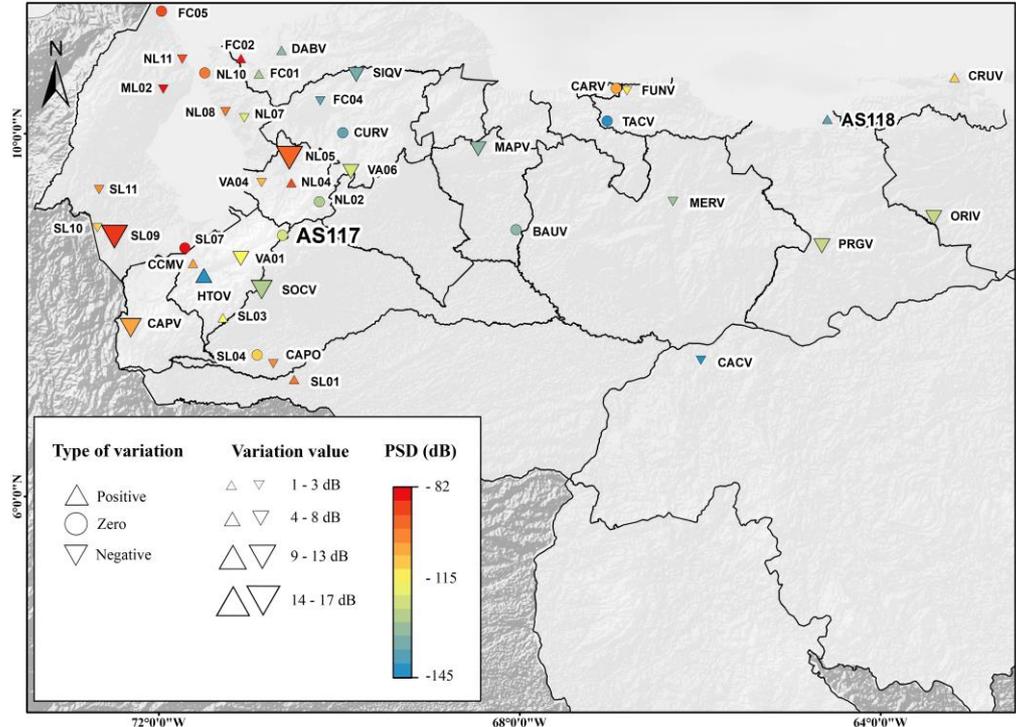
AS118 HORIZONTAL COMPONENTS



- Station **AS117** shows high values of low period noise because of the proximity to the water discharge of the Santo Domingo dam.
- For periods longer than 30 s, the vertical component of **AS117** presents noise values close to the NLN, while the horizontal components present a sharp increase in the noise values. The opposite behavior occurs in station **AS118**.

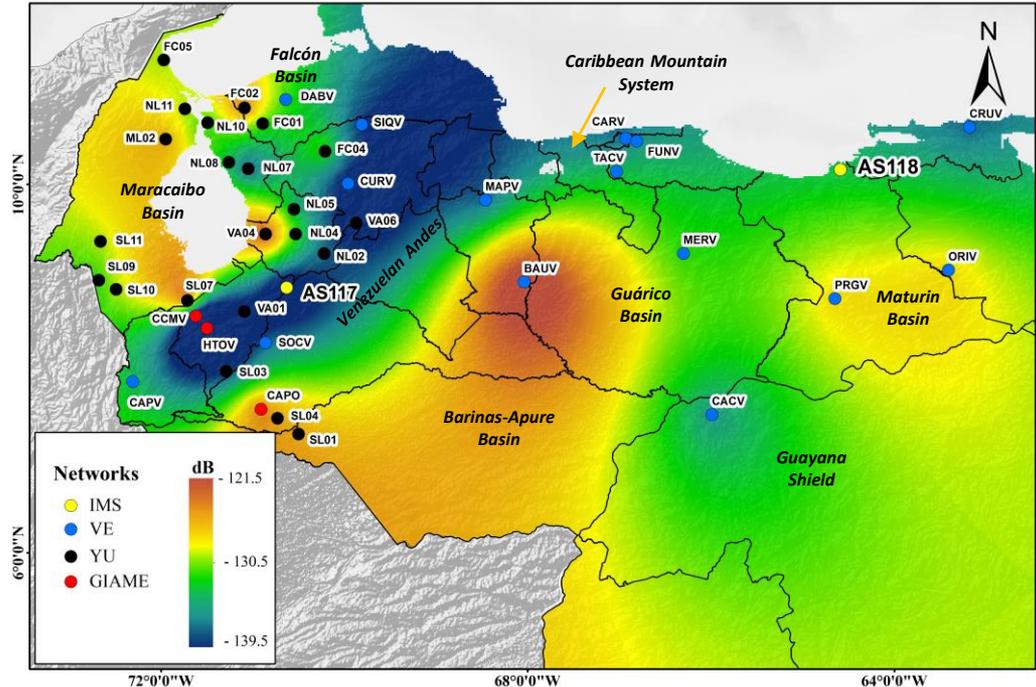
CULTURAL NOISE VARIATIONS BETWEEN DAY AND NIGHT

- **AS117** doesn't show noise values variation between day and night while **AS118** shows an increase of 1 dB.
- Higher values of noise in western Venezuela at stations belonging to **temporary networks**.
- Higher variations (station SL09, NL05 and CAPV) in stations near to zones that shows a **decrease in cultural activity throughout night** (quarries and military facilities).



DOUBLE FREQUENCY PEAK MICROSEISM (4-8 s) MAPPED ACROSS VENEZUELA

- **AS117** station shows one of the lowest values (-134.5 dB) and **AS118** a mid value of -129.5 dB.
- **Lower values of noise (< -131.5 dB)** in the Venezuelan Andes, Caribbean Mountain System and the Guayana Shield.
- **Intermediate values of noise (-128.5 to -131.5 dB)** in boundaries between mountain systems and basins.
- **Higher values of noise (> -128.5 dB)** in basins, with the higher value in the Barinas-Apure Basin.



- The absence of **low-period noise** variation between day and night at the station **AS117**, shows the influence of the continuous water discharge from the Santo Domingo dam.
- Higher **low-period noise** values were observed in temporary network stations due to their proximity to areas of high cultural activity. This proximity was due to the fact that the safety of the equipment was prioritized over the influence of cultural activity on the records.
- The behavior of the **double frequency microseism** obtained throughout Venezuela suggests that the local geology of where the station is located is more influential in the amplitude values of this phenomenon than the distance between the noise source and the station.

- McNamara, D. E., & Buland, R. P. (2004). Ambient noise levels in the continental United States. *Bulletin of the seismological society of America*, 94(4), 1517-1527.