Laboratory experiments on alluvial coastal sediments to characterize radium desorption in mixing waters

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ABSTRACT

Radium isotopes (^{223}Ra, ^{224}Ra, ^{226}Ra, ^{228}Ra) are one of the most widely tracers used to quantify submarine groundwater discharge (SGD). Nevertheless, understanding their behavior in the mixing zone of coastal alluvial aquifers, and therefore in the discharging groundwater, is still a challenge.

To identify the main aspects governing radium release in the fresh-saline water interface (FSWI), we have performed a set of batch experiments. We use different types of sediments obtained from an experimental site located in an anthropized area northern Barcelona (Spain), few meters from the discharge of an ephemereal stream to the sea. This site is particularly interesting because it is surrounded by granitic outcrops that provides sources for Ra isotopes due to weathering and recoil, and numerous geophysical, hydrogeological and hydrochemical techniques are being carried out to characterize the coupled effects of SGD and seawater intrusion (SWI) in an alluvial coastal aquifer.

Sediment samples were taken from different depths of the alluvial aquifer of Argentona corresponding to the fresh-, mixing- and saltwater zones, respectively. Several batch experiments were performed using different solid/liquid ratios, fluid and sediment compositions. We studied the influence of the geochemical and petrophysical characteristics of the different sediments (mineralogy, cation exchange capacity, reactive surface area and ^{224}Ra content) on radium activity in a range of increasing salinity. In addition, the maximum ^{224}Ra available to be desorbed from the sediment surface has been quantified.

The integration of the results obtained in the laboratory experiments with those obtained in the field will help to characterize the radium endmember in coastal alluvial aquifers at different scales.

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