Using freely available satellite thermal infrared data from Landsat 8 to identify groundwater discharge in coastal areas

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Submarine groundwater discharge (SGD) has received increasing attention over the past two decades as a source of nutrients, trace elements and pollutants to the ocean that may alter coastal biogeochemical cycles. Assessing submarine groundwater flows and their impacts on the coastal marine environment is a difficult task, since it is not easy to identify and measure these water flows discharging into the sea. In this study we evaluate the capability of freely available Landsat 8 OLI thermal infrared (TIR) imagery to identify SGD areas in karstic coastal aquifers the Mediterranean Sea.The application of satellite thermal data uses the contrasts between groundwater and sea surface temperatures to locate groundwater discharging areas. The method has been tested 44 hotspots in karstic aquifers along the Mediterranean coast where SGD has been previously reported. Those areas were selected according to their different hydrogeological conditions such as submerged springs, subaerial springs and aerial springs. This study demonstrates that freely available satellite TIR remote sensing is a useful method for detecting shallow SGD in karstic areas but not to detect deeper submerged springs, springs with low discharge flow, and/or springs that discharge in shallow offshore areas. Furthermore, its application has some limitations (cloudy days, buffering of surface water discharge, resolution of images etc.) that are also discussed.