GUEST EDITORIAL

Special Section Guest Editorial: 50th Anniversary of Landsat—Current Achievement and Future Directions

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Since its launch in 1972, Landsat has revolutionized Earth Observation (EO) and become an indispensable tool for scientists, policymakers, and industry. This special section serves as a tribute to the groundbreaking achievements and enduring legacy of Landsat, showcasing its profound impact on our understanding of the Earth's dynamic systems and its role in shaping the future of remote sensing.

Over the past five decades, Landsat has provided an unparalleled perspective of our planet, capturing vast amounts of high-quality, multispectral imagery that has transformed our knowledge of land cover, land use, and environmental change. The continuity, consistency, and quality of Landsat's data have enabled researchers to monitor and analyze long-term trends, detect ecosystem shifts, assess the impacts of climate change, and make informed decisions for sustainable resource management. In 2008, the free and open access to Landsat data transformed how we use this incredible Earth Observation data archive. The rapid increase in data usage enabled by high-performance and cloud computing, including Google Earth Engine and the Microsoft Planetary Computer, has disrupted traditional applications and enabled global big data analysis.

In this special section, Mouafo et al. present an innovative application that uses Landsat 7 ETM+ and Shuttle Radar Topography Mission imagery to automatically extract geological lineaments in the Edéa area of Cameroon. Using the techniques presented in this article enabled field researchers to locate areas of high hydrogeological potential. In combination with the existing geophysical records, these data enhance the record of the shear zones and blastomylonitic faults that correspond to the general orientation of these faults that often represent regions of groundwater accumulation. Groundwater resources are critical in regions of the Earth that rely on subsurface water.

One of the greatest contributions that Landsat has made since its inception is the mapping of vegetation. As the demands for information products related to vegetation have increased, the Landsat sensors (MSS, TM, ETM+, OLI, and OLI-2) have been steadily improved to enhance our ability to extract information from these Earth Observation data. Zhang et al., present a novel method for extracting vegetation information from a deep learning algorithm that makes use of the valuable spectral bands that Landsat provides for monitoring vegetation.

Campbell et al. mapped salt marsh aboveground biomass for the contiguous United States (CONUS) using Landsat, Sentinel-2, and Sentinel-1. Their approach and results demonstrate the continued importance of Landsat in big data analysis and earth observation continuity. Their machine learning analysis found that tidal amplitude, temperature, precipitation, and relative sea level rise were the most significant drivers of salt marsh aboveground biomass across the CONUS.

Jiang et al. present an analysis of Landsat 8 OLI's potential to predict sea ice thickness in the Bohai Sea. The authors evaluate all individual bands and band combinations, identifying red and a linear combination of visible bands as the most appropriate individual and band combination, respectively, for differentiating sea ice thickness categories. The work is vital for identifying safe shipping routes and monitoring sea ice hazards.