RUHR-UNIVERSITÄT BOCHUM



DSEBRA GOES TO GREECE AND NORTHERN MACEDONIA AS PART OF ADRIAARRAY

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Introduction

The AdriaArray project addresses fundamental questions related to the geodynamics and the deformation and stress field of the Adriatic plate in south-eastern Europe. The observational basis of AdriaArray is a recently formed seismic broadband array that joins newly deployed temporary and existing permanent stations all over the entire Adriatic plate.

Deployment

Monitoring

The streamed state-of-health (SOH) channels are permamently monitored. The monitoring system evaluates the SOH channels for the external power (230V), battery power (12V), charger status, router status, datalogger temperatur, mass centering, clock quality and data gaps. The output is summarized on a web page. From there plots of the SOH channels and waveform plots (dayplots) are accessible. Links to the seedlink monitoring are also present. The seedlink monitoring uses the tool *slmon* of the SeiscomP software. Most **frequent problems** are **power outages** and **router problems**. But other failuers like broken charger, batteries or GPS antennas could also be detected. In most cases local **contact persons** could help to fix problems if it wasn't possible remotely.

The contribution of the Ruhr University Bochum (RUB) in Greece and Northern Macedonia enhances the local networks by 35 temporary stations (GR01 - GR33, LFKM and MK01A – MK04A on the map) and upgrades the instruments at 17 permanent sites

(other labled stations). Most of these sites are equipped with broadband instruments from the German DSEBRA array which were previously installed within the scope of the AlpArray project. Deployment started with **39 stations in Greece** at the end of September 2022. Local partners are the universities of Thessaloniki, Athens and Patras, as well as the National Observatory of Athens (NOA). The deployment of 13 stations in North Macedonia is planned for March 2023 in cooperation with the Seismological Observatory of the University of Skopje.

All stations have mobile routers for livestreaming of waveform and state-of-health data to servers of the Seismological Observatory of the RUB and to the EIDA node of NOA. The FDSN network code 1Y has been assigned to the temporary stations, while the upgraded permanent stations keep the original network code. Access to the waveform data is restricted to members of the AdriaArray project.

Data Quality

19° E 20° E MONTENEGRO	21° E KOSOVO	22° E 23 SERBIA MK01A	° E 24° E	25° E	26° E	27° E 28° E Events (Magnitude) • 3,5 - 4,0
-42° N		SKO KNE		BULGARIA		O 4,0 - 4,5 O 4,5 - 5,0
						Stations
6			GR01 GR02	GR03	GR06	$ \begin{array}{c} & \text{installed} \\ & & \\$
-41° N	BI	A GR07 A GR	.08	GR04	GR05	41°-N
	F	NA GR10 GR11	GR09 GR13			
	PENT GB15	GR12 GR16 O	O A		as X	
	GR14 A	GR17 GR18	۵ دور کو	Δ.	0	
LFKM	A	GR20 GR22			° [©] [©] ^Δ	o o
		GR24 AXAE	GR23 MRKA A			O 39° N
Â		SAA COMV	GR26	GR27		
	GR28	GR29 ACOR				38° N

Station	last active	230 V	12 V	router	charger	vonage	mass	CIOCK	gaps	temp	sinion	2411-piot
<u>Y.GR01</u>	0:01:26	OK	OK	WARN	WARN	OK	OK	OK	OK	20.6°C	show	<u>plot</u>
<u>Y.GR02</u>	0:01:02	FAIL	FAIL	FAIL	FAIL	OK	OK	OK	OK	-10.7°C	<u>show</u>	<u>plot</u>
Y.GR03	0:02:26	OK	OK	WARN	WARN	OK	OK	OK	OK	19.9°C	show	<u>plot</u>
<u>Y.GR04</u>	0:05:27	OK	OK	FAIL	OK	OK	OK	OK	OK	23.6°C	show	<u>plot</u>
<u>Y.GR05</u>	0:01:28	WARN	OK	OK	OK	WARN	OK	OK	OK	20.1°C	show	<u>plot</u>
<u>Y.GR06</u>	0:02:21	WARN	OK	WARN	OK	OK	OK	OK	OK	23.1°C	<u>show</u>	<u>plot</u>
<u>Y.GR07</u>	0:01:54	OK	OK	WARN	OK	OK	OK	OK	OK	20.1°C	<u>show</u>	<u>plot</u>
<u>Y.GR09</u>	0:02:46	WARN	OK	OK	OK	OK	OK	OK	OK	22.1°C	<u>show</u>	<u>plot</u>
<u>Y.GR10</u>	0:01:31	OK	OK	WARN	WARN	OK	OK	OK	OK	21.0°C	show	<u>plot</u>
<u>Y.GR11</u>	0:01:58	OK	OK	WARN	OK	OK	OK	OK	OK	19.0°C	show	<u>plot</u>
Y.GR12	0:01:13	OK	OK	WARN	WARN	OK	OK	OK	OK	22.3°C	show	<u>plot</u>
<u>Y.GR13</u>	0:03:02	OK	OK	WARN	OK	OK	OK	OK	OK	23.3°C	<u>show</u>	<u>plot</u>
<u>Y.GR14</u>	0:00:41	OK	OK	OK	OK	OK	OK	OK	OK	22.1°C	<u>show</u>	<u>plot</u>
<u>Y.GR15</u>	0:01:21	OK	OK	OK	OK	OK	OK	OK	OK	18.5°C	<u>show</u>	<u>plot</u>
<u>Y.GR16</u>	0:04:37	WARN	OK	WARN	OK	WARN	OK	OK	OK	12.4°C	<u>show</u>	<u>plot</u>
<u>Y.GR17</u>	0:02:34	WARN	OK	WARN	OK	WARN	OK	OK	OK	19.9°C	<u>show</u>	<u>plot</u>
<u>Y.GR18</u>	0:01:21	OK	OK	WARN	OK	OK	OK	OK	OK	17.0°C	show	<u>plot</u>
<u>Y.GR20</u>	0:00:32	OK	OK	OK	OK	OK	OK	OK	OK	17.4°C	<u>show</u>	<u>plot</u>
<u>Y.GR21</u>	0:00:50	OK	OK	OK	OK	OK	OK	OK	OK	21.8°C	show	<u>plot</u>
<u>Y.GR22</u>	0:00:47	OK	OK	WARN	WARN	OK	OK	OK	OK	20.7°C	<u>show</u>	<u>plot</u>
<u>Y.GR23</u>	0:01:50	OK	OK	OK	OK	OK	OK	OK	OK	23.4°C	<u>show</u>	<u>plot</u>
<u>Y.GR24</u>	0:01:47	OK	OK	WARN	OK	OK	OK	OK	OK	21.3°C	<u>show</u>	<u>plot</u>
<u>Y.GR26</u>	0:02:52	FAIL	FAIL	FAIL	FAIL	OK	OK	OK	OK	-10.6°C	<u>show</u>	<u>plot</u>
<u>Y.GR27</u>	0:01:09	OK	OK	WARN	WARN	OK	OK	OK	OK	25.9°C	show	<u>plot</u>
<u>Y.GR28</u>	0:00:29	OK	OK	WARN	OK	OK	OK	OK	OK	25.0°C	<u>show</u>	<u>plot</u>
<u>Y.GR29</u>	0:00:58	OK	OK	WARN	WARN	OK	OK	OK	OK	23.6°C	<u>show</u>	<u>plot</u>
<u>Y.GR30</u>	0:04:40	OK	OK	WARN	WARN	OK	OK	OK	OK	22.3°C	<u>show</u>	<u>plot</u>
<u>Y.GR31</u>	0:03:34	OK	OK	WARN	OK	OK	OK	OK	OK	25.0°C	show	<u>plot</u>
<u>Y.GR32</u>	0:01:00	OK	OK	OK	OK	OK	OK	OK	WARN	32.5°C	<u>show</u>	<u>plot</u>
<u>Y.GR33</u>	0:00:52	FAIL	FAIL	FAIL	OK	WARN	OK	OK	WARN	17.0°C	show	<u>plot</u>
Y.LFKM	0:00:39	OK	OK	WARN	OK	OK	OK	OK	OK	28.1°C	show	<u>plot</u>
IA.ACOR	0:00:57	OK	OK	OK	OK	OK	OK	OK	OK	23.7°C	show	<u>plot</u>
IA.AXAR	0:02:35	OK	OK	OK	OK	OK	OK	OK	OK	24.1°C	show	<u>plot</u>

Recorded Seismicity

The newly deployed stations in Greece recorded many events right from the start of the deployment. This includes data of the seismic series of Evia which started in November 2022 and lasted at least to February 2022. Especially the station GR27 in the vincinity of the active region could provide valueable data to get precise locations of small events. The map shows the events of magnitude 3.5 and larger but the network was also able to automatically detect and locate much smaller events down to magnitude 1.4. The regional sesimicity is monitored in more detail by the partners in Greece and Northern Macedonia, Nevertheless some example seismogramms are shown below.

The data quality of the stations has been estimated by pseudo power spectral density (**PPSD**) plots. Some examples for one week of data is shown for a selection of bad, average and good stations. The produced **day plots** of the stations also give an overview of the high frequency noise and the variation over time of the background noise.









