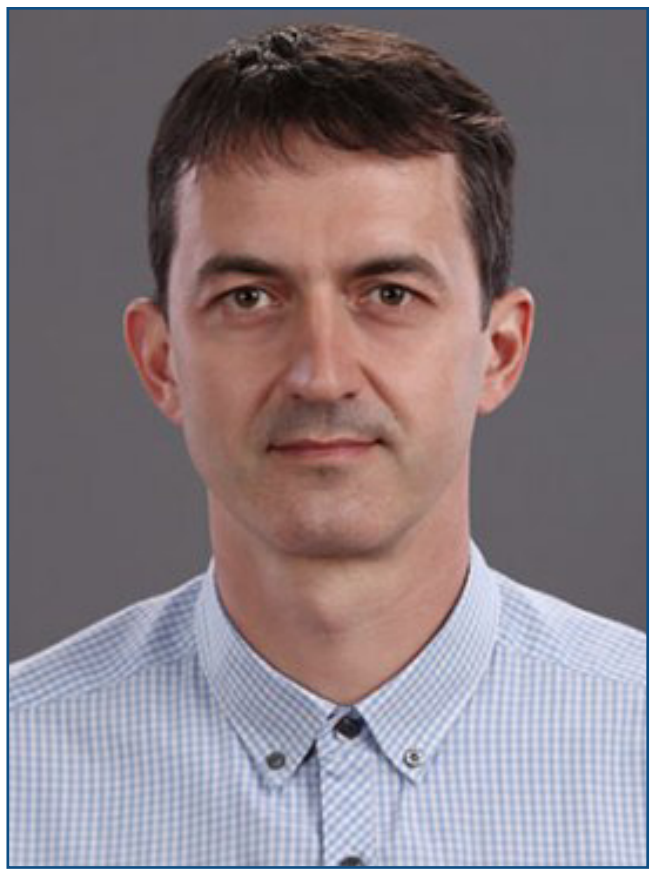
Institutul Național de Fizică și Inginerie Nucleară
Horia Hulubei

IFIN-HH

Seminar general

^{39}Ar dating of groundwater: still hardly available



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Numerous methods are available to study the age distribution of karst water bodies, if they are characterised by longer residence times. To investigate the past few decades, tritium, $^{3}H/^{3}He$, SF_6, CFC's, ^{85}Kr age determination methods are frequently used to calculate the time elapsed since recharge. ^{14}C seems to be the only tool for studying water bodies having residence times of thousands to tens of thousands of years. However, piston flow movement of groundwater occurs very rarely in aquifers longer than a few months. Hence, based on isotope analyses there are cases when young (<70 years), not too old (few hundred years) and old (thousands of years) components are present in a groundwater system. While there are tools for 0 to 70 years, and for thousands of years, for the time scale of 100-2000 years ^{39}Ar dating is the only available method for the time being. ^{39}Ar is a cosmogenic isotope with a half-life of 269 (±3) years. The activity concentration of atmospheric argon is about 1.5 $mBq/dm^3_{Ar}STP$, it dissolves into groundwater during recharge. Along the flow line, its activity is decreasing due to the radioactive decay. Knowing the activity of the atmospheric and the dissolved argon, the "age" can be calculated. Nevertheless, due to the tremendously complicated analytical requirements it is limited only to a few laboratories in the world.

In our presentation, the details of the analytical procedure to determine $^{39}Ar/Ar$ will be shown. The technique consists of three steps: 1. extraction of at least 100 litres of dissolved gas in the field from the groundwater; 2. separation and purification of the argon from the gas; 3. determination of the ^{39}Ar activity concentration by a proportional counter system in an underground laboratory.

Joi, 7 noiembrie 2019, ora 11^{00}

Sala de seminar Prof. Marius Petraşcu (DFN)