

Description of dataset “Seismic investigations of clay pans in the Atacama Desert (N-Chile) (SEISCLAYPAN)”

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Abstract

The data set was acquired in the framework of the CRC 1211 “Earth – Evolution at the dry limit” which aims to study continuous longterm (Quaternary-Miocene) paleoclimatic/environmental records from the hyperarid core of the Atacama Desert / N Chile covering the last up to 10 Ma. As part of this project, three clay pans were investigated in the Coastal Cordillera (Huaqui 20° 4'32.75"S; 69°55'1.46"W; PAG: 21°32'27.39"S; 69°54'47.21"W; Paranal 24°29'20.53"S; 70° 8'54.63"W). The clay pans are located along a latitudinal transect across the hyperarid core of the Atacama from 20° S to 24.5° S. The seismic survey comprised a couple of crossing 2D high-resolution seismic lines per each of the clay pans, acquired with vertical component geophones, Geode recorders and a PEG-40 accelerated weight drop as source.

Coordinates: Huaqui: 69° 55' 1.46" W / 20° 4' 32.75" S

PAG: 69° 54'47.21" W / 21° 32'27.39" S

Paranal: 70° 8' 54.63" W / 24° 29' 20.53" S

Keywords: controlled source seismics, seismic weight drop, near surface geophysics, desert

1. Location

Figure 1 shows an overview of the location of the three sites in Chile, while Figure 2 shows the location of the seismic profiles in each of the three clay pans.

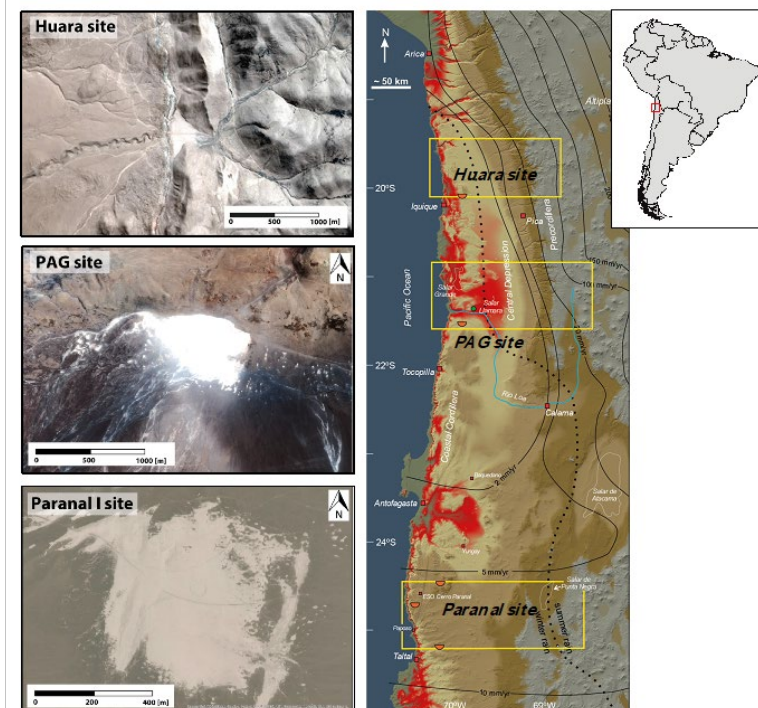


Fig. 1: Location of the study area including the three survey sites in Northern Chile. Figure from Ninnemann, 2020.

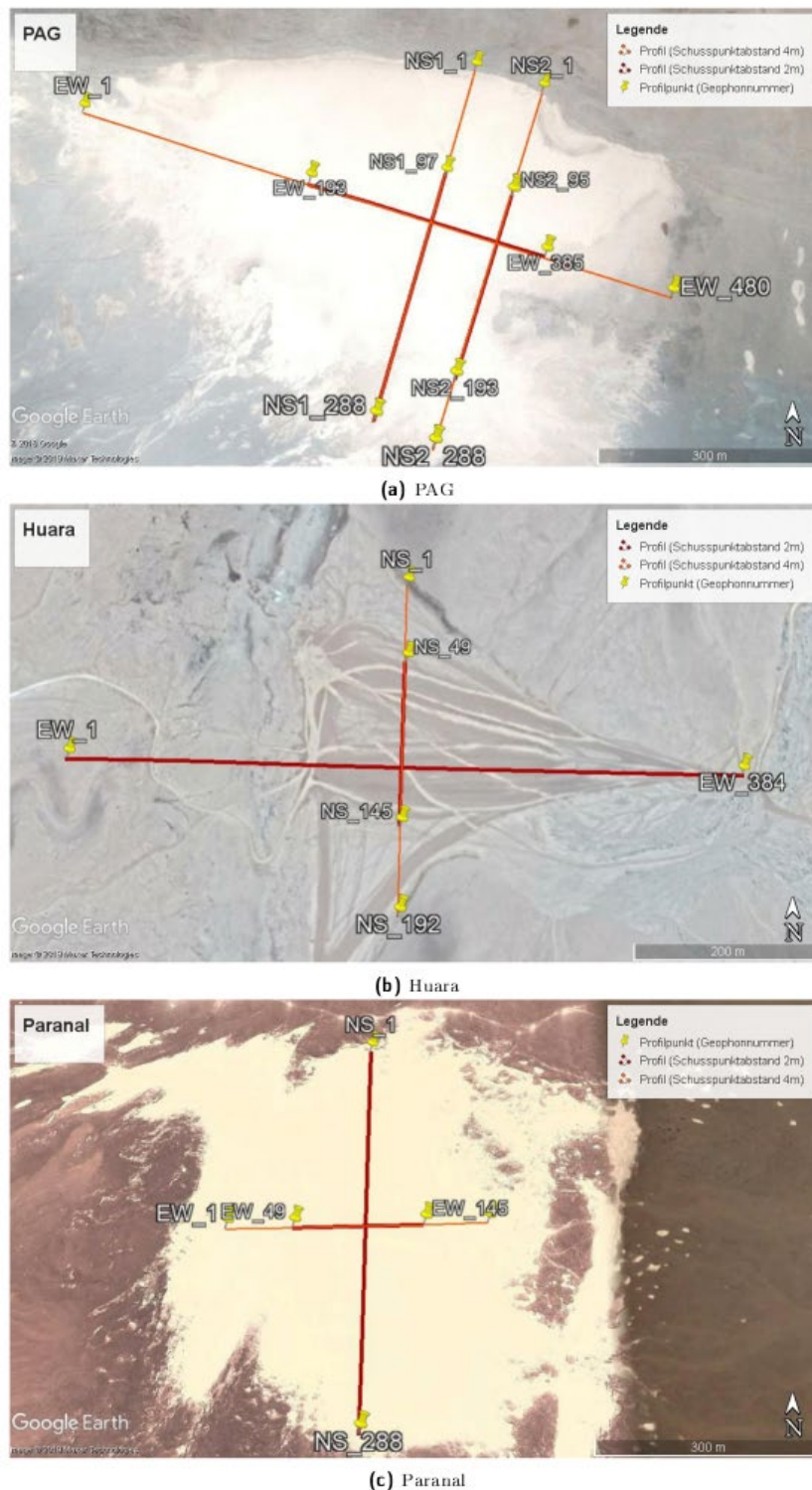


Fig. 2: Location of the seismic profiles in each of the three clay pans. The profiles are oriented approximately in North-South (NS) or East-West (EW) direction. The first and last geophone along each line is indicated by its number appended to the profile name, e.g. for PAG the first geophone along the EW profile is EW_1 and the last geophone is EW_480, respectively. Figure from Ninnemann, 2020.

2. Data Acquisition

Data acquisition took place between October-November 2018. At each location 2-3 profiles were acquired (see Fig. 1 and 2). We used a Geometrics GEODE multichannel, cable-based system in combination with a PEG-40 accelerated weight drop as source.

	PAG			HUARA		PARANAL	
	NS1	NS2	EW	NS	EW	NS	EW
total line length	574 m	574 m	958 m	382 m	766 m	574 m	382 m
no. of geophone points	288	288	480	192	384	288	192
no. of source points	140	144	240	144	384	288	144
geophone spacing	2 m	2 m	2 m	2 m	2 m	2 m	2 m
source spacing	2-4 m	2-4 m	2-4 m	2-4 m	2 m	2 m	2-4 m
vertical stacking	3	4	3	3	3-4	4	4

Table 1: Acquisition parameters.

3. Data Description

The following files are included in directory /segY (named according to clay pan site and geographical direction of the profile):

- PAG_NS1.sgy
- PAG_NS2.sgy
- PAG_EW.sgy
- HUARA_EW.sgy
- HUARA_NS.sgy
- Paranal_EW.sgy
- Paranal_NS.sgy

For each site a corresponding location file in googleearth kmz-format is included that contains the geographical (latitude/longitude) coordinates of the start and end points of each profile. Within the SEG-Y data files, local x-coordinates are used along straight 2D profile lines (x-axis) connecting the start and end points of the profiles. The profiles start with coordinate x=0 at the first geophone of each profile.

The raw data are stored in SEG-Y format including the local coordinates in standard header entries according to Barry et al. (1975); byte order is "Big Endian", data format is "IBM float (32 bit)", fixed trace length.

Table 2 shows an example of the trace header summary for file Paranal_EW.sgy.

Byte numbers	SEG-Y description	Minimum value	Maximum value
1-4	Trace sequence number	1	192
5-8	Trace sequence number within reel	1	27456
9-12	Original field record number	4735	5246
13-16	Trace sequence number within original field record	1	192
17-20	Energy source point number	1	2
29-30	Trace identification code	1	
29-30	X source coordinates	0	380
81-84	X receiver coordinates	0	382
115-116	Number of samples in this trace	2000	
117-118	Sample interval in microseconds	1000	
157-158	Date/Time year	2018	
159-160	Date/Time day	320	

161-162	Date/Time hour	11	14
163-164	Date/Time minute	0	59
165-166	Date/Time sec	0	59

Table 2: Trace header summary (exemplary for file Paranal_EW.sgy).

A comprehensive description of the data acquisition and all parameters is given in the BSc thesis of Lukas Ninnemann which is also included in the directory /info (Ninnemann, 2020).

4. Data Availability/Access

Data is archived at the *GIPP Experiment and Data Archive* where it is freely available under a “Creative Commons” (CC-BY 4.0) license for further use. When using the data, please give reference to this data publication. Recommended citation is:

S. Buske, V. Wennrich, M. Melles & L. Ninnemann (2021) Data of the “Seismic investigation of clay pans in the Atacama Desert (N-Chile) (SEISCLAYPAN)”. GFZ Data Services. <https://doi.org/10.5880/GIPP.201812.1>

Acknowledgments

Instruments were provided by Geophysical Instrument Pool Potsdam (GIPP) of GFZ and by TU Bergakademie Freiberg.

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