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IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing
Special Issue on "Open-World Earth Observation: Unified Learning from Observation Restoration to Geospatial Understanding"

Earth observation is entering a new stage shaped by increasingly diverse sensors, continuously changing environments, and expanding application demands. Optical, SAR, multispectral, hyperspectral, LiDAR, thermal, aerial, geospatial, and auxiliary data provide complementary observations across spatial, spectral, temporal, and physical dimensions. However, real-world Earth observation remains affected by clouds, atmospheric disturbances, acquisition gaps, resolution mismatches, incomplete temporal coverage, sensor variation, geographic distribution shifts, and the continual emergence of unseen classes and events. Existing studies often treat low-level observation processing, high-level visual understanding, and cross-domain generalization as largely separate problems, limiting their ability to exploit the interplay between observation quality, semantic interpretation, and environmental variation. These challenges call for unified learning frameworks that jointly enhance degraded or incomplete observations, support reliable geospatial understanding, and generalize across sensors, regions, times, and previously unseen concepts.

Recent advances in self-supervised learning, generative models, vision-language models, foundation models, and unified multi-task learning provide new opportunities to connect observation restoration with downstream understanding. Such methods can enhance incomplete or degraded observations, learn transferable representations across sensors and domains, and support semantic interpretation under limited supervision. However, significant challenges remain in jointly modeling low-level observation quality and high-level semantics, adapting to unseen regions and sensors and recognizing novel concepts. This Special Issue focuses on methodological advances that ***unify observation restoration***, ***geospatial understanding***, and ***open-world learning for Earth observation***. It provides a venue for research that bridges low-level data enhancement, high-level visual interpretation, foundation-model-based learning, and robust generalization across sensors, tasks, regions, and time.

The broad topics include (but are not limited to):

- Observation restoration and enhancement (e.g., cloud removal, gap filling, denoising, super-resolution, spatiotemporal fusion, modality translation)
- Unified learning across restoration and downstream understanding tasks
- Geospatial visual understanding (e.g., classification, segmentation, change detection, tracking, and temporal analysis)
- Foundation models and self-supervised learning for multi-modal and multi-task Earth observation
- Open-world, open-vocabulary, zero/few-shot, parameter-efficient fine-tuning
- Domain adaptation, domain generalization, test-time adaptation, and cross-sensor transfer
- Generative models for observation recovery, representation learning, and geospatial interpretation

Schedule

November 10, 2026	Submission system opening
June 30, 2027	Submission system closing

Format

All submissions will be peer reviewed according to the IEEE Geoscience and Remote Sensing Society guidelines. Submitted articles should not have been published or be under review elsewhere. Submit your manuscript on http://mc.manuscriptcentral.com/jstars, using the Manuscript Central interface and select the "Open-World Earth Observation: Unified Learning from Observation Restoration to Geospatial Understanding" special issue manuscript type. Prospective authors should consult the site https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=9082768 for guidelines and information on paper submission. All submissions must be formatted using the IEEE standard format (double column, single spaced). Please visit http://www.ieee.org/publications_standards/publications/authors/author_templates.html to download a template for transactions. Please note that since Jan. 1, 2025, IEEE J-STARS, as a fully open-access journal, is charging a flat publication fee $1,800 per paper.

Guest Editors

Mengmeng Zhang	Beijing Institute of Technology, China	mengmengzhang@bit.edu.cn
Gemine Vivone	National Research Council, Italy	gemine.vivone@cnr.it
Jie Pan	Aerospace Information Research Institute, Chinese Academy of Sciences, China	panjie@aircas.ac.cn
Wenzhi Liao	Ghent University, Belgium	wenzhi.liao@ugent.be
Yuxiang Zhang	The University of Hong Kong, Hong Kong, China	yxzhang7@hku.hk

Cecilia Masemola South African National Space Agency, South Africa cmasemola@sansa.org.za
Nurlan Bekmukhamedov National Center of Space Research and Technology, Kazakhstan nurlan1964@yandex.ru