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Abstracts

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Session *	(Theme 9) Emerging Frontiers in Satellite Remote Sensing and Geoinformation in Antarctic Earth Sciences: Cross-disciplinary Advances
Title of Paper *	High-resolution remote sensing techniques for monitoring penguin colonies in the Ross Sea, Antarctica
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Abstract * (less than 4,000 characters)	<p>Penguins have been recognized as one of the indicators of environmental changes (e.g. varying sea ice conditions) in Antarctica; therefore, monitoring penguin colonies is important for investigating the effects from the environmental changes. In this study, we applied high-resolution remote sensing techniques, i.e., high-resolution satellite imageries and unmanned aerial vehicle (UAV) images, for efficient monitoring Adélie penguin (<i>Pygoscelis adeliae</i>) colonies in the Ross Sea, Antarctica. It is reported that more than 30% of Adélie penguin population breed in the coastal areas in the Ross Sea. To precisely delineate the colonies, high-resolution imageries from multiple multispectral satellite sensors, e.g., WorldView-2, WorldView-3, Korea Multi-Purpose Satellite-2 (KOMPSAT-2), KOMPSAT-3, etc., were collected in the study areas. Ground truth data for spectral analysis of the colonies were collected using hyperspectral imaging camera during field investigation. Based on the collected field spectra, penguin colony potential index was proposed with a consideration of low solar angle condition in Antarctica, and then applied to the high-resolution satellite imageries. From the results of the satellite imagery based penguin colony mapping, the locations, areas and distribution of the colonies were identified. For more detailed investigation on the colonies, very high-resolution UAV images were acquired in Ca Hallett, Antarctica. The UAV image acquisition has merits of shorter operation duration than field investigation by researcher, decreased disturbance to colonies and penguins and providing vertical viewing geometry preventing overlapping between penguin during counting. The UAV images were mosaicked and then used for counting individual penguins. The counting individual penguin was conducted using Google's tensorflow object detection application programming interface (API). These high-resolution remote sensing techniques can be applicable to the penguin colonies in other regions in Antarctica or other species of penguins, e.g., emperor penguin.</p>
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