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High-Resolution UAV Hyperspectral Imagery for Antarctic Research

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Unmanned Aerial Vehicles (UAVs) have emerged as a promising tool, providing exciting opportunities for Antarctic research. They constitute a non-invasive, repeatable, affordable, and time-efficient alternative to address the observational gap between satellite imagery and ground-based techniques. Additionally, they provide an unparalleled advantage for collecting data in remote and difficult-to-access regions, as is the case of a significant portion of the cryosphere. In the last few years, a rising number of studies have used a wide variety of multispectral sensors mounted on UAVs to describe vegetated areas, monitor penguin colonies, or detect changes on Antarctic terrestrial ecosystems. The recent development of new hyperspectral (HS) sensors adapted to UAV platforms has enhanced the characterization of such heterogeneous ecosystems, combining an unprecedented scale in spectral and spatial resolutions for better discrimination in smaller and sparser areas within the Antarctic ecosystem. In this work, we demonstrate the potential of the synergy between HS technology and UAV imagery to address important and diverse ecological issues on Antarctic environments, including the spectral characterization of penguin colony ecosystems and the detection of massive snow algae blooms on glacial formations. Furthermore, this methodology has been validated using *in-situ* spectroradiometry and has been applied in conjunction with other remote sensing techniques, such as UAV-based multispectral technology and satellite imagery, to cover broader regions in a climate change context.