Precipitation as transport of cosmogenic Be-7 radioactive input to Earth surfaces.

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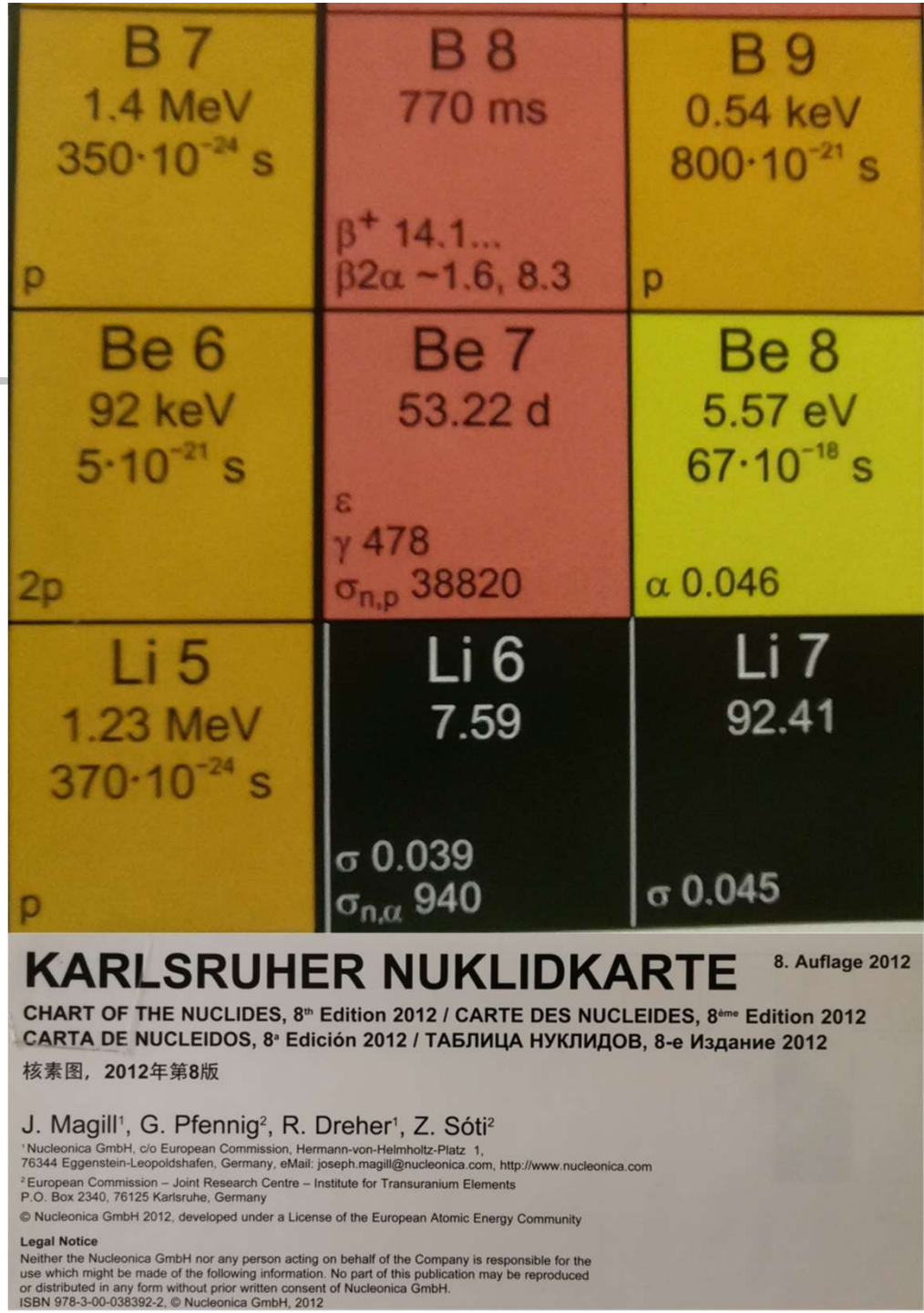
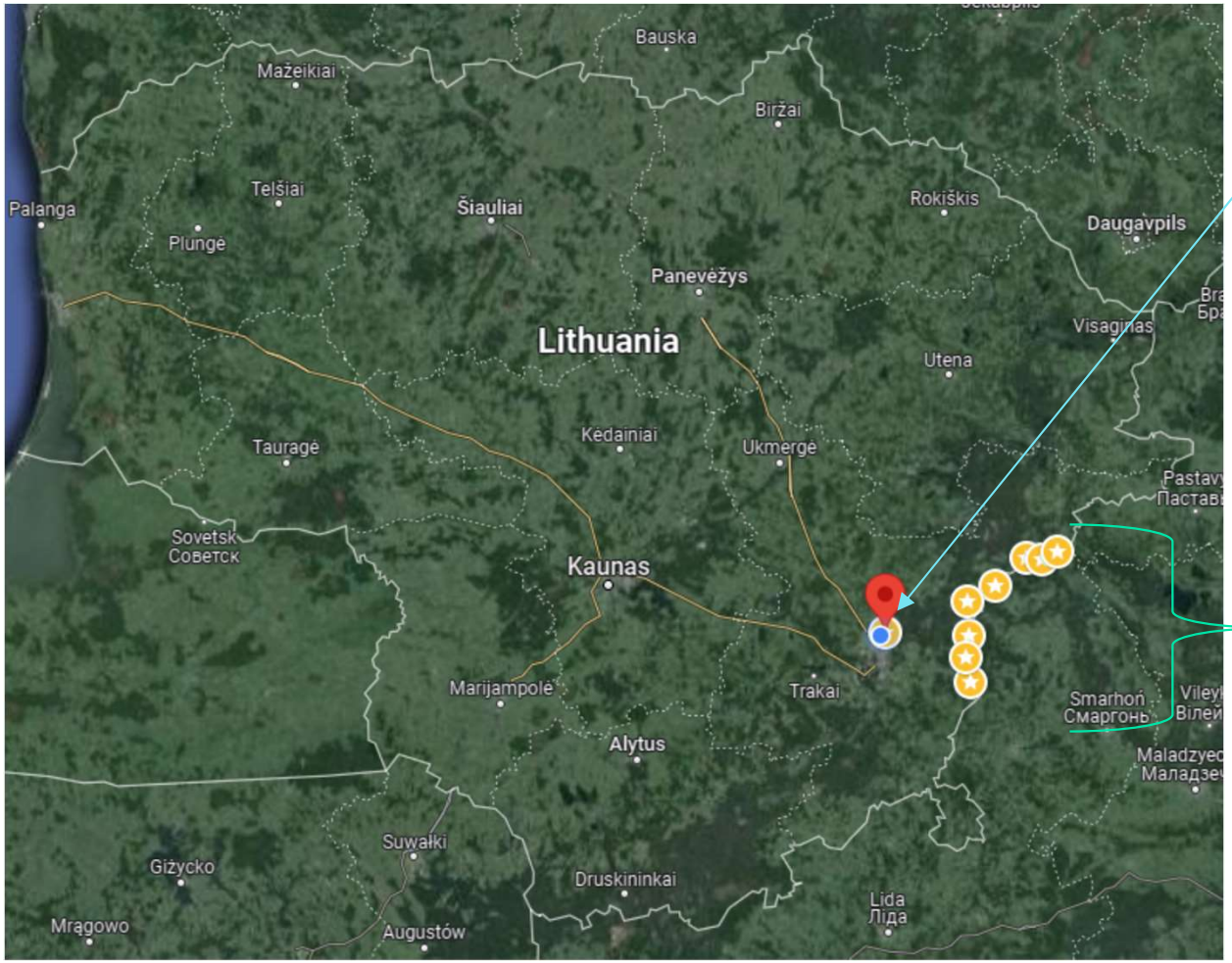
- The Be-7 production in atmosphere depends on galactic cosmic- ray interactions with nitrogen and oxygen and on the 11-year cycle of solar activity.

- It is known that the high of troposphere and solar energy amount depend on Latitudes as well as seasons. Our measured data of precipitation and flora represent location 54°-55° North Latitudes and 25°-26° East Longitudes.

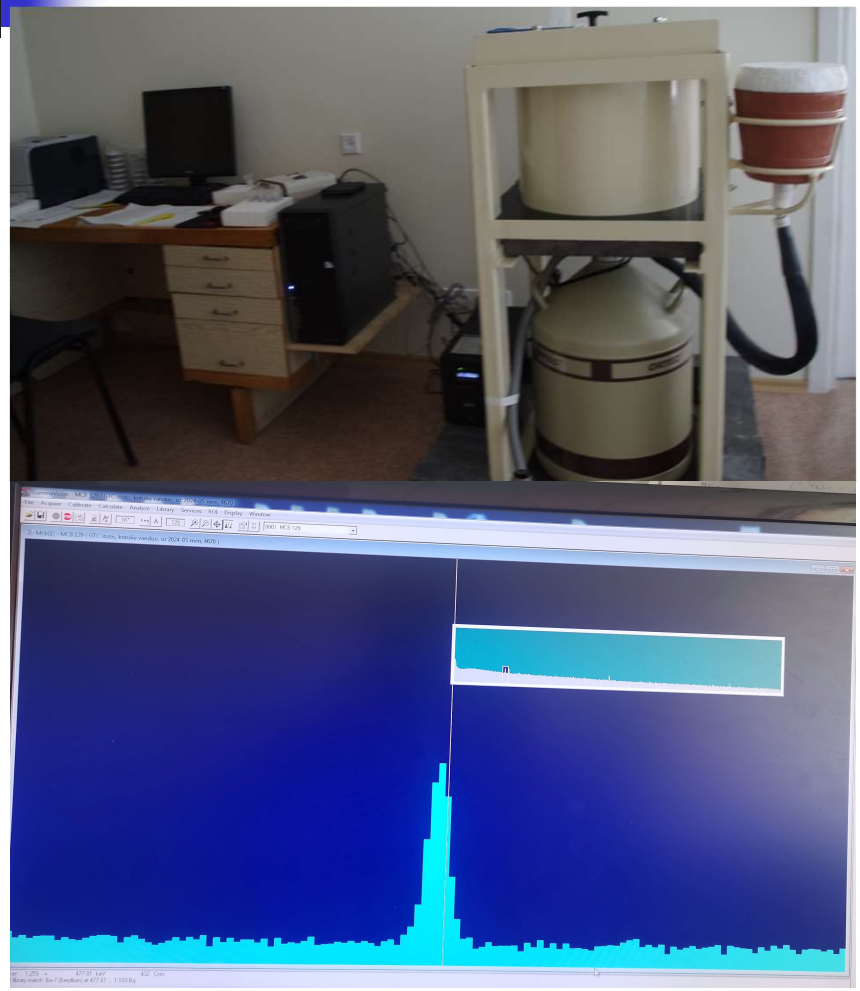


Sampling and methods

Precipitation sampled monthly;
Rowan leaves – annually;
Mosses – in 2017 and 2022.

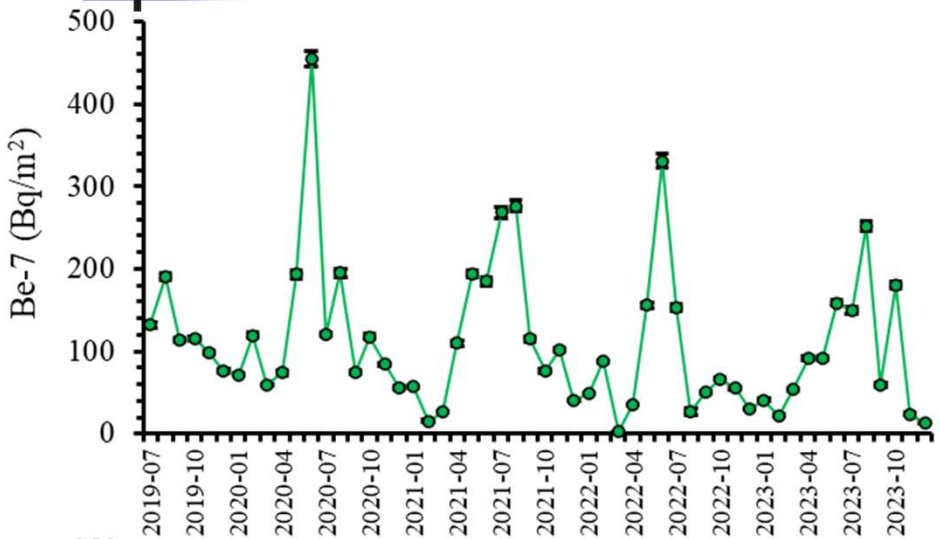


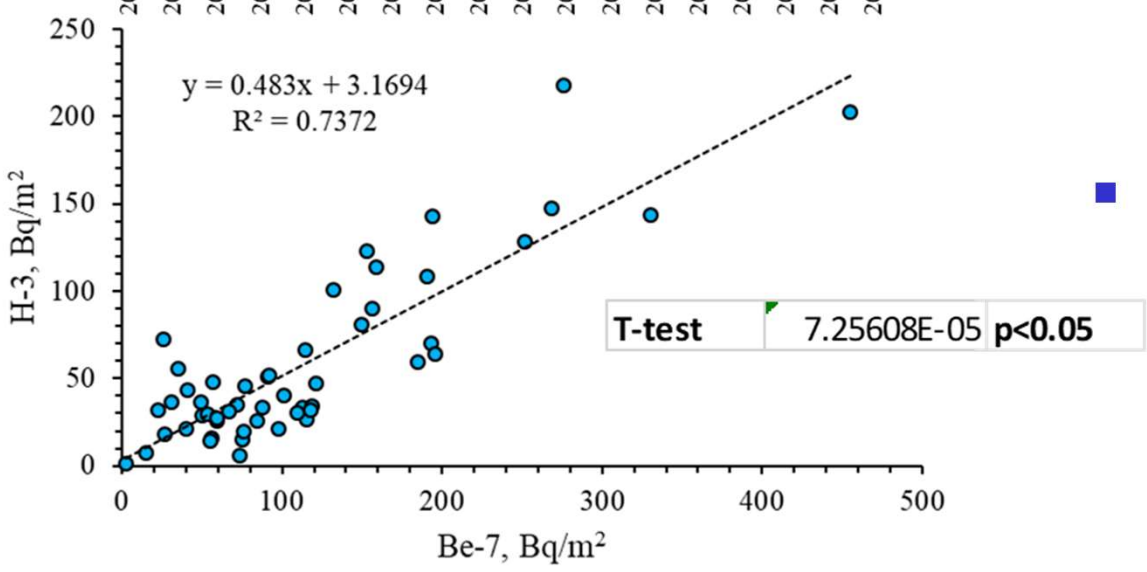
Sampling and methods



- Precipitation were concentrated to 3 mL.
- Samples of flora were dried and burned.
- All samples were measured by gamma-detector.

Results and discussion





- Values of the Be-7 specific activity transported from upper troposphere to square meter with precipitation is shown in the upper figure.
- Values of the Be-7 specific activity input to square meter in open air place is usually higher than the values of another cosmogenic natural radionuclide H-3, however it correlated.
- Both radionuclides shown seasonal fluctuations; however, H-3 is part of precipitation and participates in global cycle of water, and for Be-7 precipitation play only transport role.

Results and discussion

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^{14}C AND OTHER RADIONUCLIDES IN THE ENVIRONMENT IN THE BORDER REGION OF LITHUANIA BEFORE THE START OF THE BELARUSIAN NUCLEAR POWER PLANT OPERATION

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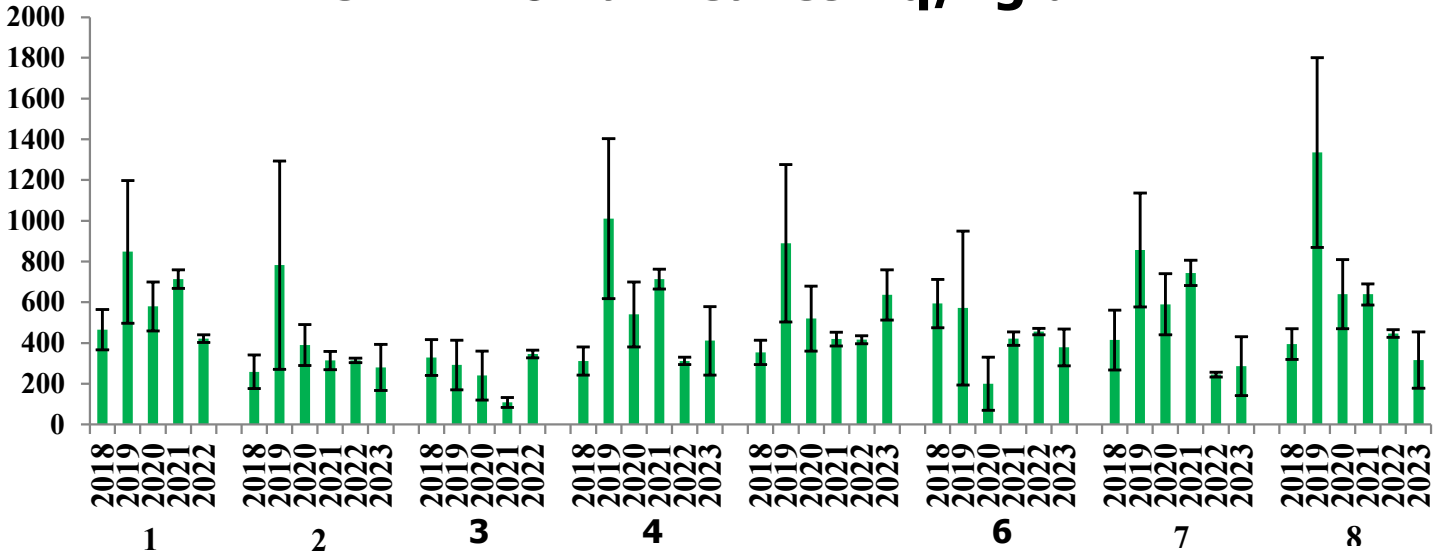
- As is shown in a previous publication, the specific activity of H-3 (TU/kg) in tissue free water of rowan leaves differ in sampling points slightly and is similar to values of specific activity of H-3 (TU/L) in precipitation. It shown water fast exchange.

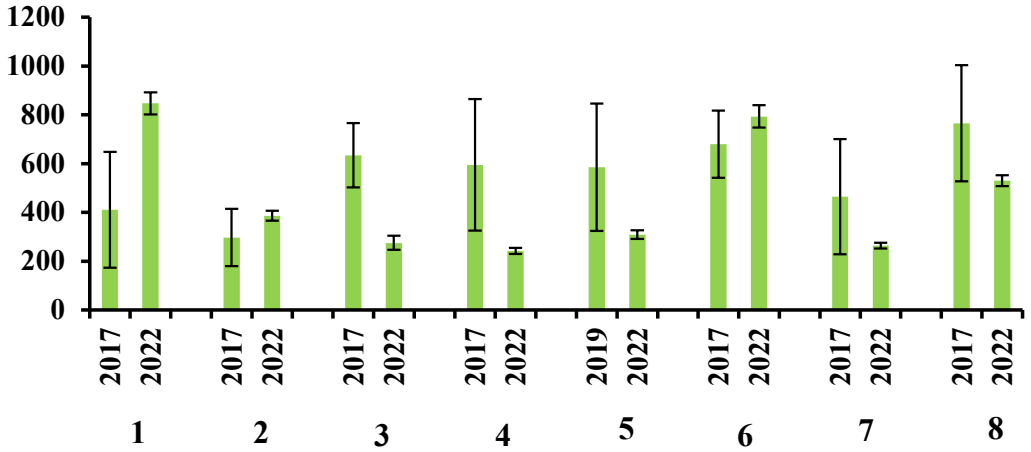
Be-7 in rowan leaves Bq/kg d.w.



It is not observed the correlation between Be-7 specific activity and humidity on rowan leaves. Pine forest have vertical structure and is not open air area. Distribution of Be-7 specific activity on/in biological objects in forest ecosystem differ from water cycle and is uneven in investigated sampling areas.

Results and discussion

Be-7 specific activity (Bq/kg d.w.) in collecting year growth moss layer



Growing in season

Ol – layer with impurities from other biological objects

Of – layer with started biodegradation processes

- Moss in winter under snow does not increase its biomass. The samples taken in August allow to separate the growth of the represented year.
- There is no single trend for all 8 points, which means that the uniqueness of each place affects.
- Thickness of layers also differ in each sampling areas. Interested, that specific activity of Be-7 detected in top layers and drop rapidly deeper. It demonstrate distribution only in surface.

Conclusion

- It is known, that contamination after the Chernobyl accident dropped out in Scandinavia with precipitation in higher level than in e.g. Lithuania with dry aersols particles. Precipitation are more effective transport to a particle of dust and aerosol than only gravitational force.
- Data of historical investigations are used for modeling; however, each investigated area is unic. Pine forest ecosystem is evergreen and has several vertical (some overlapping) floor. It is almost impossible to choose two absolutely identical sites for research.
- Distribution character of Be-7 specific activity in investigated biological compartments of pine forest ecosystem differ from distribution H-3 specific activity. Although dropped out from upper troposphere also with precipitation but distribute mostly on surfaces.
- The Be-7 specific activity can be used as fingerprint for investigation of atmospheric fallout to surfaces in places where this knowledge can be important in future:

Pluses:

- it is good detectable values, especially in summer season;
- the T ½ of Be-7 is quite short, that eliminate effects of long-term accumulation.

Minuses:

- the aiming for the shortest possible time between sample collection and measurements;
- according to the 11-year cycle and uneven annual amount of precipitation, the fall out of Be-7 is uneven annually and seasonly (difficulty for interpretation, requires constant monitoring).

Thank you for attention.