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IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing
Special Issue on "Foundation Models and Agents in Earth Observation"

With the exponential growth of Earth observation (EO) data, traditional machine learning and task-specific deep learning paradigms, constrained by limited model capacity and representation bottlenecks, struggle to meet the requirements of complex tasks. Although foundation models and AI agents have recently achieved ground-breaking progress, their direct application to remote sensing (RS) often leads to significant performance degradation, revealing a persistent applicability gap.

Specifically, general foundation models often lack specialized geospatial cognition, struggling to accommodate the multi-modal complexities, extreme scale variations, and intricate spatiotemporal dynamics inherent to Earth observation data, which renders precise end-to-end interpretation difficult. Concurrently, existing general-purpose agents struggle with the dynamic orchestration of heterogeneous geospatial tools, adaptive multi-step reasoning (e.g., error reflection, context retention), and effective multi-agent collaboration, thereby failing to autonomously manage the complex task planning required by intricate RS workflows.

To fully unlock the immense potential of AI in Earth observation and accelerate the intelligent transformation of RS data analysis, this Special Issue is dedicated to exploring the core technologies, methodological innovations, and evaluation frameworks of RS-specific foundation models and AI agents.

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

- Unified Architectures for Multi-Source and Cross-Resolution Data: Developing general foundation models to construct universal feature representations and pre-training paradigms across diverse sensors (e.g., Optical, SAR, Hyperspectral) and resolutions.
- Cross-Modal Weak Alignment and Spatiotemporal Representation: Addressing weak alignment challenges caused by time gaps or cloud occlusion, and exploring deep spatiotemporal feature learning for multi-temporal change detection and dynamic scene reasoning.
- RS Foundation Models with Enhanced Spatial Cognition and Physical Perception: Designing physics-driven architectures (e.g., polarimetric scattering, spectral unmixing) and injecting geoscientific priors to achieve precise 3D spatial grounding and zero-shot/weakly-supervised interpretation.
- RS Agentic Systems for Interactive Interpretation and Collaborative Perception: Exploring Vision-Language Models (VLMs) for interactive Remote Sensing Visual Question Answering (RS-VQA), human-in-the-loop Copilot workflows, and multi-agent collaborative perception in embodied AI (e.g., UAV swarms).
- Comprehensive Benchmarks and Dataset Construction:Creating complex spatial reasoning benchmarks and high-quality instruction-tuning datasets to evaluate expert-level decision-making capabilities and diagnose model hallucinations.
- Advanced RS Applications Powered by Foundation Models and Agents: Leveraging large-scale models and agentic workflows for specialized tasks in precision agriculture, disaster monitoring, urban intelligence, and carbon neutrality, emphasizing intelligent reasoning and autonomous decision support in complex real-world scenarios.

Schedule
June 1, 2026 Submission system opening
December 31, 2026 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 "**Foundation Models and Agents in Earth Observation**" 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.

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