Call for Papers
Special Issue of Photogrammetric Engineering & Remote Sensing (PE&RS)

A New Era of Earth Observation: Applications of Google DeepMind's 10-m AI-Generated Remote Sensing Embeddings of the Planet Earth

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Overview

The release of Google DeepMind Alpha Foundation's 10-m global satellite embeddings (2017–2024) on Google Earth Engine (GEE) marks a profound shift in how remote sensing data are represented, accessed, and analyzed. Unlike traditional Earth observation products, that are delivered as radiance, reflectance, emissivity, indices (e.g., NDVI), transformation (e.g., Tassel-cap), backscatter coefficient, or other physically interpretable variables, Google Deep Mind-generated AlphaEarth's of the Planet Earth provides a 64-dimensional (or bands) learned embedding for every 10-m (1 pixel = 0.01 hectares) on Earth, with values ranging from –1 to +1. This data is available for the entire Planet from 2017-2024 at present.

These embeddings integrate information from wide array of remote sensing and non-remote sensing data such as:

- Landsat 8\9 MSI, Pan, Thermal
- Sentinel-2 MSI, Pan

- Sentinel-1 C-Band SAR
- GEDI Raster Canopy Height GLO-30 DEM
- ERA5-Land Reanalysis Monthly Aggregates
- ALOS PALSAR-2 ScanSAR
- GRACE monthly mass grids
- Ancillary environmental layers: climate, soils, topography
- Textural and spatial context features
- Self-supervised learning across multi-sensor, multi-year archives

This new representation of the Planet in terms of sensor-agnostic, harmonized, standardized, and semantically rich data opens unprecedented opportunities for AI-driven Earth system science. These 10 m embeddings of the Planet enable multitude of applications at high degree of accuracy using sophisticated Earth Observation (EO) foundation models. Nevertheless, there is lot to learn. For example, they raise important questions about accuracy, interpretability, generalization, and comparison with traditional datasets such as the 2-3 days Harmonized Landsat 30 m data (HLSL30) and Harmonized Landsat and Sentinel-2 30 m data (HLSS30).

To address these emerging scientific, methodological, and operational questions, *Photogrammetric Engineering & Remote Sensing (PE&RS)* of the American Society of Photogrammetry and Remote Sensing (ASPRS) invites submissions to a Special Issue (or multiple issues, depending on number of submission) dedicated to the science, validation, and applications of 10-m global embeddings of the Google Deep Mind-generated Alpha Foundation's 64-D data.

Scope and Themes

Manuscripts utilizing the 10-m embedding dataset, including the following are welcome:

1. Embedding Characteristics & Methodological Foundations

- Structure and behavior of the 64-D, 10 m embedding space
- Temporal stability and interannual consistency (2017–2024)
- Sensor contributions and feature disentanglement
- Comparisons with reflectance, backscatter, and spectral indices
- Interpretability and explainability of embedding dimensions

2. Accuracy Assessment & Benchmarking

- Validation of 10-m embeddings against:
  - HLSL30 (Harmonized Landsat 30 m)
  - HLSS30 (Harmonized Landsat + Sentinel-2 30 m)
  - Other multispectral, hyperspectral, or SAR datasets
- Performance across biomes, climates, and land-use types
- Sensitivity to training data, sampling strategies, and model choice
- Cross-sensor generalization and transferability

3. Applications Across Earth and Environmental Sciences

- Land cover and land-use mapping
- Agriculture: cropland mapping, irrigated versus rainfed, crop type, yield, phenology
- Hydrology: water bodies, wetlands, snow, soil moisture proxies
- Forests: biomass, structure, disturbance, species mapping
- Urban studies: impervious surfaces, heat islands, infrastructure

- Hazards: floods, fires, droughts, storms
- Biodiversity and ecosystem monitoring
- Environments and Natural Resources Management and assessment, sustainability

4. AI, Machine Learning, and Foundation Model Integration

- Self-supervised learning workflows using embeddings
- Few-shot and zero-shot classification
- Embedding-based change detection
- Integration with climate models, digital twins, and geospatial AI pipelines
- Computational efficiency and cloud-native analytics

5. Operationalization & Future Directions

- Embeddings for national mapping agencies
- Scalability, reproducibility, and open science workflows
- Ethical, societal, and policy implications of AI-derived EO products

Submission Details

- **Submission Deadline:** *March 31, 2027*
- **Submission Portal:** PE&RS Manuscript Central (standard journal submission system)
- **Article Types:** Research Articles, Review Papers, Technical Notes, Application Papers
- **Multiple Special Issues:** If submission volume is high, PE&RS may publish multiple themed issues under this call.
- **Peer Review:** All submissions will undergo full peer review following PE&RS standards.

Why This Special Issue Matters

The emergence of global 10-m embeddings represents a paradigm shift in remote sensing moving from sensor-specific physical measurements to unified, semantically rich, AI-derived representations. This Special Issue aims to:

- Establish scientific baselines for accuracy and reliability
- Compare embeddings with traditional EO datasets
- Explore new applications enabled by this representation
- Provide guidance for researchers, agencies, and practitioners
- Shape the future of AI-driven Earth observation

Guest Editor

Dr. Prasad S. Thenkabail, Senior Scientist (ST), U.S. Geological Survey (USGS), is an Internationally recognized authority in hyperspectral remote sensing, remote sensing science, global agricultural cropland modeling and mapping, and Geospatial Science. Prasad has a PhD from the Ohio State University (OSU) in 1994, has 200+ peer-reviewed articles, edited 15 books, and has many awards to his name including the 2025 Outstanding Technical Achievement Award of American Society of Photogrammetry and Remote Sensing (ASPRS) in recognition of pathfinding, pioneering research to develop breakthrough methods and modeling techniques in hyperspectral remote sensing.

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