National seismological network in Republic of Srpska/B&H

Republic Hydrometeorological Service/Sector for Seismology

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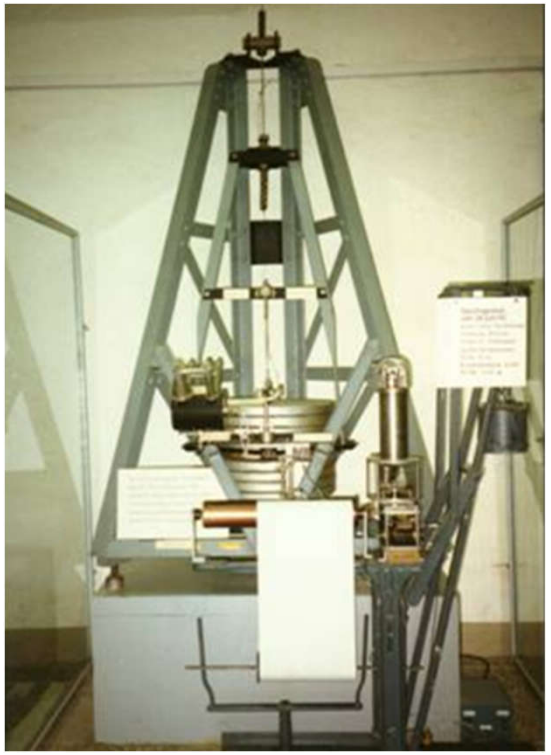
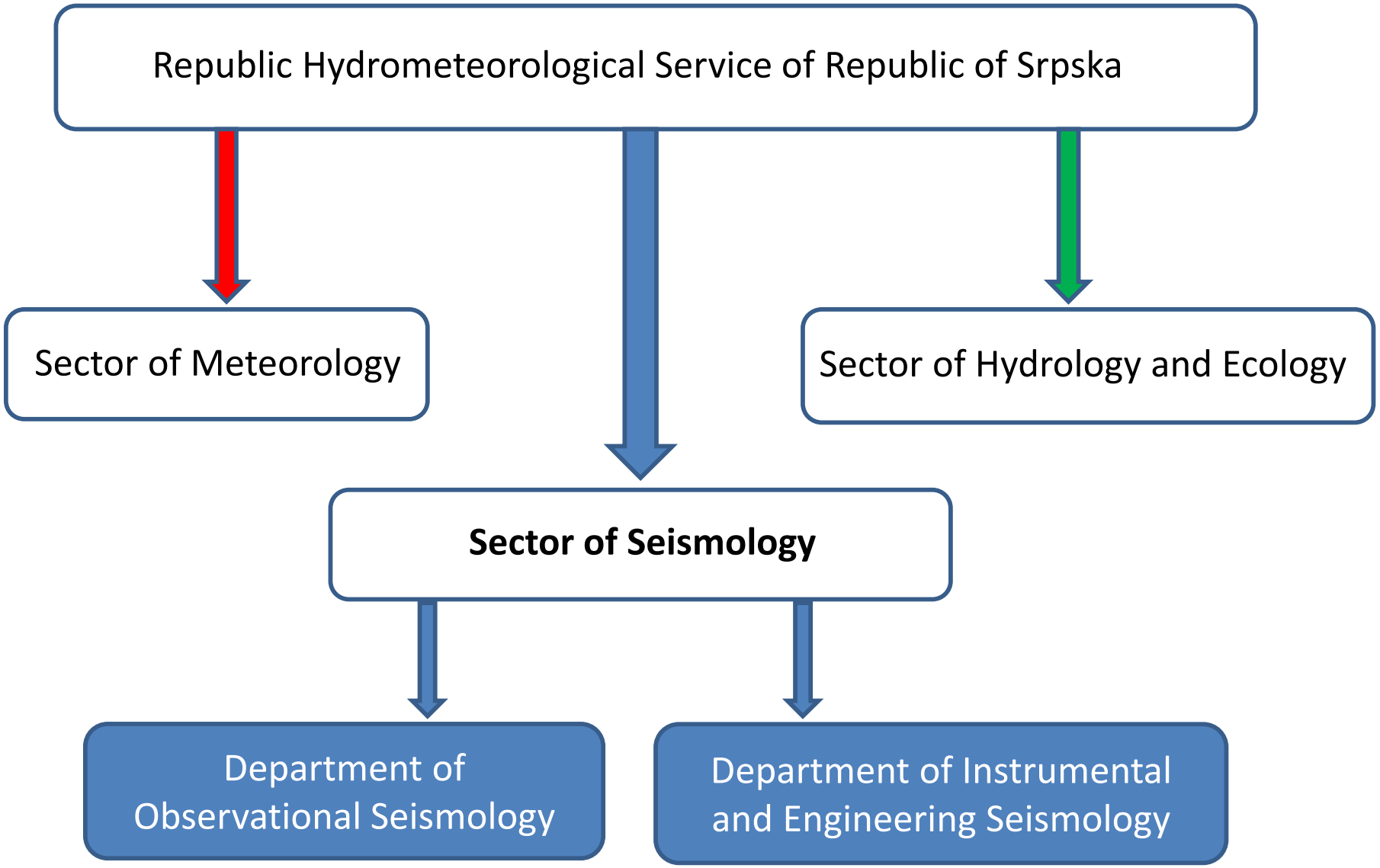
Early instrumental period in B&H

- 1905 in Sarajevo, during the Austro-Hungarian occupation, on Grdonj hill, the first mechanical seismograph (vertical component) was installed and started working.

- Record Banja Luka earthquake (1969) at the seismological station in Sarajevo




Republic Hydrometeorological Service of Republic of Srpska
Sector of Meteorology
Sector of Hydrology and Ecology
Sector of Seismology
Department of Observational Seismology
Department of Instrumental and Engineering Seismology

Seismological station in Banja Luka

Significant moments in the development of the seismology department

- First seismic station in Banja Luka has been installed after earthquakes at 26th and 27th October 1969
- Hydrometeorological Service in Banja Luka is established 1992 and responsible for seismic monitoring of the territory of Republic of Srpska
- 2003 - RHMS received the first digital station as a gift from the City of Banja Luka after celebrating its 30th earthquake anniversary (Lennartz, Compact 24+LE3D)
- After this, 2004 and 2005, RHMS soon bought 2 more SP digital seismological stations (Kinemetrics, SS1+ Digitizers K2, and SS1+Q 330)
- First BB station installed 2009 in Banjaluka by INGV/MedNet
- Real-time data transmission exist from 2007

Seismic network of Republic of Srpska

- Significant improvement during 2010- 2011 period through implementation of **DETERMINE Project** in B&H with the Slovak AID agency

- Results: Installation of 4 new stations/digitizers Wave 24 + 4 sets of SM2 (old Russian seismometers donated after the Banja Luka earthquake)/

- Establishing an automatic data processing on SeisComp3, but insufficiently precise, due to the lack of a greater number of stations from the national network and the surrounding area

- The operation of these stations lasted for a short time, Wave 24 broke and we have nowhere to get new parts - the stations do not exist

- In the project "Harmonization of seismic hazard maps of the Western Balkans countries" were purchased 2 integrated seismological stations and 1 for strong motion

- The donated equipment turned out to be of poor quality, immediately after the donation, it was sent for refinishing. Unfortunately, and after the complaint, the equipment was not brought into working order, and could not serve its purpose.

- **2015-2017– AlpArray**

- Benefit of RHMS - installation of 3 mobile seismological stations, exchange of data from other temporarily deployed stations from the AlpArray network, the most affected the accuracy of the locations of local earthquakes

- **2016-2017 – CASE**

- 3 broadband seismological stations in the area of Herzegovina whose data served to improve the monitoring of our territory

- **DuFault** - Characterization and monitoring of the fault system of the wider Dubrovnik area.

- At the end of October 2021 our department finalized the activities related to the installation of two broadband seismological stations at the locations of Ljubinje and Bileća for the needs this project. We are in the process of finding solutions for the permanent stay of these stations in our territory.

Seismic network/monitoring of Republic of Srpska - current state

- consists of 4 +6 seismic stations: BB-7, SP-3 /1 incomplete –horizontal seismometers
- All sites with internet connection
- Real time data transmission is provided
- Data acquisition and processing center in Banja Luka- SC ver. 2.1
- Real time data exchange with all neighboring countries and more
- We are in procces of running SC ver2.5/automatic processing/sms alerting – only internal, not public yet, because it is still being tested
- Seismic monitoring of dams and integration into the National network
- Establishing accelerometric network

AdriaArray in Republic of Srpska/B&H

- 12 BB seismological stations installed on the territory of Republic of Srpska
- 8 BB seismological stations in Federation of Bosnia and Herzegovina
- All stations on the territory of Bosnia and Herzegovina were installed by ETH from Switzerland
- 1 site we used from AlpArray (Klekovača- BH11A) and 11 new locations
- The experiences and education we received during the preparation and installation of a large number of stations in AdriArray will help us a lot to overcome our problems more easily.

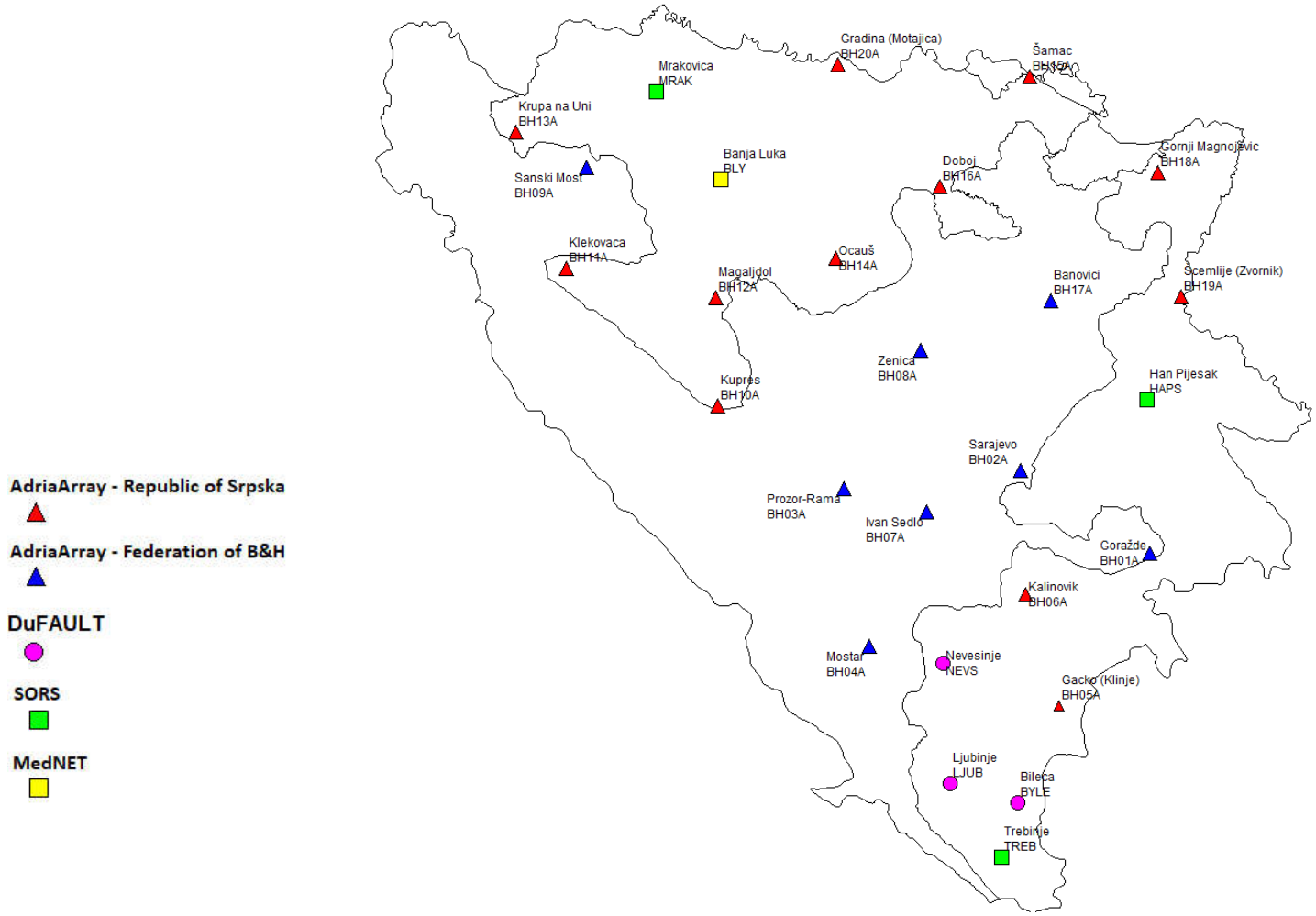
Stations of the AdriaArray Network in Republic of Srpska:

Location	Station code	Latitude	Longitude	Elevation (m)
Krupa na Uni	BH13A	44.890764	16.320242	327
Klekovača	BH11A	44.481844	16.531313	899
Kupres	BH10A	44.068548	17.165691	1128
Magaljdol	BH12A	44.393089	17.157294	705
Očauš	BH14A	44.513557	17.657208	834
Šamac	BH15A	45.058136	18.464769	101
Doboj	BH16A	44.726258	18.089228	174
Gornji Magnojević	BH18A	44.770368	18.997248	139
Zvornik (Šćemlije)	BH19A	44.398208	19.093175	338
Gradina (Mt. Motajica)	BH20A	45.092811	17.662483	660
Gacko (Klinje)	BH05A	43.169517	18.585392	1034
Kalinovik	BH06A	43.502236	18.446322	1078

Stations of the AdriaArray Network in other part of B&H (Federation of B&H)

Location	Station code	Latitude	Longitude	Elevation (m)
Goražde	BH01A	43.62646	18.96271	374
Sarajevo	BH02A	43.87458	18.42409	730
Prozor (Rama)	BH03A	43.821239	17.688522	990
Mostar	BH04A	43.348317	17.793517	110
Ivan Sedlo	BHo7A	43.751114	18.036111	962
Zenica	BH08A	44.235739	18.008219	464
Sanski Most	BH09A	44.785611	16.615556	245
Banovići	BH17A	44.383708	18.551372	325

Map of AdriaArray seismological stations



Installation of stations – some photos

- Gradina (Mt.Motajica)

- Krupa na Uni

- Doboj

- Magaljdol

- Zvornik

- All stations with internet connection (mobile 4G) connected trough VPN with ETHZ
- ETHZ receives data directly from the stations, and we use these data from their server
- These data are very useful for more precise manual location of earthquakes of all magnitudes, even the weakest ones - contributed to increasing the completeness of the observed and analized data
- Our automatic and manual location of local earthquakes are much better
- Our service has never had a denser network and the data we get in these two years will be very important for us.
- Finally, I want to share with you about our very happy news that we have finally received serious promises for financial support for the improvement of seismological monitoring in BiH

Thank you for your attention!

We acknowledge the support by ORFEUS & EPOS within the EPOS SP project (Horizon 2020 Grant Agreement No. 871121)