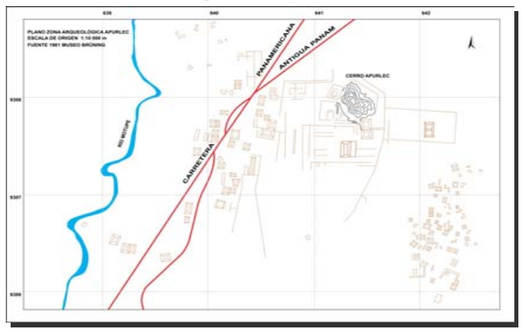
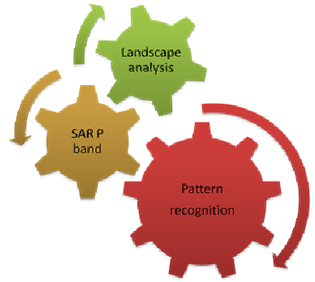
Use of the SAR (Synthetic Aperture Radar) in P band for detection of the MOCHE and LAMBAYEQUE canals network in the APURLEC region of PERU

INGV Maria Ilaria Pannaccione Apa mariailaria.pannaccioneapa@ingv.it
CORISTA Maria Rosaria Santovito mariarosaria.santovito@corista.eu; Giulia Pica giulia.pica@corista.eu
IREA-CNR Ilaria Catapano catapano.i@irea.cnr.it; Gianfranco Fornaro fornaro.g@irea.cnr.it; Riccardo Lanari lanari.r@irea.cnr.it; Francesco Soldovieri soldovieri.f@irea.cnr.it
MAB Carlos Wester La Torre museonacionalbruning@yahoo.es; Marco Antonio Fernandez Manayalle marcofer23@yahoo.es
ASI Francesco Longo francesco.longo@asi.it; Claudia Facchinetti claudia.facchinetti@asi.it; Roberto Formaro roberto.formaro@asi.it

TEST-SITE AREA



WORKFLOW



INTRODUCTION

The forthcoming APURLEC project (North Coast, Peru) is a multidisciplinary research, managed by the Museo Arqueológico Nacional Brüning of Lambayeque, devoted to preserve and protect the Apurlec archaeological area within the wider complex system of artificial irrigation technology built between the VII and XIV centuries AD. In 1981, the Brüning Museum started actions in the Apurlec Complex producing the first planimetric survey based on aerial photography. In 1983 Apurlec was included in the National Inventory of Archaeological Monuments, Northern Zone (Apurlec No. 8 - 9).

RESEARCH

In recent years, research attention has been devoted to the development of a new class of airborne radar systems using low frequency bands ranging from VHF/UHF to P and L ones. In this frame, the Italian Space Agency (ASI) has promoted the development of a new multi-mode and multi-band airborne radar system, which can be considered even a “proof-of-concept” for the next space-borne missions. In particular, in agreement with the ASI, the research consortium CO.RI.S.T.A. has in charge the design, development and flight validation of such a kind of system, which is the FIRST AIRBORNE RADAR ENTIRELY BUILT IN ITALY. The aim was to design and realize a radar system able to work in different modalities as: nadir-looking sounder at VHF band (163 MHz); side-looking imager (SAR) at P band with two channels at 450 MHz and 900 MHz. The P-band is a penetration radar. The data collected by the radar system have been processed using a model-based microwave tomographic approach, recently developed by IREA-CNR, with the aim to enhance the interpretability of the raw-data radar images. Currently, the non-invasive SAR in P band application is under evaluation to be tested to recognize the Apurlec Pre-Hispanic subsurface canals network remodeled, restored over time and still in use by local communities.

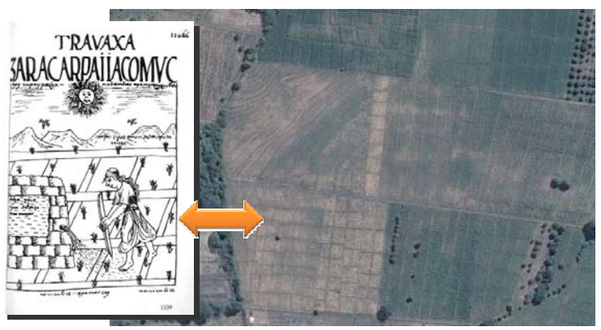
APPROACH

AIRBORNE RADAR APPLICATIONS

Ground based radar can offer a limited investigation area per time unit

Airborne systems can overcome this problem, allowing the investigation of a very large areas per time unit

TOPIC

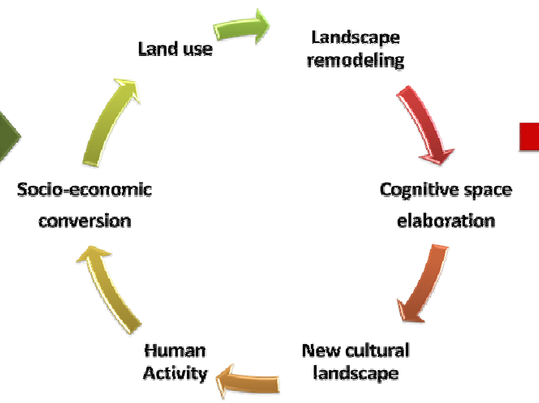


Pre-Hispanic canals pattern (Guamán Poma de Ayala, XVII c.)

Modern canals pattern (Motupe district, Lambayeque)

GOAL

RECONSTRUCTION OF THE APURLEC LANDSCAPE REMODELING CIRCULAR ACTIVITY



EXPECTED OUTCOMES

1. Implement a comprehensive and detailed archaeological survey of the Apurlec Monumental Complex Intangible Reserve
2. Finalize the Apurlec Complex planimetric maps for registration in the Register of Real Property of Peru (Public Records)
3. Assess the current state of the Monument for conservation, protection and management plan
4. Definition of the future Apurlec restricted area, according to the Regulation Artº3 Archaeological Research