

Terrace Agriculture in the Lake Titicaca Basin

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Overview

This project utilized satellite remote sensing techniques to attempt to answer key questions about Terrace agriculture around Lake Titicaca. High resolution (0.5 m) Worldview-2 data were used for identification of terraces. Landsat 5 TM data (30m resolution) were also gathered. These were useful for their wide range of spectral bands, including a thermal infrared band, and for their free availability. Digital elevation model data from the Shuttle Radar Topography mission (SRTM) were also employed. The data were atmospherically corrected to top of atmosphere reflectance, and analysis was performed to derive information about vegetation cover, surface temperature, and soil moisture.

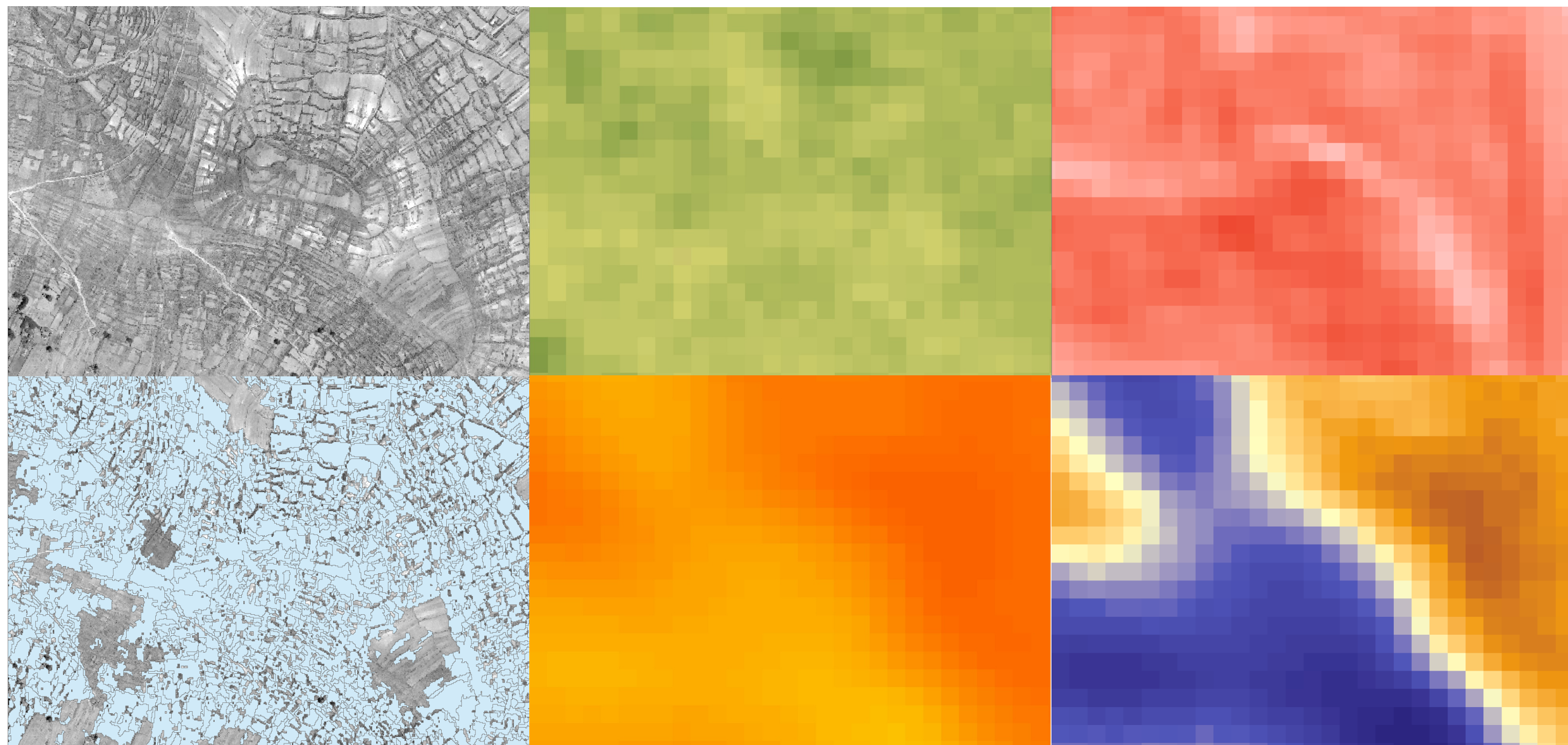


Key Findings

The SRTM data were converted to slope values. These slope values proved relatively effective in differentiating area where terraces occur from areas where lowland agriculture occurs.

The soil moisture data was derived using the temperature vegetation dryness index (TVDI), which is based on the triangle method for soil moisture determination.

Linear feature identification has only achieved moderate success thus far. A full analysis of results awaits a more proper completion of this process. The following images show side by side the results of these processes, as well as the raw high resolution data.



References (A list of the KEY references, if applicable)

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Context

The Tiwanaku civilization began in the 6th century, and made extensive use of both agricultural terraces and raised field techniques.

Treacy and Denevan (1994) indicate four likely benefits of terrace agriculture over other farming techniques. These are:

1. Increasing soil depth.
2. Reducing erosion.
3. Protecting from frost.
4. Increasing soil moisture.

Satellite remote sensing has been extensively used for both environmental monitoring and archaeological applications in recent years.

Impact

Information about the properties and effectiveness of agricultural terraces in the Lake Titicaca area is of both modern and historical significance. By increasing soil water content and protecting from frost, Terraces could prove more effective than modern lowland farming techniques in the region. Additionally, knowledge of the capabilities of these farming techniques can provide useful information about the potential agricultural output and size of past civilizations in the area, Tiwanaku in particular.

From left to right: 1) Raw high resolution images of a small area from around Lake Titicaca. 2) NDVI; darker greens indicate more vegetation content. 3) Slope; darker reds indicate higher slope. 4) Polygons derived from attempted linear feature extraction. 5) Land Surface Temperature. 6) Soil moisture; blue values represent more moisture.