

## **Estimating groundwater discharge in the coastal lagoons of La Palme and Salses-Leucate along the French Mediterranean coastline by using radium isotopes**

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Although submarine groundwater discharge (SGD) has been investigated in many places of the world, very few studies were conducted along the French Mediterranean coastline, despite presence of several well-known karstic springs. Almost no information is available on the fluxes of water and chemical elements associated with these systems and on their potential impact on the geochemical cycling and ecosystems of the coastal zones. In this study, we report airborne thermal infrared (TIR) images that allowed us to locate fresh groundwater inputs in the coastal lagoons of La Palme and Salses-Leucate. The four radium isotopes ( $^{223}\text{Ra}$ ,  $^{224}\text{Ra}$ ,  $^{226}\text{Ra}$ ,  $^{228}\text{Ra}$ ) were analyzed in these coastal lagoons and along transects conducted on board RV NEREIS II between the coast and offshore (between 200 m and 8 km). We also analyzed major elements, nutrients (nitrates, phosphates and silicates), DIC, DOC, DON, DOP, as well as several trace elements in these water samples. A mass balance of radium isotopes was used to quantify SGD fluxes and to determine the fluxes of nutrients and other chemical species associated with SGD. Ra isotopes were also used to estimate the residence time of the waters in the lagoons.