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Radioactivity measurements in the atmosphere and water column of Rogoznica Lake (central Adriatic)

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Croatian Science Foundation MARRES project (MARine lake (Rogoznica) as a model for EcoSystem functioning in a changing environment) aims to investigate the unique environment (slow exchange of seawater with the sea; atmospheric input is the only source of freshwater) of the marine lake which is an example of highly stratified (permanent anoxia below 9 m depth), and by climate changes affected marine system in the middle of the eastern Adriatic coast (43.53° N, 15.95° E). The area of the lake is characterized by the extensive tourism and mariculture, and the low impact of local industrial activities. It is also affected by the combined influence of long-range transport of air masses and local emissions (open-fire events).

An important part of the project is focused on the exchange and interaction between atmosphere, water column and sediment by measuring the atmospheric input (wet and dry deposition) of sulphur compounds, organic carbon, trace metals and radionuclides (Be-7, Pb-210).

This work for the first time will present the current state of the measurements of radioactivity in the Rogoznica lake area, including samples of aerosol particulate matter, $PM_{2.5} < 2.5 \mu m$, rainwater and lake water column. Namely, the concentrations of Be-7 and Pb-210 in $PM_{2.5}$ are measured to determine and correlate the dynamics of particle transport, meteorological information, especially origin of air masses and seasonal variation of $PM_{2.5}$. While presence of Be-7 indicates the recent wet or dry deposition from the upper parts of the atmosphere, Pb-210 may be used as a tracer for continental air masses. Therefore, it can also indicate the influence of the pollution induced by human activity. Regarding that, special attention will be paid to compare results before and during the Covid-19 lockdown periods.

So far, preliminary results do not show significant difference in $PM_{2.5}$ masses and measured radionuclide activity concentrations for the lockdown period. Be-7 and Pb-210 were regularly detected in aerosols collected on a glass fiber filters during a one-week sampling periods with the air flow rate of $2.3 \text{ m}^3/\text{h}$. Their activity concentrations are determined by gamma spectrometry using High Purity Germanium detectors. The results are found to be correlated with $PM_{2.5}$ masses, ranging from 2.9 to 12.2 Bq/m^3 for Be-7 and from 0.5 to 2.5 Bq/m^3 for Pb-210. First analyses show that the highest values can be related to the long-range transport of air masses and to the recorded near open-fire event. As expected, Be-7 is also detected in almost every rainwater sample (event), with the activity concentration up to 5.6 Bq/L , while low activities of Pb-210 are detected only sporadically. Related to that, Be-7 is detected in lake water column as well, but only

in the surface layer and in samples collected during, or immediately after the rain events.

Dynamics and seasonal variation of radionuclide activity concentrations in here studied samples will be discussed, and the relationships with some meteorological parameters (temperature, wind speed, relative humidity, precipitation level) as well as local and long-range transport and physico-chemical conditions in the lake water column will be established.