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5M 2015-2016

FOSA

Scientific Technical Report STR - Data 21/02

GIPP Experiment and Data Archive

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5M 2015-2016

FOSA

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GIPP Experiment and Data Archive

Abstract

The FOSA (FOgo Seismic Array) project has been carried out from October 2015 to December 2016 to investigate the seismicity of Fogo volcano after its eruption in 2014/2015. Fogo is the only volcano of the Cape Verde archipelago with reported historic eruptions. The eruptions occur frequently with an interval of about 20 years. However, the structure and extent of the related volcanic plumbing system are not well understood. The focus of the FOSA project was on the detection of ongoing magmatic activity and information about the plumbing system, using seismic array techniques. The array of the FOSA study was operated from October 2015 to December 2016, close to the village Achada Furna. From January 2016 we complemented the network with three additional broadband stations for an improved event detection and localization.

1 Introduction

Seismic arrays are capable of locating events outside of the network, like offshore earthquakes, which were expected around Brava, the neighboring island of Fogo, and events without clear onset of phases, like many volcanic seismic signals. The FOSA network includes a seismic array and three single stations, deployed on Fogo, Cape Verde. The circularly shaped array consists of eight stations, an aperture of 700m and is located nearby the village Achada Furna. Seven of the array stations were equipped with 3-component 4.5 Hz geophones, one with a Trillium Compact (broadband) sensor. The remaining three stations were distributed across the island and equipped with Trillium Compact sensors. Data were recorded continuously with a sample rate of 200 Hz.

The study was performed as a pilot study for the FoMaPS project (from 2017 to 2018, FDSN code 9J), which involved station deployments on Fogo and Brava.

2 Data Acquisition

2.1 Experimental Design and Schedule

The station distribution is shown in Fig. 1, and Table 1 summarises the most important information about each station.

2.2 Site Descriptions

All stations are powered using conventional car batteries (70 Ah capacity) and are buried completely for security reasons. Only the GPS-Antenna is kept above ground.

2.3 Instrumentation

The broadband stations were equipped with Trillium Compact seismometers and a breakout-box for the connection to the datalogger. Geophones were in operation at the short-period stations. Data are collected and stored with DATA-CUBE3 dataloggers at each station. Every 30 minutes the GPS-signal was retrieved.

2.4 Sensor orientation

All sensors were oriented to magnetic north and horizontally leveled.

3 Data Description

3.1 Data Completeness

Fig. 3 shows the uptime of each station. Due to limited data storage, there are four recording gaps (20/12/2015-14/01/2016; 28/03/2016-04/04/2016; 17/06/2016-18/07/2016; 01/10/2016-18/10/2016).

3.2 Data Processing

The data were converted to one hour-long traces using the program cube2mseed from the GIPP tools (https://www.gfz-potsdam.de/en/section/geophysical-deep-sounding/infrastructure/geophysical-instrument-pool-potsdam-gipp/software/gipptools/). The options chosen were –byte-order=BIG-ENDIAN –encoding=STEIM-1.

3.3 Data quality and Noise Estimation

Fig. Fig. 2 shows noise probability density functions for all channels.

4 Data Access

4.1 File format and access tools

The data are stored in the GEOFON database, and selected time windows can be requested by EIDA access tools as documented on http://geofon.gfz-potsdam.de/waveform/ . Normally the data are delivered in miniseed format. The current data access possibilities can always be found by resolving the DOI of the dataset.

4.2 Availability

The data are embargoed until 01 July 2021.

5 Conclusions and recommendations

Detailed analysis of this data is described in Leva et al. 2019 (https://doi.org/10.1016/j.jvolgeores.2019.106672) and Leva et al. 2020 (https://doi.org/10.5194/nhess-20-3627-2020).

6 Acknowledgments

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Table 1: Station table. Note that start and end times represent the maximum validity of the corresponding configurations, not the actual data availability or time in the field. Azi: Azimuth of north or '1' component.

Label	Lat	Lon	Ele	Azi	Rate	Sensor	ID	Logger	Id	Start	End	Channels
CV00	14.865167	-24.3516	745	90	200	SM-6	xxxx	CUBE	0A69	2015-10-08	2016-12-29	EHZ EHN EHE
CV01	14.868383	-24.351683	820	90	200	SM-6	xxxx	CUBE	0ABP	2016-10-20	2016-12-30	EHZ EHN EHE
CV03	14.863183	-24.354183	711	90	200	Trillium-Compact	0137	CUBE	0A6D	2015-10-09	2016-10-19	HHZ HHN HHE
CV03	14.863183	-24.354183	711	90	200	SM-6	xxxx	CUBE	0A6D	2016-10-19	2016-12-29	EHZ EHN EHE
CV04	14.86595	-24.354733	760	90	200	SM-6	xxxx	CUBE	0A2U	2015-10-09	2016-01-15	EHZ EHN EHE
CV04	14.86595	-24.354733	760	90	200	SM-6	xxxx	CUBE	0A6C	2016-01-15	2016-12-30	EHZ EHN EHE
CV05	14.86665	-24.34885	781	90	200	SM-6	xxxx	CUBE	0A68	2015-10-08	2016-12-30	EHZ EHN EHE
CV06	14.862917	-24.35105	712	90	200	SM-6	xxxx	CUBE	0A67	2015-10-09	2016-12-29	EHZ EHN EHE
CV07	14.8647	-24.353017	740	90	200	SM-6	xxxx	CUBE	0A6A	2015-10-09	2016-12-30	EHZ EHN EHE
CV08	14.866483	-24.3525	778	90	200	SM-6	xxxx	CUBE	0A2T	2015-10-09	2016-01-15	EHZ EHN EHE
CV08	14.866483	-24.3525	778	90	200	SM-6	xxxx	CUBE	0A2U	2016-01-15	2016-12-30	EHZ EHN EHE
CV09	14.865133	-24.349983	751	90	200	SM-6	xxxx	CUBE	0A6F	2015-10-08	2016-12-29	EHZ EHN EHE
CV10	14.928444	-24.3595	1793	90	200	Trillium-Compact	0026	CUBE	0791	2016-01-16	2016-12-29	HHZ HHN HHE
CV11	15.041919	-24.369489	376	90	200	Trillium-Compact	0025	CUBE	0793	2016-01-18	2016-07-21	HHZ HHN HHE
CV11	15.039717	-24.370683	414	90	200	Trillium-Compact	0025	CUBE	0793	2016-07-21	2016-12-31	HHZ HHN HHE
CV12	14.92295	-24.48345	351	90	200	Trillium-Compact	0024	CUBE	0792	2016-01-18	2016-12-31	HHZ HHN HHE

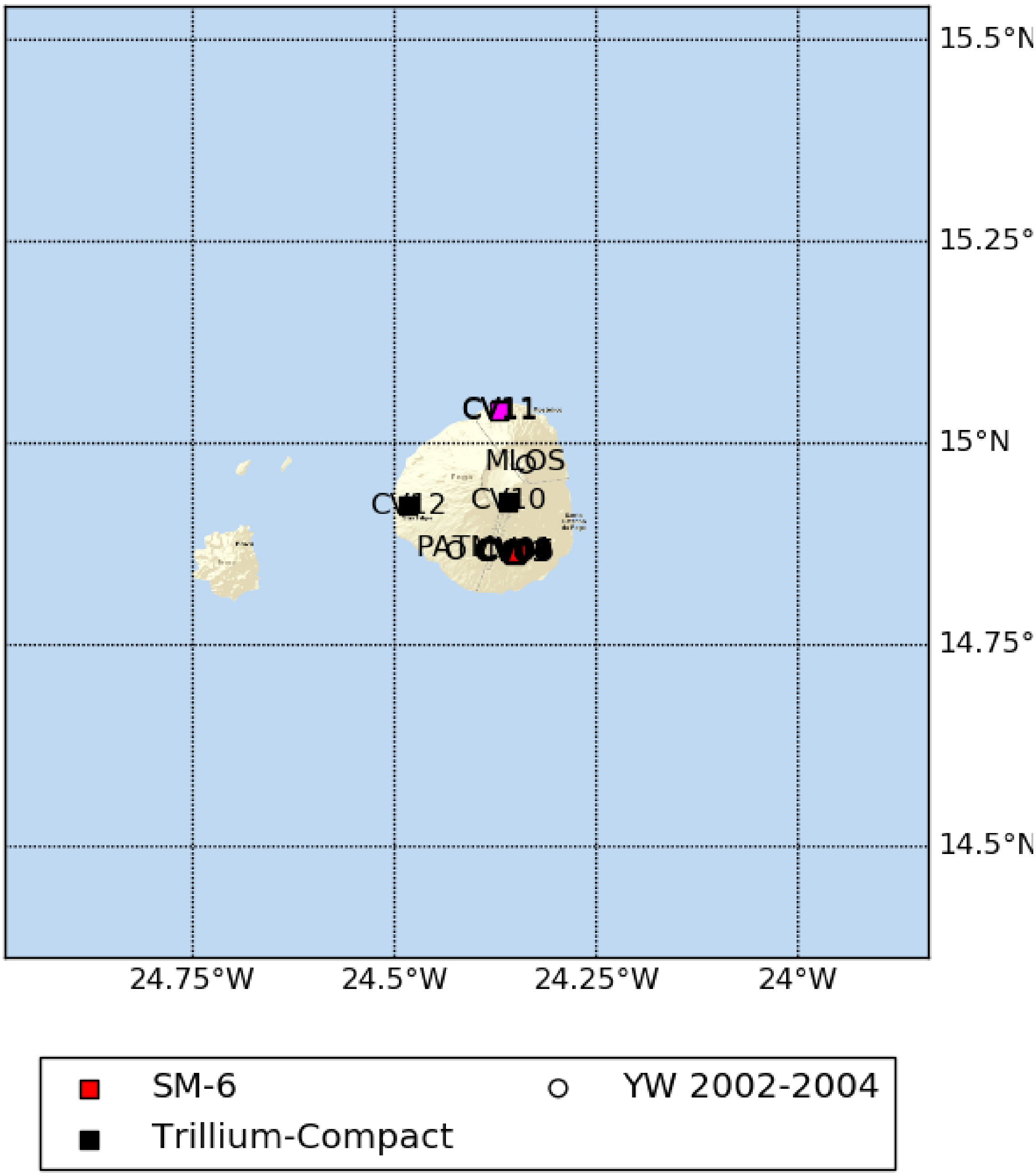

Fig. 1: Station distribution in experiment (red and black symbols). White-filled symbols show permanent stations and other temporary experiments archived at EIDA or IRIS-DMC, whose activity period overlapped at least partially with the time of the experiment. If present, open symbols show station sites which were no longer active at the time of the experiment, e.g. prior temporary experiments.

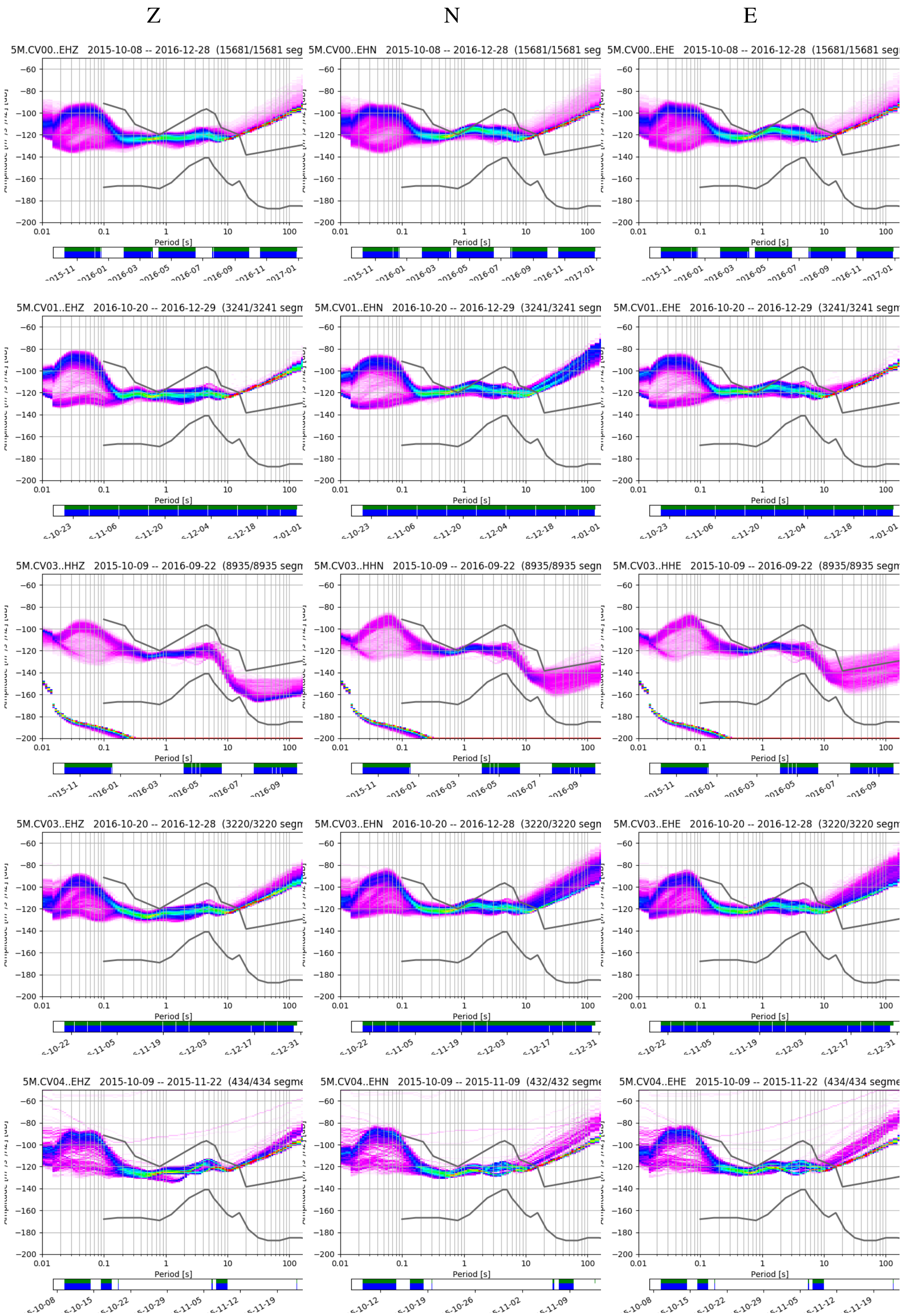

Fig. 2 – continued on next page

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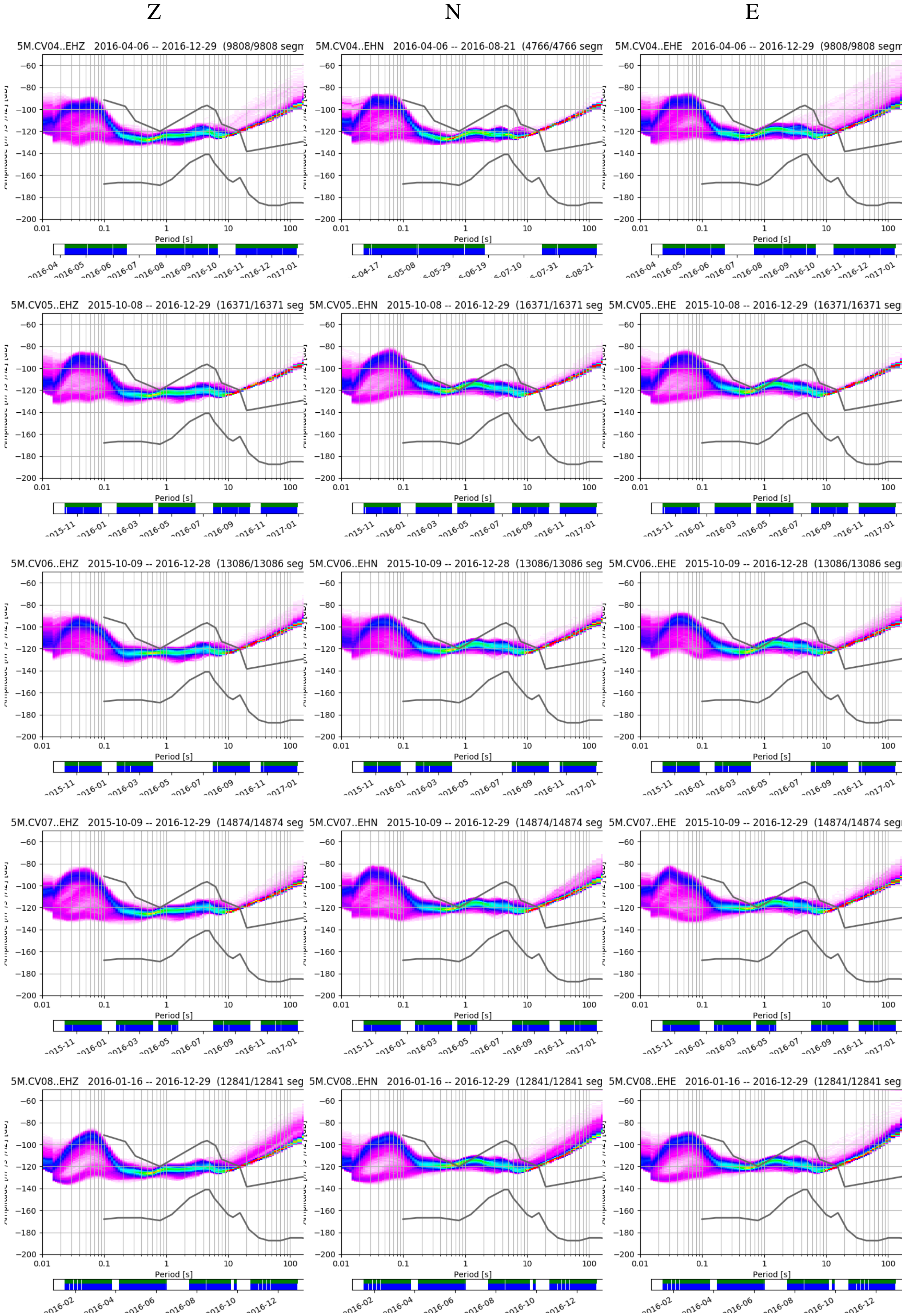

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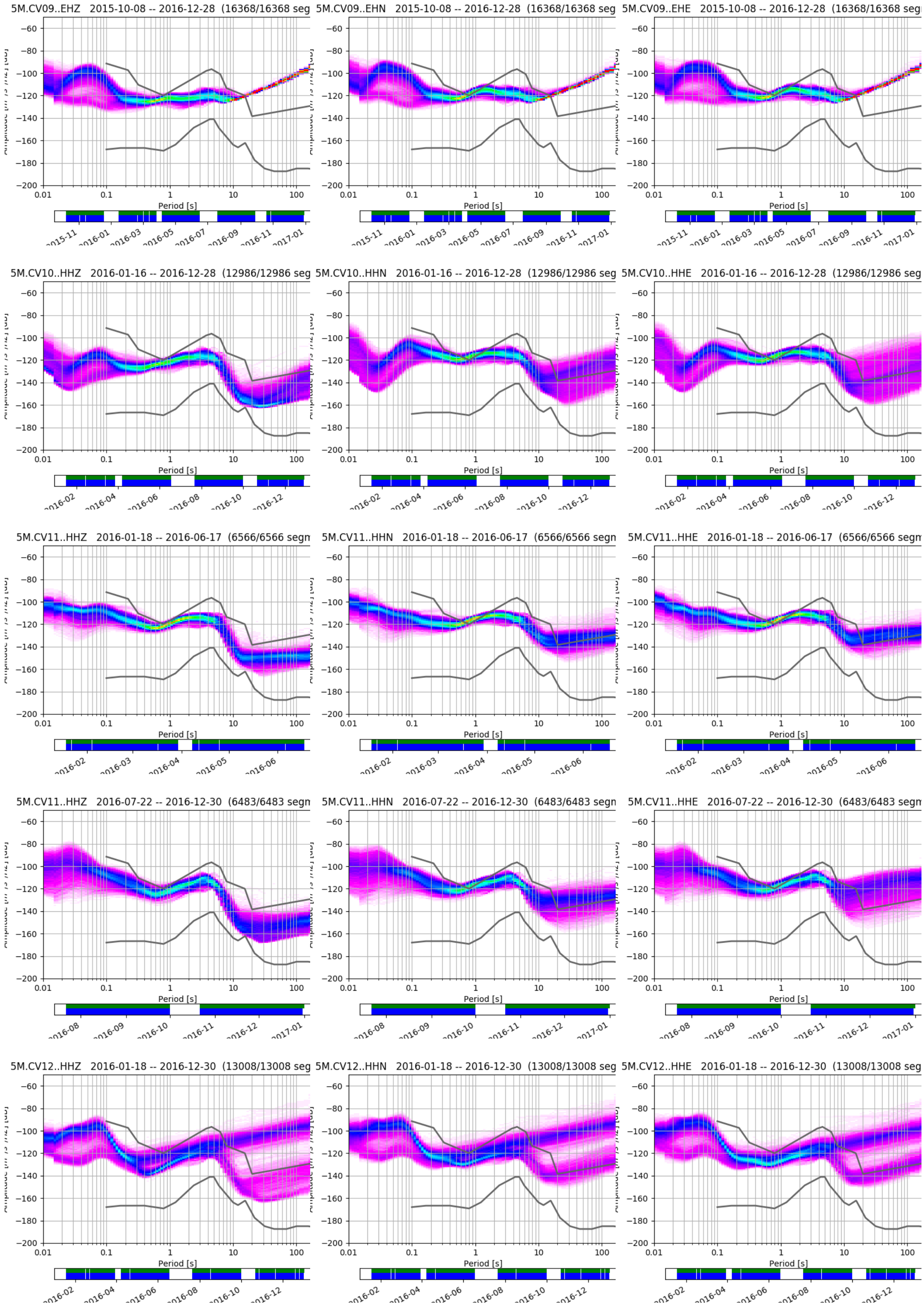

Fig. 2: Noise probability density functions for all stations for database holdings

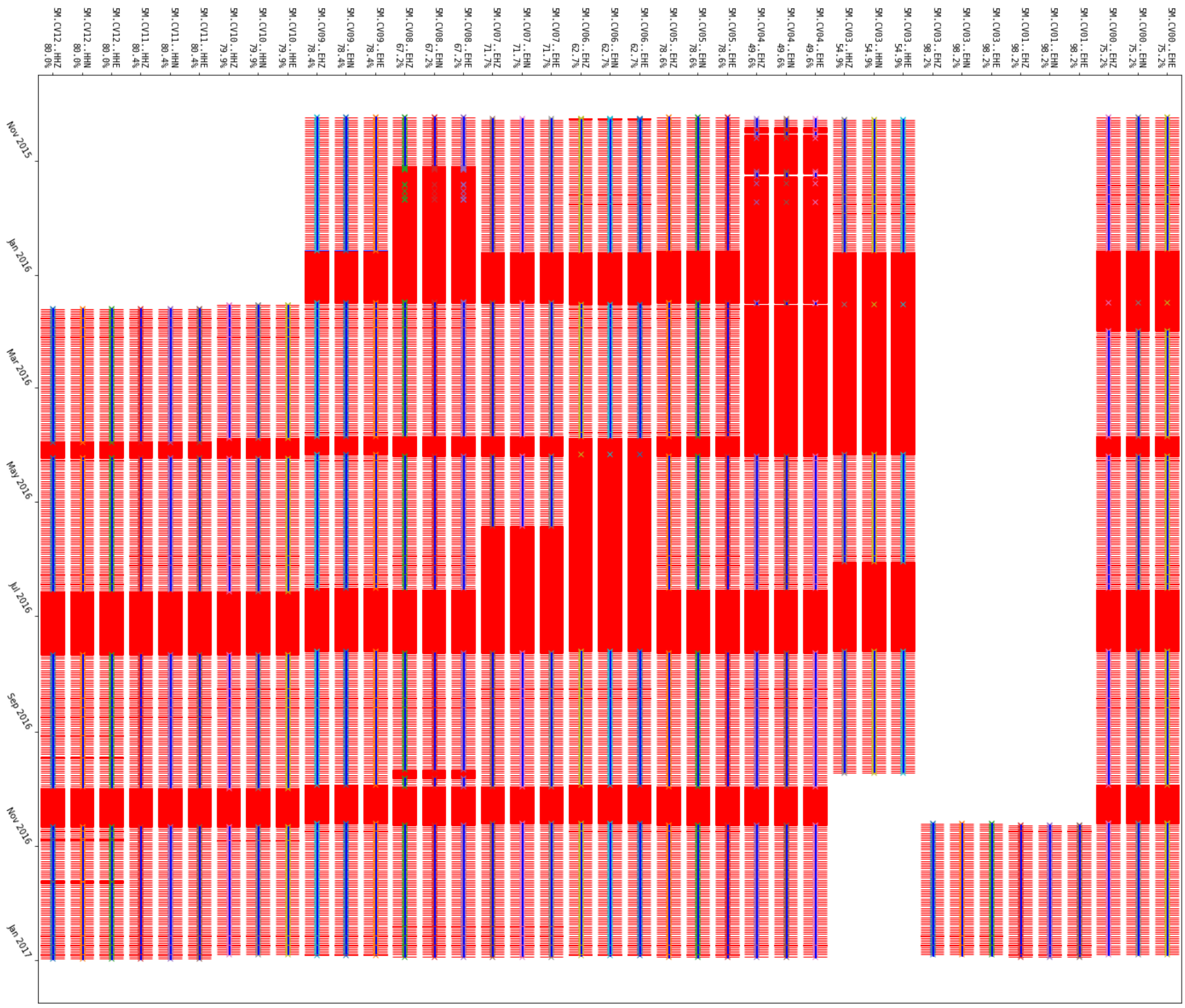

Fig. 3: Overview of uptimes of all stations generated with *obspy-scan*

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