

REDUCTION OF THE ECONOMIC-FINANCIAL EXPOSURE OF THE STATE AND  
PROTECTION OF HUMAN LIVES

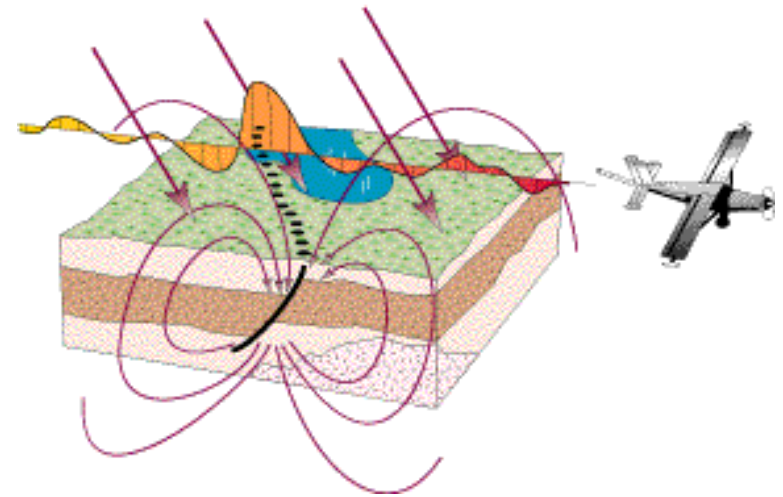
Models for the prevention and mitigation of damages to people and properties  
through an insurance coverage

PRESENTATION

NAME EXPERT: Massimo CHIAPPINI

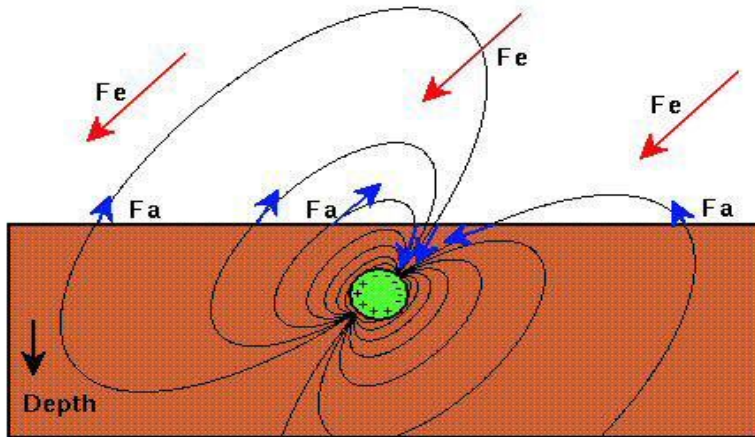
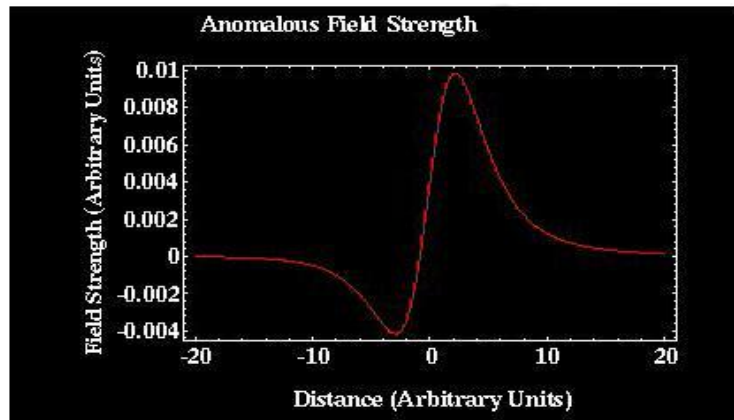
REFERENCE INSTITUTE: Istituto Nazionale di Geofisica e Vulcanologia (INGV)

# Airborne geophysical techniques



- ❖ (magnetometer H & V gradiometer, dynamic precise positioning, laser altimetry, barometric altimetry, flight path video recording, real-time data visualization, infrared sensor, gamma ray spectrometry)

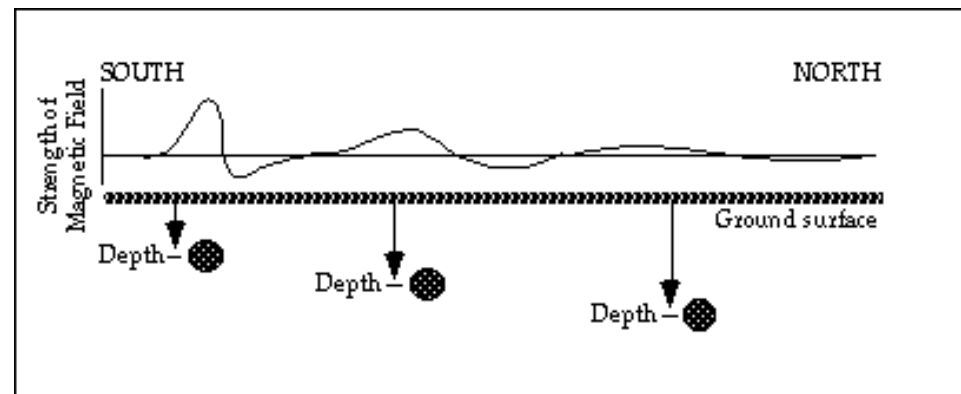
# Magnetism



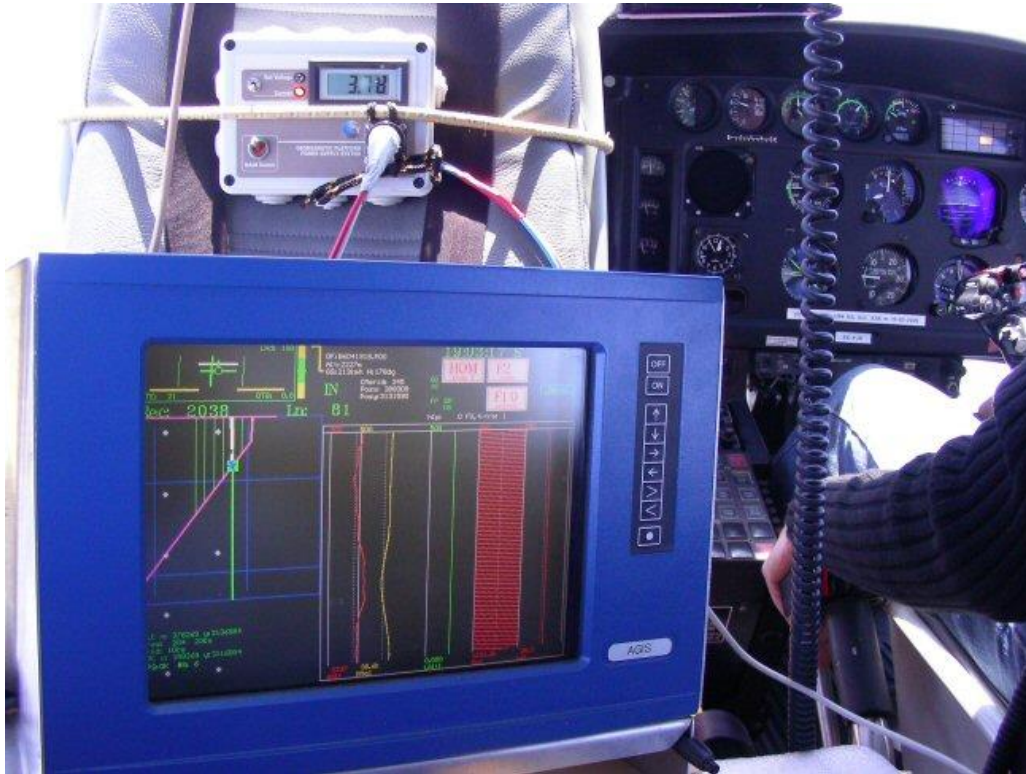
Fe = Earth's Main Magnetic Field  
Fa = Induced Anomalous Magnetic Field

Campo magnetico prodotto da un oggetto sepolto

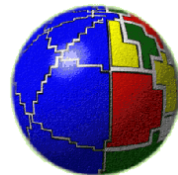
L'intensità del campo di anomalia magnetica diminuisce con l'aumento della quota di volo



# Elements of the platform



Towed-bird configuration: far off the electromagnetic disturbances



**INGVA**

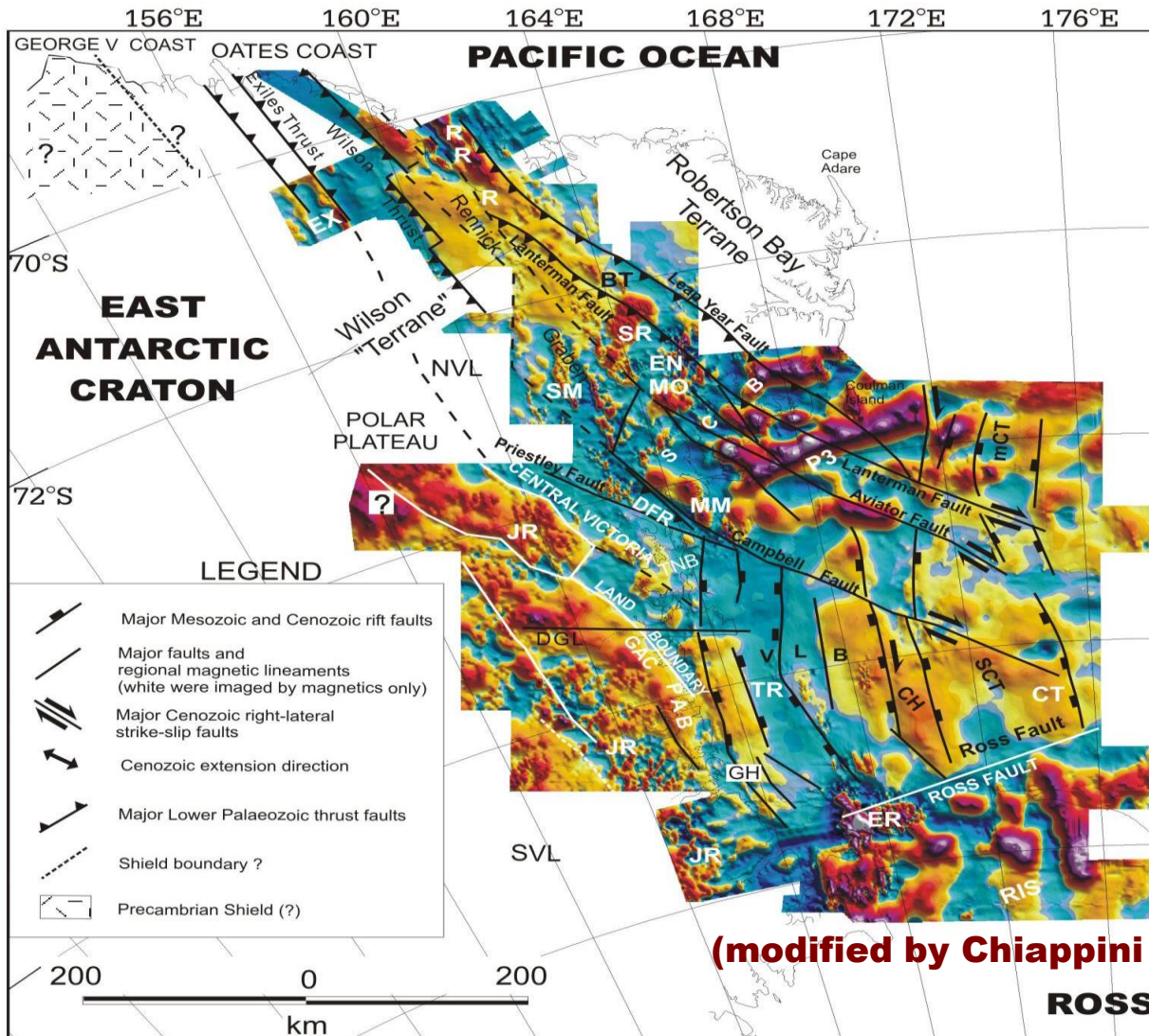
# Aeromag configuration

48°

Towed-bird  
magnetic sensor



# Tectono-dynamic triad WB-WARS-TAM

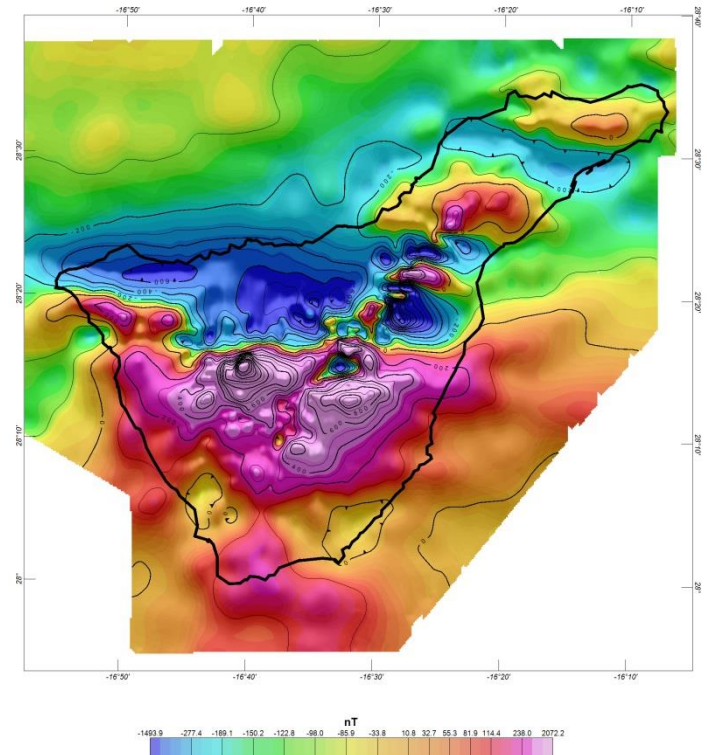
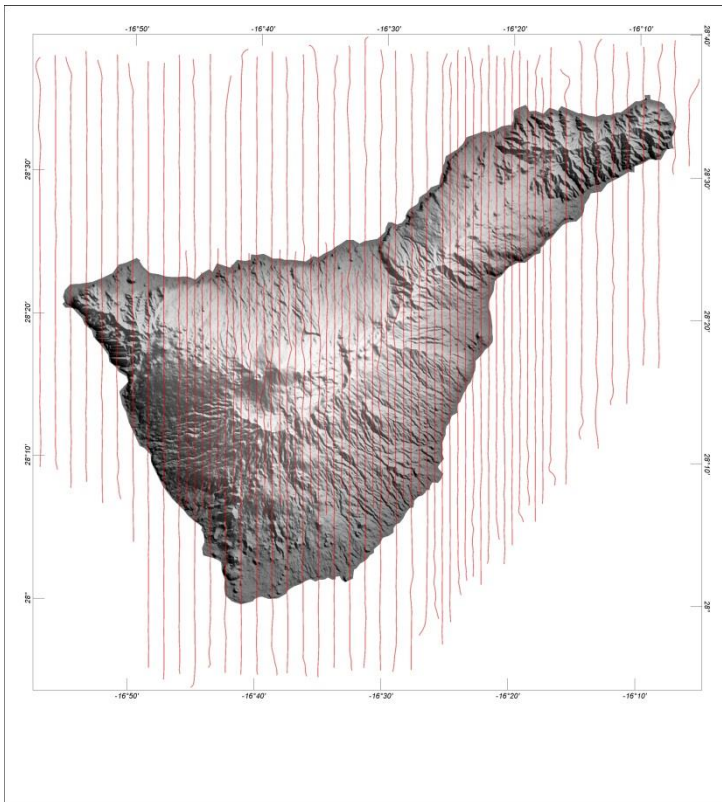


(modified by Chiappini et al., Tectonophysics, 2002)

# - Magnetic data: 2006 survey (CSIC-INGV UBU)

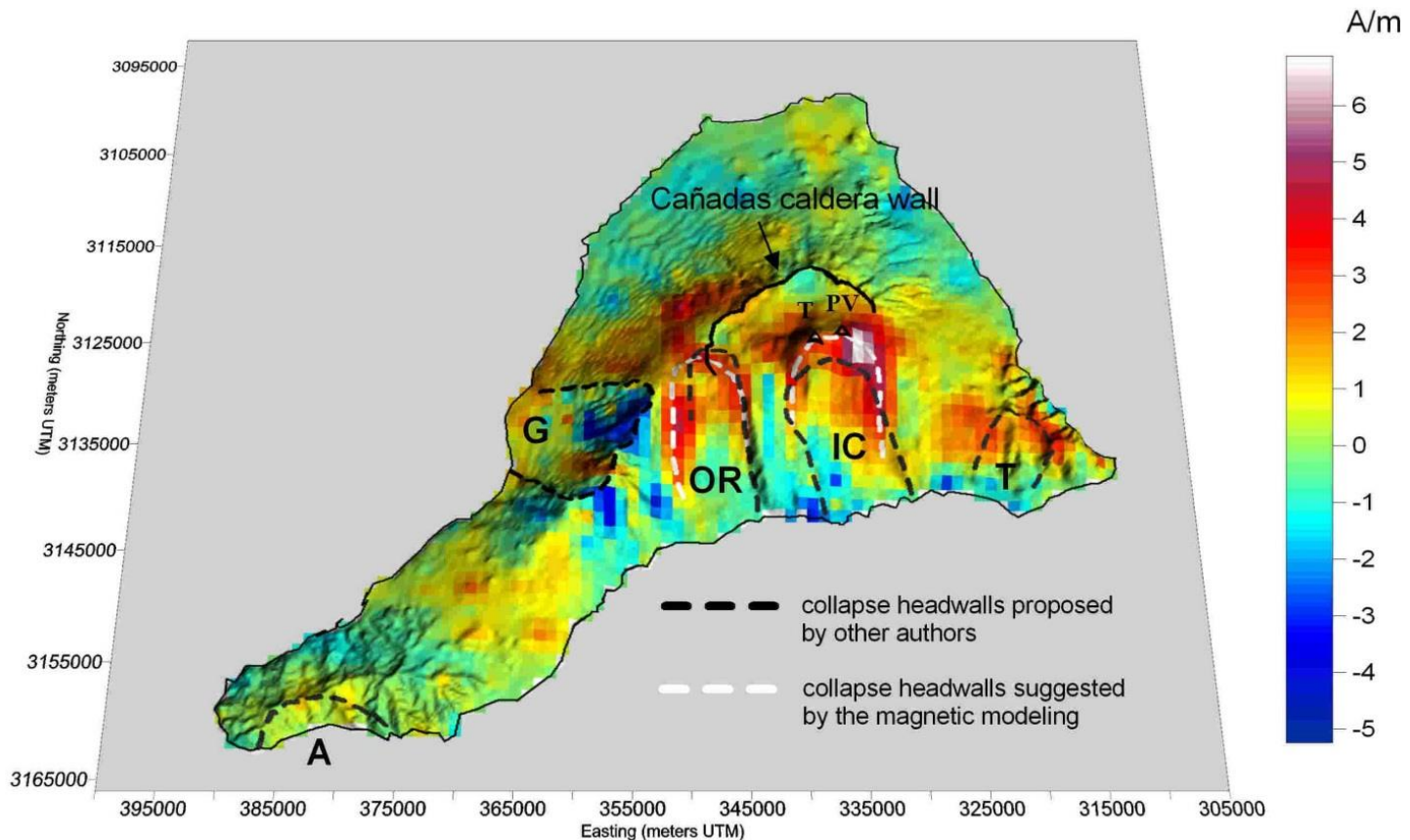
Flight lines measured with an helicopter-borne Cs-vapor magnetometer owned by the INGV

High-resolution magnetic anomaly map of Tenerife



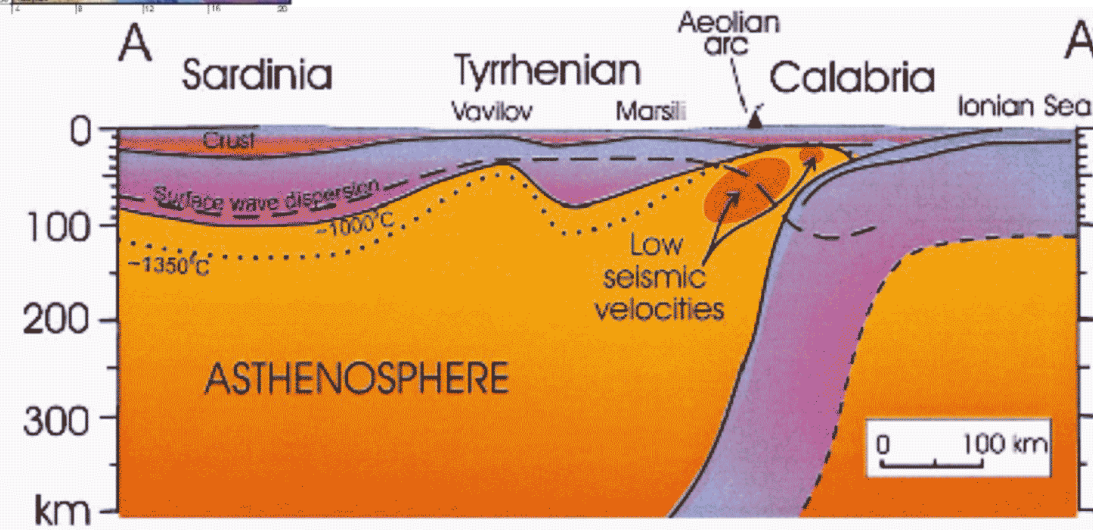
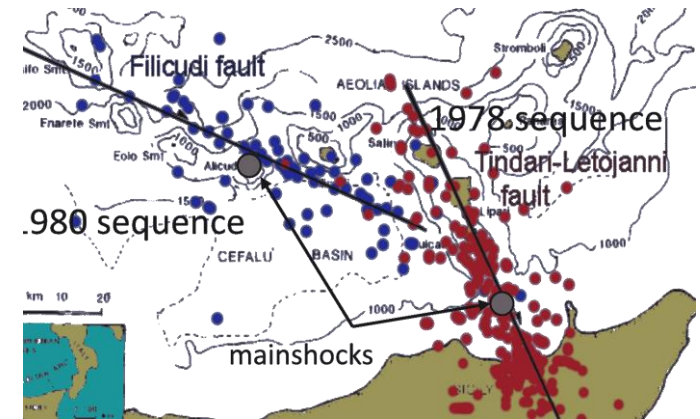
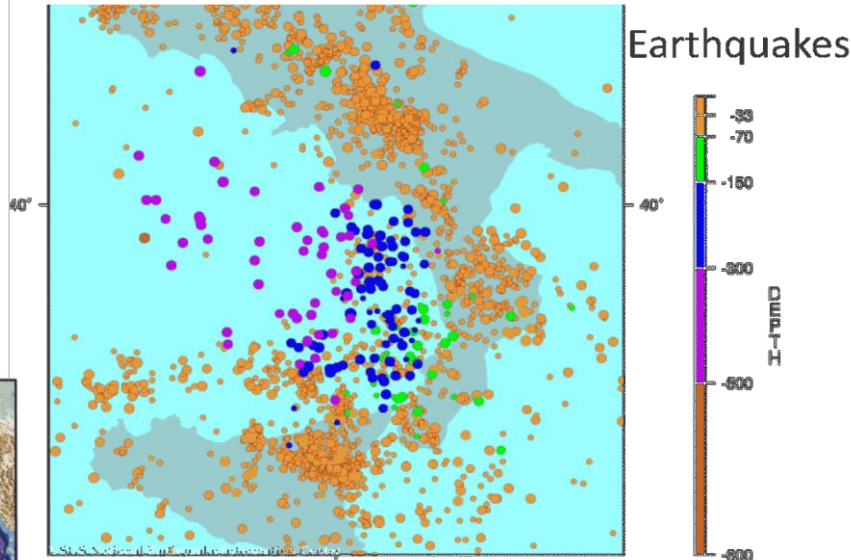
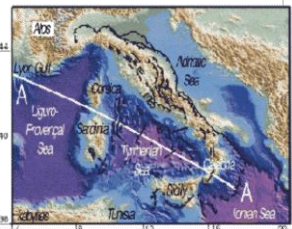
# - Inversion of the magnetic anomalies: linear method

**OBJECTIVE:** To identify the main lateral magnetization contacts and to relate them with the magmatic feeding system.

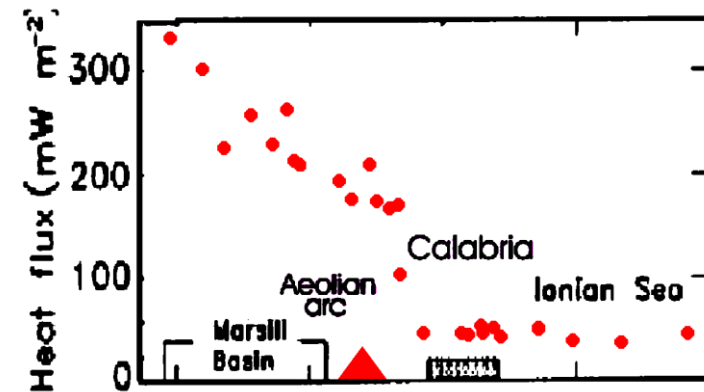




# SOUTHERN TYRRHENIAN SEA - GEODYNAMIC SETTING

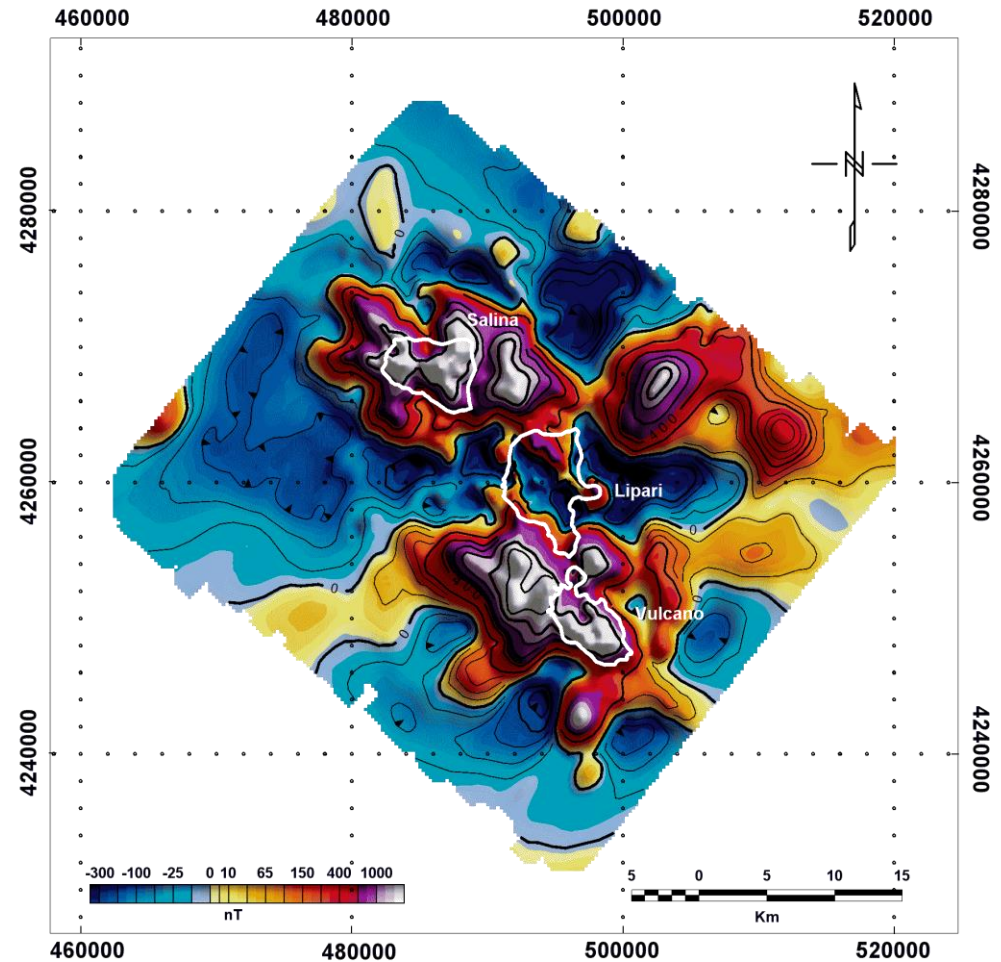
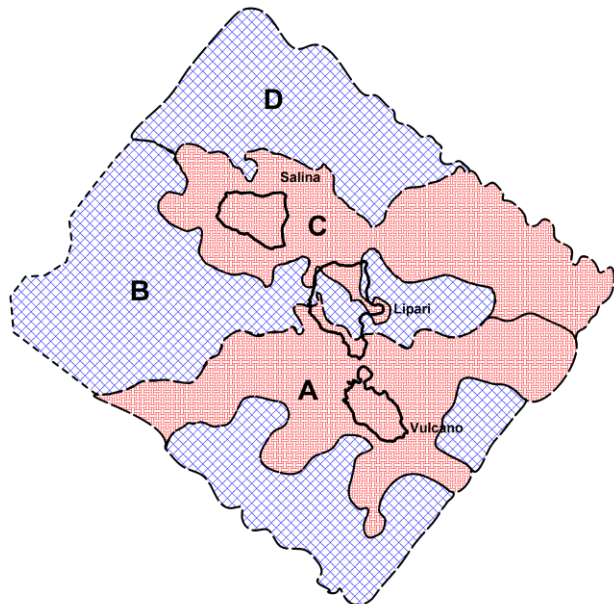


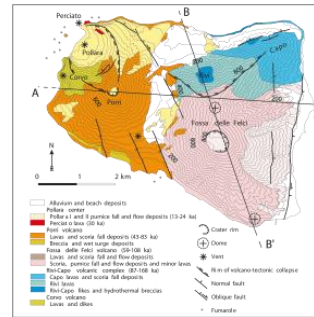
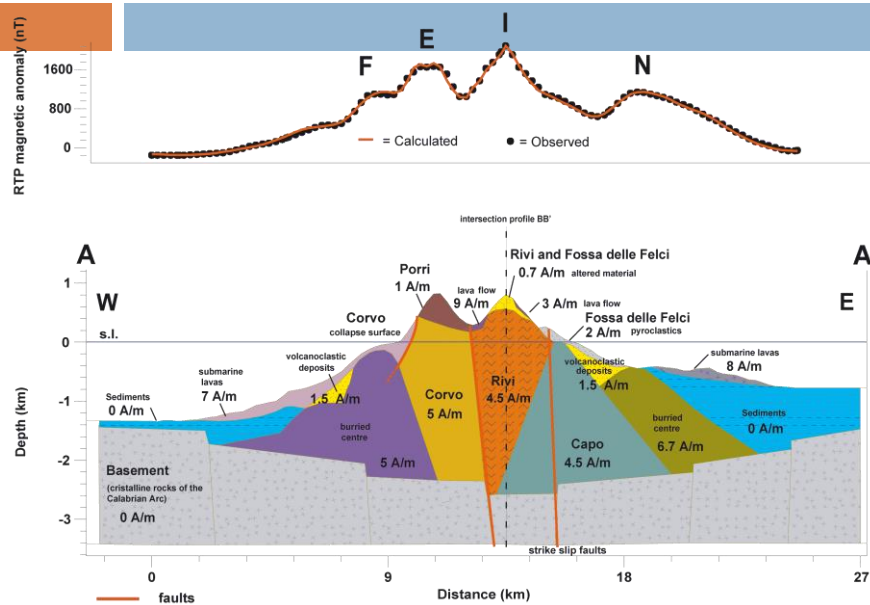
*Heat flow and earthquakes*



## OBSERVATION

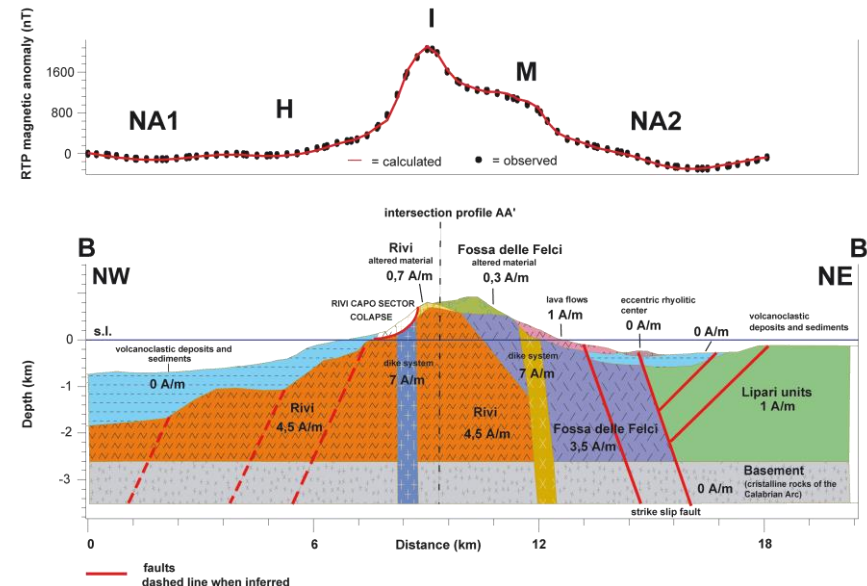
The magnetic anomaly field of the VLS ridge can be described by four main regions, East-West oriented and alternating negative and positive signature on the North-South direction. The focus of the research is to obtain the magnetic bottom using the spectral method



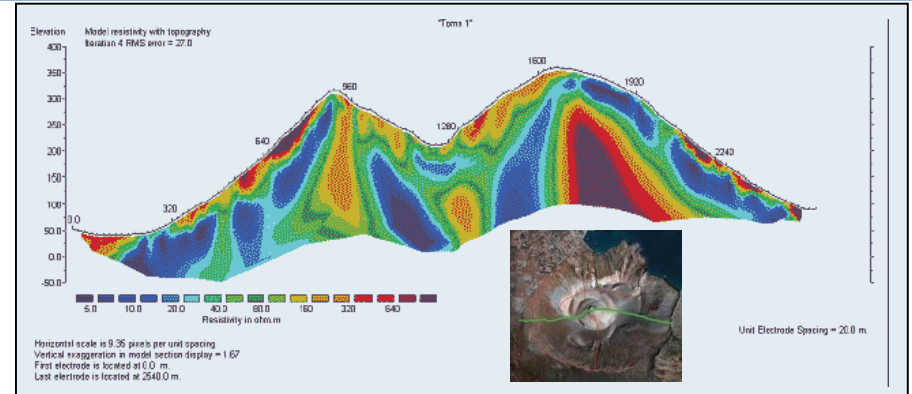
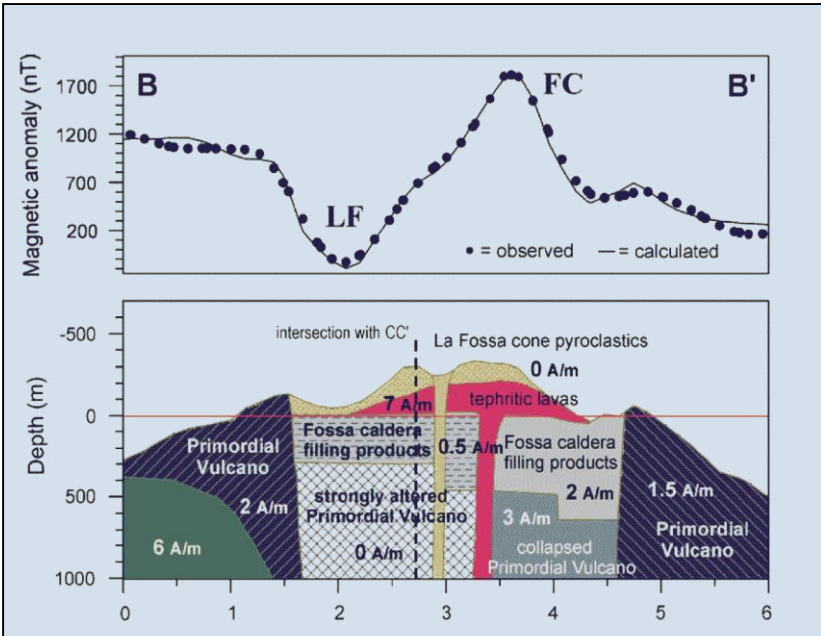


- time succession of overlapping and contiguous volcanic phases
- inner volcanic structure characterized by an omogeneity of the magnetization properties due to the mafic nature of the first eruptive phases
- not magnetic basement with a graben like structure in which the VLS volcanism emplaced
- the regional local magnetic bottom is represented by the boundary between the volcanic units and the Arco Calabro basement. Below this depth, magnetized material can be found cristallized along the conduits or as intrusion in the fault pattern

- highly magnetized volcanics end in eteropy or interdigitized with the sedimets with null or very low magnetization.
- the highly magnetized sources are mainly lava blankets and vertical structures with deep roots (eg. dykes, cristallized vertical conduits);
- outcropping and shallower structures have low magnetization. This can be reasonably explained by: i. acid chemism; ii. demagnetization processes as hydrothermal activity (eg. Rivi and Fossa delle Felci). The magnetic sygnal derives from the island inner structure and it is not due to its topographic effect.
- direct structural control on the emplacement of volcanic bodies, this is reflected by the shape and orientation of the magnetic anomalies
- negative long wavelenghts mangetic anomalies are expression of the not magnetic sedimentary basins

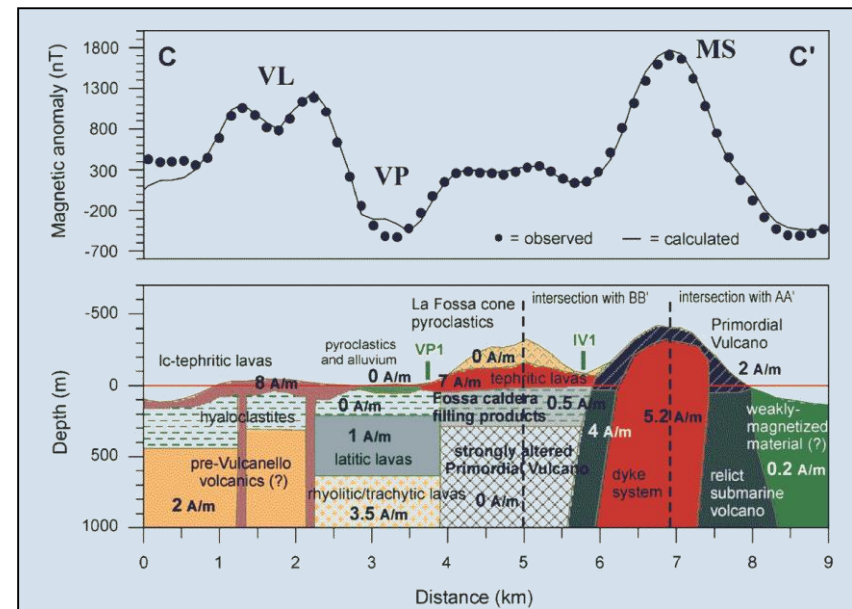


# CONVERGENCE BETWEEN MAGNETIC MODEL AND GEOELECTRICAL TOMOGRAPHY E-W PROFILE “LA FOSSA CONE”



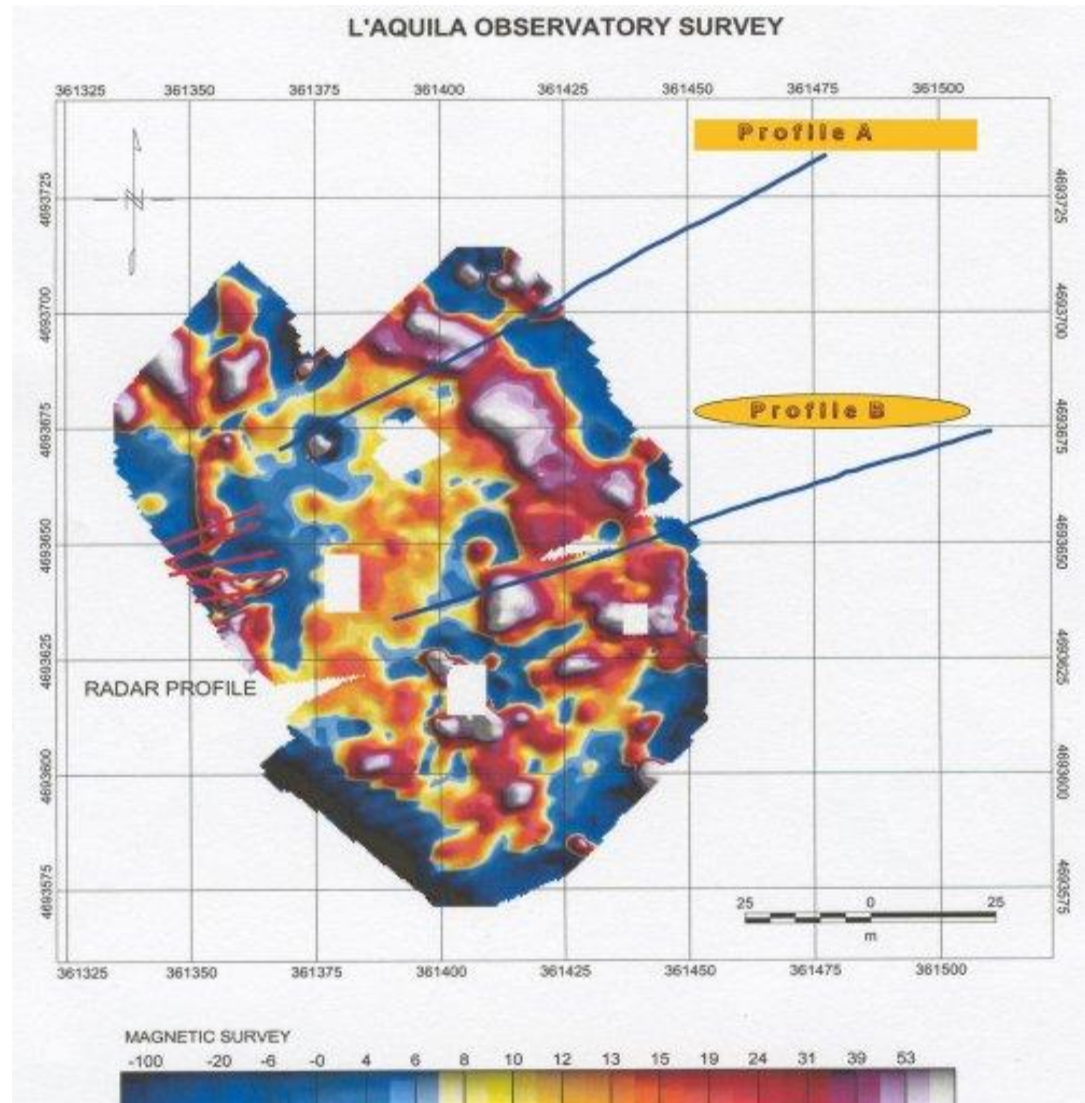
GNV –PROJECT Sub Project V3\_5 - VULCANO  
Istituto di Metodologie per l'Analisi Ambientale – CNR  
Tito Scalò (Pz)

- different magnetic pattern in the western and eastern sides
- pyroclastic and hyalocalstic units idrotermally altered with low to null magnetization (ANOMALY LF and VP);
- highly magnetized thickness of mafic lavas below the pyroclastic units of the La Fossa Cone (ANOMALY FC)
- the VL double peaks are well matched by the field of a highly magnetic lava blanket with two deep conduits, expression of mafic phase

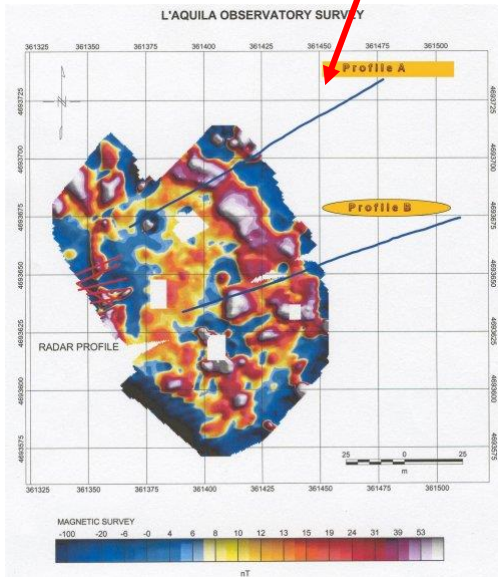


# Further geophysical investigations

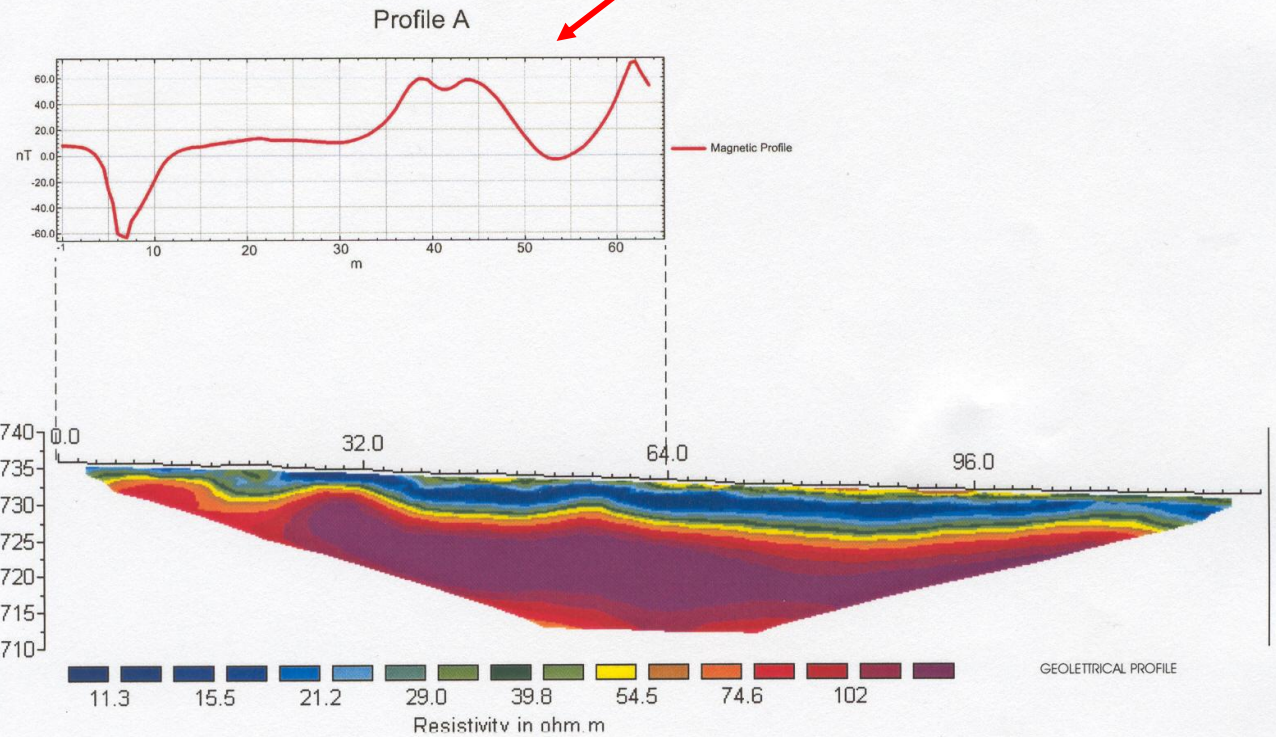
- ❖ Electrical resistivity (conductivity) measurements
- ❖ Ground penetrating radar



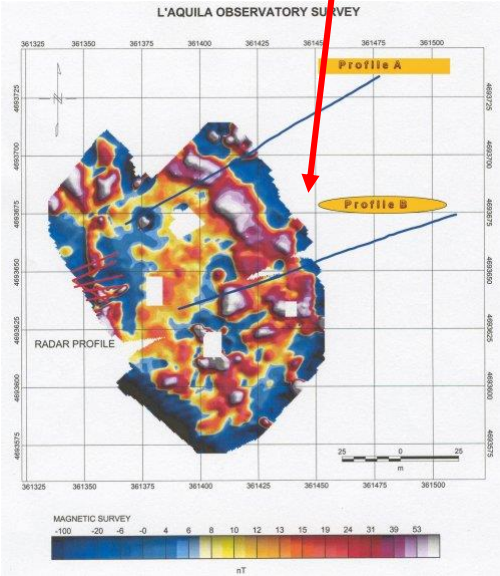
# Geoelectrical measurements along profile A



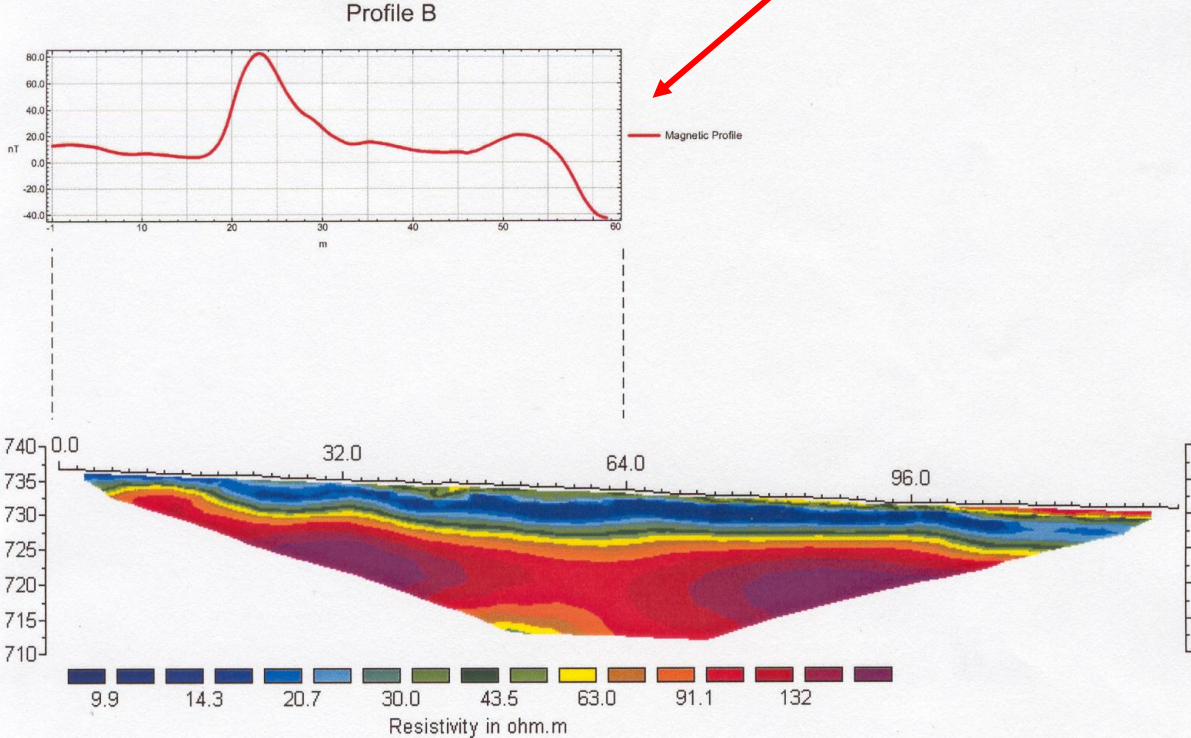
# Magnetic profile



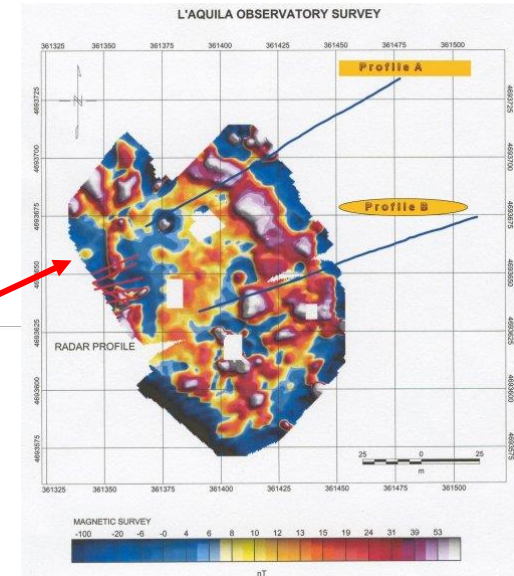
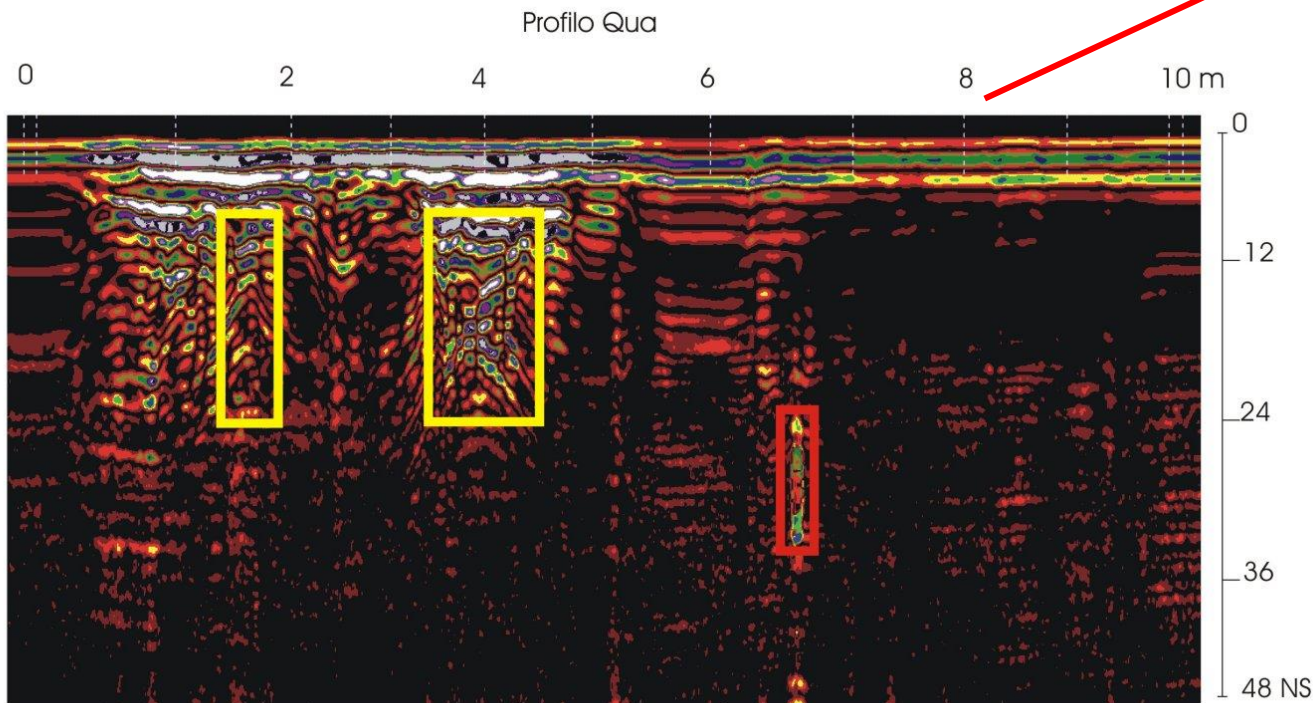
# Geoelectrical measurements along profile B



Magnetic profile



# Ground penetrating radar profiles





# Gravity surveys



Scientists measure the gravitational acceleration,  $g$ , using gravity meters. The measurements are not affected by metallic bodies nearby as magnetic measurements.

# Synergy among techniques: deliverables

Ground-based , airborne, and satellite (InSAR) techniques act in an integrated manner to image and characterize areas in a very efficient manner from the surface with depth resolution.

Output from module #1 will be input to module #2, contributing to define several parameters (e.g. construction, insurance, etc.)

