


Monitoring the Preonzo rock slope instability using resonance mode analysis: research data

Research data and meta data

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Metadata and instructions for data access

Introduction

The enclosed data were analyzed and published by Häusler et al. (2021), Monitoring the Preonzo rock slope instability using resonance mode analysis, *Journal of Geophysical Research: Earth Surface*. Details on the field experiment can be found in section 3 (Field experiments) of the publication.

Metadata compiled by M. Häusler, Swiss Seismological Service, ETH Zurich (January 2021)

Seismic array data

Seismic data analyzed and presented in section 5 (Results of array-based FDD modal analysis using ambient vibrations) in the study by Häusler et al. (2021) consists of three data sets from three separate surveys with partly overlapping sensor locations.

All sensors were placed on a metal trihedron in shallow holes after removing the uppermost layer of the soil, on rock, or talus material. All data are converted from `mseed` to `sac` format and corrected for the corresponding instrument response (band-pass filter from 0.1 to 50 Hz, mean subtracted, trend removed, output dimension is velocity). All coordinates are given in the CH1903 metric grid (SRID 21781). Locations are measured with differential GNSS (accuracy ~ 2 cm). In case of insufficient reception, locations were determined by standard GNSS and by calibration using the topographic map and altimeters (accuracy ~ 1 m). PRE02, PRE04, and PRE05 were permanently installed monitoring stations and their data was used in the array-based data analysis. For convenience, we provide the relevant time windows together with the seismic array data.

Array 1

Start date and time: 24 June 2019 02:00 (UTC)

End date and time: 24 June 2019 04:00 (UTC)

Sampling rate: 200 Hz

Details for each station are summarized in Table 1.

Table 1 Station information for the temporary seismic array 1.

Station name	CH_x	CH_y	CH_z	Note	Sensor	digitizer
PRE100	719012	123257	1561	rock	LE3D-1s	Taurus
PRE102	719041.41	123282.45	1526.60	soil	LE3D-5s	Centaur
PRE103	719071.71	123301.61	1516.85	soil	LE3D-5s	Centaur
PRE104	719078.84	123277.41	1511.75	rock	LE3D-5s	Centaur
PRE105	719078.45	123320.46	1518.19	rock	LE3D-5s	Centaur
PRE106	719083	123307	1517.1	rock	LE3D-5s	Centaur
PRE107	719087.77	123294.22	1513.84	soil	LE3D-5s	Centaur
PRE108	719091.45	123302.84	1513.32	soil	LE3D-5s	Centaur
PRE109	719097.64	123275.35	1510.38	soil	LE3D-5s	Centaur
PRE110	719098.37	123294.30	1512.75	soil	LE3D-5s	Centaur
PRE111	719096.65	123307.47	1512.46	soil	LE3D-5s	Centaur
PRE112	719104.58	123293.41	1512.73	soil	LE3D-5s	Centaur
PRE113	719051.38	123344.58	1522.06	rock in soil	LE3D-1s	Taurus
PRE114	719051.39	123344.52	1522.07	soil	LE3D-5s	Centaur
PRE115	719060	123320	1521	rock	LE3D-1s	Taurus
PRE116	719094.44	123322.25	1508.81	soil	LE3D-1s	Taurus
PREO2	719098.80	123282.03	1513	soil	LE3D-1s	Taurus
PREO4	719087.12	123263.94	1510	soil	LE3D-1s	Taurus
PREO5	719048.70	123318.20	1523	soil	LE3D-1s	Taurus

Array 2

Start date and time: 25 June 2019 10:55 (UTC)
 End date and time: 25 June 2019 12:00 (UTC)
 Sampling rate: 200 Hz

Details for each station are summarized in Table 2.

Table 2 Station information for the temporary seismic array 2.

Station name	CH_x	CH_y	CH_z	Note	Sensor	digitizer
PRE200	719012	123257	1561	rock	LE3D-1s	Taurus
PRE202	719041.41	123282.45	1526.60	soil	LE3D-5s	Centaur
PRE203	719071.71	123301.61	1516.85	soil	LE3D-5s	Centaur
PRE206	719083	123307	1517.1	rock	LE3D-5s	Centaur
PRE211	719096.65	123307.47	1512.46	soil	LE3D-5s	Centaur
PRE212	719104.58	123293.41	1512.73	soil	LE3D-5s	Centaur
PRE213	719051.38	123344.58	1522.06	rock in soil	LE3D-1s	Taurus
PRE214	719051.39	123344.52	1522.07	soil	LE3D-5s	Centaur
PRE215	719060	123320	1521	rock	LE3D-1s	Taurus
PRE216	719094.44	123322.25	1508.81	soil	LE3D-1s	Taurus
PRE217	719067.74	123285.65	1512.16	rock in soil	LE3D-5s	Centaur
PRE218	719117	123248	1480	rock in soil	LE3D-5s	Centaur
PRE219	719098.83	123247.10	1505.85	rock	LE3D-5s	Centaur
PRE220	719071.78	123183.70	1516.20	rock	LE3D-5s	Centaur
PRE221	719056.07	123237.80	1515.53	talus	LE3D-5s	Centaur
PRE222	718998.61	123379.43	1557.46	rock in soil	LE3D-5s	Centaur
PRE02	719098.80	123282.03	1513	soil	LE3D-1s	Taurus
PRE04	719087.12	123263.94	1510	soil	LE3D-1s	Taurus
PRE05	719048.70	123318.20	1523	soil	LE3D-1s	Taurus

Array 3

Start date and time: 26 June 2019 02:00 (UTC)
 End date and time: 26 June 2019 04:00 (UTC)
 Sampling rate: 200 Hz

Details for each station are summarized in Table 3.

Table 3 Station information for the temporary seismic array 3.

Station name	CH_x	CH_y	CH_z	Note	Sensor	digitizer
PRE300	719012	123257	1561	rock	LE3D-1s	Taurus
PRE313	719051.38	123344.58	1522.06	rock in soil	LE3D-1s	Taurus
PRE316	719094.44	123322.25	1508.81	soil	LE3D-1s	Taurus
PRE323	719087	123280	1512.6	soil	LE3D-5s	Centaur
PRE02	719098.80	123282.03	1513	soil	LE3D-1s	Taurus
PRE04	719087.12	123263.94	1510	soil	LE3D-1s	Taurus
PRE05	719048.70	123318.20	1523	soil	LE3D-1s	Taurus

Continuous seismic data

Raw seismic data analyzed and presented in section 6 (Results of EFDD monitoring) in the study by Häusler et al. (2021) are available as daily `mseed` files. Station PREO5 was a semi-permanent installation used for a different experiment. Data of that station are not used for continuous monitoring and are only used as part of the seismic arrays. Table 4 summarizes the acquisition parameters of both permanent seismic stations. Both stations are LE3D-1s sensors from Lennartz with a Taurus digitizer by Kinematics.

Table 4. Summary of the acquisition parameters of the permanent seismic stations. On-time percentages represent the period from installation until 31 August 2019. "Ongoing" refers to the date of compilation of these metadata (January 2021).

Station	online	Installation	On-time percentage	CH_x	CH_y	CH_z
PREO2	14 June 2012, ongoing	East of open rear fracture, shallow installation, unstable ground, covered by metal cap	90.5 %	719098.80	123282.03	1513
PREO4	16 June 2015, ongoing	West of open rear fracture, shallow installation, covered by metal cap	92.4 %	719087.12	123263.94	1510

Extensometer and reflector data

Data of extensometer 7 and reflector 116 are provided in the enclosed CSV files, units are millimeters [mm].

These data are published by courtesy of the Canton of Ticino, Switzerland (Ufficio dei pericoli naturali, degli incendi e dei progetti).

Temperature and precipitation data

Meteorological data of the Swiss Federal Office of Meteorology and Climatology (MeteoSwiss) are available without charge for universities and educational institutions only. Data can be downloaded after registration at IDAWEB: <https://gate.meteoswiss.ch/idaweb/more.do>. For use outside of research and education, please contact the customer service of MeteoSwiss to access the application CLIMAP-net to download data: <https://www.meteoswiss.admin.ch/home/form/customer-service.html>

Station code is CIM (Cimetta). Parameters used in this study are:

rre003d0 precipitation, three-day sum, [mm]
rka150d0 precipitation, daily sum, [mm]
tre200d0 temperature, daily average 2 m above ground, [°C]

River discharge data

River discharge data from the Ticino river at Bellinzona (and other hydrological data from Switzerland) are available free of charge on the website of the Swiss Federal Office for the Environment (FOEN): <https://www.bafu.admin.ch/bafu/en/home/topics/water/state/data/obtaining-monitoring-data-on-the-topic-of-water/hydrological-data-service-for-watercourses-and-lakes.html>