Groundwater origin and recharge in a Mediterranean karstic aquifer : A ^{222}Rn and Ra isotope investigation

A. MOLINA PORRAS[13], J. L. SEIDEL[1*] AND M. CONDOMINES[2]

[1]HydroSciences, Montpellier Univ., 34095 Montpellier, France (*correspondence : jean-luc.seidel@um2.fr)

[2]Geosciences, Montpellier Univ., 34095 Montpellier, France (condomines@gm.univ-montp2.fr)

[3]University of Costa Rica, San José, Costa Rica (arnold.molinaporras@ucr.ac.cr)

Introduction

^{222}Rn and Ra isotope measurements have been undertaken in a Mediterranean karstic aquifer for a better characterization of groundwater origin and recharge. Ra isotope activities in water involve various processes depending on their different half-lives and allow to investigate hydrodynamical behaviour over short or long time periods [1] .

Sampling and analytical methods

A radon and radium isotope survey is in progress for four springs of the Lez karstic system (South of France).

^{222}Rn has been determined using an Alphaguard© Quantum 2 equipped with the AquaKit© system. Ra isotopes in water have been measured by γ spectrometry after extraction with MnO_2 fibers and treatment.

Results and discussion

(^{228}Ra/^{226}Ra) activity ratio of the Lez spring (≥ 0.6) is constant over the hydrological year but significantly higher than the ratio of the other springs (≈ 0.45), suggesting distinct lithology of their reservoirs.

Radon behaviour of the four springs shows the dominant influence of precipitations, marked by a significant increase of the concentration in the less mineralised waters.

The similar variations of ^{222}Rn and (^{224}Ra/^{228}Ra) ratios, inversely correlated with electrical conductivity, suggest a shallow origin for the short period nuclides, as shown for ^{222}Rn [2].

A new deep well (335 m), equipped with isolated sampling levels, should help to decipher each compartment hydrodynamics.

This study suggests that analyses of all four radium isotopes and ^{222}Rn can provide a valuable tool to characterize recharge processes in complex inland karstic systems.

[1] Condomines et al. (2012). *Geochem. Cosmochim. Acta*, **98**, 160-176. [2] Savoy et al. (2011). *J. Hydrol.*, **406**(**3**), 148-157.