

Multi-Tracer Reconnaissance of Submarine Groundwater Discharge along the French Mediterranean Coast

Thomas Stieglitz^{1,2}, Pieter van Beek¹ and Marc Souhaut¹

¹Laboratoire d'Etudes en Géophysique et Océanographie Spatiales (LEGOS), Observatoire Midi-Pyrenees, 31400 Toulouse, France.

²Marine Geophysical Laboratory, School of Engineering & Physical Sciences, James Cook University Townsville QLD 4811 Australia.

In order to evaluate the regional distribution of SGD along the French Mediterranean coast, the spatial distribution of radium, radon and salinity was investigated at a number of locations where groundwater was previously known to discharge into coastal waters. Field work was carried out during summer 2009 in the coastal lagoons of Salses-Leucate, La Palme and Thau, and along the karstic coastline of 'Les Calanques' between Marseille and Cassis. The hydrogeology of the region is dominated by the karstic rocks of the coastal uplands. Mixing of coastal waters region is driven primarily by wind and air pressure changes. Radon and salinity in surface waters were mapped concurrently to obtain an overview of SGD locations and processes, and spot radium samples were collected to study fluxes of SGD, mixing relationships with coastal waters and residence times of the lagoon waters. Radon was measured in situ with a surface-towed, continuously recording multi-detector setup using DurrIDGE Rad7 Radon-in-air monitors. Radium was sampled with manganese fibers by standard methods. Short and long lived isotopes were counted with RADECC delayed coincidence counters and gamma spectrometry in the underground laboratory at Ferrières (Pyrenees) respectively.

A brief overview of the study sites and results will be presented. For example, in the lagoon of La Palme, the spatial distribution of radionuclides varied dramatically over short periods of time, likely associated with wind-driven input of saline groundwater from disused salt evaporation ponds, in addition to the groundwater input from karstic springs. In the Thau lagoon, the well-known submarine freshwater spring 'La Vise' in ca 25 m of depth appears to have only a small impact on the radionuclide budget of the lagoon due to a very small flow rate. The Canal Du Midi may be an additional source of radon during southerly winds, and small but systematic elevations of radon at typical lagoon salinity in shallow parts of the lagoon suggest the recirculation of seawater there. The residence time of water in the lagoons was found to be in the order of a few days, but varies with wind conditions.