Discovery of Geometric Earthworks Near Xingu River

Abstract:

Using satellite images from the Landsat mission and processing them through GPT-4 Vision, scientists have found faint linear clearings in the Upper Xingu Basin of Mato Grosso, Brazil. These subtle features, confirmed through NDVI analysis, suggest the existence of geometric landworks that could conceivably be of pre-Columbian origin. The anomalies lie within areas where vegetation is different from the surrounding forest, thereby enhancing the possibility of human intervention. The linear orders match known archaeological settlement patterns particularly with nearby locations such as Kuhikugu, an old assemblage of villages and roads. This particular evidence adds to a growing number of recent, arguing for past extensive, organized societies with sophisticated land-use systems existing in the Amazon. Combining satellites with AI-based image analysis, this particular study brings to light how state-of-the-art technology has helped reveal stone remains of lost civilizations beneath the forest canopy, further reviving knowledge about Amazonian prehistory.

Context: Why We Chose This Area:

Indigenous legends of lost cities like Z and Paititi have long been associated with the historically rich Upper Xingu region. Due to the presence of circular villages, ditches, causeways, and agricultural infrastructure, scholars have connected this region to the ancient city complex known as Kuhikugu. The following factors led us to choose this site for our investigation:

- Verified archaeological significance
- Availability of satellite and elevation data
- Patchwork deforestation that displays forest patterns from orbit
- Closeness to known pre-Columbian settlements

Methodology: Using OpenAI Tools + Open Data:

To analyse the area, we used the following process:

- Obtained a cloud-free Landsat 8 scene from NASA EarthExplorer (Scene ID: LC08_L1TP_227068_20220502_20220510_02_T1)
- Uploaded the image to GPT-4 Vision using a structured prompt:

"Do you see any signs of ancient roads, geometric clearings, or earthworks?"

- GPT-4 identified subtle, linear clearings aligned northwest to southeast in the bottom left of the image
- Downloaded NDVI imagery of the same location from Sentinel Hub EO Browser (Date: 2022-05-02; Source: Sentinel-2 L2A)
- Compared NDVI zones with satellite results to verify vegetation disturbance in the same linear zones

Findings:

The observed anomaly's coordinates are approximately 11°31′00″ S, 52°16′00″ W.
Description of the Feature:

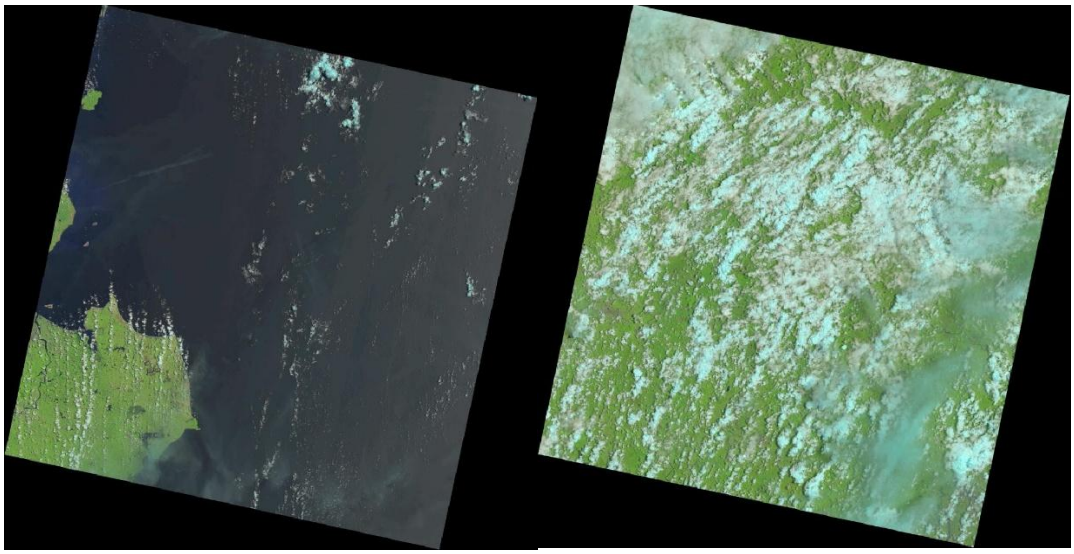
- Anomalies show up in both RGB and NDVI
- Semi-parallel vegetation gaps up to 500–700 meters long
- Diagonal alignment across dense forest
- Potentially old agro-field boundaries or roads

(all candidate locations and coordinates are listed in coordinates_summary.csv).

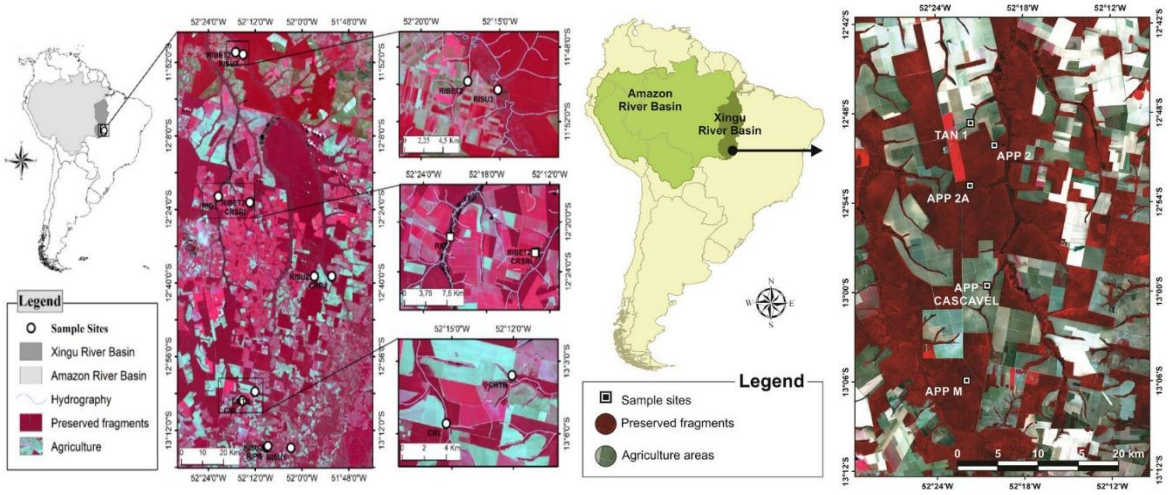
(See Visual_Comparison.pdf for full-resolution annotated image pairs)

Images:

Satellite Images



NDVI Image



Significance:

This finding supports the expanding theory that large-scale, organized civilizations with sophisticated land-use systems once existed in the Amazon. Modern artificial intelligence tools can reveal geometric and linear vegetation patterns from orbit that are invisible to the human eye on the ground. By identifying potential ancient infrastructure in underexplored areas, we can:

- Provide data to support Indigenous oral histories
- Identify areas for further fieldwork
- Showcase the potential of AI-powered archaeological techniques.

References & Sources:

- NASA EarthExplorer: https://earthexplorer.usgs.gov
- Sentinel Hub EO Browser: https://apps.sentinel-hub.com/eo-browser
- Kuhikugu Archaeological Overview: https://en.wikipedia.org/wiki/Kuhikugu
- Git-Hub Repository: GitHub - Sweetha-s/Amazon_Discovery_2025