

Huaca



A *huaca* (sacred anthropomorphic rock) and a wood pole standing on top of a hill, indicating to the archaeologist a very wide area of tombs and temples.

Pottery



Sampling Strategy

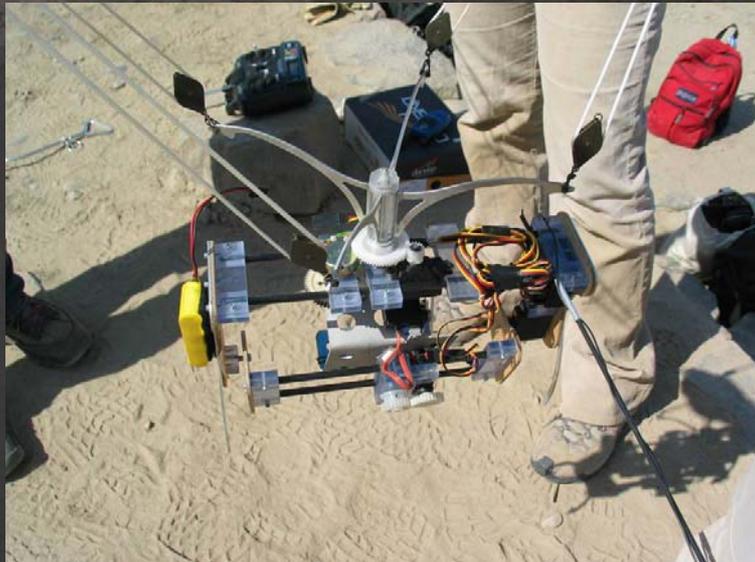
	Site/Region	Architectural	Detail
Geometry	GPS Aerial LIDAR	Laser Scanning Photogrammetry	Close Range Scanning
Imagery	Aerial Photography Satellite Imagery	Digital Photography Kite Photography	High Resolution Digital Photography

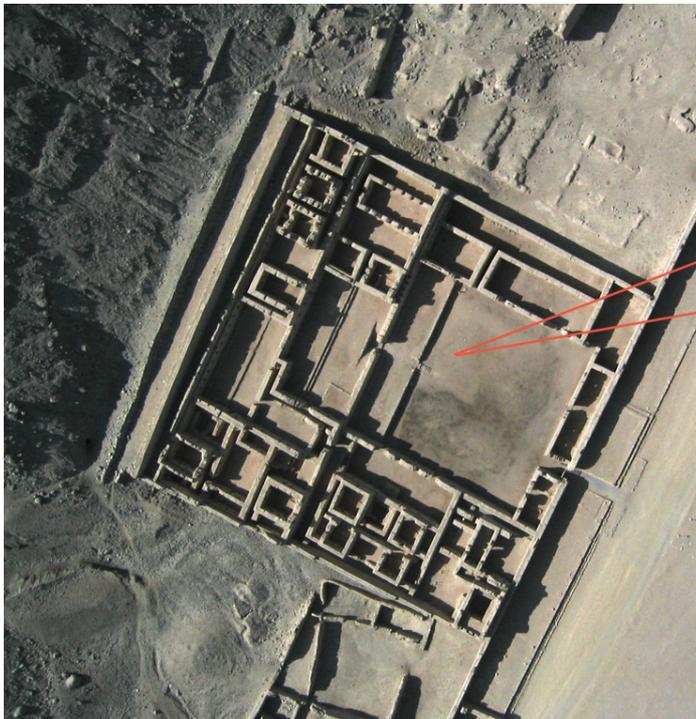
Survey





Kite Aerial Photography





Kite Aerial Photograph

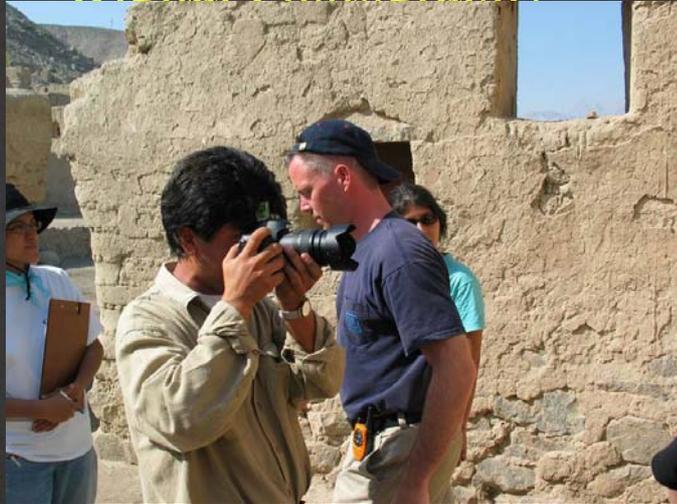
Northern Palace
Height: 900ft



Ground Control

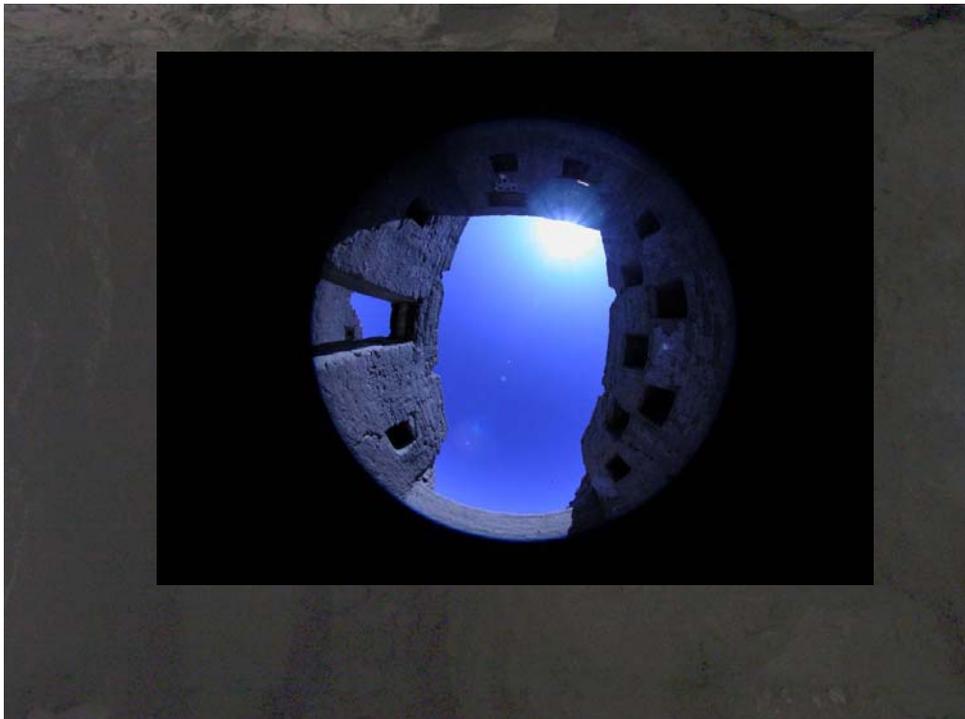
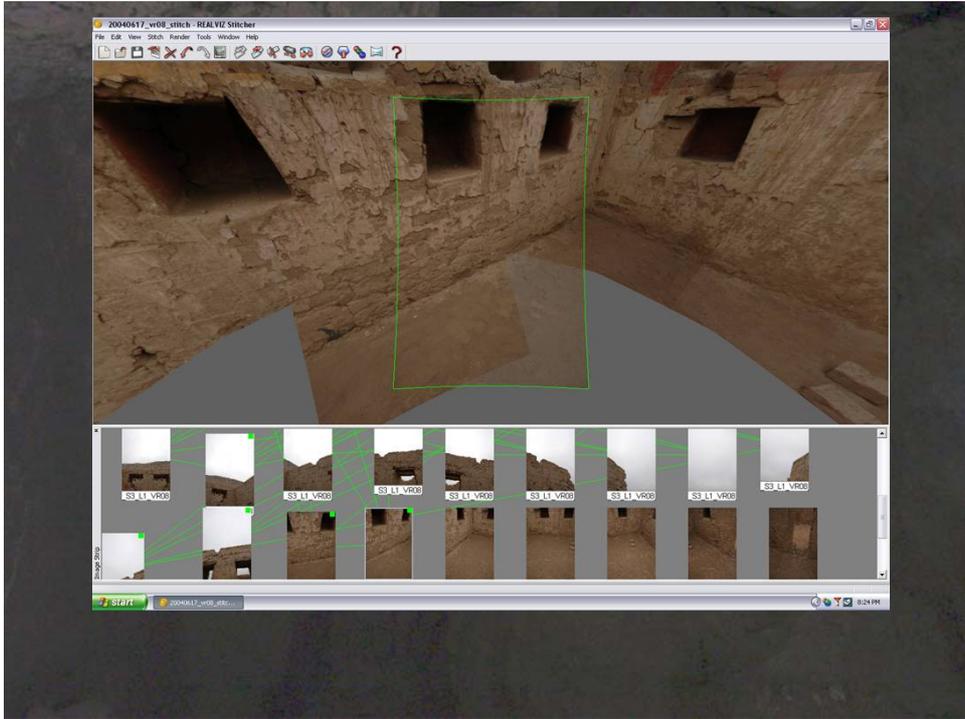


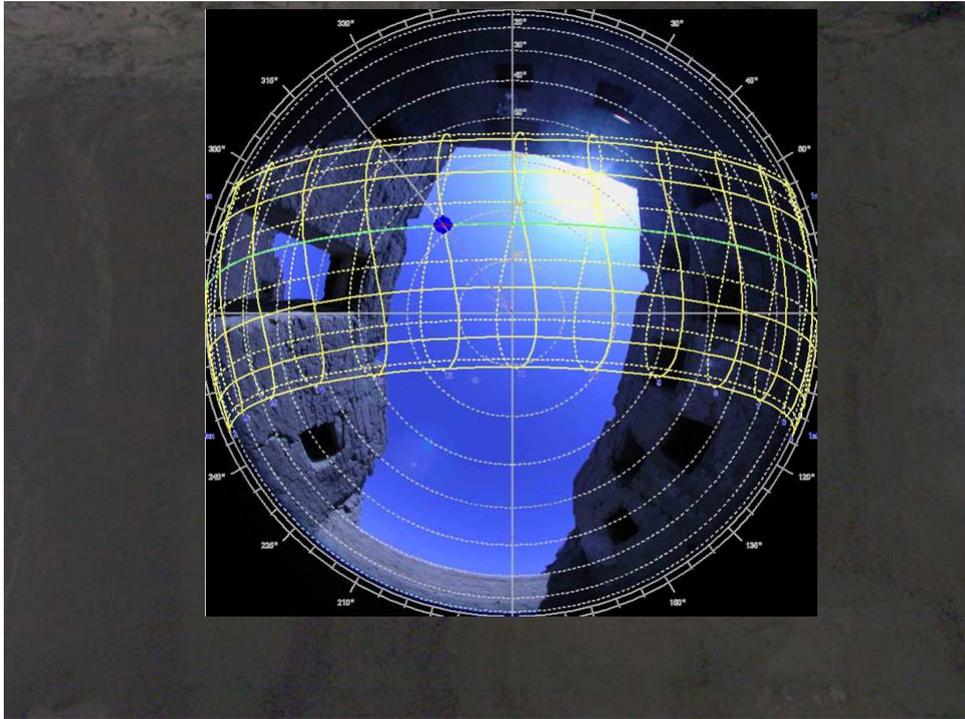
Digital Photography

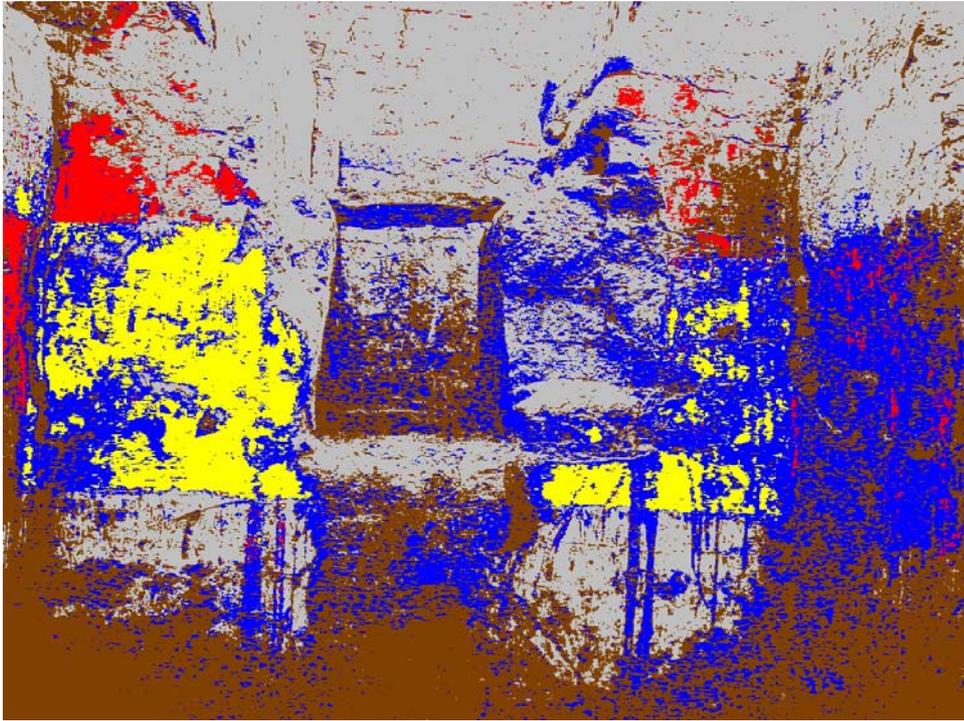


Panoramic Photography







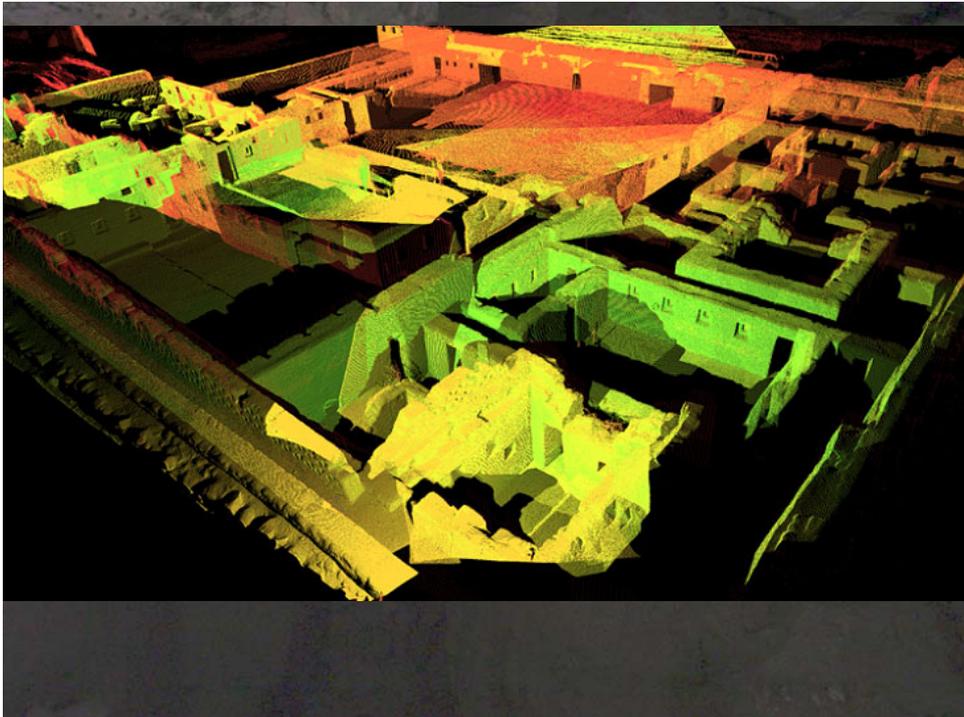


Long-Range Laser Scanning

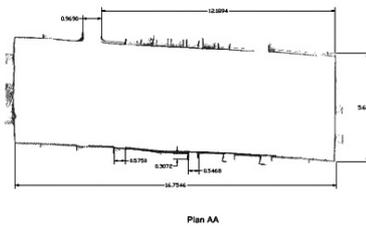
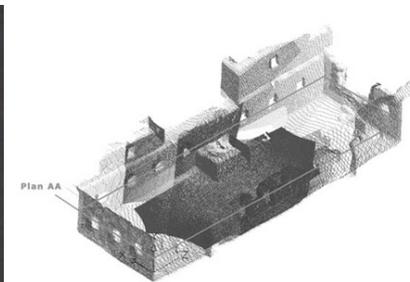
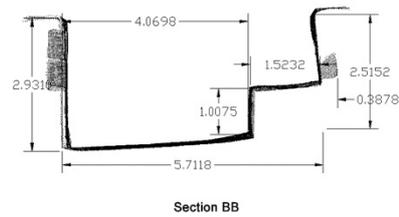
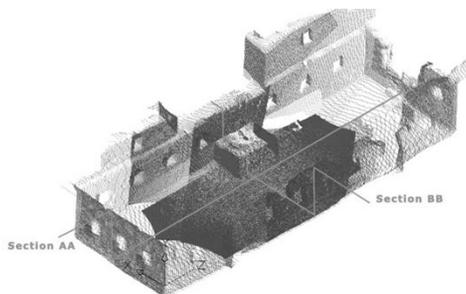
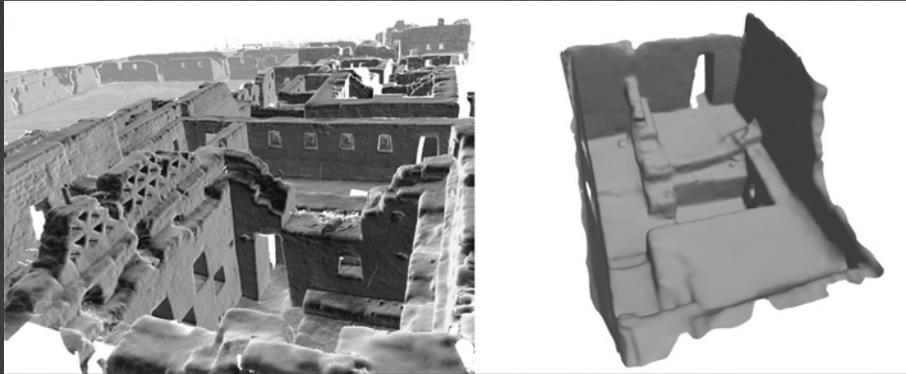


Leica HDS 2500

- Range: From 2m to 300m.
- Accuracy: 6mm Accuracy.
- Field of View: 40 Degree in the Horizontal and Vertical.
- Scan Time: Approximately 1000 points collected per second.



Meshed Scan Data



Close Range Laser Scanning



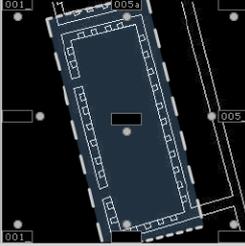
	Type	Laser light-stripe triangulation rangefinder
	Distance to object	0.6 to 2.5m (2m for WIDE)
	Scanned area (x,y)	1200 x 903 x 400 mm (@ 2 m)
	X, Y Resolution	0.35mm (0.6m) to 5.50mm (2.5m)
	Accuracy	+/- 0.008mm
	Camera Resolution	400 x 400 Pixel
	Scanning time	0.6s
	Weight	11kg
	Dimensions	210mm x 367mm x 326mm

Space 006_

Room 6 Northern Palace

TAMBO COLORADO

SITE | COMPOUND | AREA | SPACE | SURFACE | FEATURE | FACET

- Space NP006
- Surface NP006_F1
- Feature NP006_F1P01
- Feature NP006_F1P02
- Surface NP006_W1
- Feature NP006_W1D01
- Feature NP006_W1D02
- Feature NP006_W1N01
- Feature NP006_W1N02

46

E_000018	QTVR of space for primary record.	
20030704_111336.jpg	QTVR of space for primary record.	
E_000019	QTVR of space for primary record.	
20030704_111355.jpg	Test shot of wall 1	
E_000327	Test shot of wall 1	
20030712_113538.jpg	Test shot of wall 1	
E_000331	Test shot of wall 1	
20030712_114752.jpg	White balance in sun, balanced for shade	
E_000401	White balance in sun, balanced for shade	
20030712_124717.jpg	White balance in sun, balanced for shade	
E_000402	White balance in sun, balanced for shade	
20030712_124740.jpg		

Related Events 10

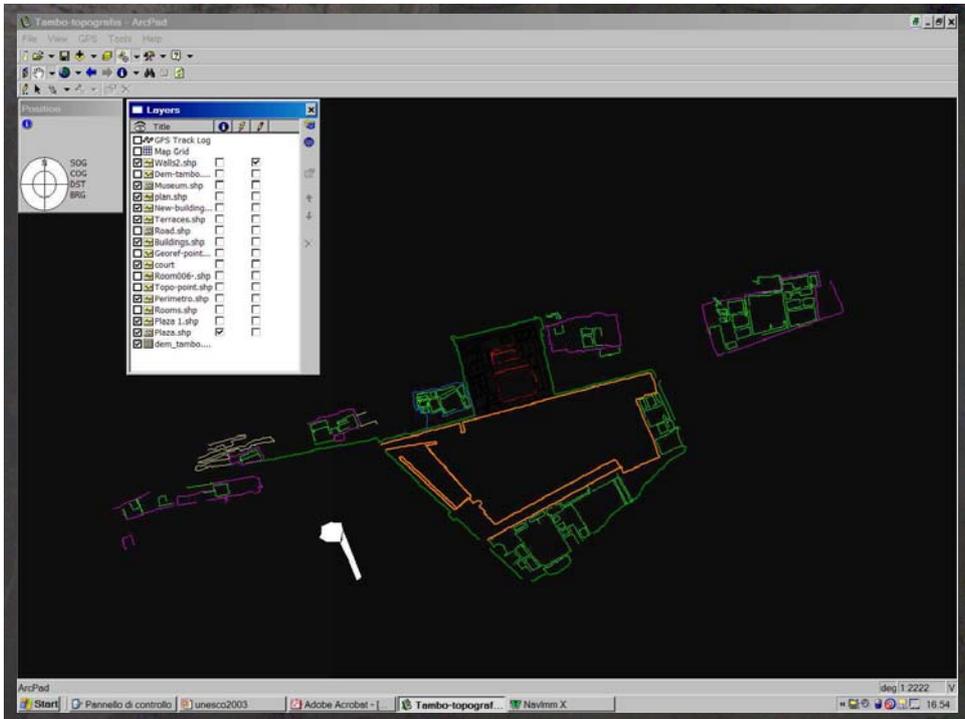
Area	NP
Compound	
Space	006_
Surface	
Feature	
Facet	
Appelative_CAL	NP006_
Class_CDE	Space



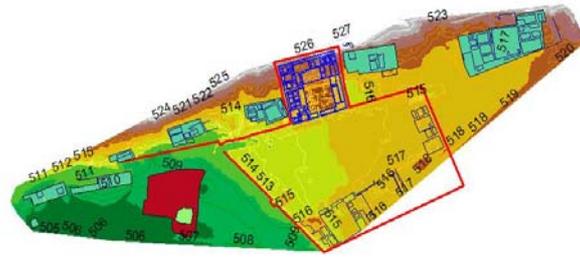


Cirax 2400

- Dimensions: 15,8'D x 13,25'W x 16,9'H.
- Weight: 20,5 Kg
- Resolution: 6 mm
- Spot laser: 6 mm
- Scanning time: 1000 points per second
- Acquisition: 50-100 m
- Vertical field of view: 40°
- Horizontal: 40°
- Integrated digital camera: 480 x 480 pixel.
- Software: Cyclone, Rapidform



Tambo Colorado

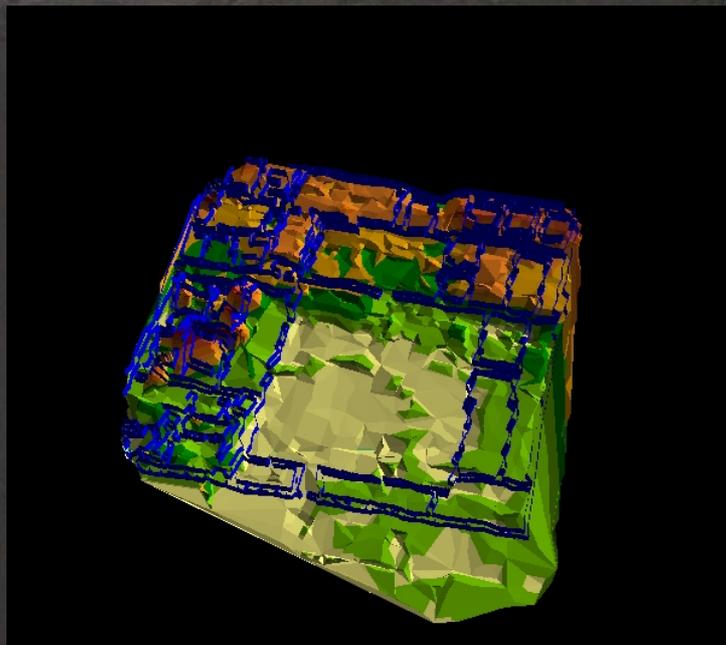


- Plans_rooms.shp
- Plans_in.shp
- Walls.shp
- Building.shp
- Theme1.shp
- Museum1.shp
- Plan.shp
- Parking2.shp
- Dem_palazzo
- Breaklines
 - Hard
 - Soft
- Elevation Range
 - 521.209 - 522.062
 - 520.355 - 521.209
 - 519.502 - 520.355
 - 518.648 - 519.502
 - 517.795 - 518.648
 - 516.941 - 517.795
 - 516.088 - 516.941
 - 515.234 - 516.088
 - 514.381 - 515.234
- Dem_tambo_17
- Breaklines
 - Hard
 - Soft
- Elevation Range
 - 526.209 - 528.941
 - 523.477 - 526.209
 - 520.746 - 523.477
 - 518.014 - 520.746
 - 515.282 - 518.014
 - 512.55 - 515.282
 - 509.819 - 512.55
 - 507.087 - 509.819
 - 504.355 - 507.087



DGPS survey and mapping made by Maurizio Forte (CNR-ITABC, Roma)

DTM OF THE INCA'S PALACE: 60.000 POINTS



TAMBO COLORADO

Tambo Colorado is a 15th century Incan administrative centre located in the Pisco Valley south of Lima in present day Peru. The structure is one of the best preserved examples of Incan adobe architecture.

A team from the University of California at Berkeley visited the site and extensively documented the main complex with a Cyrax 2400 laser scanner, an instrument capable of collecting millions of three dimensional points.

The following is a virtual representation of Tambo Colorado constructed from the laser scan data.

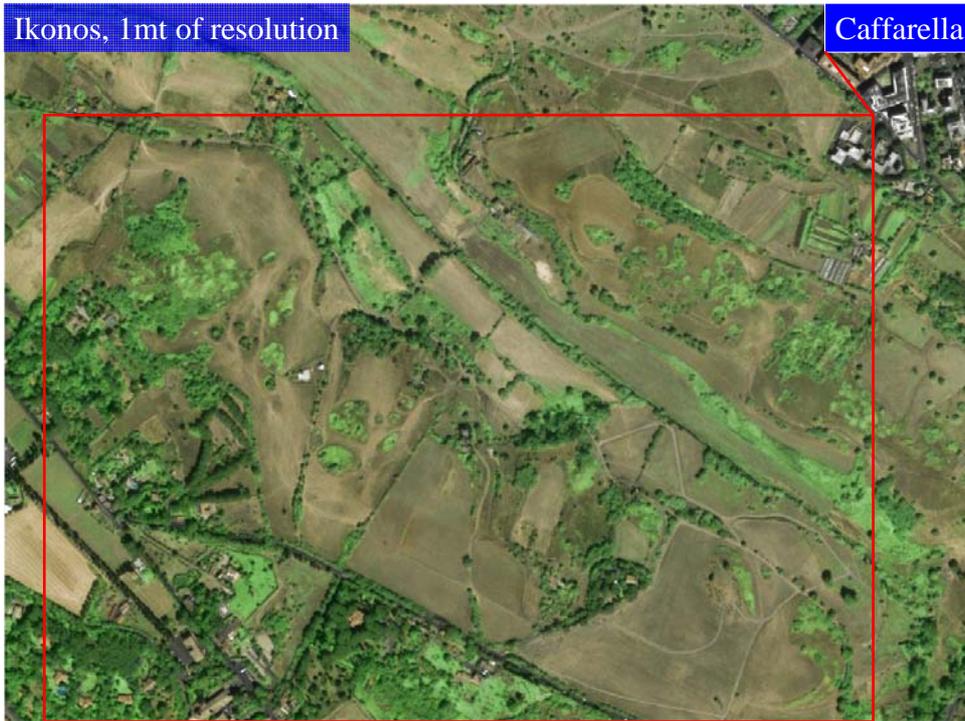
Appia Antica Project

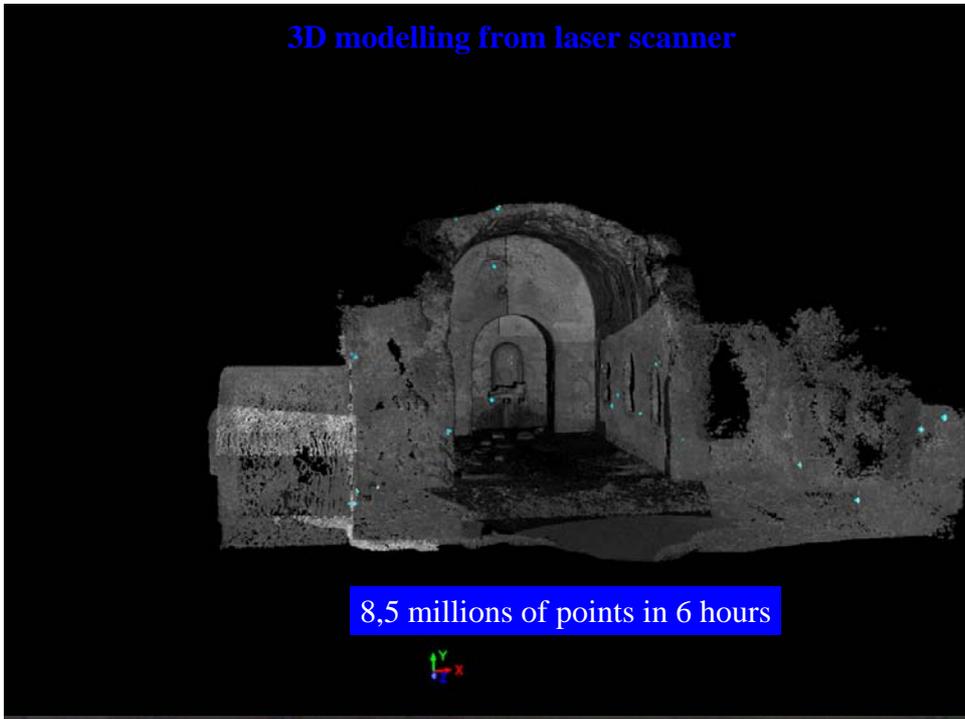
CNR-ITABC

Soprintendenza Archeologica Comunale

-3000 -2000 -1000 0 500 1000 2000











OpenSceneGraph

www.openscenegraph.org

- Open Scene Graph is a toolkit to develop graphic applications such as flight simulator, scientific visualisation, augmented reality environments.
 - Born in 1998, become Open project in 1999
 - Based on OpenGL
- Features:
 - Crossplatform (Windows, Linux, Irix)
 - Real Time optimisation
 - Wide range of input format support (flt, 3ds, obj, osg)
 - Extensible through-plug-in architecture
 - Built in support of *paged lod* terrain generation and navigation
- OSG already provides both a **tool to generate hierarchical paged terrains** from Geoimages and Digital Elevation Models and a **network loader** capable of providing browsing of such hierarchies with reasonable bandwidth requirements.

Virtual Terrain Project

www.vterrain.org

- *VTP originally was a project on the creation of a community interested in the 3d digital creation of territories*
- *VTP has developed software for real-time visualisation of territories (ENVIRO) and a series of other tools for geospatial data elaboration and the creation of models (VTBuilder, CManager...)*
- *With these tools it's possible to prepare geospecific data, such as vectorial, geoimage, DEM, etc (with VTBuilder) and to visualise and modify them dynamically in 3D (with Enviro).*

The new VTP tools

- Modified version of the two principal tools available from the VT project:
 - VT Builder
 - VT Enviro
- Modifications:
 - Import different terrain databases (FLT, TXP)
 - Capabilities of importing different 3d models format inside Enviro (FLT, TXP, OSG, IVE)

Appia Antica Project

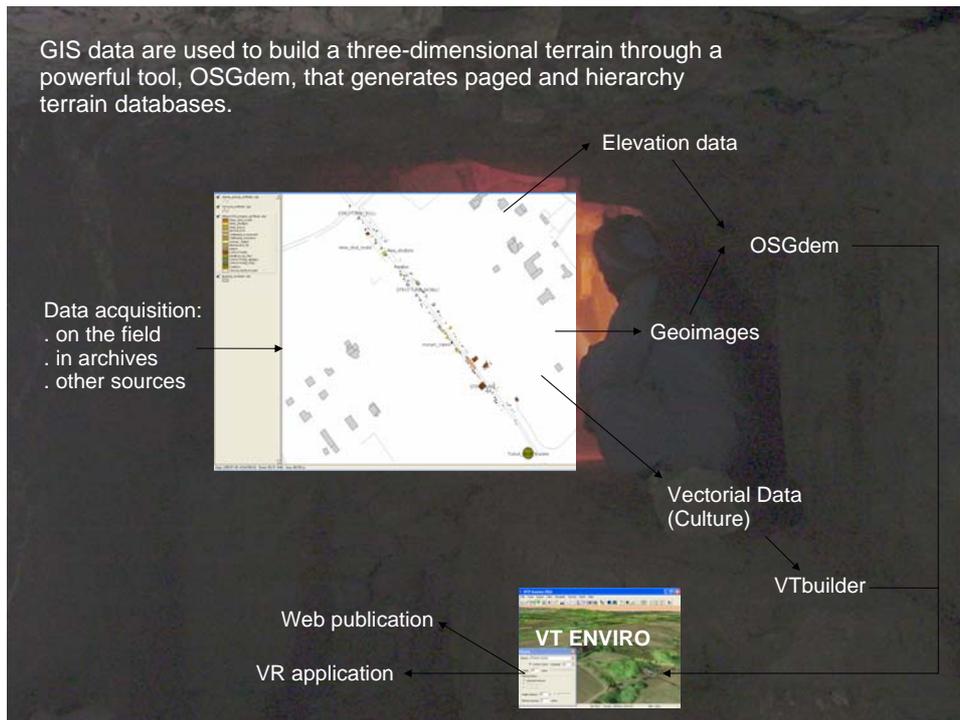
- Final Goal of the project:

Creation of a 2d and 3d digital spatial archive for the Roman Superintendence on the Appia Park. In the future VR system for a visitor center that will be realized in the park
- Goal of the OpenSource project
 - 1) Creation of a shared, open, web-based, interactive system to reconstruct the territory and modify dynamically in 3d the landscape;
 - 2) enable a restrict access to the acquired 3d data through the web for the teams (during the processing phase).
- Source Data:

GIS data; Satellite images; Historical Maps; Digital Pictures; Scanner Laser data; Laser total station data; DGPS data..
- Tool used and developed:

GIS software; GDALlibrary; OSGdem; VT Builder; VT Enviro; ActiveX.

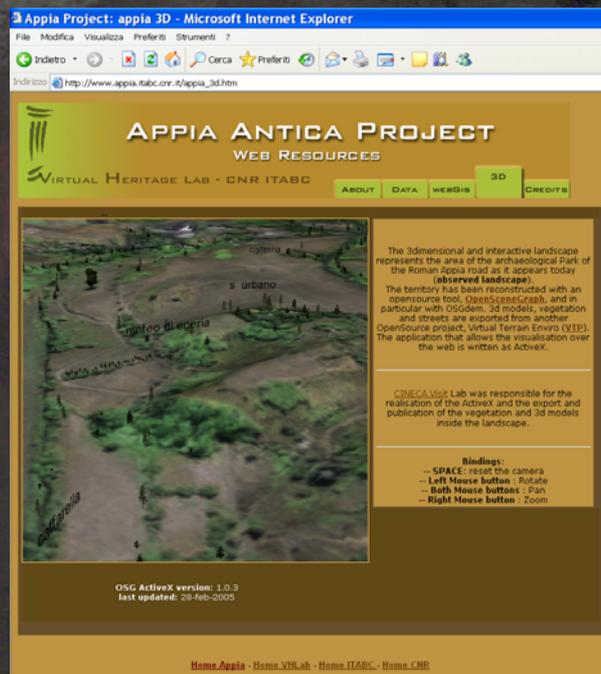
GIS data are used to build a three-dimensional terrain through a powerful tool, OSGdem, that generates paged and hierarchy terrain databases.



Results

Realisation of an useful system for the Public Administration and the Research teams involved, but also for the worldwide community. In fact it let any user not only to **navigate in real time through the Web** even large territories, but also to **interact dynamically with them**:

- adding point of views
- activating or deactivating vectorial layers that can be added on the terrain, better understanding in this way the landscape.
- switching different models of the same terrain



Future developments

- > A **GIS repository** based on an OpenSource WebGIS such as MapServer
- A **3D Models repository** based on OSG, PHP and PostgreSQL
- A **plug-in viewer** for Internet Explorer for .ive (and .txp) formats, and either a stand alone application for other browsers.
- > An **editing client** with more functions such as the possibility to add new models or trees in geographical position, taking them from the repositories.
- A **server component** to which is demanded the task of data distribution and validation
- A **rebuilding tool** that activates a terrain re-generation procedure in order to apply the modified elements.

We would like to continue the project inside an OpenSource perspective

We are open to co-operation and to exchange ideas within this framework

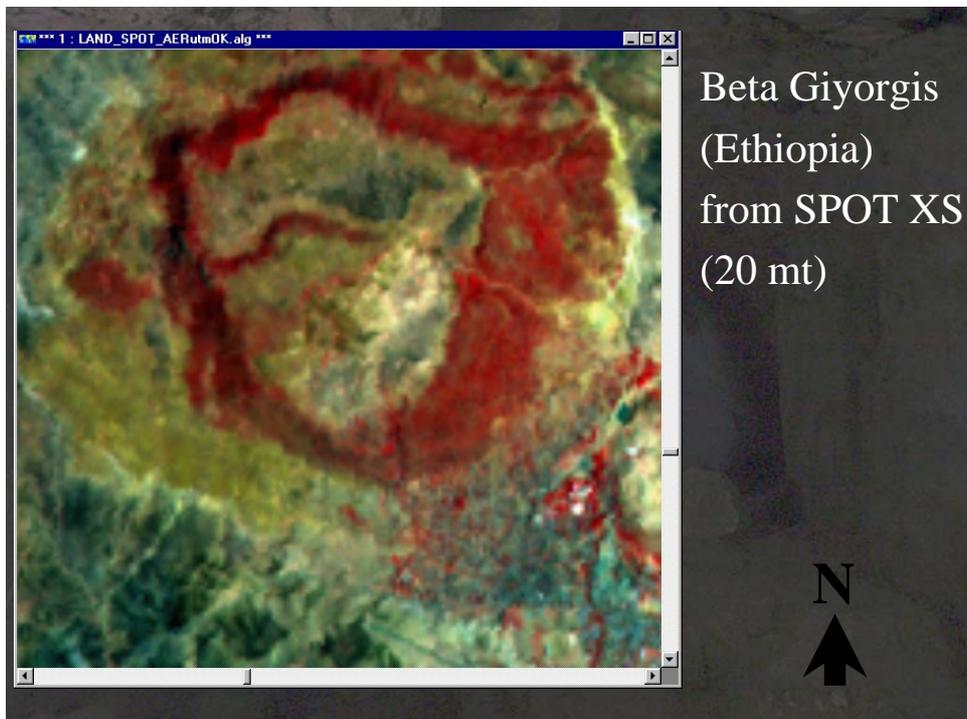
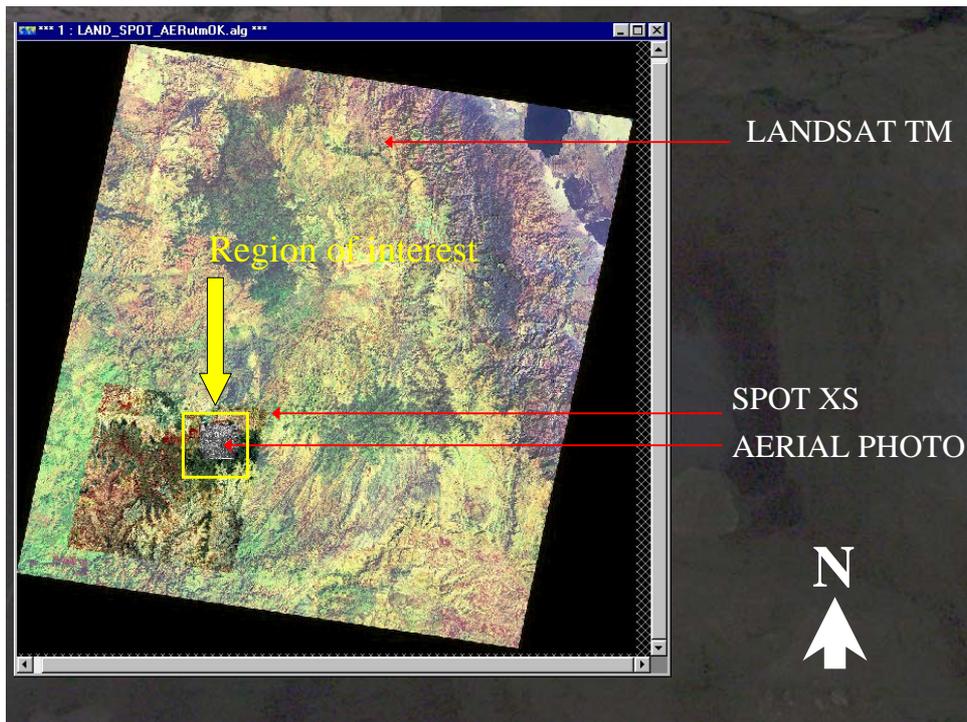


Aksum Project

(part of the project was supported by CNR Agenzia 2000)

Istituto Universitario Orientale
Boston University
CNR-ITABC
CINECA

-3000 -2000 -1000 0 500 1000 2000



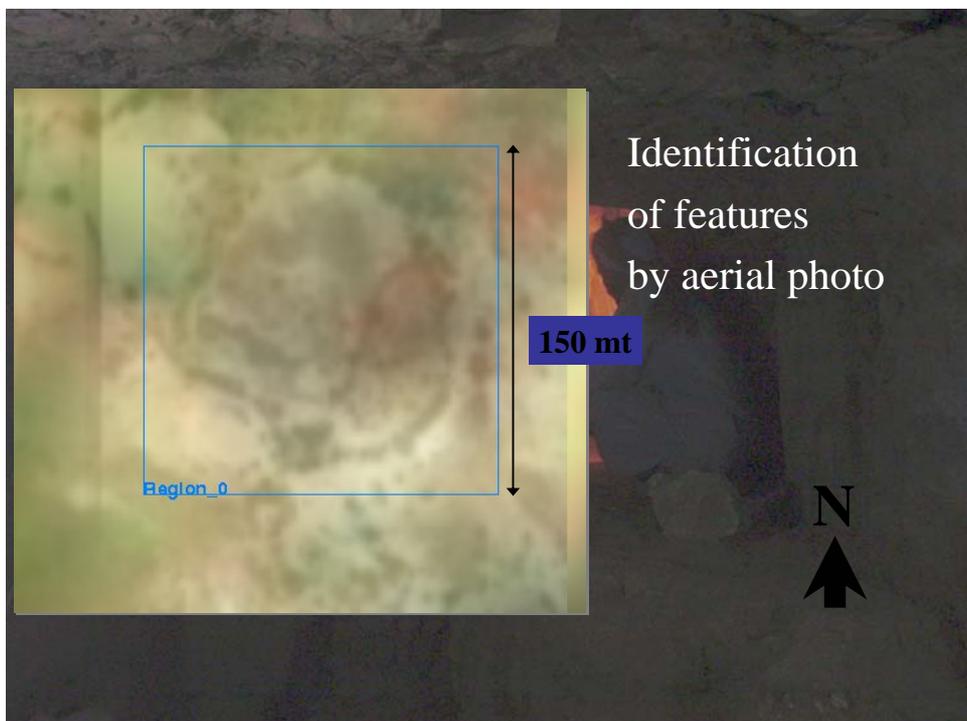
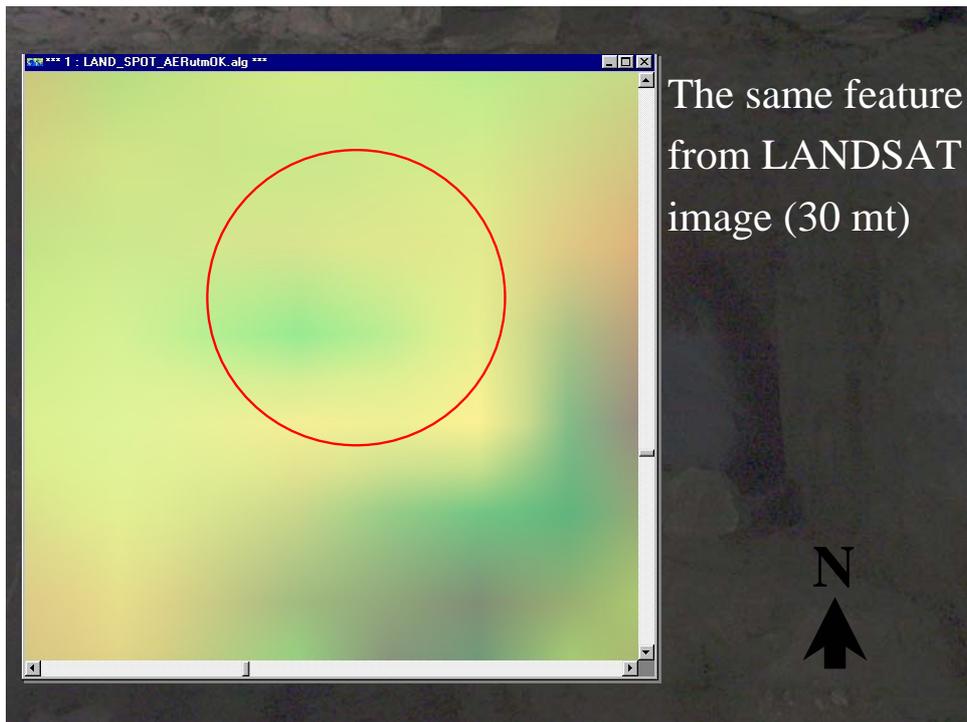


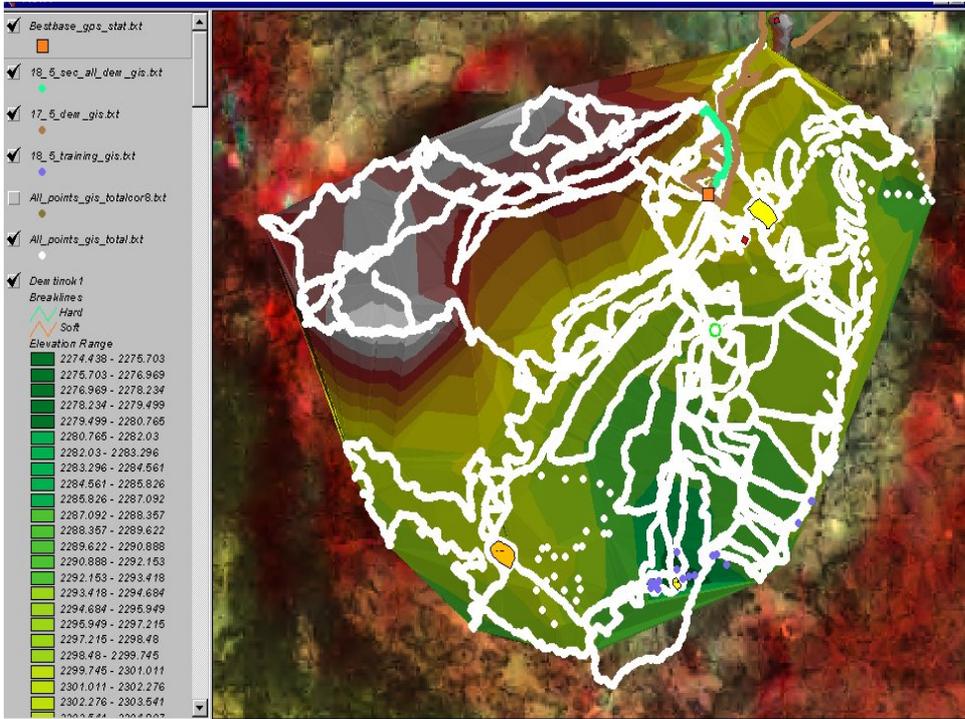
Visibility and identification of a feature by aerial photo (3 mt)

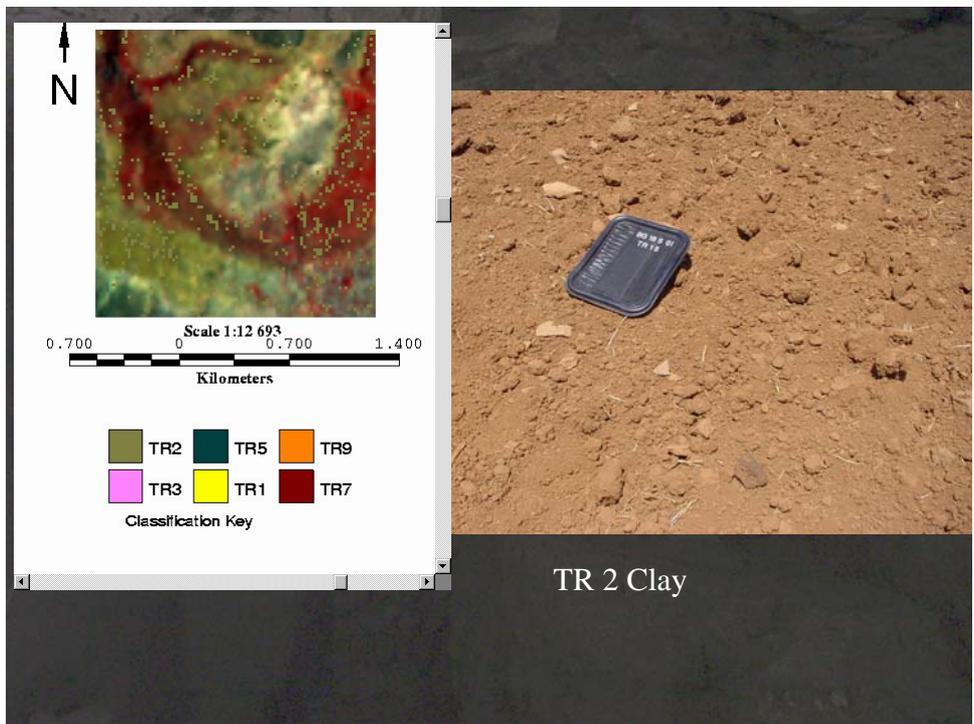
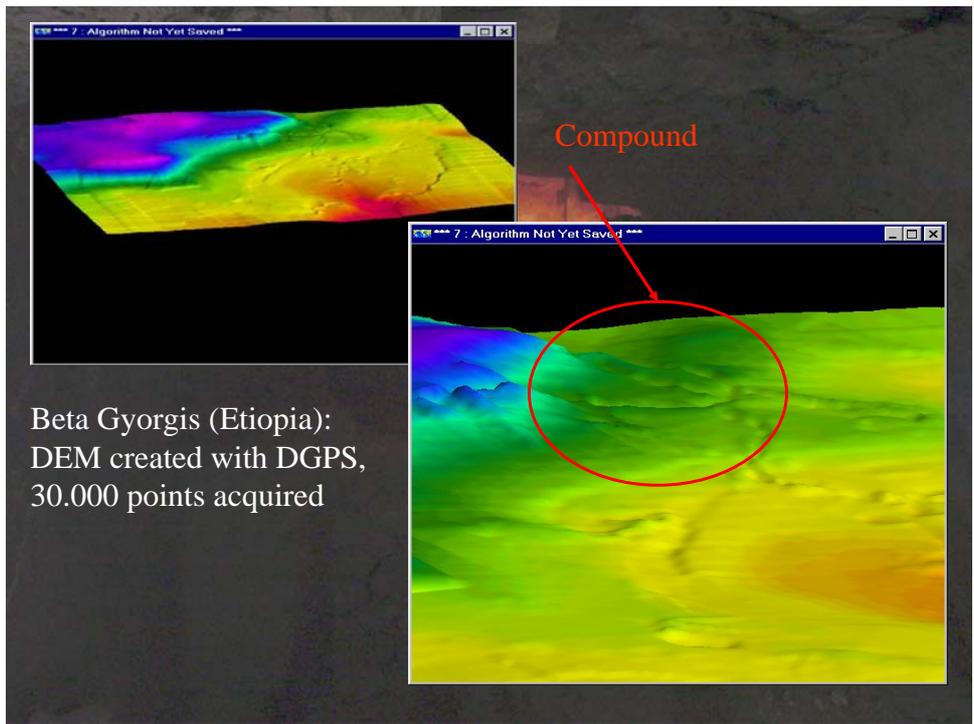


The same feature from SPOT XS image (20 mt)

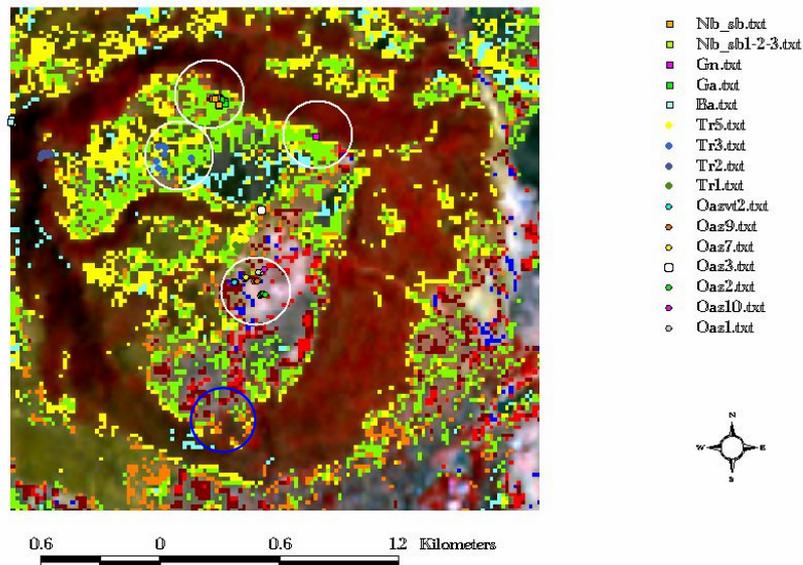








BG: supervised classifications (soils and sites)



Supervised classification: results

- **green**: NB_SB1-3, TR 1, TR 7, TR 4, BA, GA, OAZ3, TR 3, TR 6, G(uadguad) A(gazien)
- **yellow**: TR 3, GN, TR 1, TR 5, TR 4, TR 7, O(na) E(nda) A(boi) Z(ewge) X-XII.
- **blu**: OAZ9, OAZVT2, OAZ2
- **red**: OAZVT2, OAZ1, OAZ2
- **dark red**: OAZ7, TR 10, TR 7, TR 8, TR 9, ONA NAGAST AREA
- **light blu**: TR 3
- **orange**: TR 3, T(ukul) E(meni)

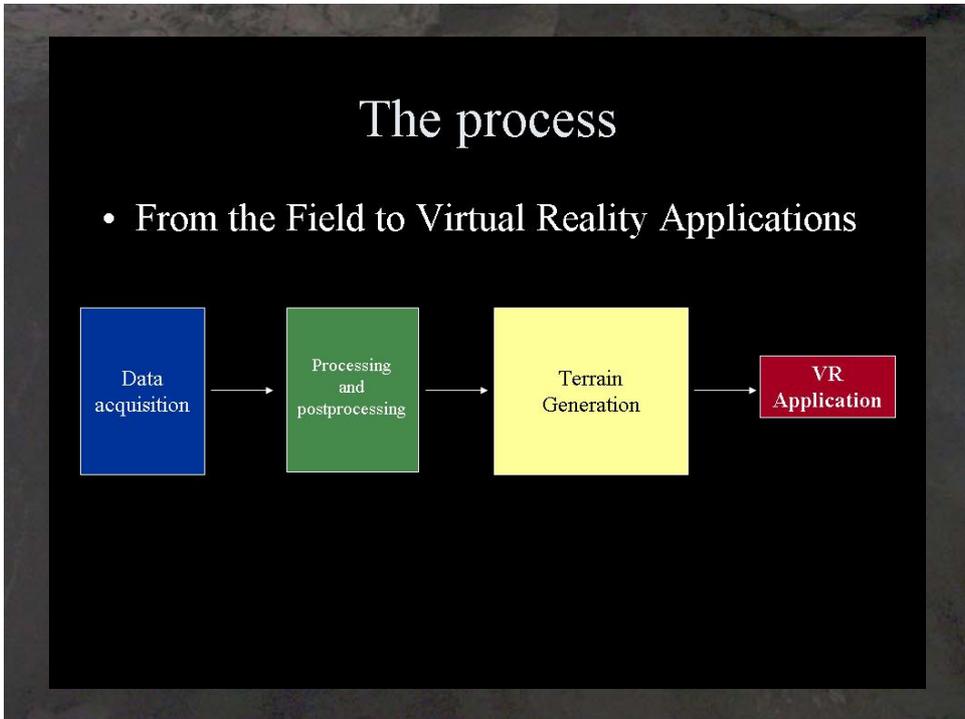
Mindscape

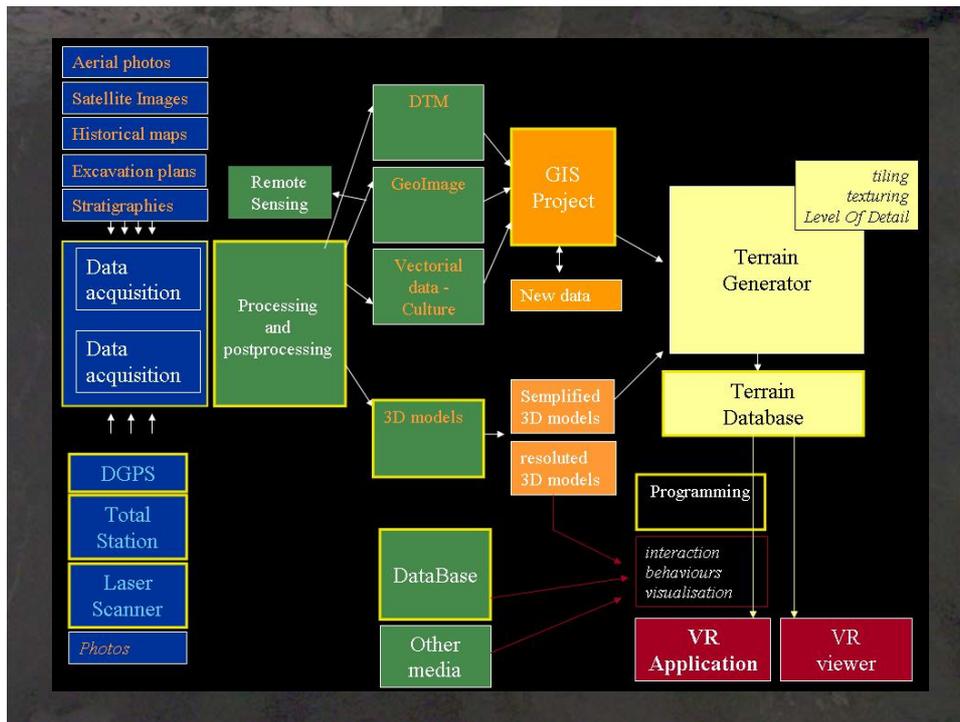


Visit



Theatre





Activities	OS Tool used	Other Tool used for comparison	Input	Output produced by <i>export-tool</i> realised for web publishing
Terrain generation	OSGdem	Terrex Terravista, Creator Terrain Studio	.dem, .ascii, .grd, geotimages	.ive or .osg hierarchy
3d models processing (buildings, objects, etc.)	Blender	Multigen Creator, 3DStudio Max	3ds, flt, obj, osg , ive	.osg , .ive
Vegetation	Grass and VTBuilder	ArcView	Shp	.osg , .ive
Vector layer processing (roads, rivers, ...)	Grass and VTBuilder	ArcView	Shp	.osg , .ive
Automatic 3d building generation from vector data with database of eights	Grass and VTBuilder	ArcView	Shp	.osg , .ive
3d models modification: move, cancel, add	VT Enviro	Multigen Creator, 3DStudio Max	3ds, flt, obj, osg , ive , shp	.osg , .ive
Label insertion	Grass and VT Enviro	ArcView	Shp+dbf	.osg , .ive , font
Final landscape publication on the Web (terrain with layers and labels)		ActiveX		
Interaction with 3d models, vector layers or other terrains (switch on and off)	PostgreSQL and PhP		Sql db	html