AFFORDABLE, LOW-COST TECHNIQUES FOR THE DOCUMENTATION OF CULTIVATION STRUCTURES IN THE ARID ATACAMA AREA (N. CHILE)

This work is part of a project aimed at the analysis of the agricultural practices in an arid area of the Atacama desert (N. Chile) between the Late Intermediate and the Inka periods (ca. A.D. 1200–1530).

Previous descriptions existed of the cultivated fields and irrigation canals around the sites of Topaín and Paniri (eg Mostny 1949, Alliende et al. 1991).

INTRODUCTION AND CONTEXT

Fieldwork was aimed at:
- Building a detailed record
- Exploring the spatial layout of canals and fields
- Some important conditions: Excellent preservation and visibility of archaeological features
- Short field seasons (2–3 weeks), small field team (6–8 people)

Approach based on extensive use of geospatial resources:
- Photointerpretation of satellite images
- Field survey
- Ground truthing
- Stratigraphic relationships
- Constructive morphology
- Small test pits
- Sampling
- 3D detailed documentation in the field

RESOLUTIONS

A. ONLINE GIS-BASED DATABASE

The resources:
- GeoEye 1 images for photointerpretation
- 2 Trimble Juno handhelds

Visibility of fields, canals and other features in the satellite images

The results:
- A GIS-based database with >6500 single features mapped. The data are openly accessible online
- A hypothetical temporal sequence of fields and canals
- RMSE = 1.2 m, 90% < 0.7 m

B. DETAILED TOPOGRAPHY

No detailed maps available for the area – need to build our own representation of topography
3 m DEM created in Leica Photogrammetry Suite and Erdas Imagine 2011 based on two overlapping GeoEye 1 images

The settlement area of Topaín in the GeoEye 1 image (top) and the orthoimage obtained in the field (bottom).

C. 3D DOCUMENTATION

Despite their high resolution, satellite images did not provide sufficient detail of some areas

A more detailed approach – affordable and simple 3D documentation with:
- Low cost UAV (DJI Phantom)
- Compact digital camera (Ricoh G2)
- SFM software (Agisoft Photoscan)

The results:
- 3D models of settlement areas, groups of fields and individual constructions

References

Hayashida, Frances
Salazar, Diego
Troncoso, Andrés

Credits

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Research lays at the intersection between archaelogy and GIS with the development of new geomatics techniques allowing for the production of highly-detailed orthophotos and 3D models in the field.

Photographs: ** Departamento de Antropologia, Universidad de Chile

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