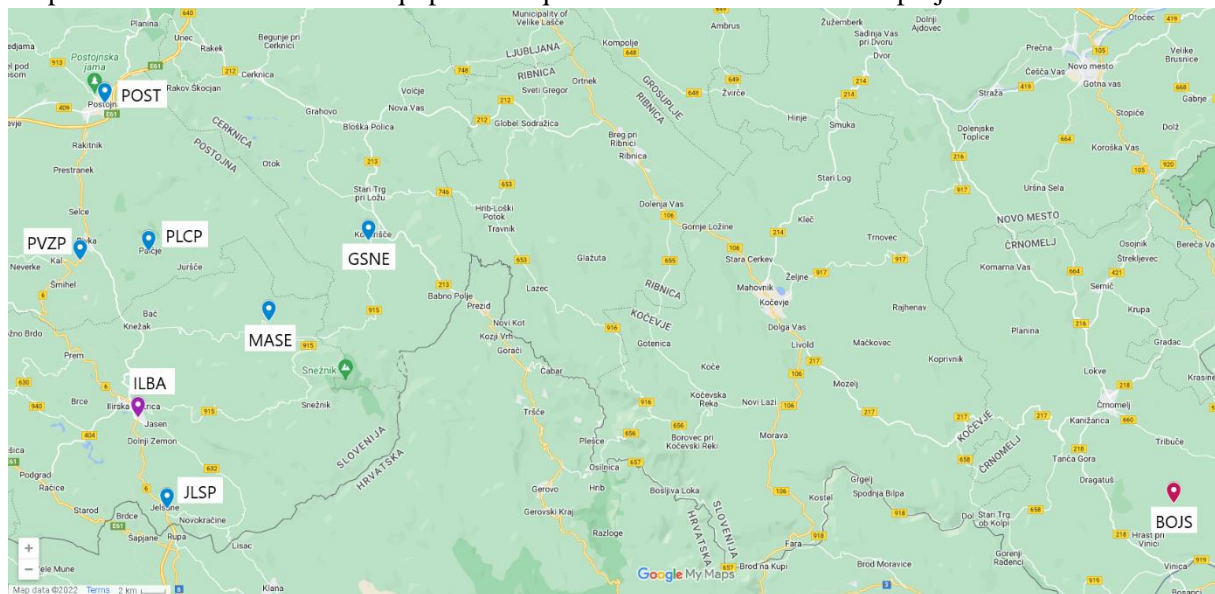


Seismic equipment and instruments acquired within the RI-SI-EPOS project

Seismic network layout

Six new instruments Kinometrics Etna2, that constitute the Slovenian Karst NFO Seismic Network, were acquired within the RI-SI-EPOS project in 2020. They are installed at locations marked with blue dots on the map. The Nanometrics broadband seismic station equipment was temporarily split and installed at two locations of Seismic Network of the Republic of Slovenia – the seismometer Trillium was installed at station BOJS near Bojanci (red dot) while the accelerometer Titan with the datalogger Centaur were installed at station ILBA in Ilirska Bistrica (purple dot). In 2023 the Nanometrics broadband station equipment will be installed in Postojna cave as it was initially planned.

Map 1: Locations with seismic equipment acquired within the RI-SI-EPOS project





Data quality

Continuous monitoring of data quality and network performance is essential for good quality measurements. Automated checking of various quality parameters of Slovenian Karst NFO Seismic Network equipment is continuously performed at ARSO and routine manual inspection is conducted:

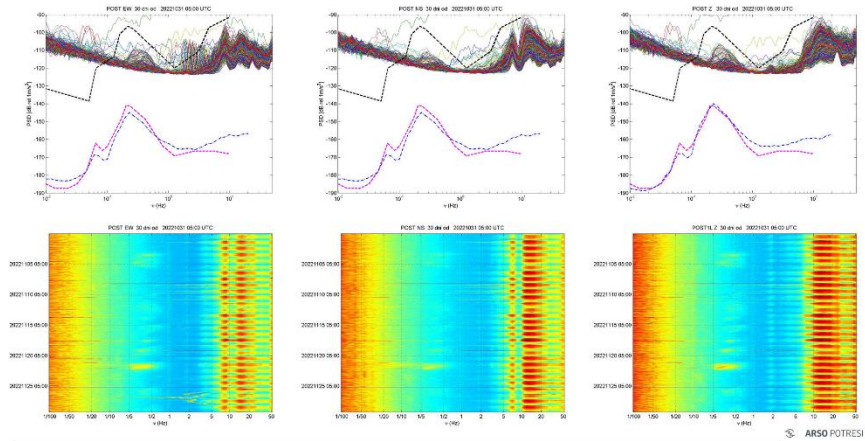
- PSD spectra of 1h segments calculation and plotting (very useful for revealing potential instrument problems)
- interdependent data quality control of all stations using strong teleseismic events
- data telemetry monitoring
- instrument parameters monitoring (GPS quality, battery voltage, processor temperature, disk quota, up-time, number of reboots, ...)
- data completeness and non-realtime data acquisition
- seismic data inspection and analyses by a seismologist

Geological data

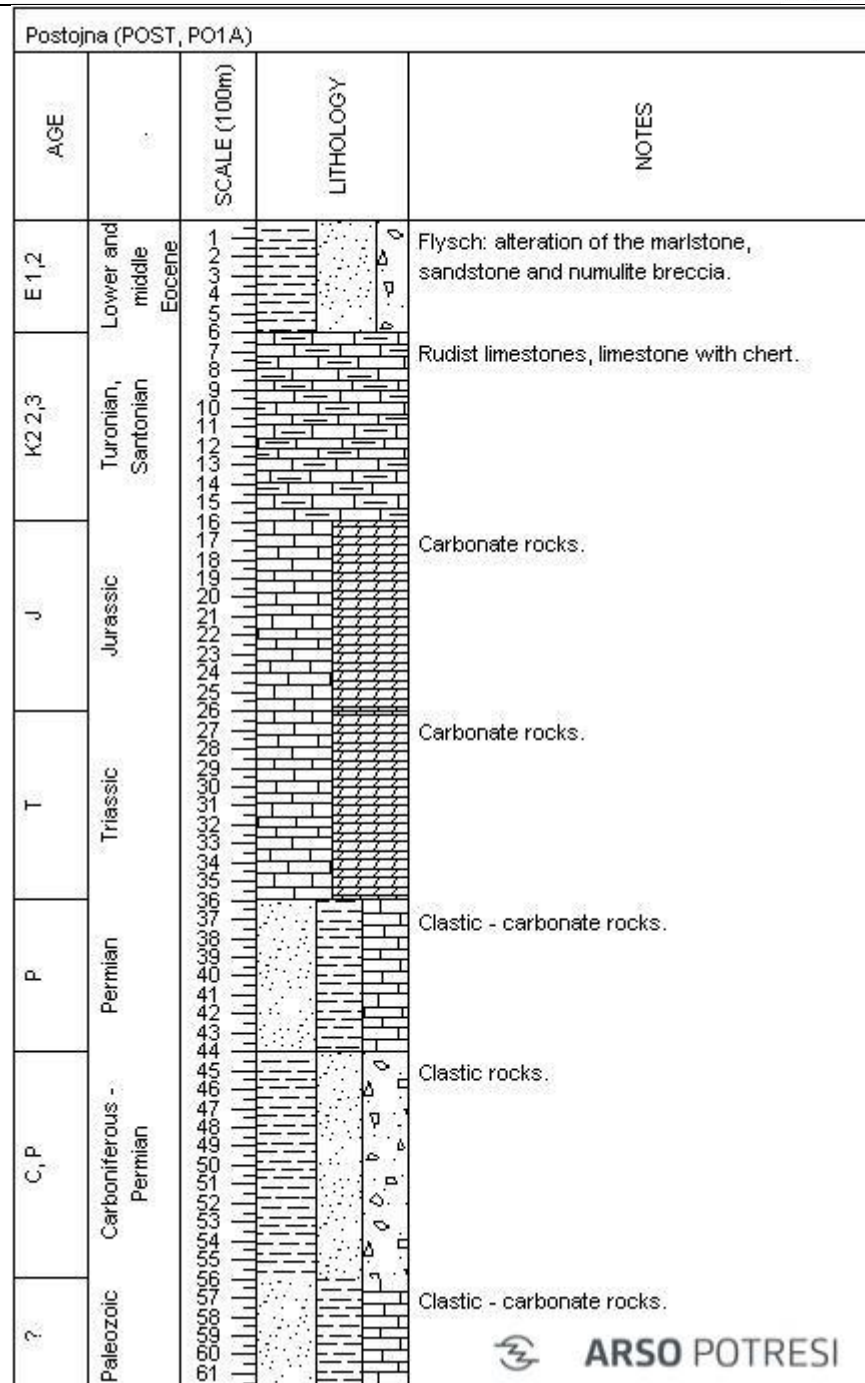
Geological bedrock was evaluated for all seismic stations sites from geological maps and available literature.


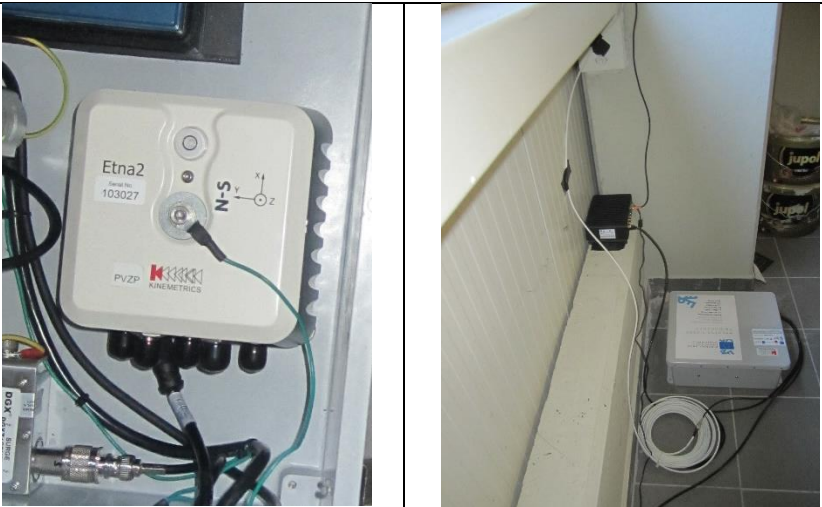
Seismic station POST			
Installation location	ZRC SAZU, Titov trg 2, 6230 Postojna		
Location on map			
Coordinates	LAT: 45.7756° LON: 14.2129° ELEVATION: 553 m		
Instrument	Type, s/n	Start date	End date
Accelerograph	Etna2 with $\pm 2g$ EpiSensor, s/n 103025	2020-05-22	-
Accelerograph	Etna2 with $\pm 2g$ EpiSensor, s/n 103026	2020-07-30	
Timing system	GPS		
Seismic channels	HN1, HN2, HNZ @ 200 sps		
Horizontal components orientation	HN1: 224° clockwise from N HN2: 134° clockwise from N		
Installation remarks	The instrument is installed in the basement near the NW outer wall, screwed to the pavement. The instrument's north component (labelled HN2) is oriented parallel to the adjacent wall and points in the direction of 134° clockwise from geographic north.		
Instrument photos			

Data quality
PSD 30 days

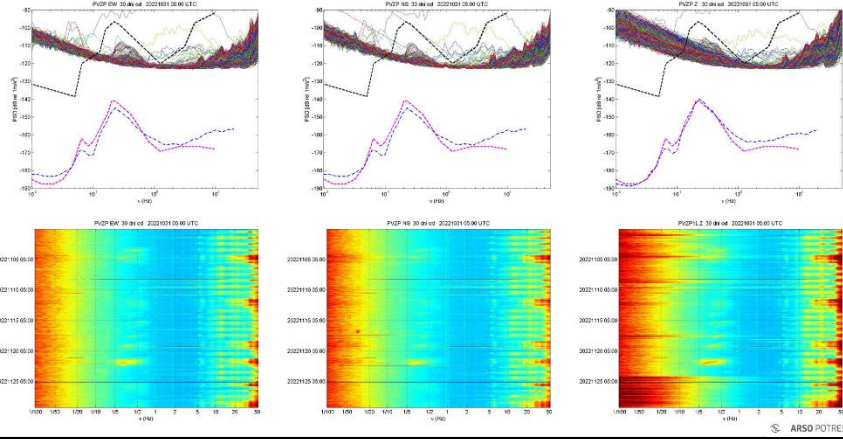


Stratigraphic column

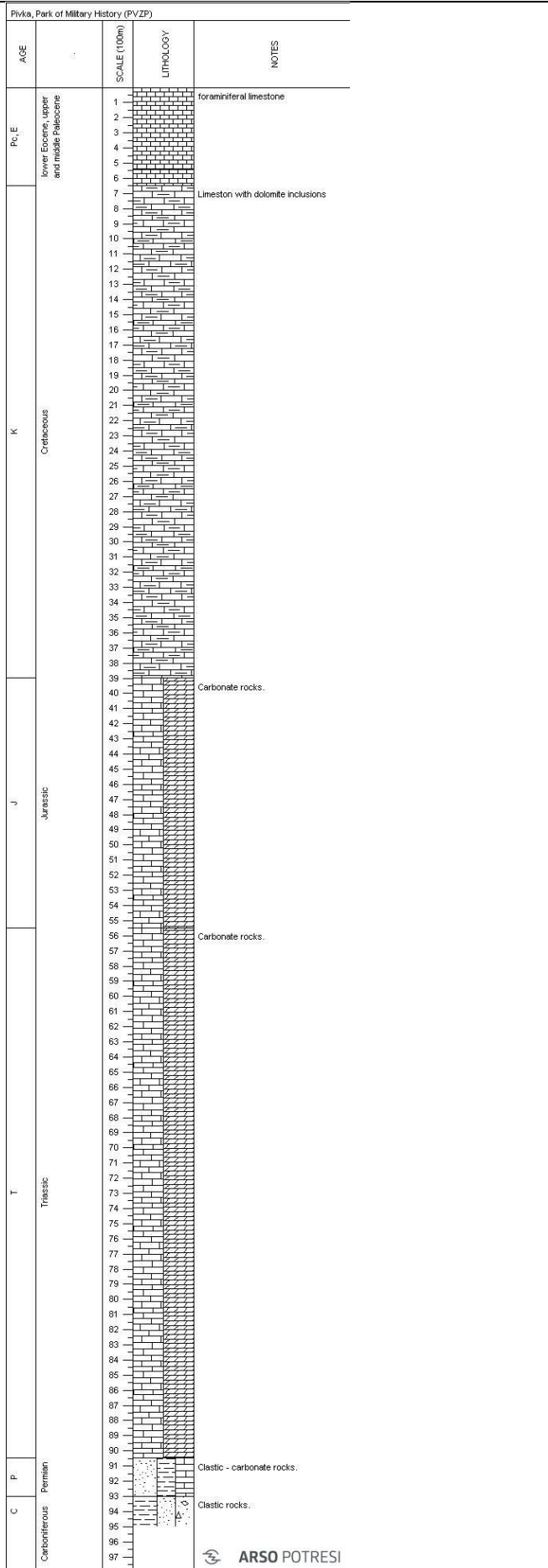



Seismic station PVZP			
Installation location	Park vojaške zgodovine, Kolodvorska cesta 51, 6257 Pivka		
Location on map			
Coordinates	LAT: 45.6685° LON: 14.1885° ELEVATION: 559 m		
Instrument	Type, s/n	Start date	End date
Accelerograph	Etna2 with ±2g EpiSensor, s/n 103027	2020-07-15	-
Timing system	GPS		
Seismic channels	HN1, HN2, HNZ @ 200 sps		
Horizontal components orientation	HN1: 49° clockwise from N HN2: 319° clockwise from N		
Installation remarks	The instrument is installed in the basement near NE outer wall, screwed to the pavement. The instrument's north component (HN2) is oriented parallel to the adjacent wall and points in the direction of 41° counterclockwise from geographic north.		
Instrument photos			

Data quality
PSD 30 days



Stratigraphic column

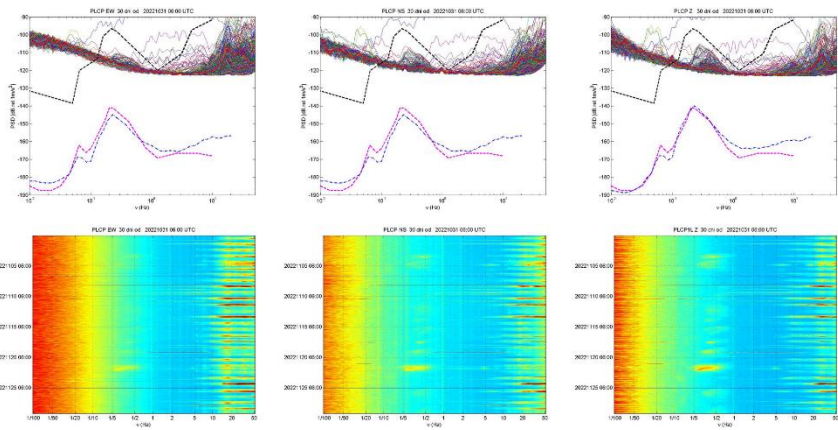


Seismic station PLCP			
Installation location	"Old elementary school" Palčje, Palčje 4, 6257 Pivka		
Location on map			
Coordinates	LAT: 45.6762° LON: 14.2562° ELEVATION: 598 m		
Instrument	Type, s/n	Start date	End date
Accelerograph	Etna2 with ±2g EpiSensor, s/n 103024	2022-06-02	-
Timing system	GPS		
Seismic channels	HN1, HN2, HNZ @ 200 sps		
Horizontal components orientation	HN1: 109° clockwise from N HN2: 19° clockwise from N		
Installation remarks	<p>The instrument is installed in the basement near west outer wall, screwed to the pavement. In the period 15. 7. 2020 – 2. 6. 2022 it was installed at Ekomuzej Pivških presihajočih jezer, Slovenska vas 10, Pivka (named MPJP). It was moved to the new location because of renovation work at previous location. The new location is seismically better (lower seismic noise and better networkwise geometry). The instrument's north component (HN2) is oriented parallel to the adjacent wall and points in the direction of 19° clockwise from geographic north.</p>		

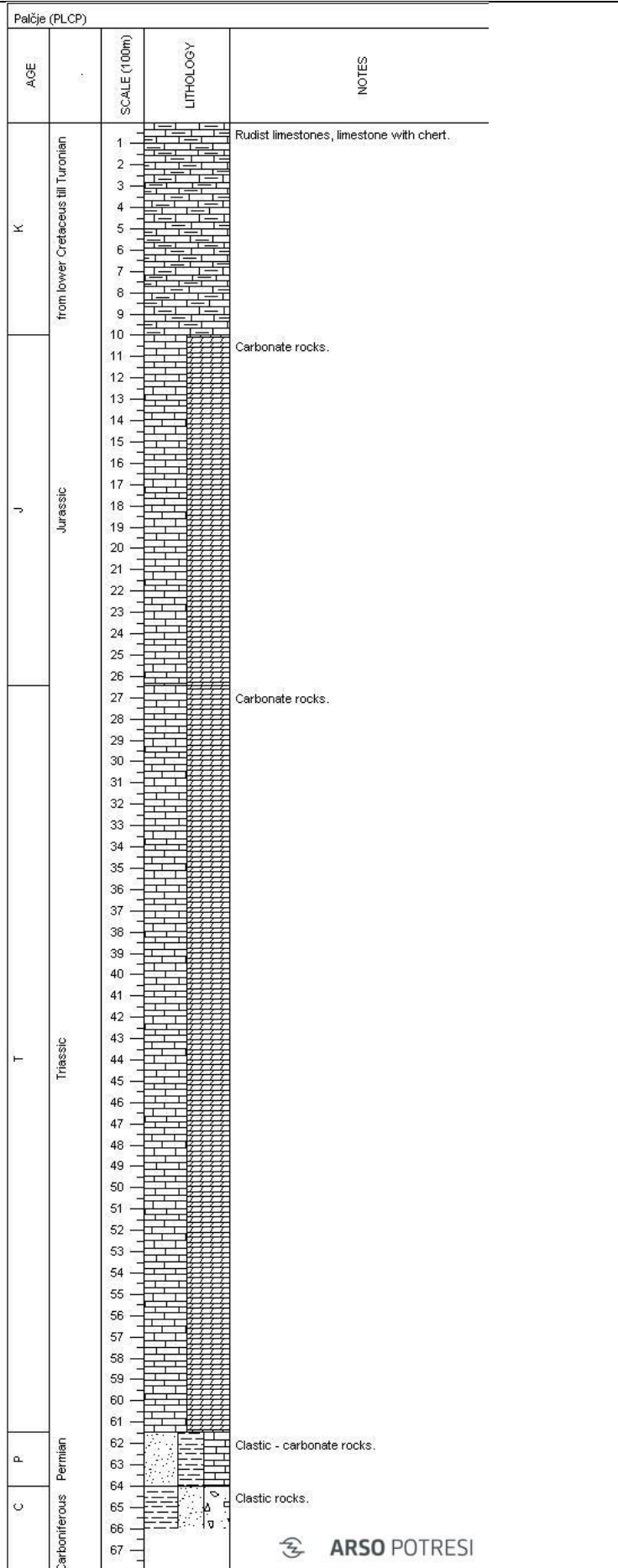
Instrument photos





Data quality
PSD 30 days



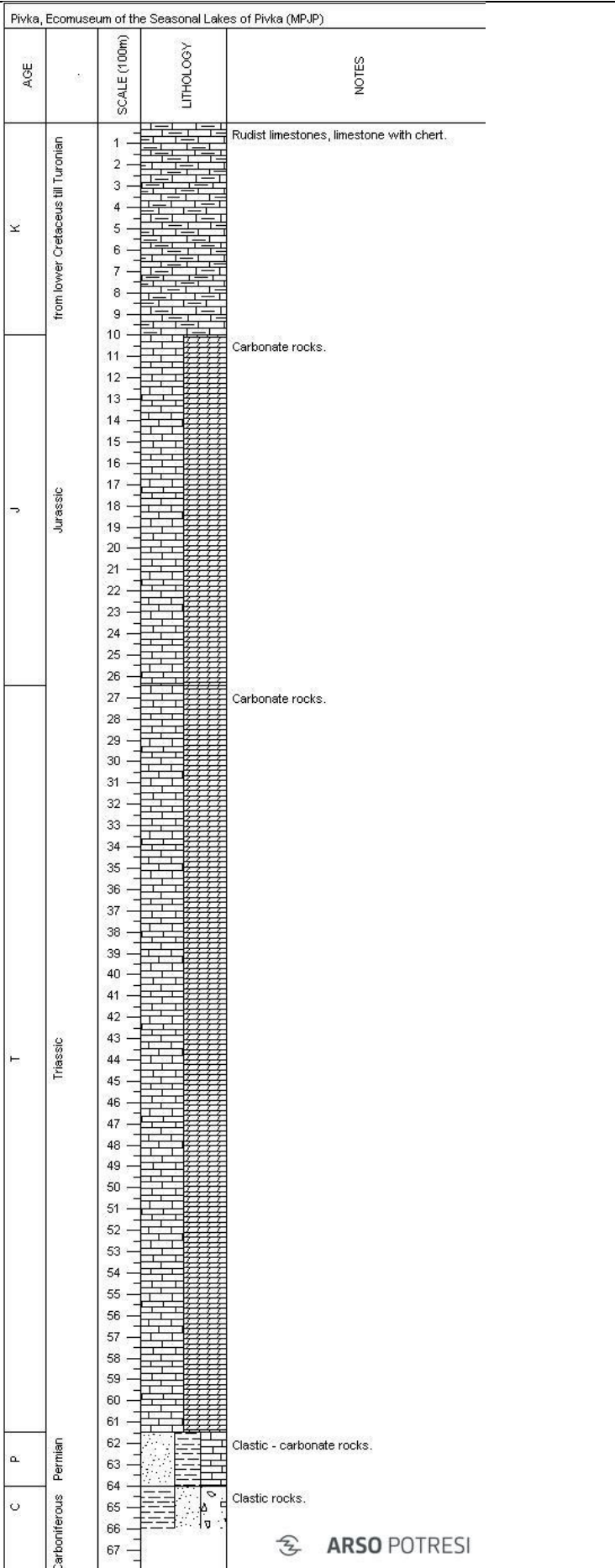
Stratigraphic column

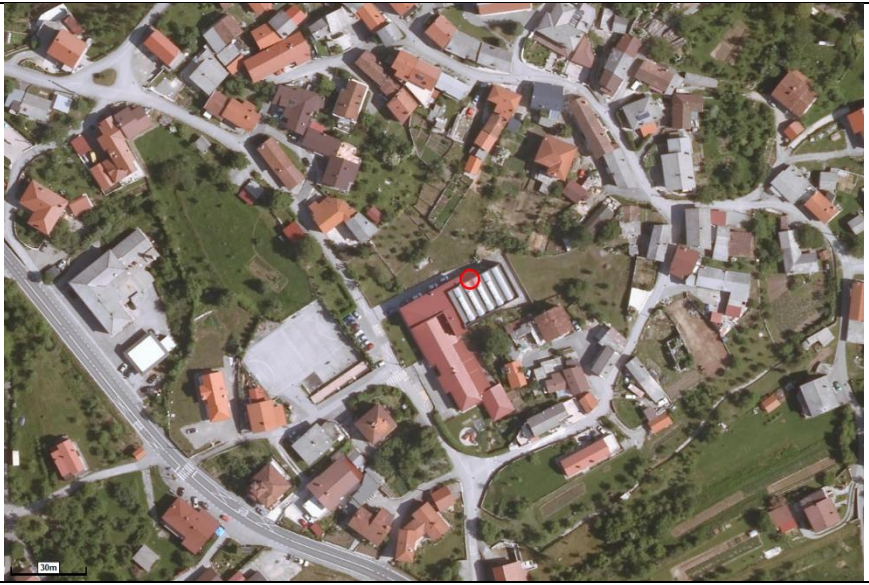
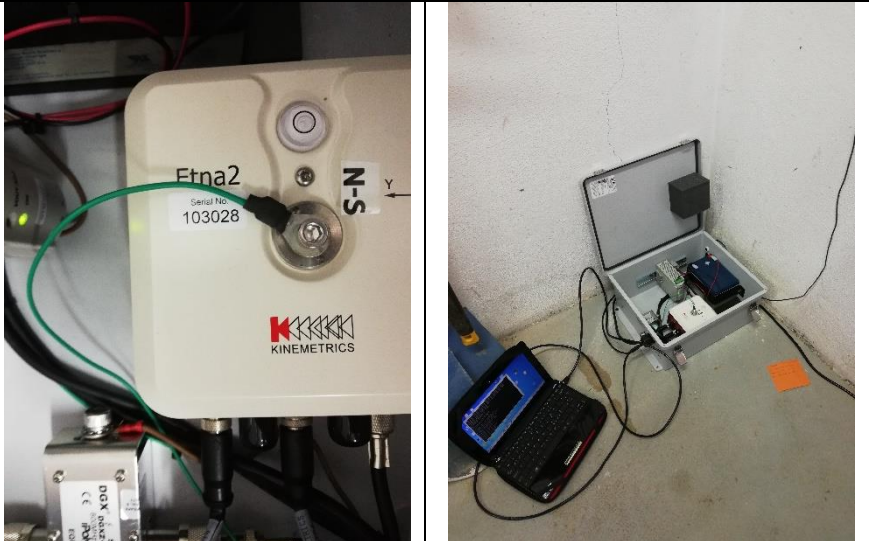


Seismic station MPJP			
Installation location	Ekomuzej Pivških presihajočih jezer, Slovenska vas 10, 6257 Pivka		
Location on map			
Coordinates	LAT: 45.7011° LON: 14.2117° ELEVATION: 559 m		
Instrument	Type, s/n	Start date	End date
Accelerograph	Etna2 with $\pm 2g$ EpiSensor, s/n 103024	2020-07-15	2022-06-02
Timing system	GPS		
Seismic channels	HN1, HN2, HNZ @ 200 sps		
Horizontal components orientation	HN1: 28° clockwise from N HN2: 298° clockwise from N		
Installation remarks	The instrument is installed on ground floor by the south building wall, screwed to the pavement. In 2022 it was moved to new location in Palčje (PLCP) due to renovation of the museum. The instrument's north component (HN2) is oriented parallel to the adjacent wall and points in the direction of 62° counterclockwise from geographic north.		
Instrument photos			

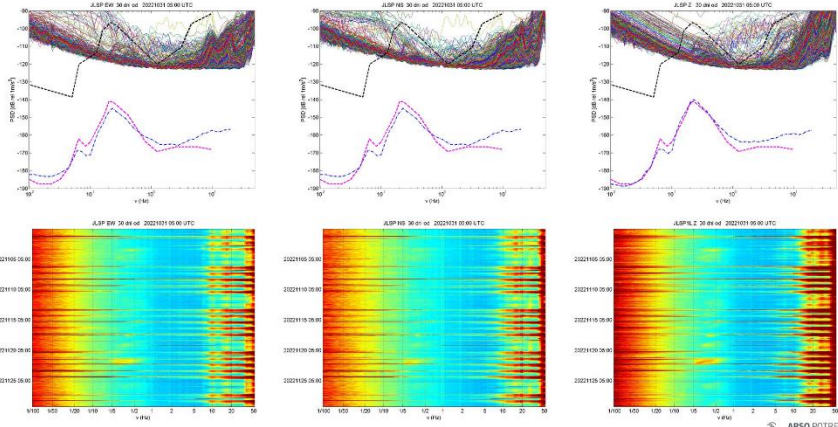
Data quality PSD 30 days	/
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Stratigraphic column

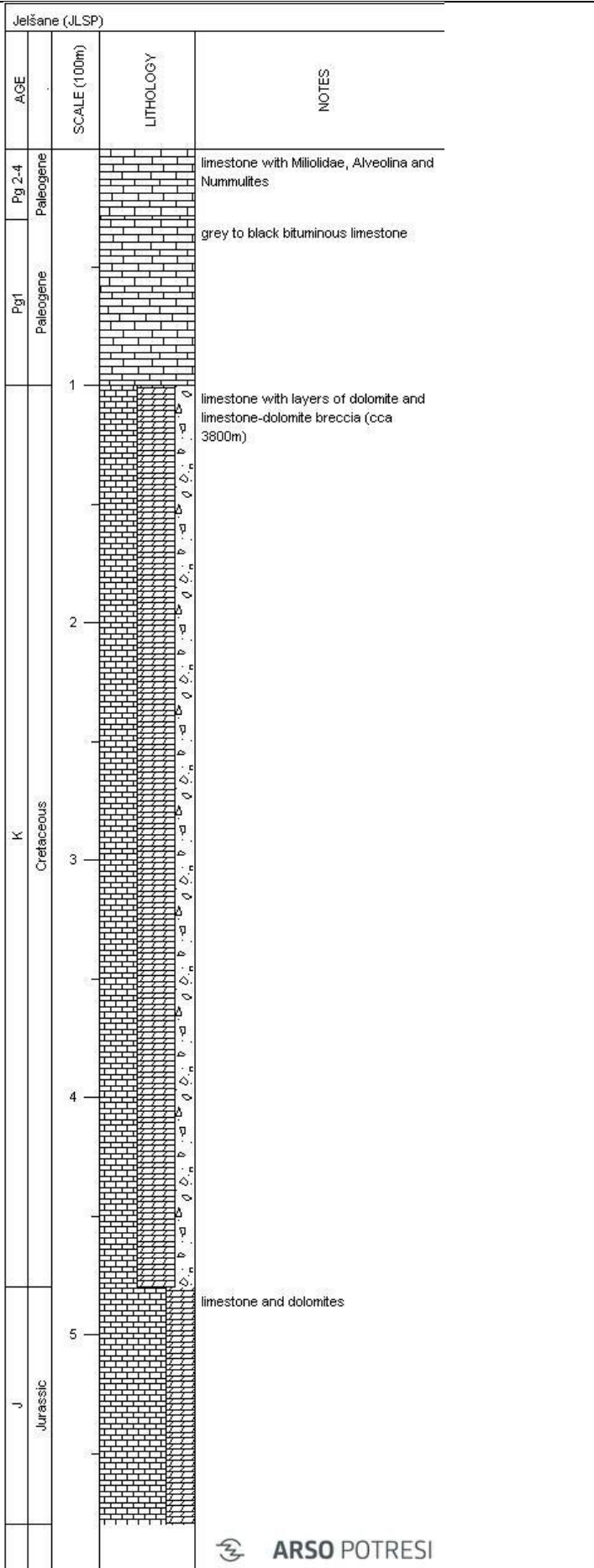




Seismic station JLSP			
Installation location	Osnovna šola Jelšane, Jelšane 82, 6254 Jelšane		
Location on map			
Coordinates	LAT: 45.5008° LON: 14.2734° ELEVATION: 509 m		
Instrument	Type, s/n	Start date	End date
Accelerograph	Etna2 with $\pm 2g$ EpiSensor, s/n 103028	2020-07-09	-
Timing system	GPS		
Seismic channels	HN1, HN2, HNZ @ 200 sps		
Horizontal components orientation	HN1: 60° clockwise from N HN2: 330° clockwise from N		
Installation remarks	The instrument is installed in ground floor of an auxilliary building next to the main school building, screwed to the pavement. The instrument's north component (HN2) is oriented parallel to the adjacent wall and points in the direction of 30° counterclockwise from geographic north.		
Instrument photos			

Data quality PSD 30 days





Stratigraphic column



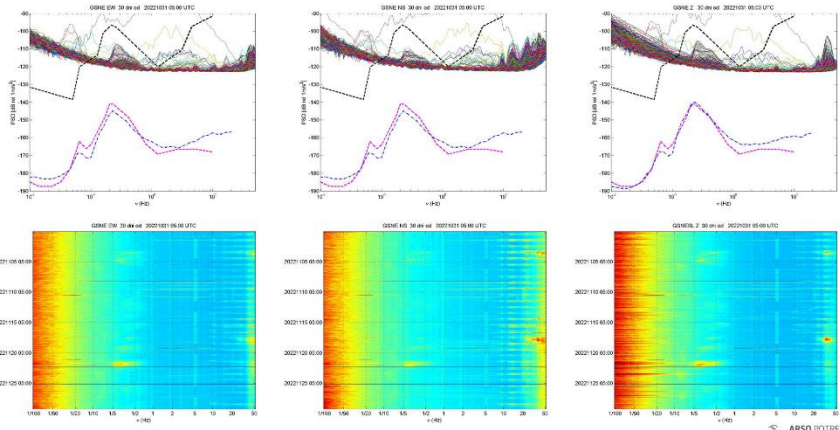
Seismic station MASE			
Installation location	private home, Mašun 10, 6253 Knežak		
Location on map			
Coordinates	LAT: 45.6290° LON: 14.3734° ELEVATION: 1043 m		
Instrument	Type, s/n	Start date	End date
Accelerograph	Etna2 with $\pm 2g$ EpiSensor, s/n 103025	2020-08-13	-
Timing system	GPS		
Seismic channels	HN1, HN2, HNZ @ 200 sps		
Horizontal components orientation	HN1: 213° clockwise from N HN2: 123° clockwise from N		
Installation remarks	The instrument is installed in the ground floor in the garage, near the entrance. The instrument's north component (HN2) is oriented parallel to the adjacent wall and points in the direction of 123° counterclockwise from geographic north.		
Instrument photos			
Data quality PSD 30 days	/		

Stratigraphic column

Mašun (MASE)				
AGE		SCALE (100m)	LITHOLOGY	NOTES
2/K2 2,3	lower Turonian	1-4		dolomite with layers of limestone (600m)
K1,2	Cenomanian and Albian	5-10		dolomite and limestone breccia with limestone layers
K1	lower Cretaceous	11-27		layers of limestone and dolomite with limestone and dolomite breccia
J	Jurassic	28-36		limestone with layers of dolomite (cca 1000m)



Seismic station GSNE			
Installation location	Grad Snežnik, Kozarišče 67, 1386 Stari trg pri Ložu		
Location on map			
Coordinates	LAT: 45.6829° LON: 14.4692° ELEVATION: 575 m		
Instrument	Type, s/n	Start date	End date
Accelerograph	Etna2 with $\pm 2g$ EpiSensor, s/n 103029	2020-08-26	-
Timing system	GPS		
Seismic channels	HN1, HN2, HNZ @ 200 sps		
Horizontal components orientation	HN1: 32° clockwise from N HN2: 302° clockwise from N		
Installation remarks	The instrument is installed on stairs in the lower part of the original castle tower, screwed to the pavement. The instrument's north component (HN2) is oriented parallel to the adjacent wall and points in the direction of 58° counterclockwise from geographic north.		
Instrument photos			

Data quality PSD 30 days

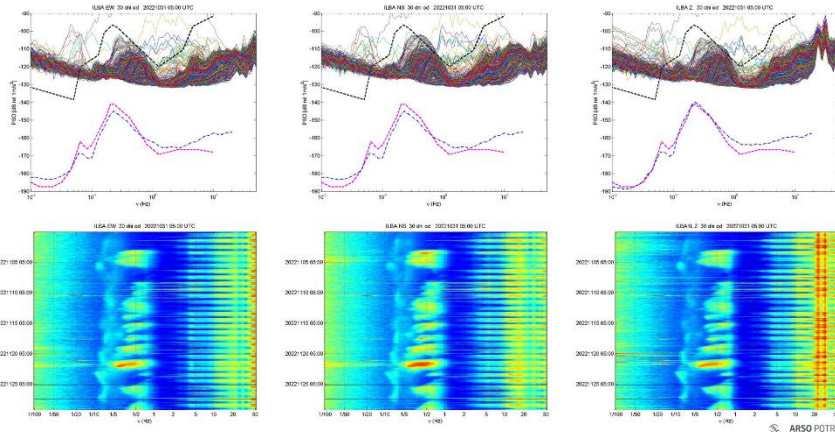


Stratigraphic column

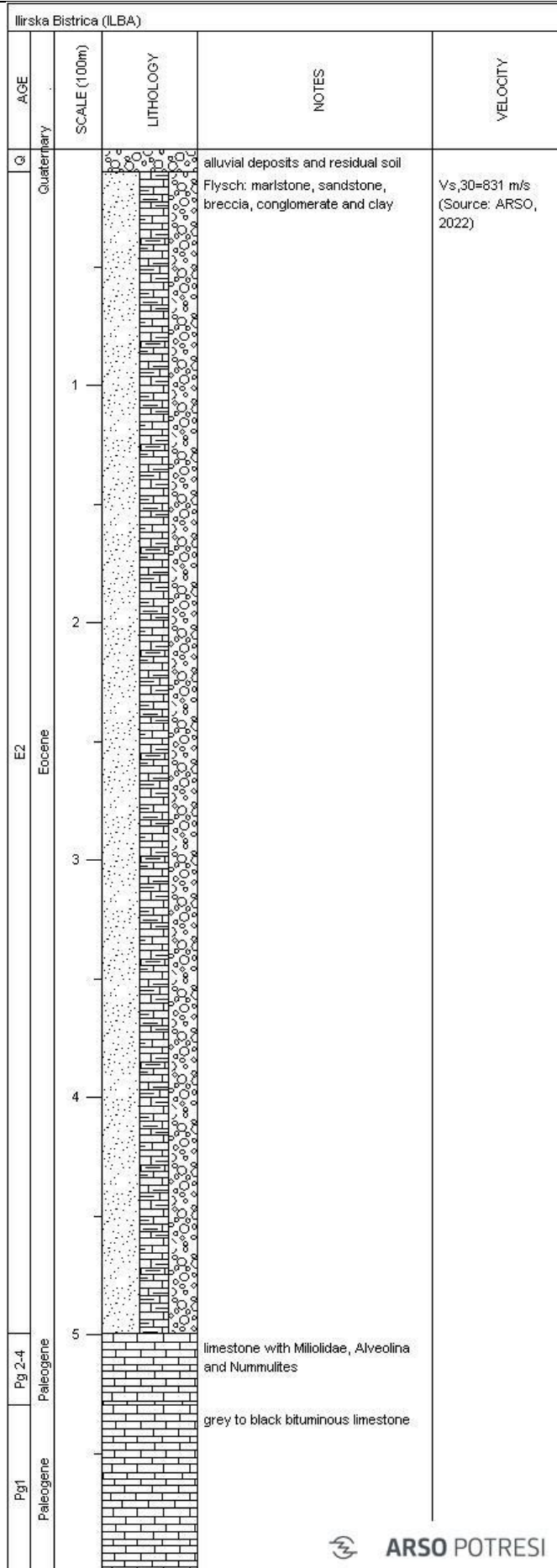
Snežnik (GSNE)		AGE	SCALE (100m)	LITHOLOGY	NOTES															
J3/2,3	Portland and Kimmeridgian	1			white crystalline dolomite with layers of limestone															
		2				Carbonate rocks.														
J	Jurassic	3					Carbonate rocks.													
		4						Carbonate rocks.												
		5							Carbonate rocks.											
		6								Carbonate rocks.										
		7									Carbonate rocks.									
		8										Carbonate rocks.								
		9											Carbonate rocks.							
		10												Carbonate rocks.						
		11													Carbonate rocks.					
		12														Carbonate rocks.				
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44													Carbonate rocks.							
45														Carbonate rocks.						
46															Carbonate rocks.					
47																Carbonate rocks.				
48																	Carbonate rocks.			
49																		Carbonate rocks.		
50						Carbonate rocks.														
51	Carbonate rocks.																			
P		Permian																	52	
					53														Clastic - carbonate rocks.	
					54		Clastic - carbonate rocks.													
C		Carboniferous			55															Clastic rocks.
					56				Clastic rocks.											
					57		Clastic rocks.													
					58					Clastic rocks.										



Nanometrics broadband seismic station			
Installation remarks	The broadband seismic station was primarily intended for installation in Postojna cave but for testing purposes it was split and installed at two locations of the ARSO Seismic Network. It is planned to de-install the equipment from ARSO locations and install the complete setup at Postojna cave location.		
Installation location #1	Municipality building, Bazoviška cesta 14, 6250 Ilirska Bistrica		
Location on map			
Coordinates	LAT: 45.5638° LON: 14.2446° ELEVATION: 404 m		
Instrument	Type, s/n	Start date	End date
Datalogger	Nanometrics Centaur, s/n 7058	2020-09-01	-
Accelerometer	Nanometrics Titan ±2g, s/n 2023		
Timing system	GPS		
Seismic channels	HN1, HN2, HNZ @ 200 sps		
Horizontal components orientation	HN1: 320° clockwise from N HN2: 230° clockwise from N		
Installation remarks	The accelerometer is installed in the basement near the emergency exit, screwed to the pavement. The instrument's north component (HN2) is oriented parallel to the adjacent wall and points in the direction of 130° counterclockwise from geographic north.		
Instrument photos			

Data quality
PSD 30 days

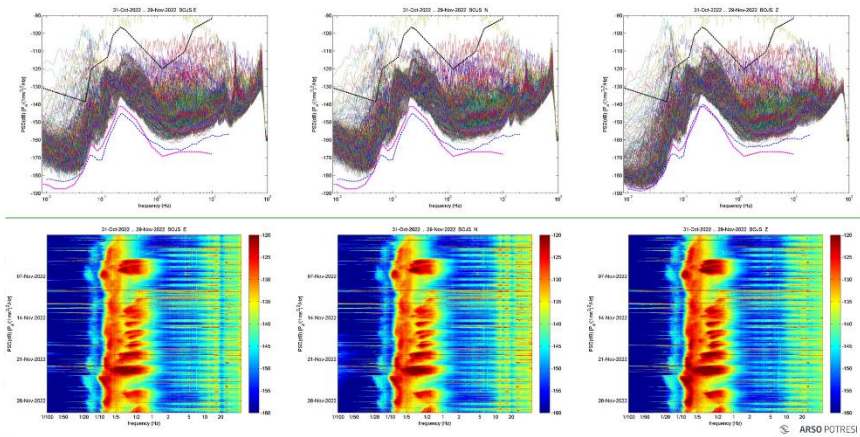


Stratigraphic column



Installation location #2	ARSO seismic station BOJS (Bojanci)		
Location on map			
Coordinates	LAT: 45.5042° LON: 15.2519° ELEVATION: 252 m		
Instrument	Type, s/n	Start date	End date
Seismometer	Nanometrics Trillium 360, s/n 1001	2020-09-03	-
Timing system	GPS		
Seismic channels	HN1, HN2, HNZ @ 200 sps		
Horizontal components orientation	HHE: East HHN: North		
Installation remarks	The seismometer is installed in the seismic vault at seismic station BOJS. It is connected to Q330 datalogger which is part of ARSO equipment.		
Instrument photos			

Data quality
PSD 30 days



Stratigraphic column

Bojanci (BOJS)			
AGE	SCALE (100 m)	LITHOLOGY	NOTES
K1 1+2 Berriasian and Valanginian	1	[Brick pattern]	limestone
	2		
	3		
	4		
J3 2,3 Kimmeridgian and Tithonian	5	[Brick pattern]	limestone
	6		
	7		
	8		
	9		
	10		
	11		
	12		