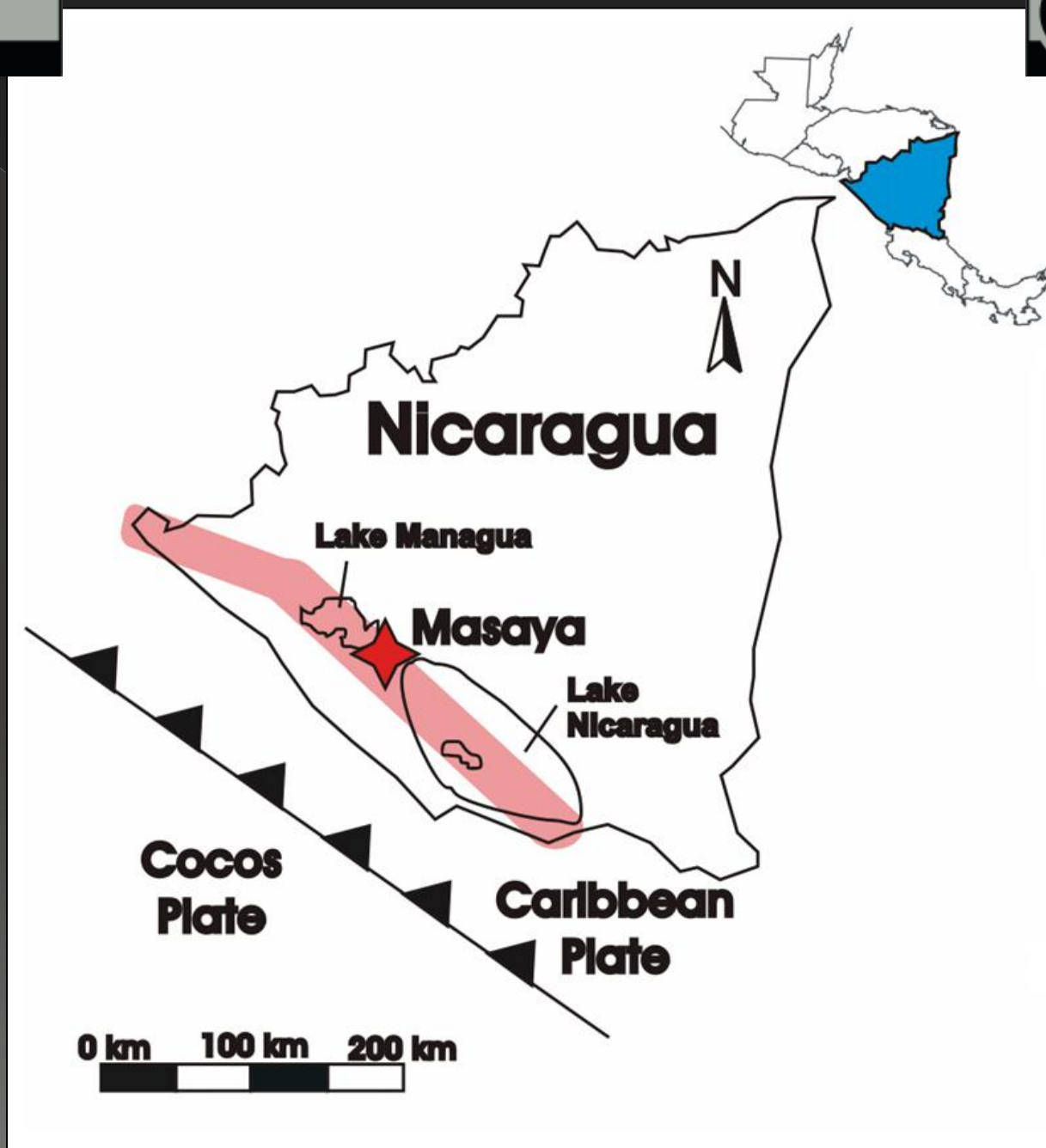
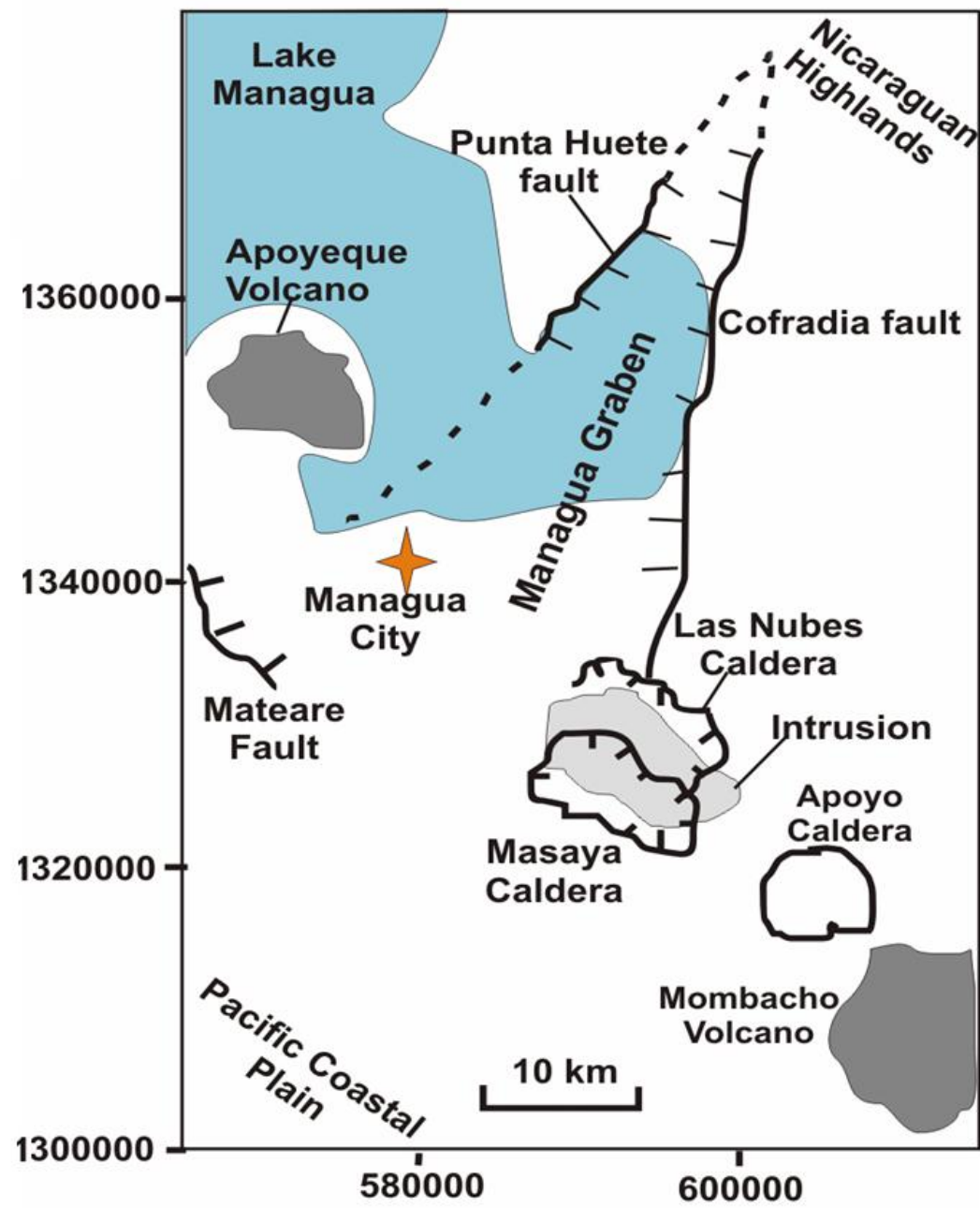


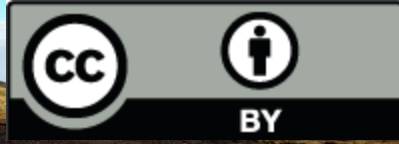
Structural and geophysical study of Masaya Caldera

Guillermo Caravantes González, Jeffrey Zurek, Hazel Rymer, Corinne Locke, John Cassidy, Glyn Williams-Jones
g.caravantes-gonzalez@open.ac.uk









Activity





Activity



Masaya, Nicaragua

Space Shuttle Image (61C-36-10)

Objective

- Understand the structure of Masaya Volcano (Caldera) and its implications for past, present, and future activity.

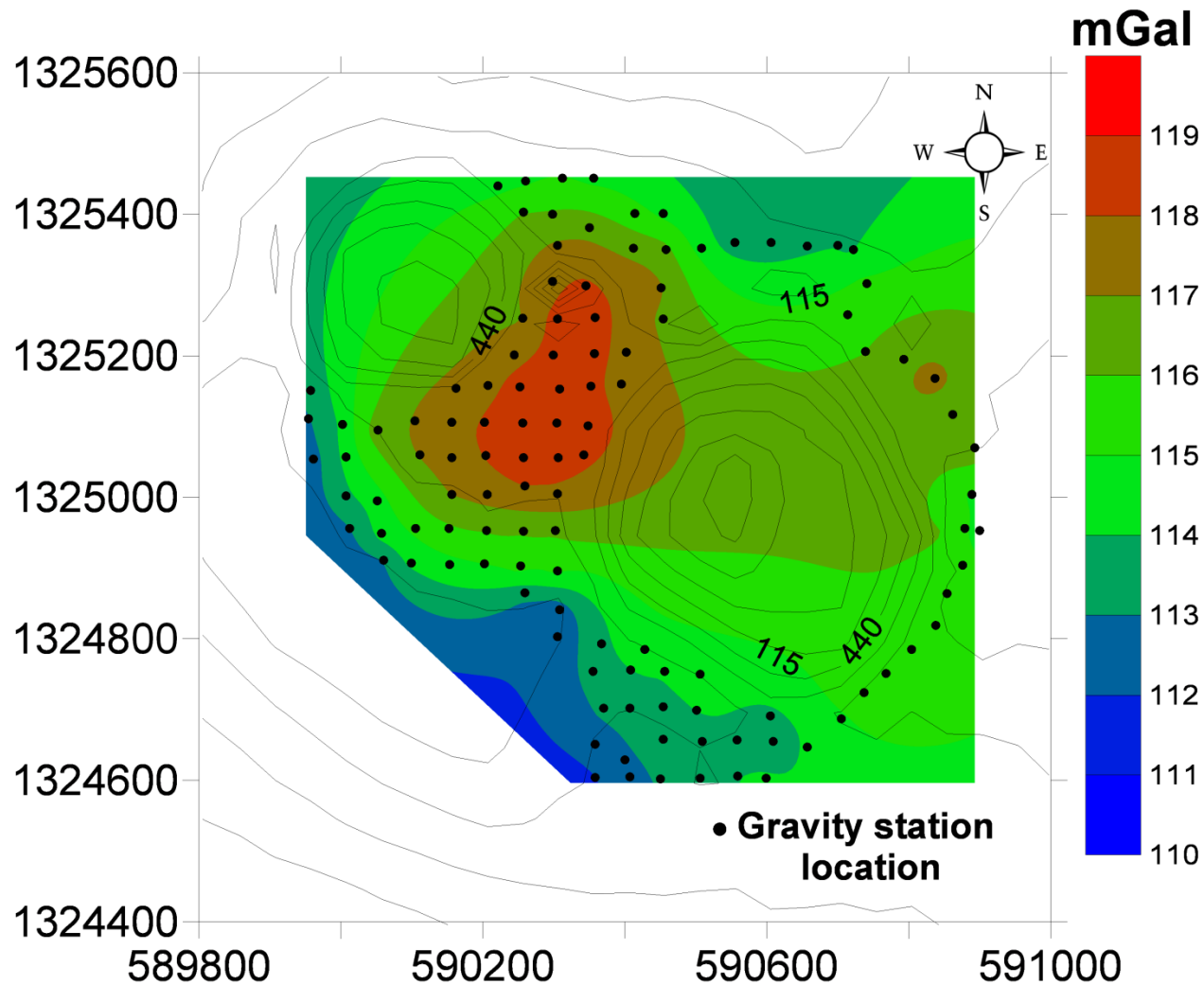
Methods

Topic	Method
1. Summit area	Bouguer gravity, magnetics, VLF
2. Caldera	Bouguer gravity, magnetics, structural surveys
Structural model of the volcano	All

Summit area

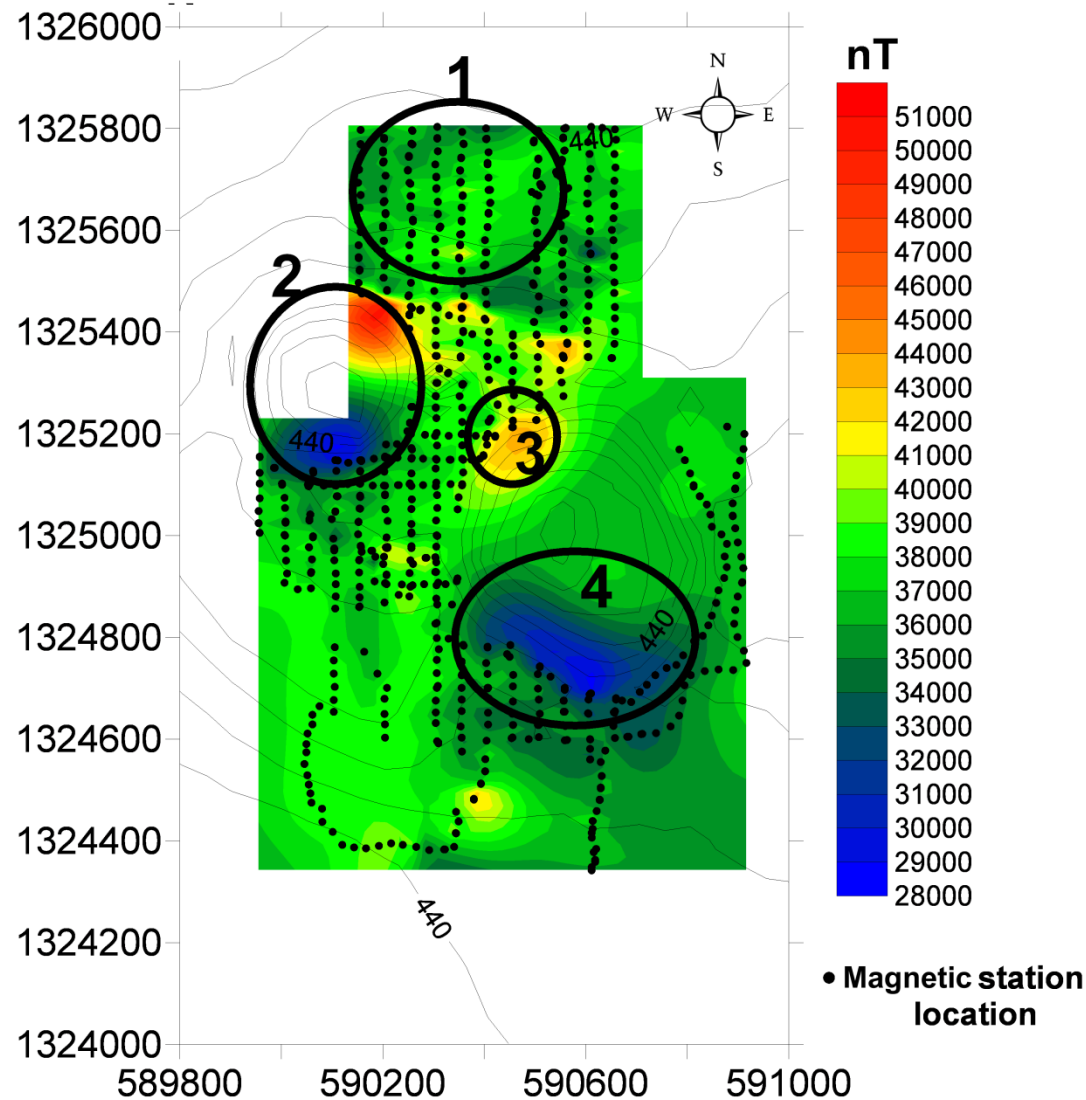


Summit area



*Gravity
(Bouguer
anomaly
map)*

Summit area



Magnetics (total magnetic field)

Summit area



ELSEVIER

Available online at w

SCIENCE

Journal of Applied Geoph

State of the hydrothermal ac volcano infer

J. Zlotnicki^{a,*}, G. Vargemezis^b,

^aUMR6524-OPGC-CNRS-UBP, 5 rue

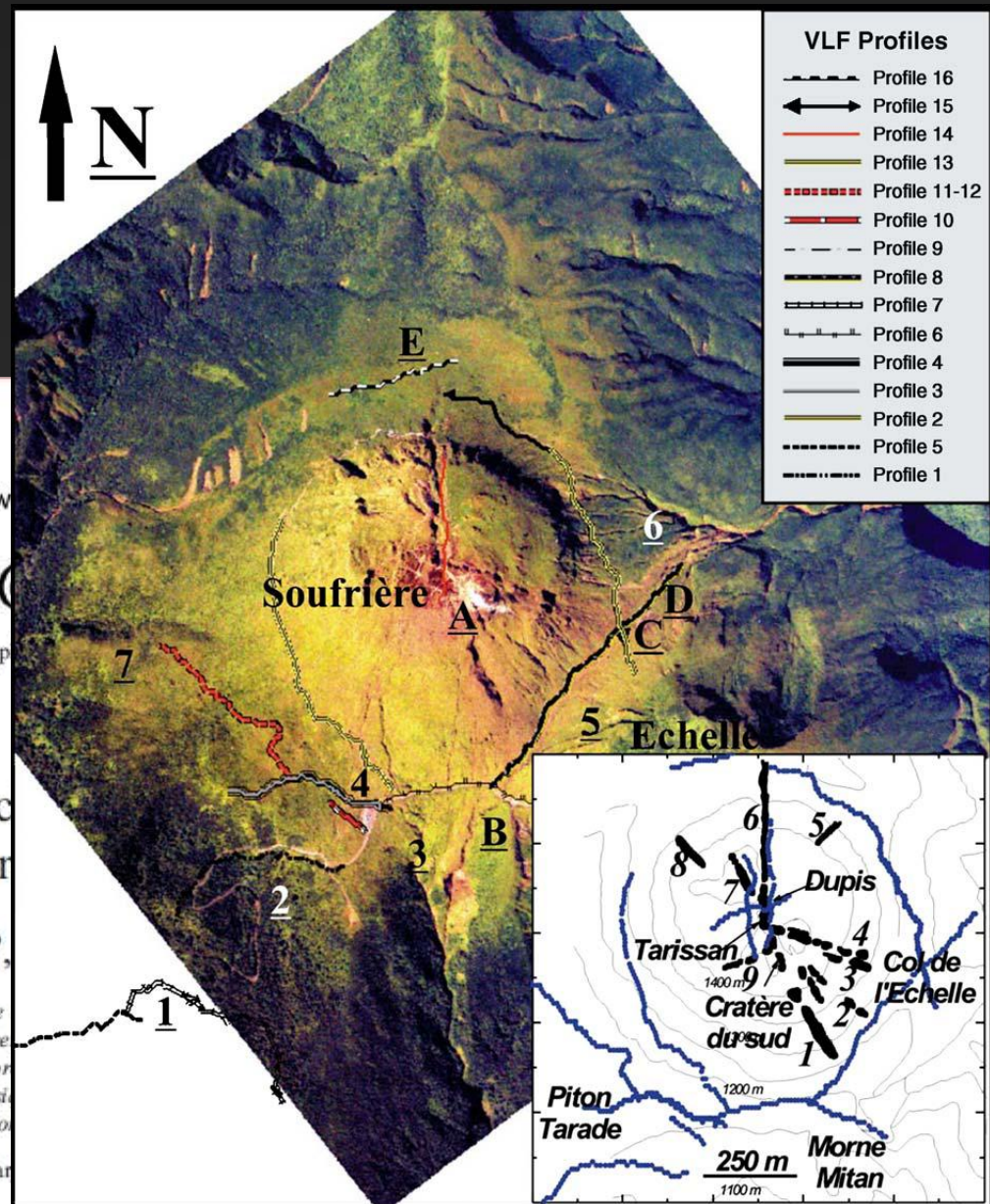
^bGeophysical Laboratory of Aristotle's Unive

^cMinistère de l'Agriculture et de la For

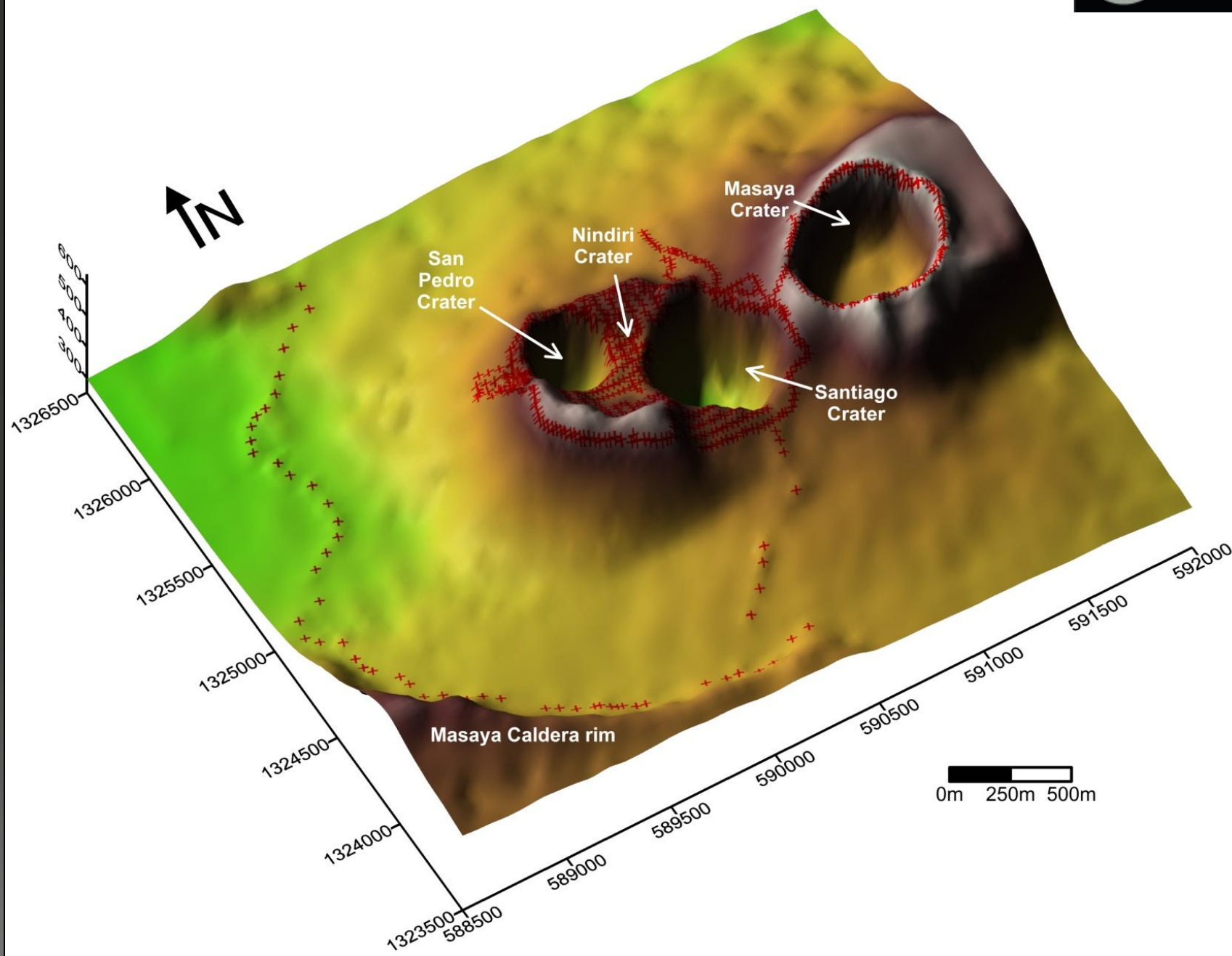
^dCompagnie Générale de géophys

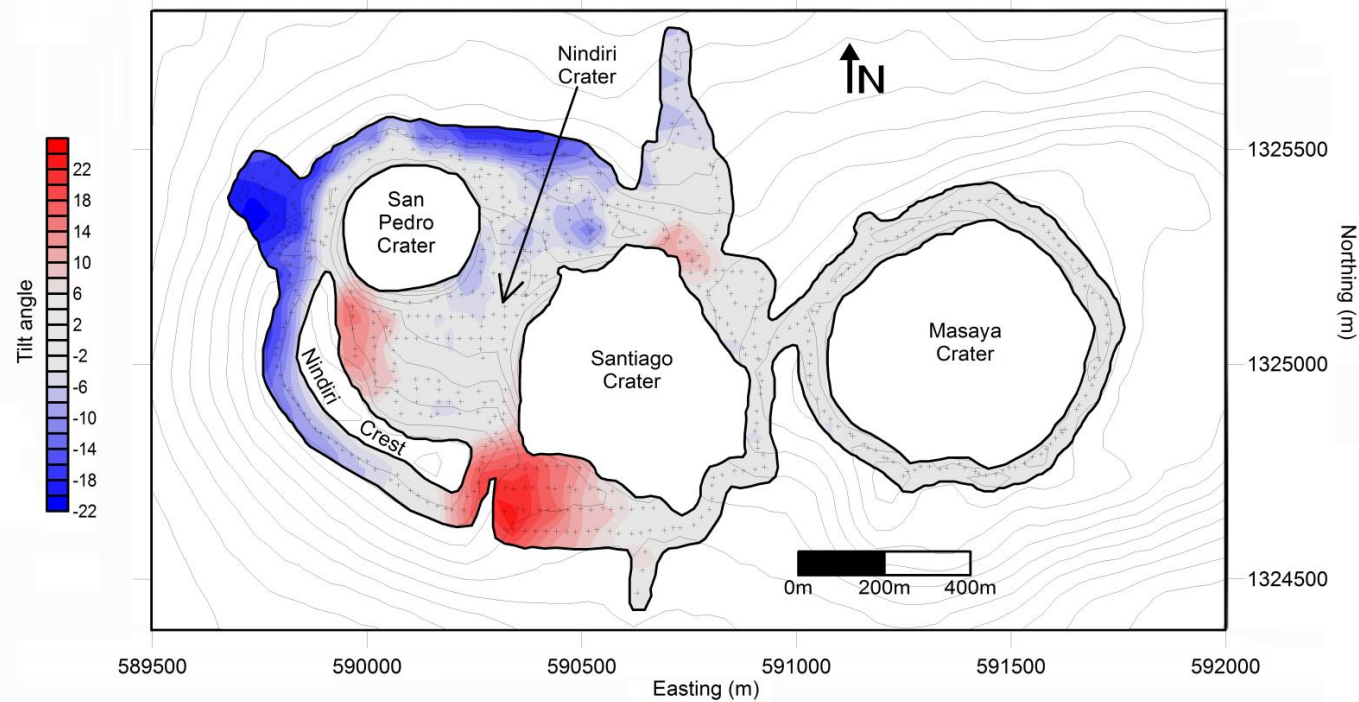
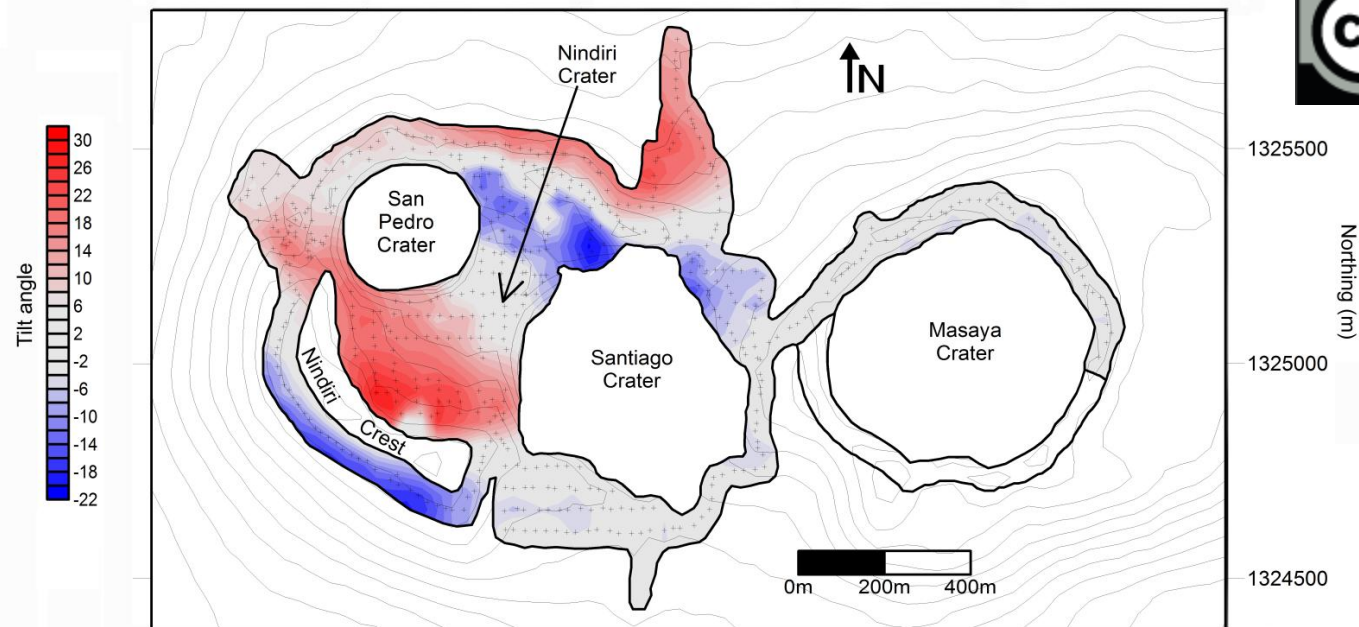
^eIPGP, Observatoire du Huëlmo

Received 28 Januar



VLF





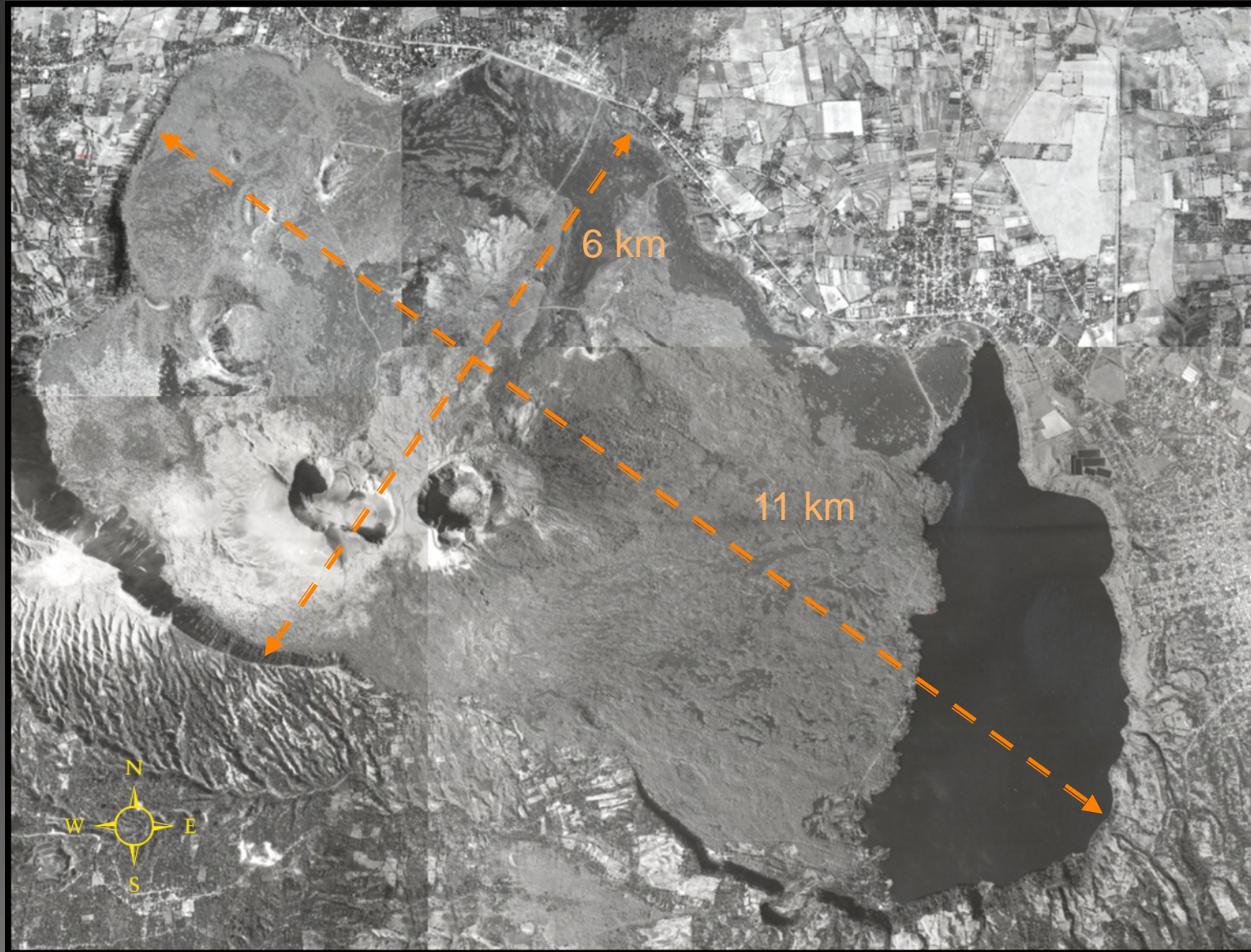


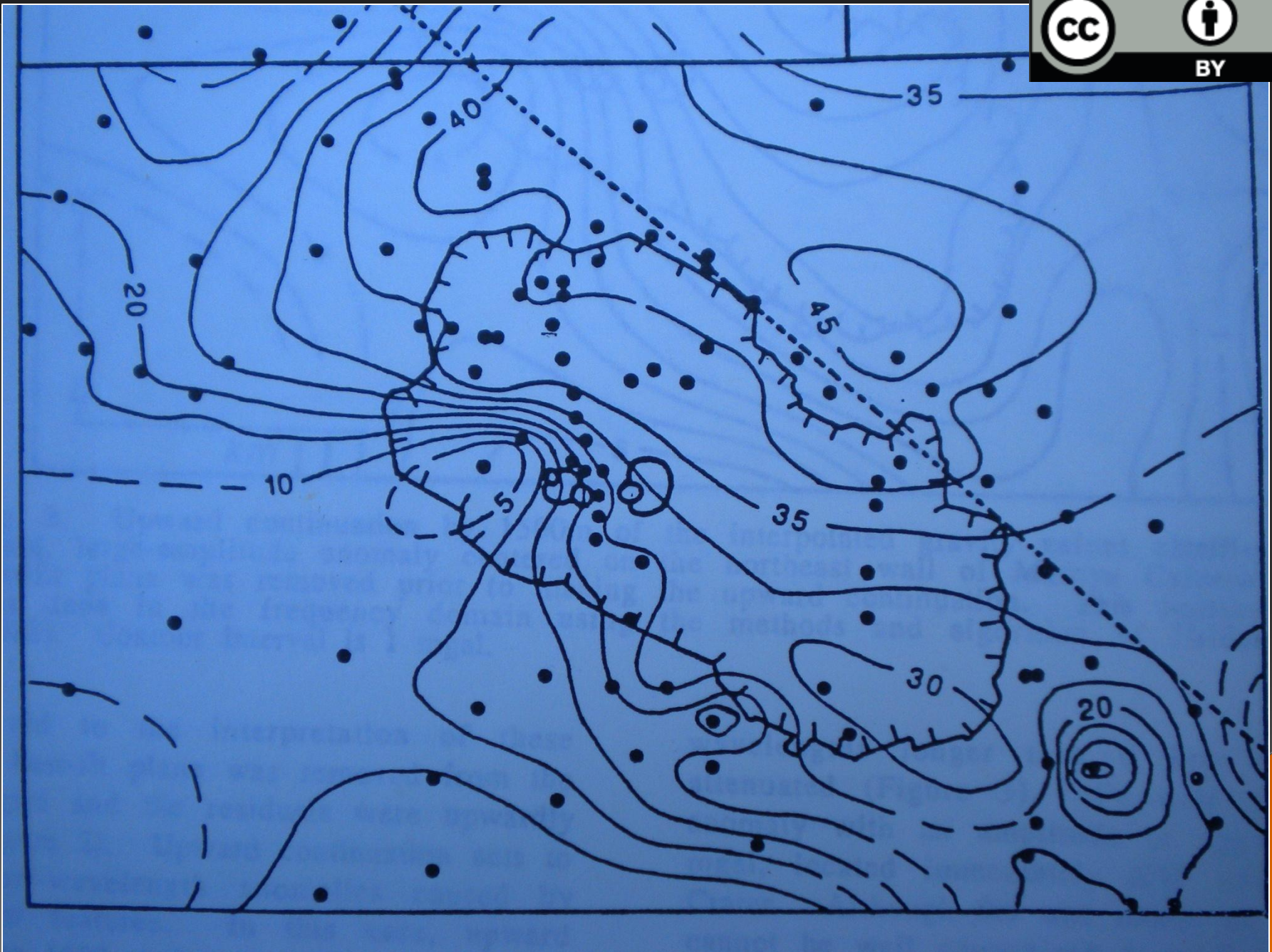


Conclusions (for the summit area)

- A gravity survey shows a high relative gravity area centered in Nindiri plateau, to the NW of the present center of activity, possibly related to a thinner layer of vesiculated magma
- VLF studies suggest the presence of several hydrothermally active areas, key to understand the structural framework of the summit area. The method allows to constrain structure geometries

Masaya Caldera

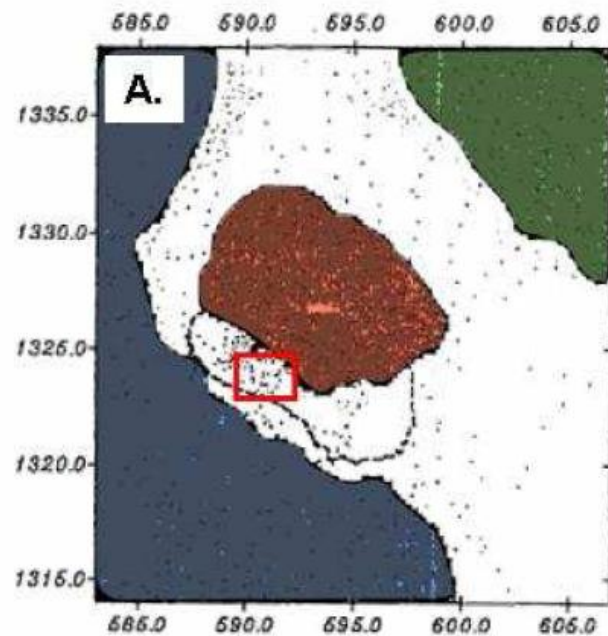




Gravity (Bouguer anomaly map)

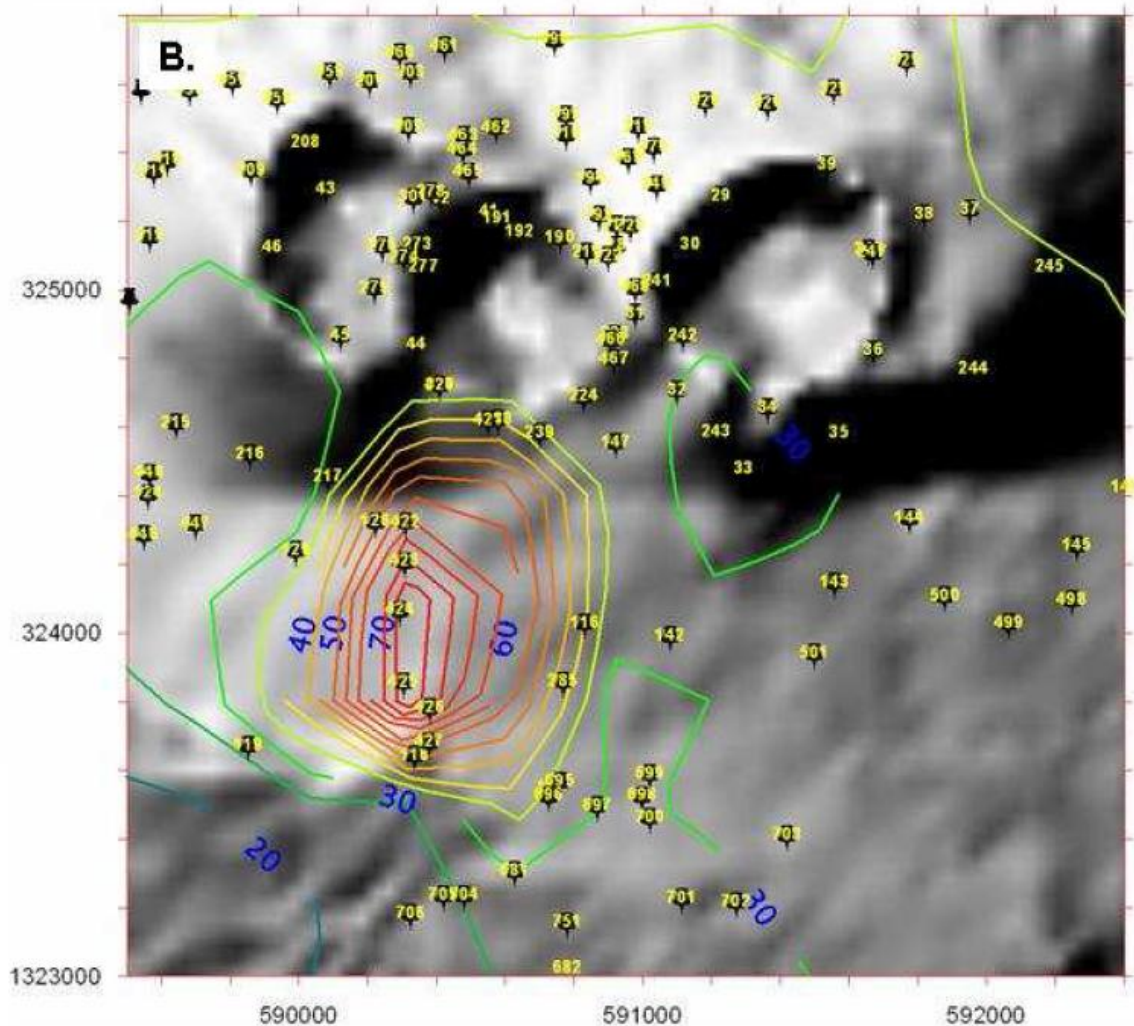
Connor, C. B. and Williams, S.N., 1990

Masaya Caldera



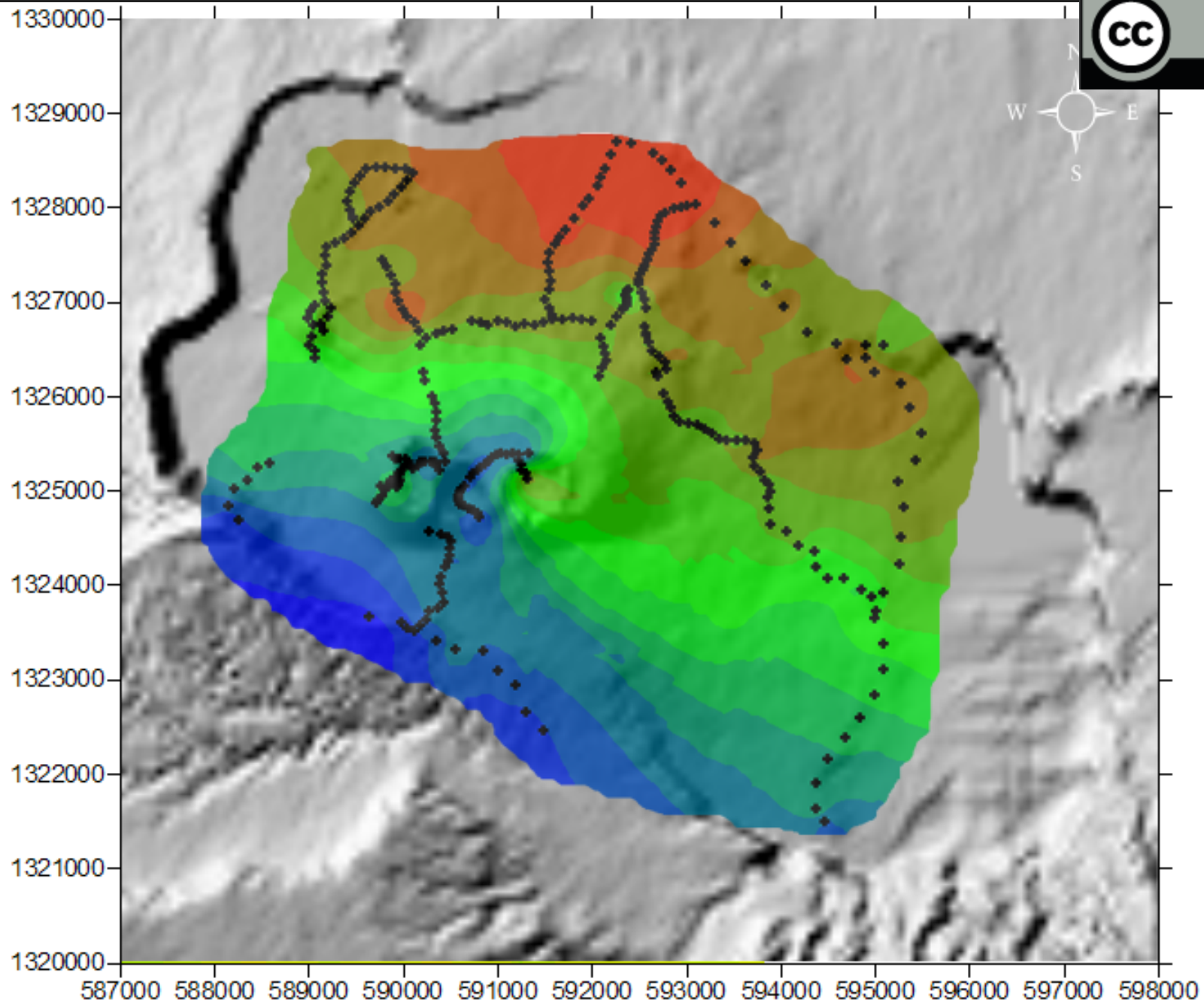
Bouguer Anomalies (Métaxian, 1994)

- Masaya caldera Anomaly (Above 42 mGal)
- NE positive Anomaly (Above 42 mGal)
- SW negative Anomaly (Below 24 mGal)
- Caldera walls



Gravity (Bouguer anomaly map)

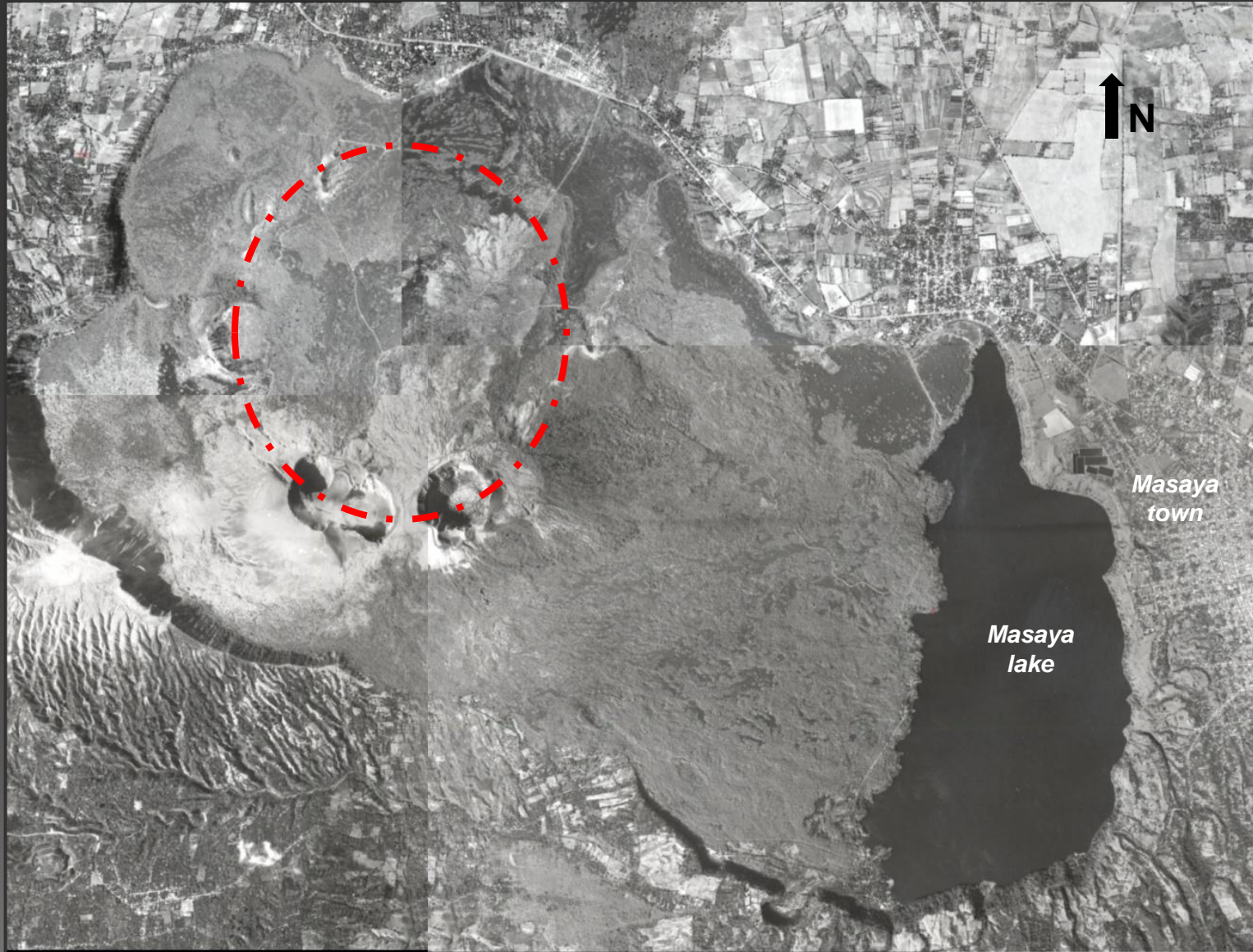
Metaxian, 1994
Pascal, 2008



Gravity (Bouguer anomaly map)

Conclusions

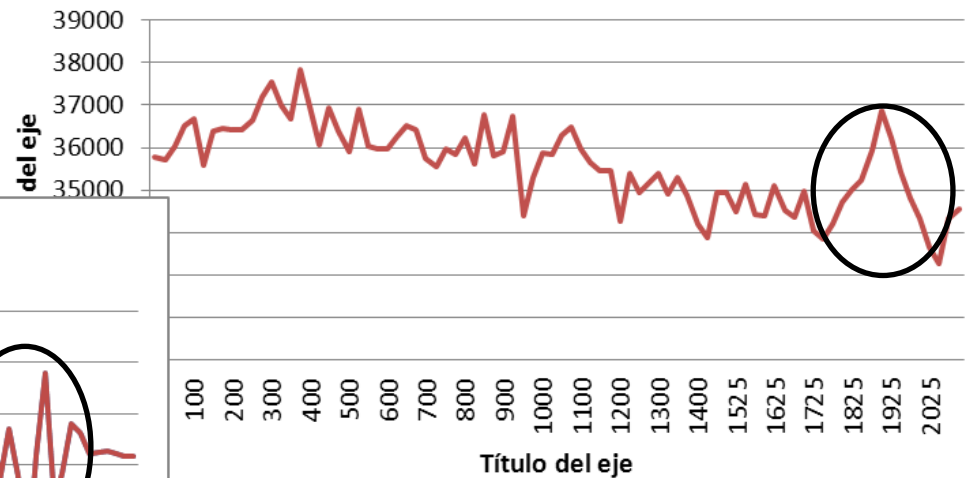
Hypothesis: ring fault?



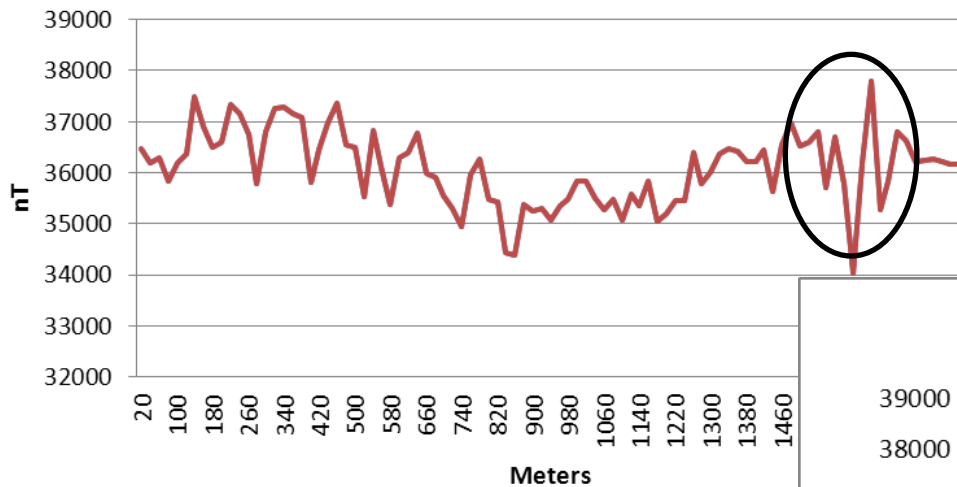
Masaya Caldera



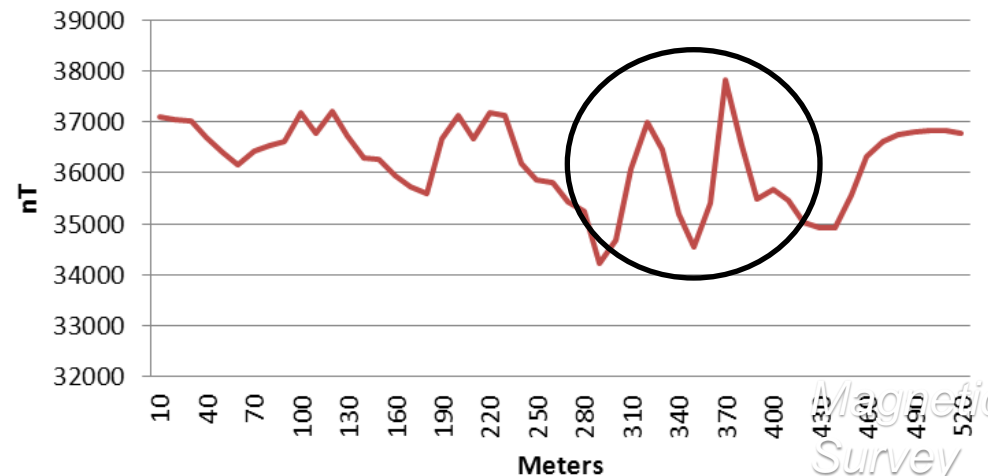
Caldera Wall-Sastepe



Las Pencas



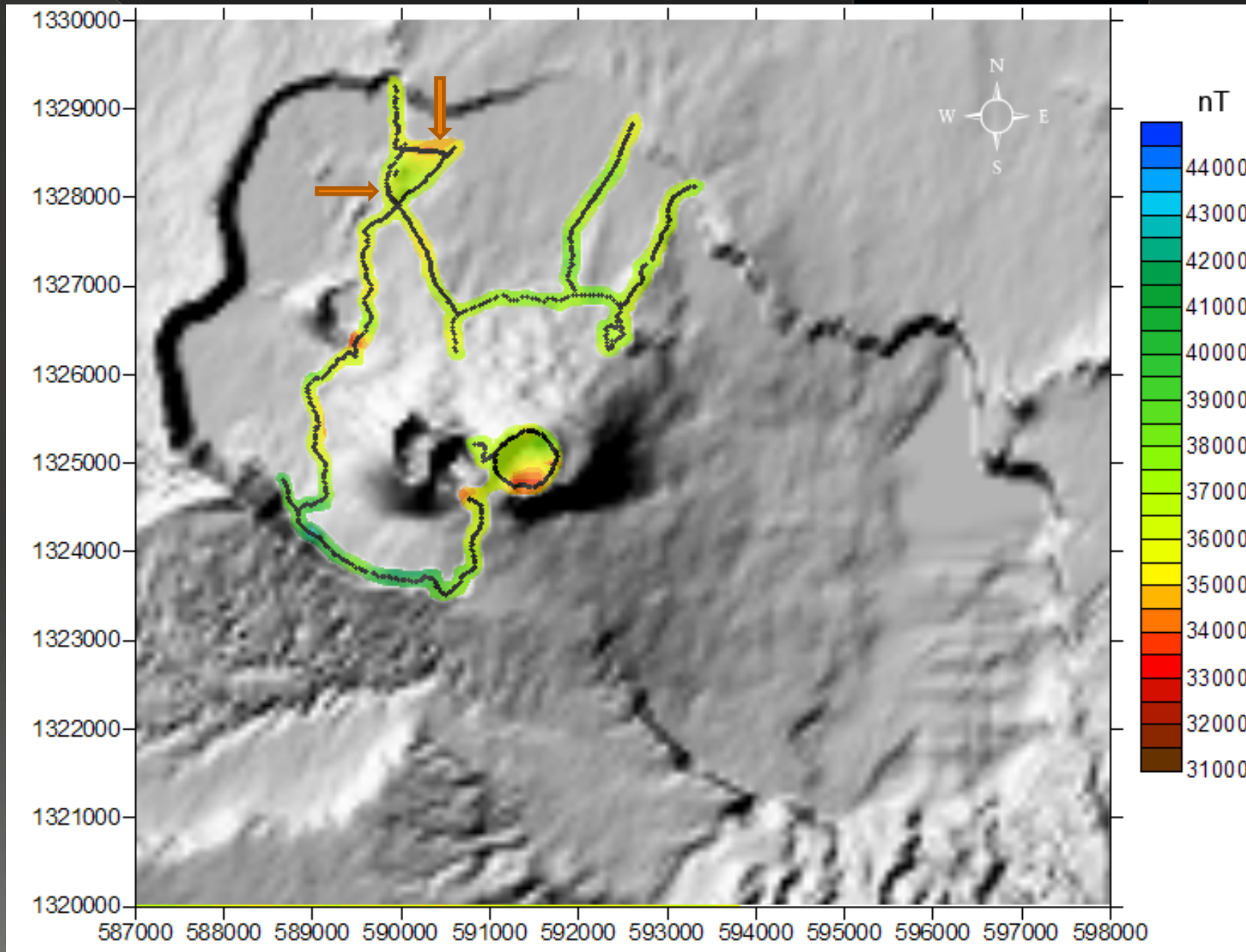
Las Pencas (10m spacing)



Masaya Caldera



Magnetics

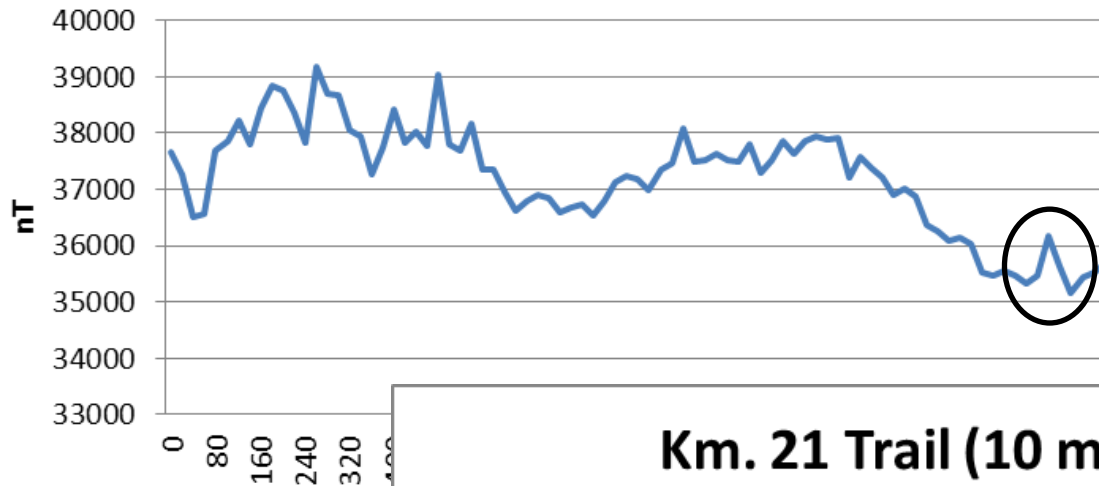


*Magnetic
Survey*

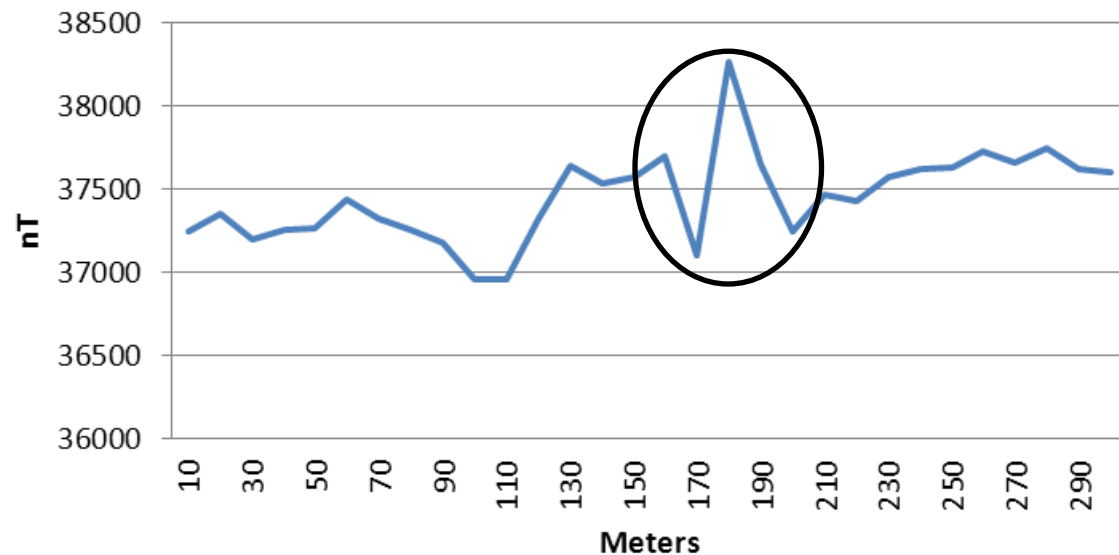
Masaya Caldera

Magnetics

Km. 21 Trail (25 m spacing)



Km. 21 Trail (10 m spacing)

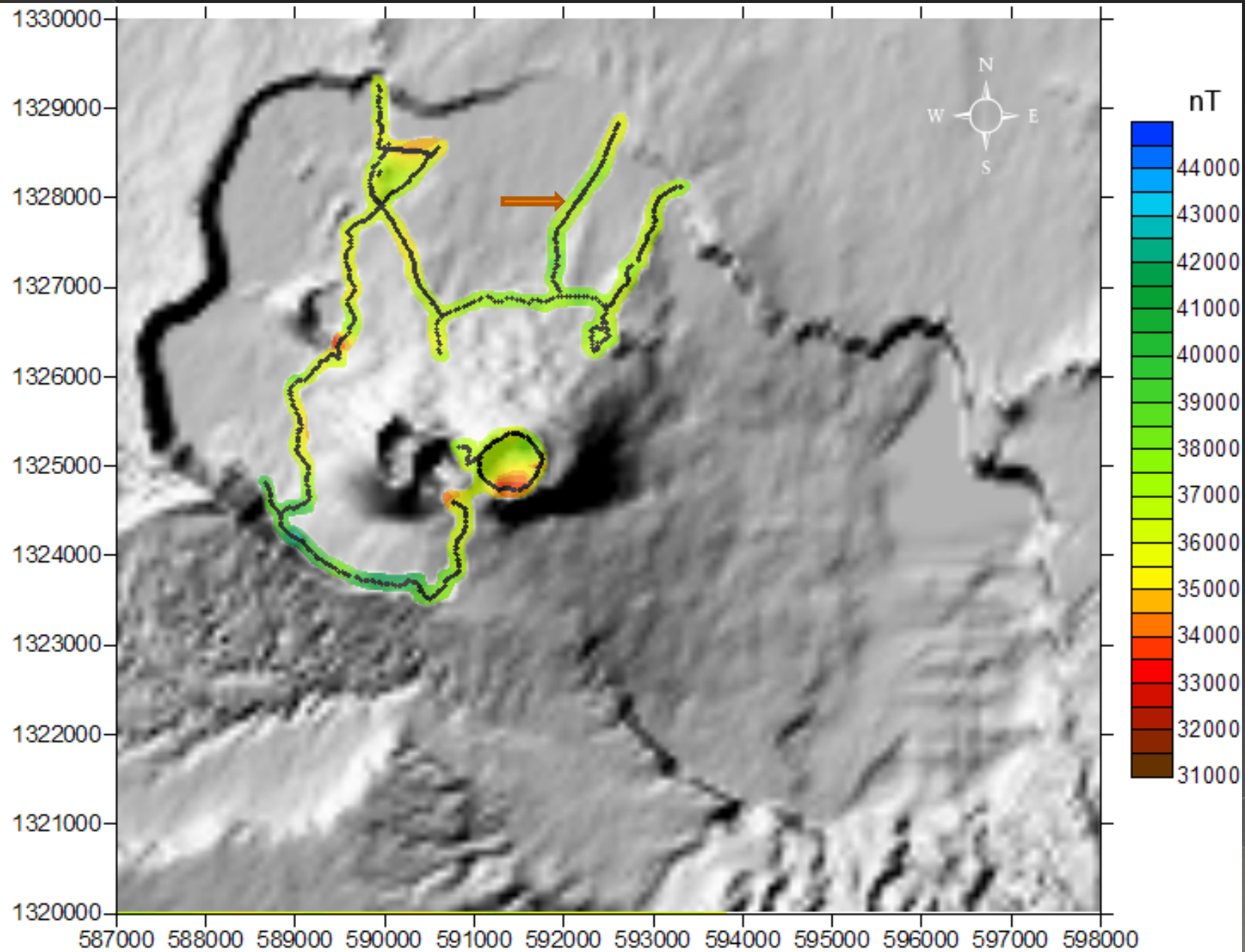


Magnetic
Survey

Masaya Caldera



Magnetics

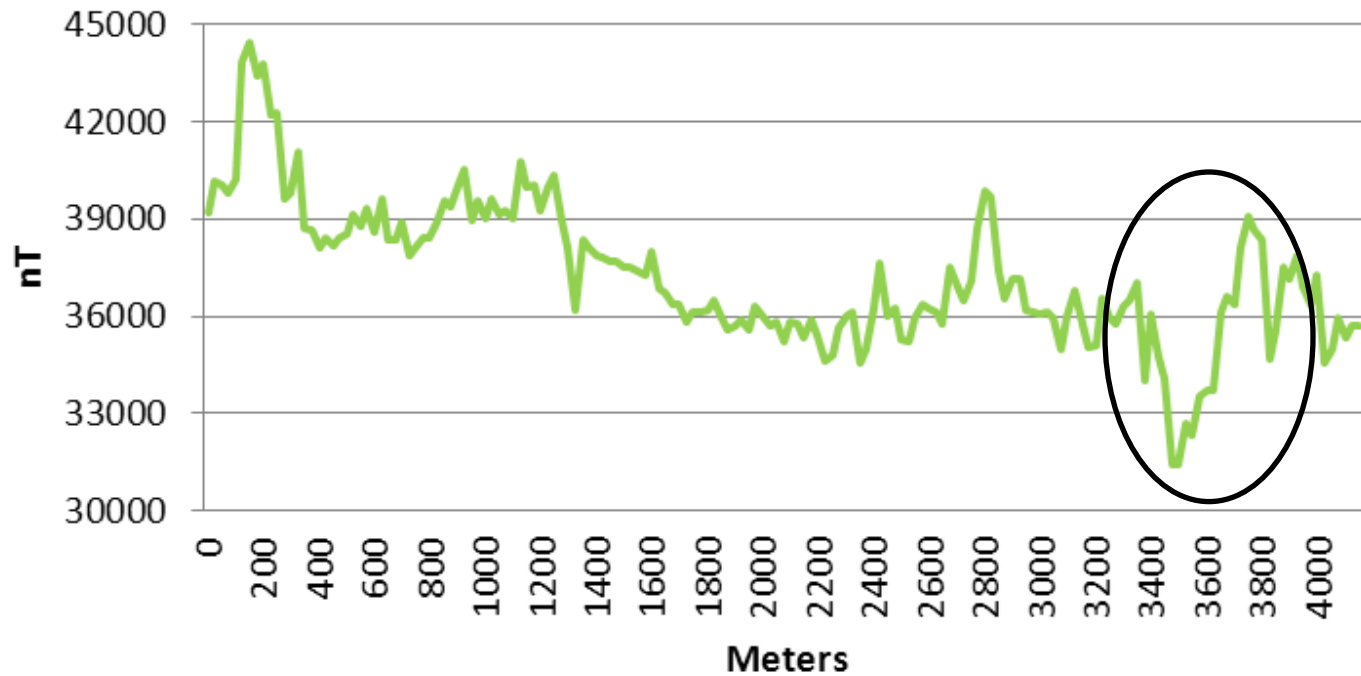


*Magnetic
Survey*

Masaya Caldera

Magnetics

Upper Chocoyos

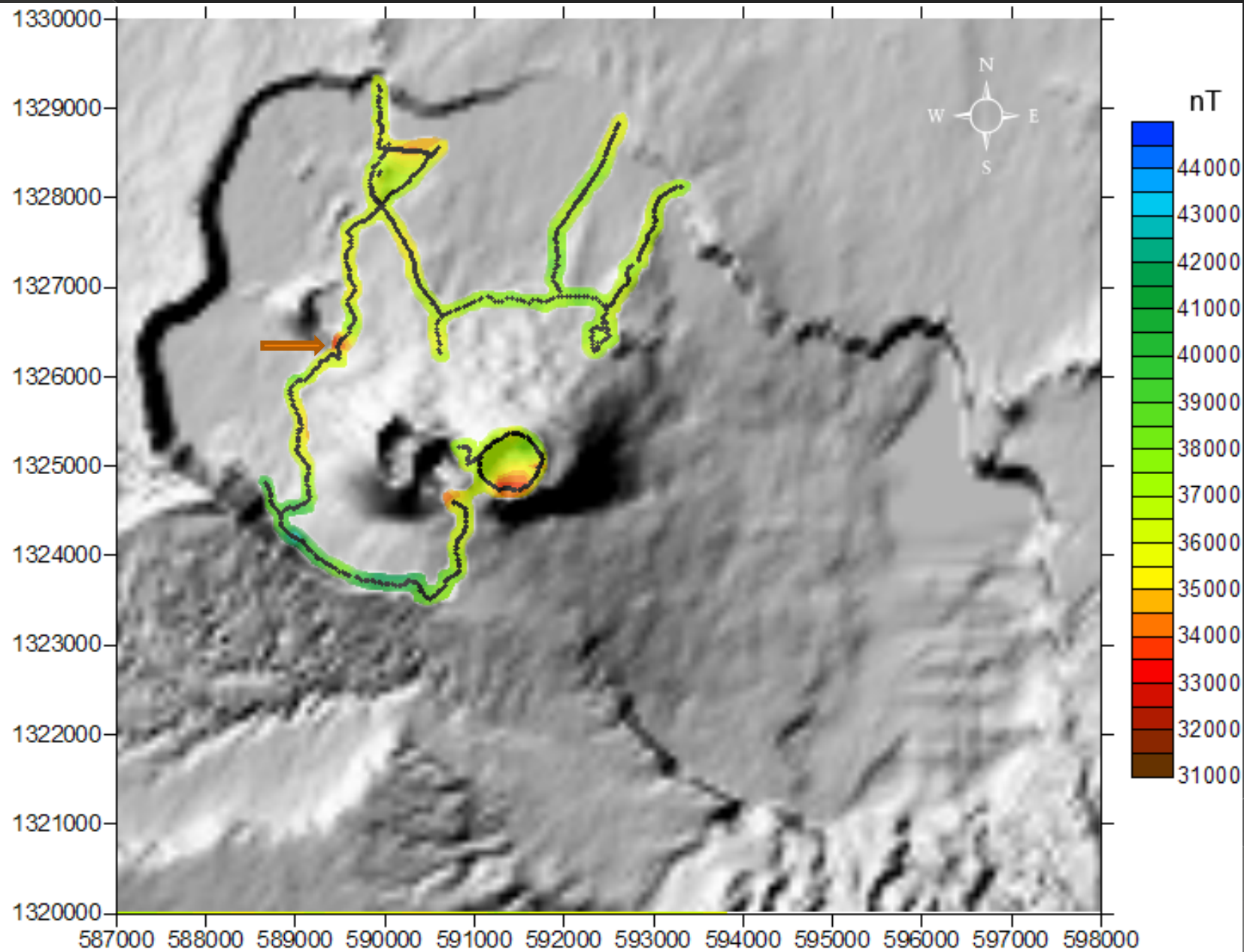


*Magnetic
Survey*

Masaya Caldera



Magnetics



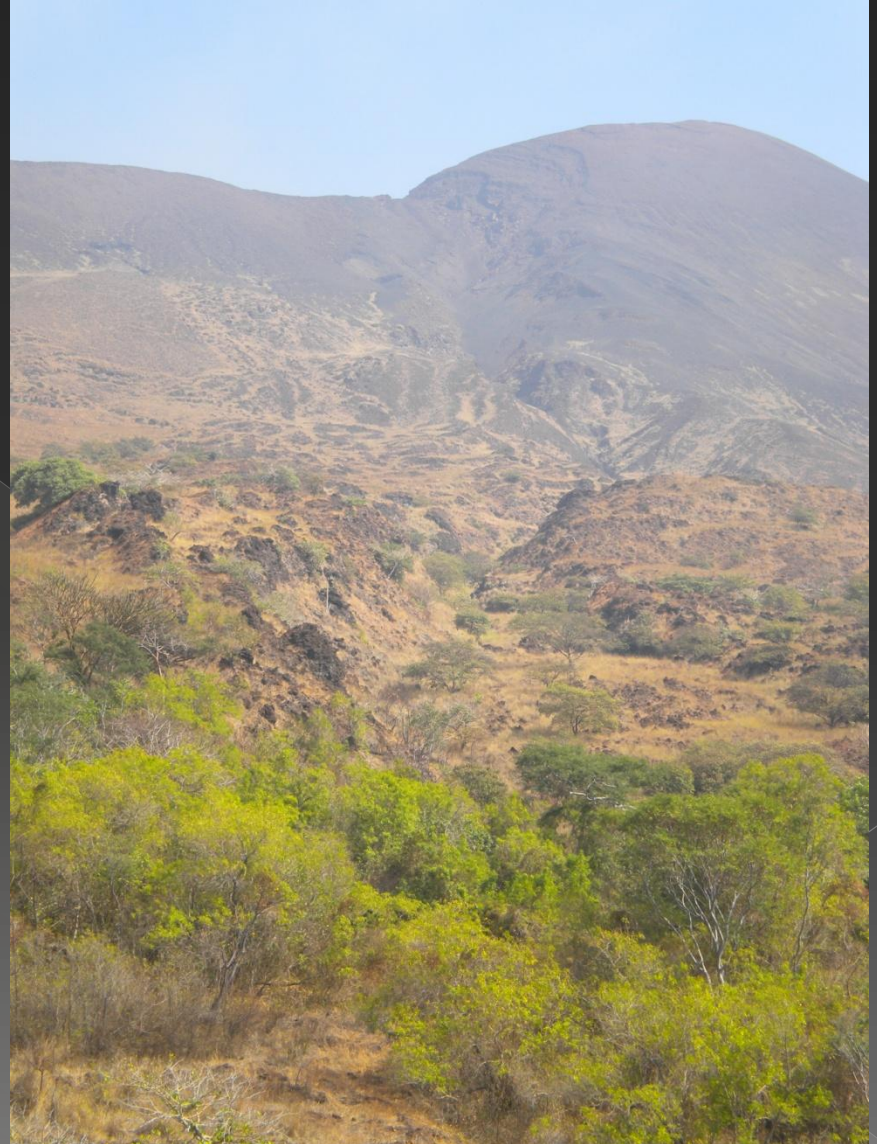
*Magnetic
Survey*

Masaya Caldera

- ◉ Features suggesting deep faulting
 - > 1) Rift valleys with lava outflow
 - > 2) Active (or very recent) faulting and opening of fissures
 - > 3) Spatter cones and ramparts
 - > 4) Bigger volcanic centers
 - > 5) Fumarolic activity, native sulphur deposition

Masaya Caldera

Structural Survey (rift valleys)



Masaya Caldera

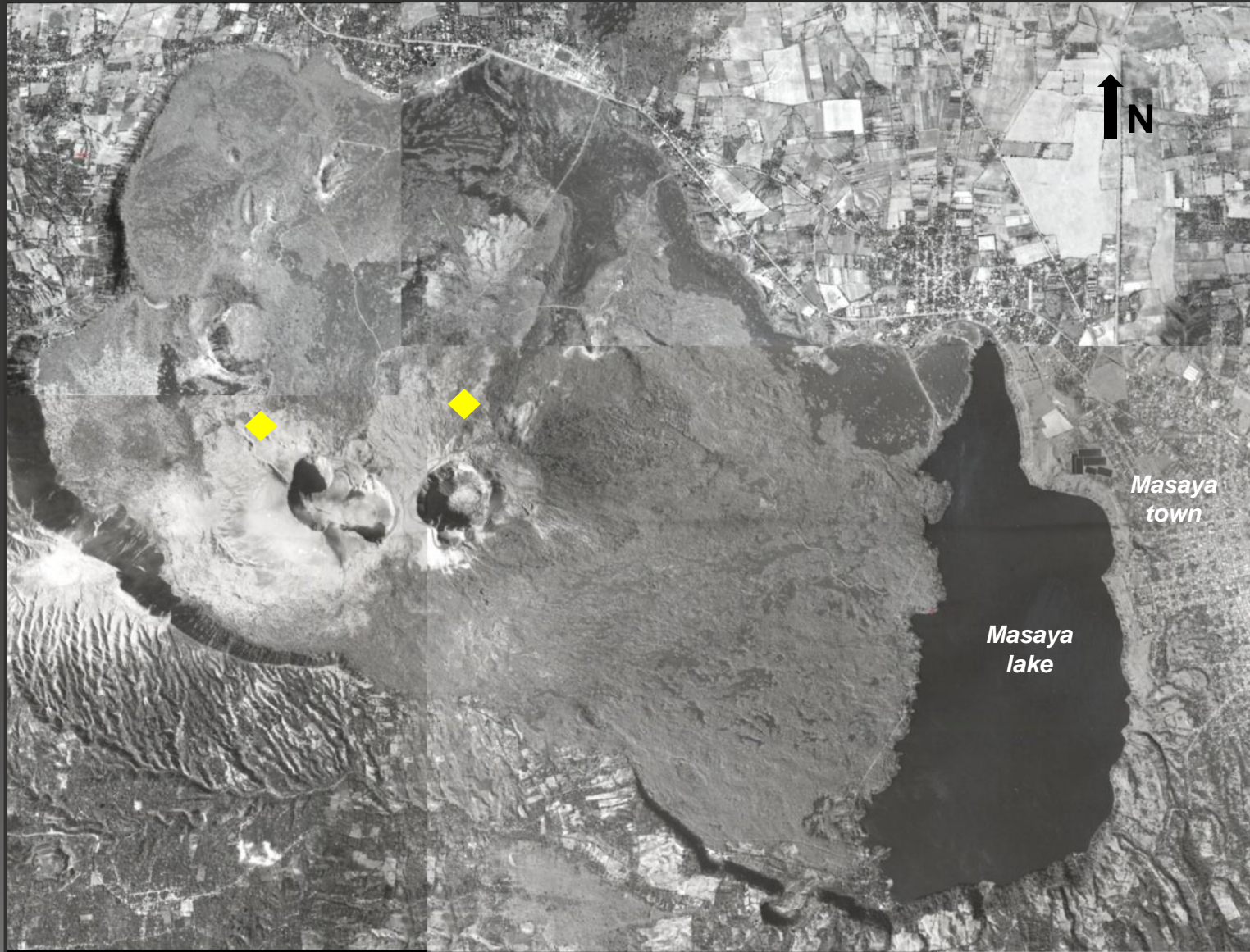
Structural Survey (rift valleys)



Source
of 1772
eruption

Masaya Caldera

Structural Survey (rift valleys)



Source
of 1772
eruption

Masaya Caldera

Structural Survey (active faulting)



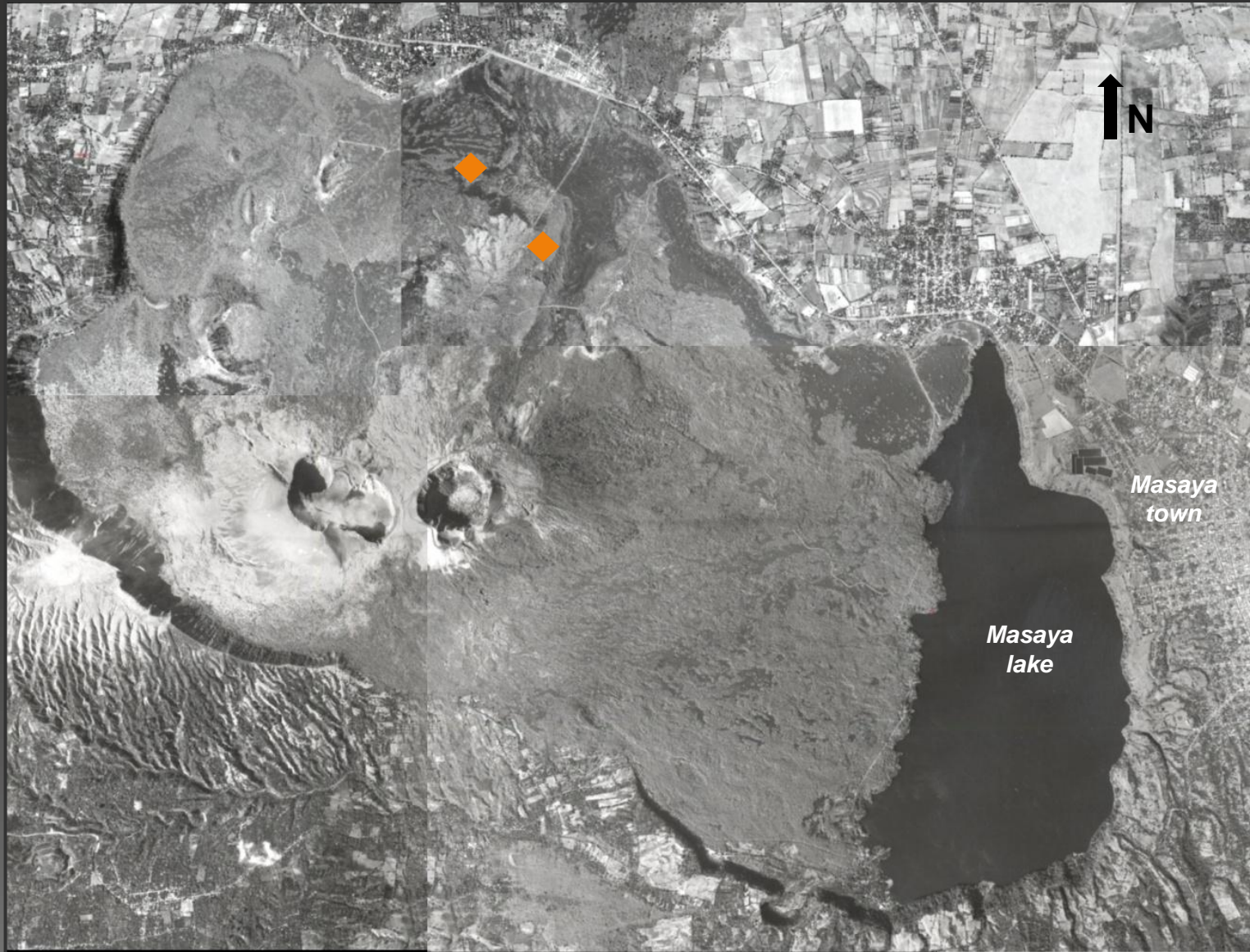
Masaya Caldera

Structural Survey (active faulting)



Masaya Caldera

Structural Survey (active faulting)



Masaya Caldera

Structural Survey (spatter centers)



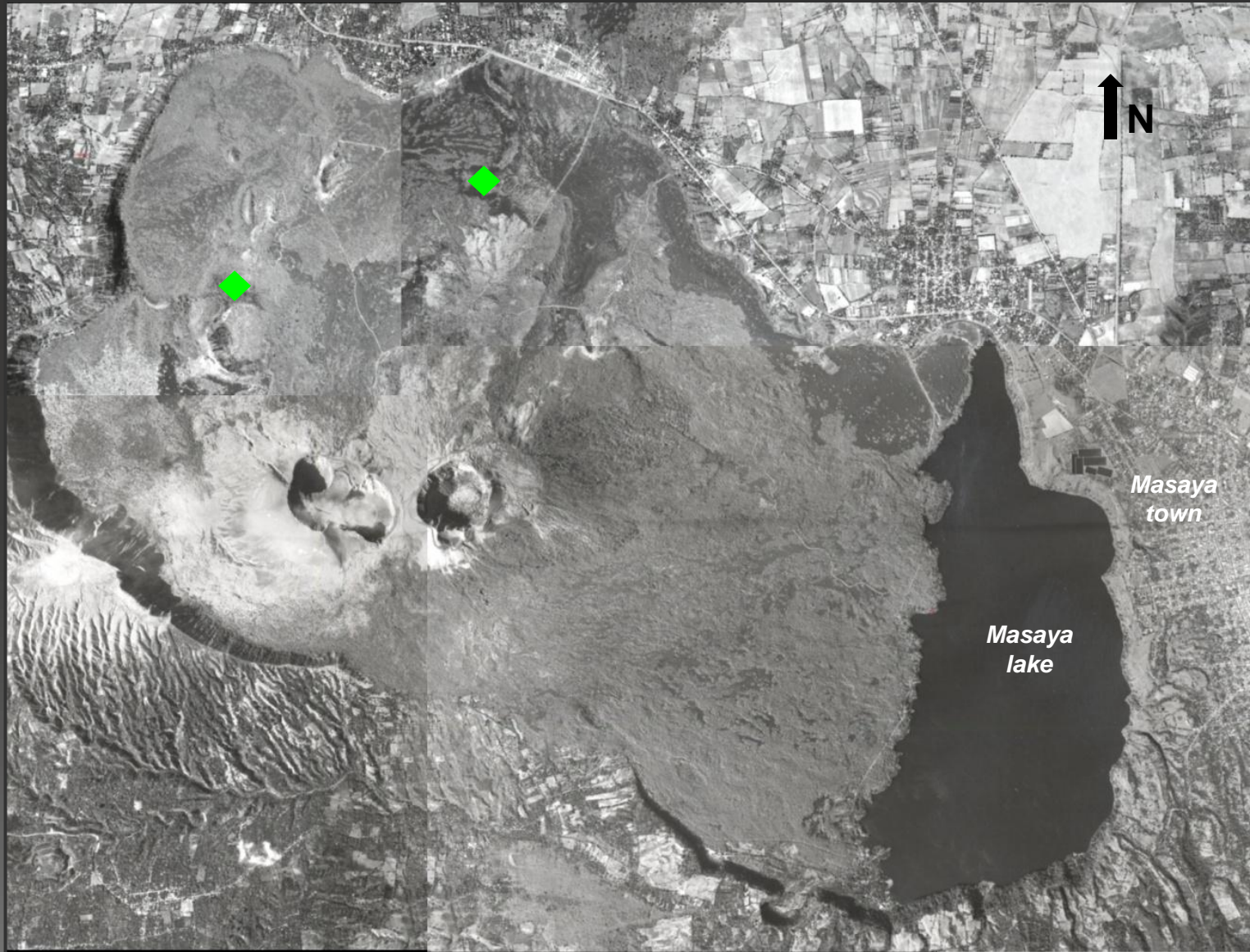
Masaya Caldera

Structural Survey (spatter centers)



Masaya Caldera

Structural Survey (spatter centers)



Masaya Caldera

Structural Survey (big volcanic centers)



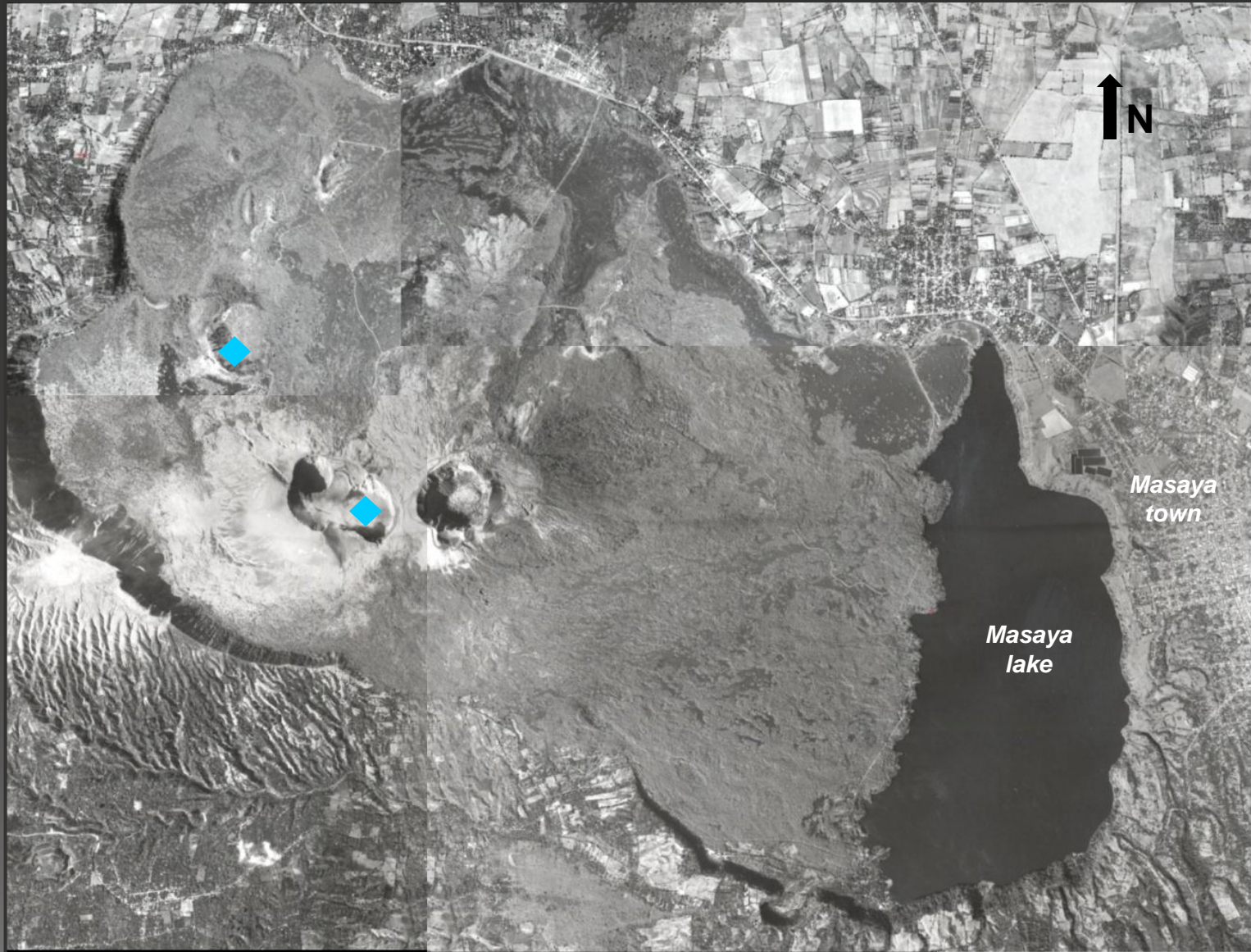
Masaya Caldera

Structural Survey (big volcanic centers)



Masaya Caldera

Structural Survey (big volcanic centers)



Masaya Caldera

Structural Survey (fumarolic activity)



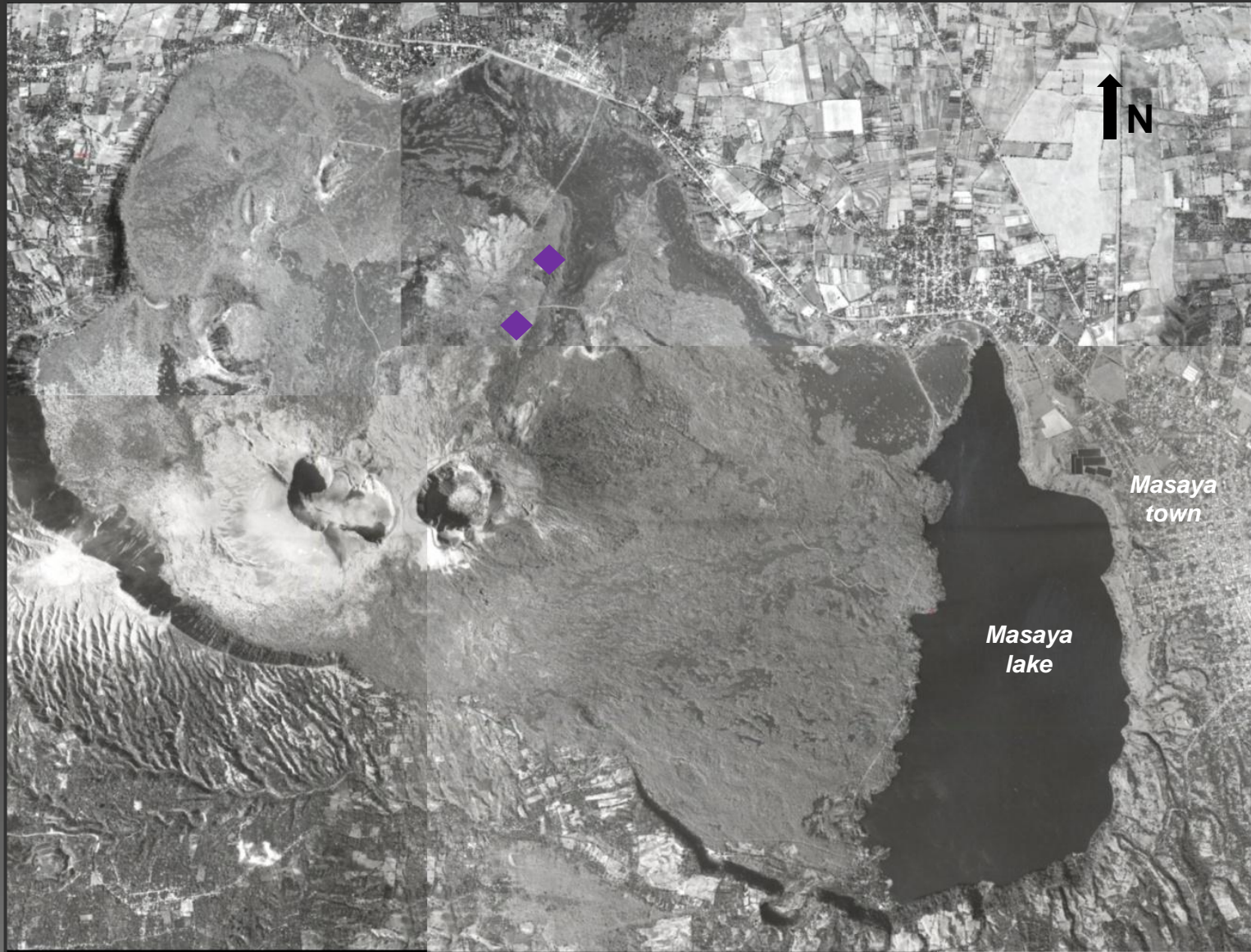
Masaya Caldera

Structural Survey (big volcanic centers)



Masaya Caldera

Structural Survey (big volcanic centers)



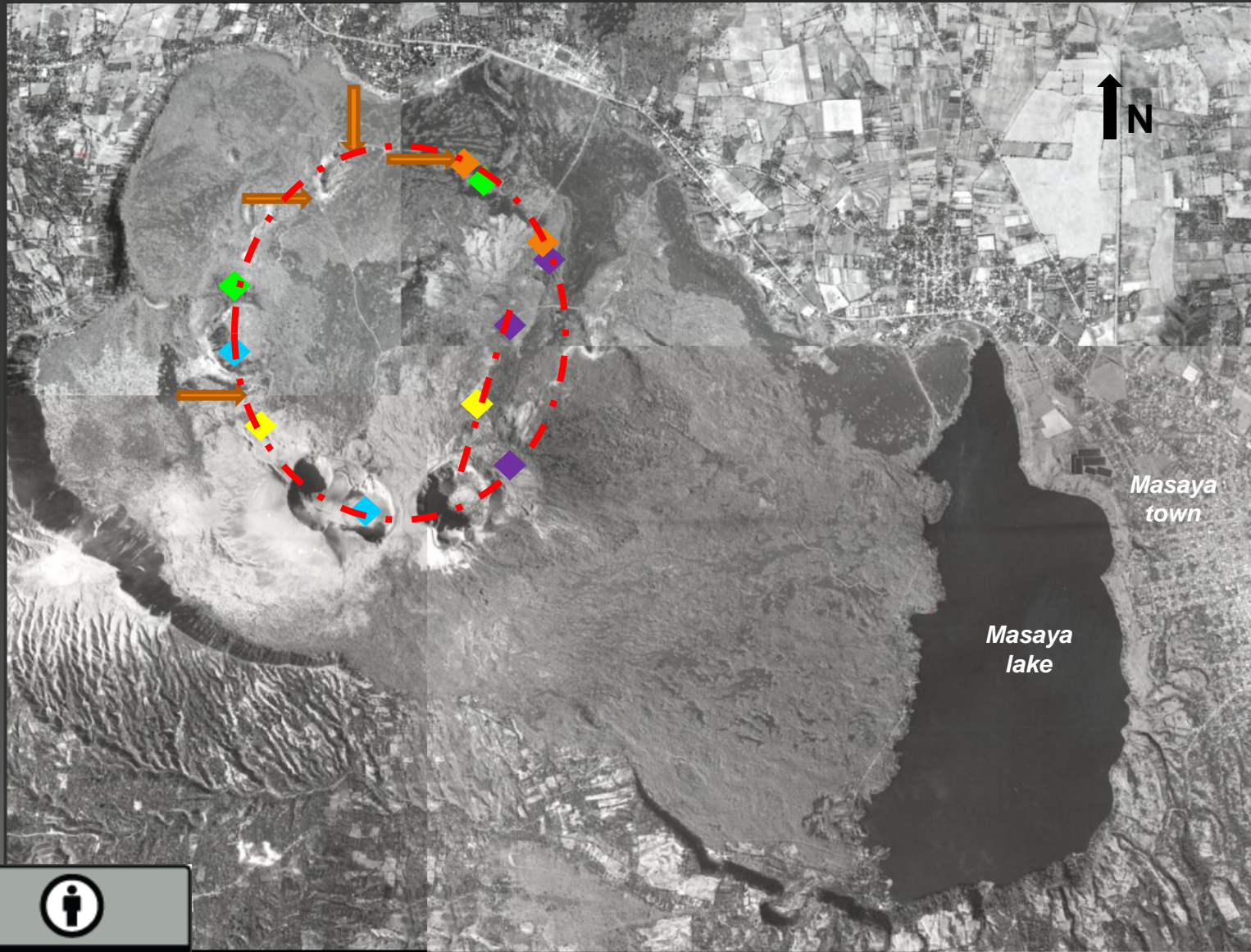
Conclusions (for the summit area)



*One Ring to rule them all,
One Ring to find them,
One Ring to bring them all
and in the darkness bind
them*

Conclusions

Composite image of Masaya Caldera:
- Rift valleys (**yellow**), active faulting (**orange**),
spatter cones and ramparts (**green**), bigger
volcanic centers (**blue**), fumarolic activity (**purple**),
magnetic anomalies (**arrows**)



Conclusions (for the caldera)

- Magnetic and structural studies suggest the presence of an annular ring fault connecting most volcanic centers within the caldera
- The structural framework is likely to have exerted control on most volcanic activity in the area for the last 2000 years
- In the future, events will be likely to exploit the structural weaknesses found in this study

Conclusions (for the caldera)

- Gravity surveys show a strong NE-SW gradient possibly related to an ancient intrusion to the NE
- A N-S structure cutting the possible annular fault seems to be consistent with the regional stress regime, controlled by the Managua Graben

Thanks!