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Abstract:

Submarine groundwater discharge (SGD) plays a crucial role in coastal ecosystems, especially coral reefs, by introducing terrestrial nutrients and freshwater, significantly affecting the primary productivity of coastal ecosystems and potentially altering ecological balances. La Valle et al. (2023) emphasized the importance of SGD in nutrient distribution and algal productivity, highlighting the need for comprehensive understanding and management strategies in the face of increasing nutrient runoff due to land use changes due to increased population. To better understand the impact, our experiments utilize remote sensing and data science by using a DJI Mavic 3 Enterprise drone with a thermal imaging camera to map the distribution of SGD because the temperature of SGD is lower than surrounding ocean water, so the thermal infrared (TIR) images can show the flow and spatial extent of the SGD. These flights will be conducted under nighttime conditions to avoid solar heating artifacts. We will calibrate all images to the blackbody before and after each flight, ensuring more accurate and reliable data collection, and fly the drone over the reefs during low tide (one of two low tides per day), where SGD's impacts are most significant. Given the profound impacts of SGD on biodiversity, water quality, and marine ecosystem health, the modeling of SDG impacts on the reef ecosystem that we have created is critical to developing informed coastal management and conservation strategies.

Key words:

coastal ecosystems

algal productivity

Submarine groundwater discharge

DJI Mavic 3 Enterprise drone

small unmanned aircraft system

Thermal infrared (TIR) images