



## **Evidence of persistent patchy submarine ground water discharge in the intertidal zone**

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We report on circular beach mounds, which we have called ‘Wonky Mounds’ in colloquial reference to locally known seafloor depressions. Two mounds have been identified in the intertidal zone off of North Stradbroke Island, located in Moreton Bay near Brisbane, Australia. They are persistent sand mounds with a diameter of 5-6m and a height of ca. 30cm relative to the surrounding beach and have not been previously documented. While these features resemble seafloor depressions which can be substantial sites for submarine groundwater discharge (SGD), we report on convex mounds at the order of the meter scale which demonstrate a heterogeneous patchiness at the local scale. Preliminary results from  $^{222}\text{Rn}$ , conductivity, and temperature measurements indicate that fresh groundwater, originating from the island, may flow from these mounds. Although previous studies have stressed the importance of SGD flows for nutrient delivery off of coastal shelves, this linkage between the fresh aquifer and intertidal waters are a new source of nutrient delivery that has not previously been considered in either hydrological or biogeochemical models. While total freshwater input into the world’s oceans is dominated by riverine discharge, the input of nutrients from SGD is disproportionately large due to its elevated nutrient loads. We consider the local scale ecosystems’ patchiness and heterogeneity in regards to the possible pathways of localized SGD discharge and the biogeochemical ramifications of discrete patchy freshwater discharge into the intertidal zone.