

# Thermal imagery of passive volcanic activity

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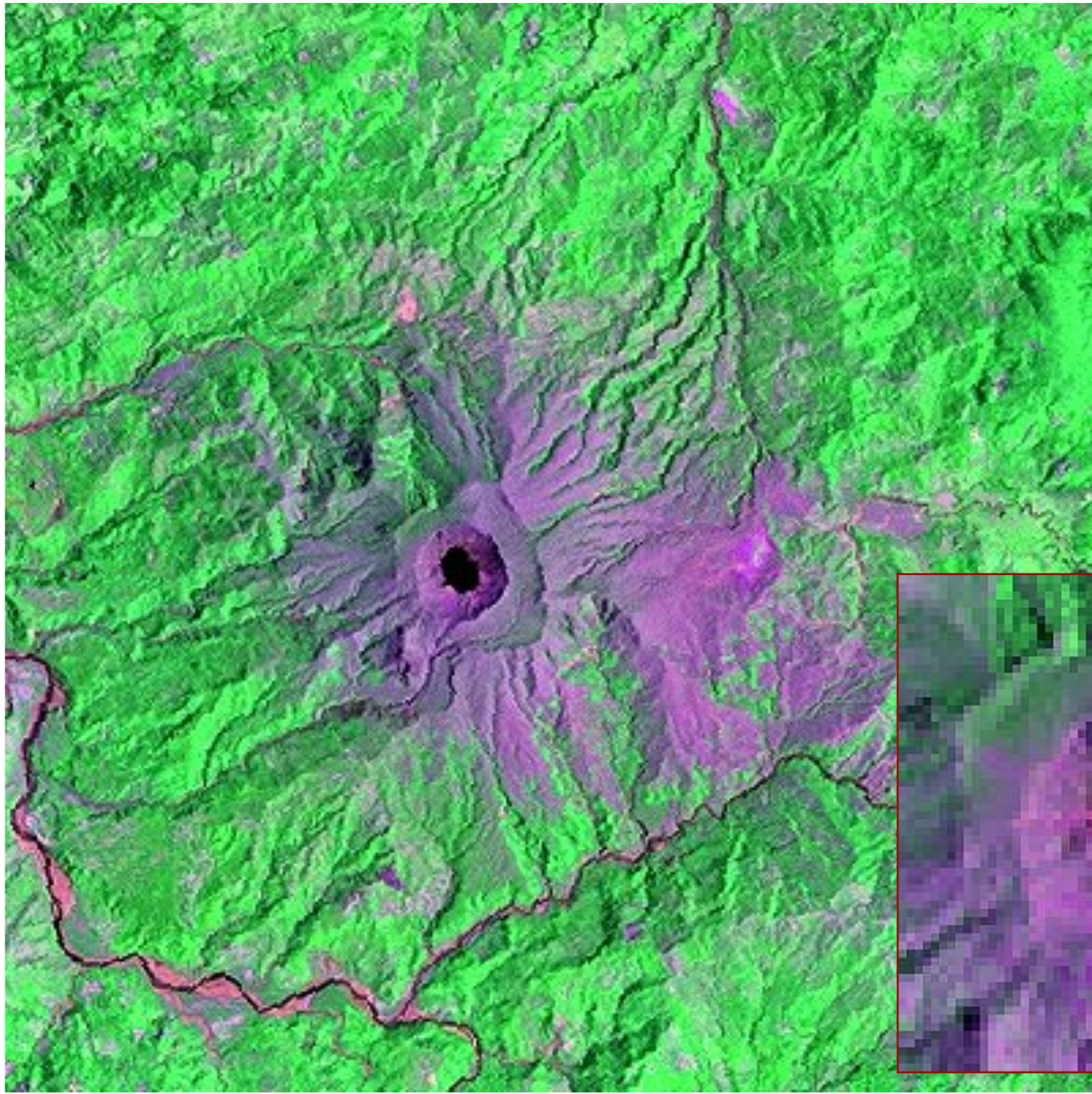
# El Chichón, Mexico



# El Chichón, Mexico

- Large eruption in 1982
- Shallow crater lake with large variation in size, unrelated to meteorological conditions
- Thermal monitoring can be used as proxy for CO<sub>2</sub> flux from ground – much quicker to carry out





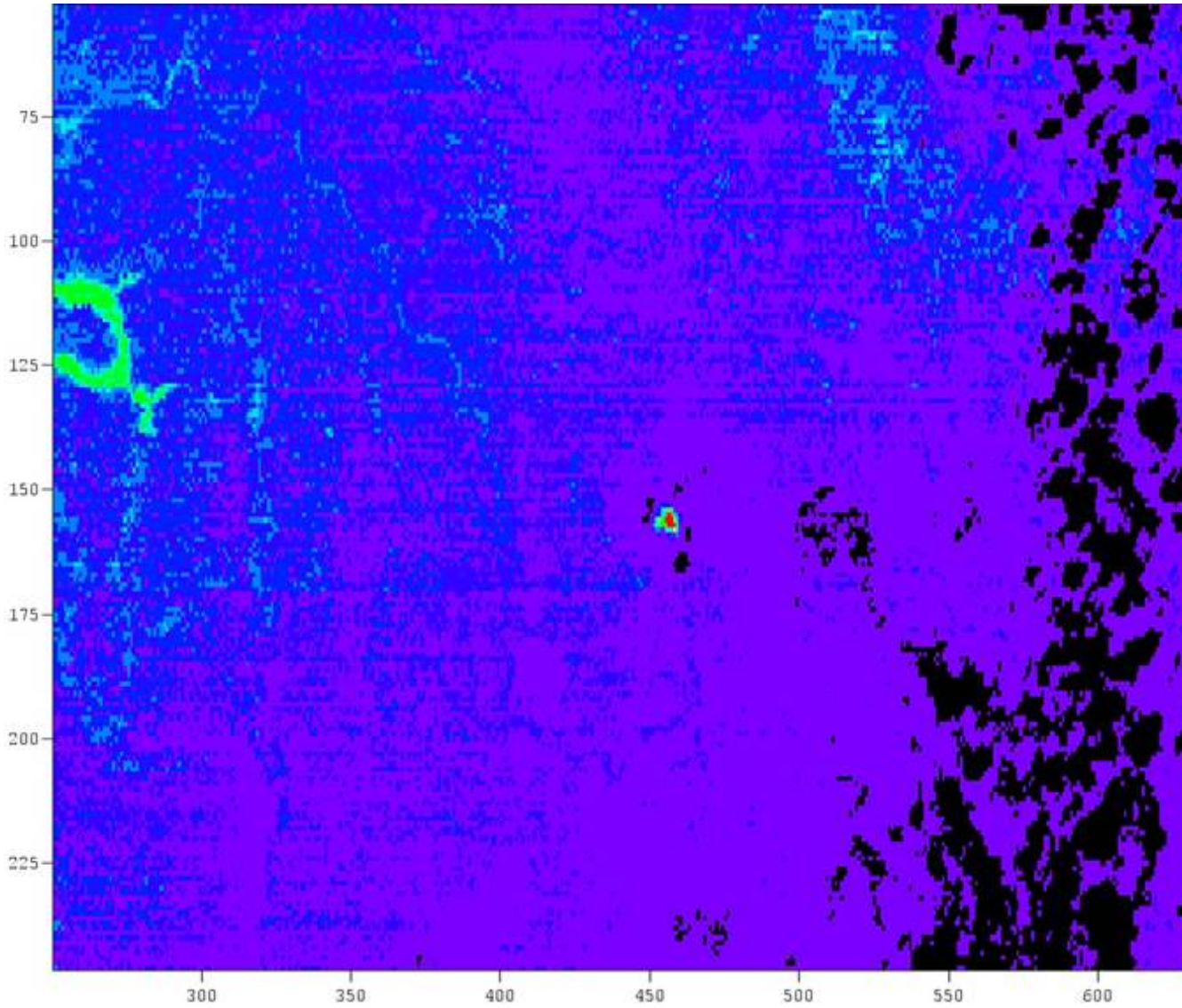
LANDSAT 7 ETM+

28 March 2001

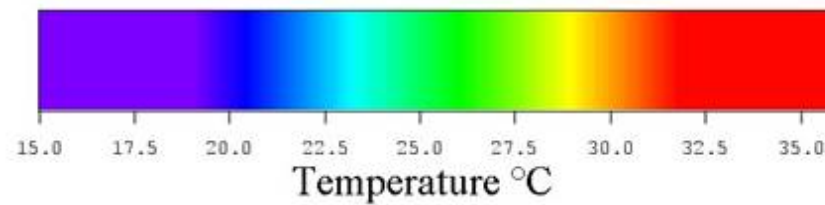
Area: 141 331m<sup>2</sup>



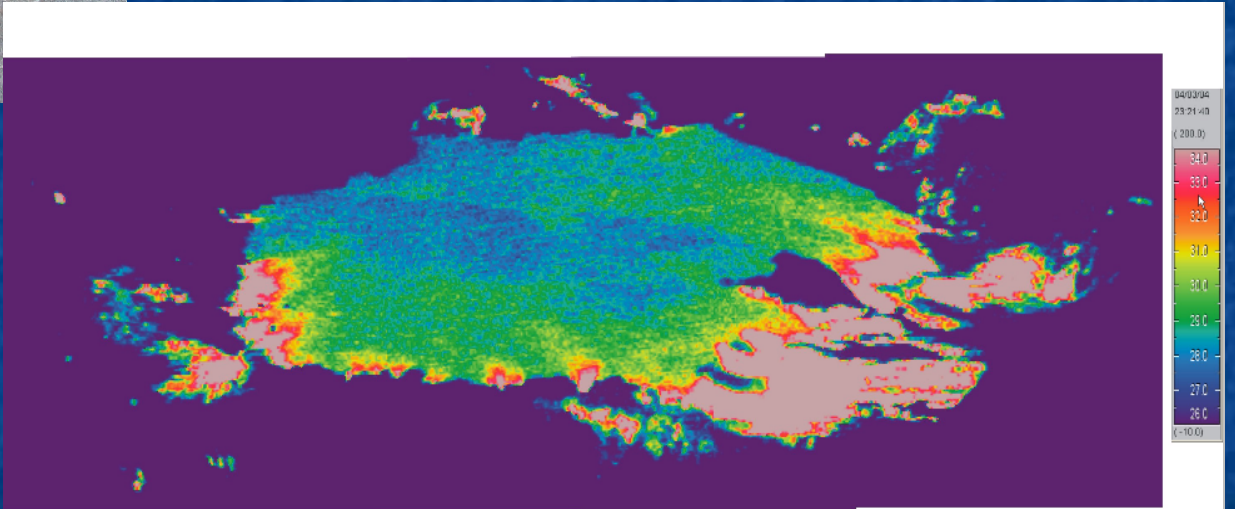
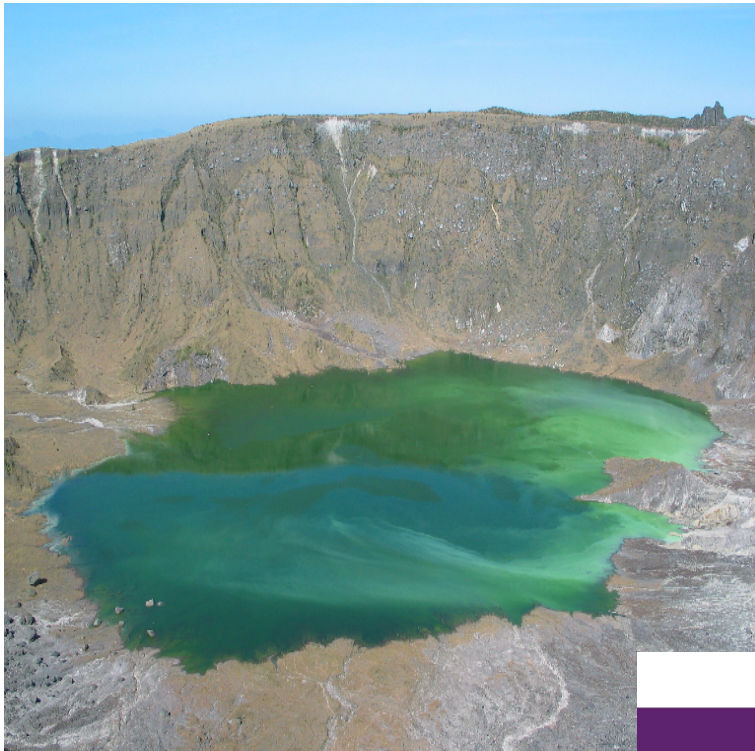




ASTER image  
showing crater  
lake

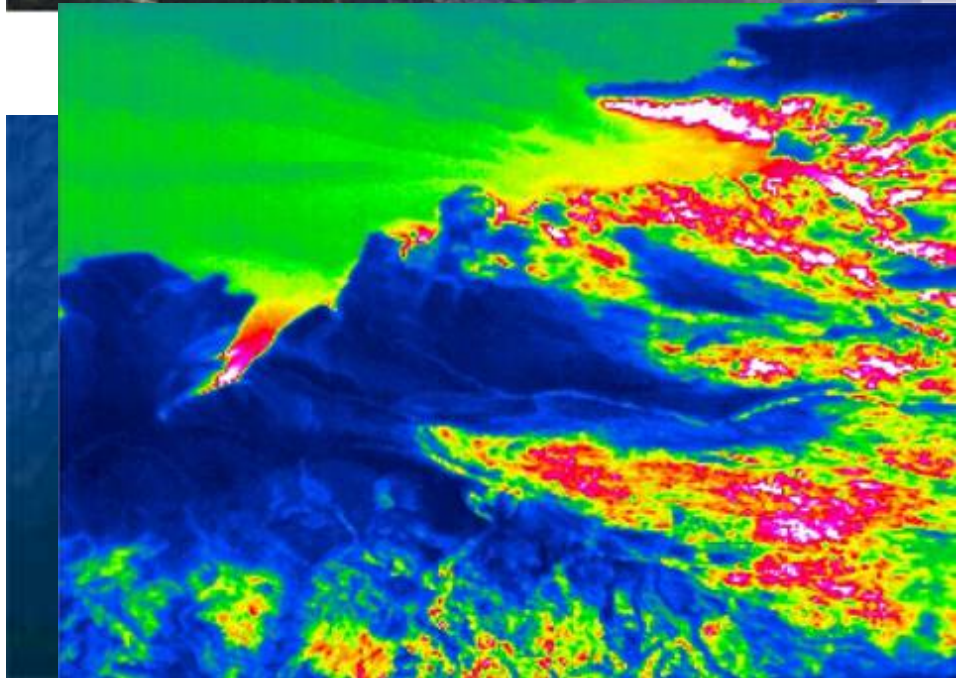
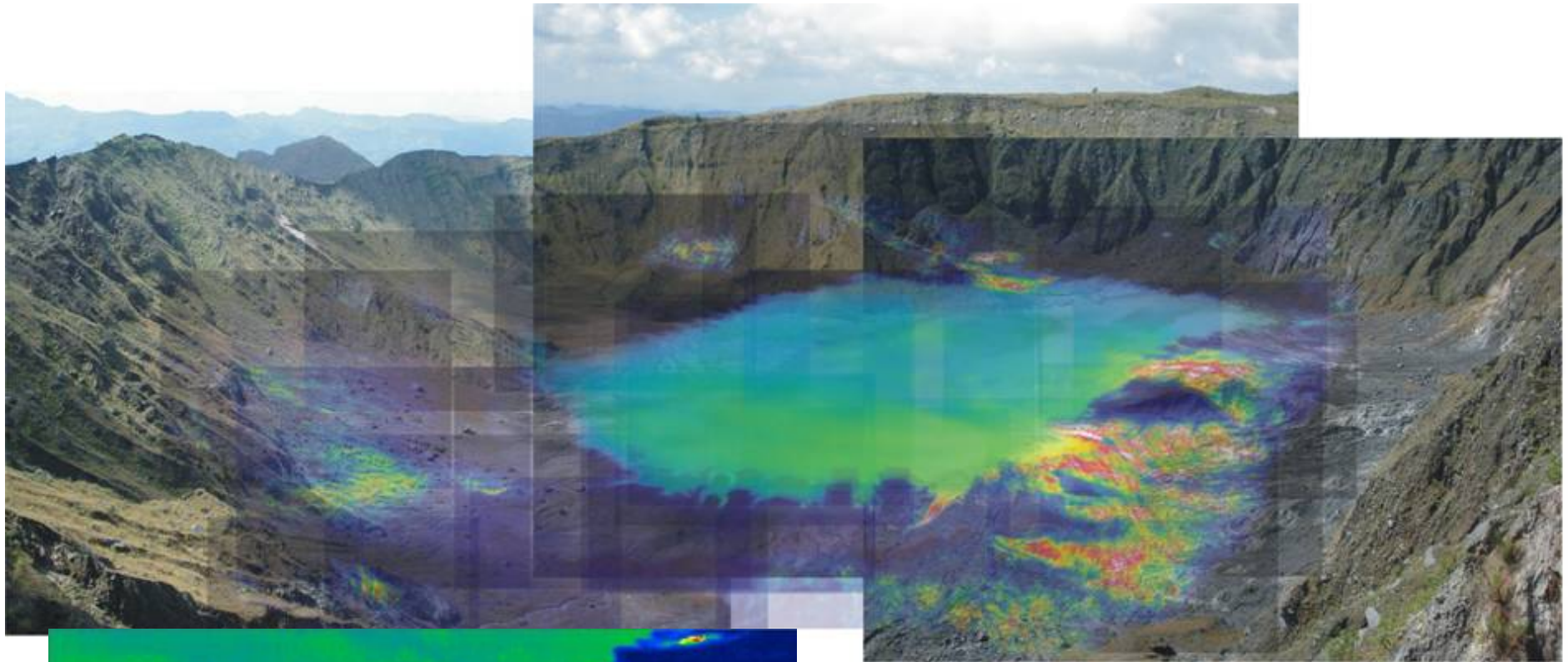


Thanks to Alan  
Bernard



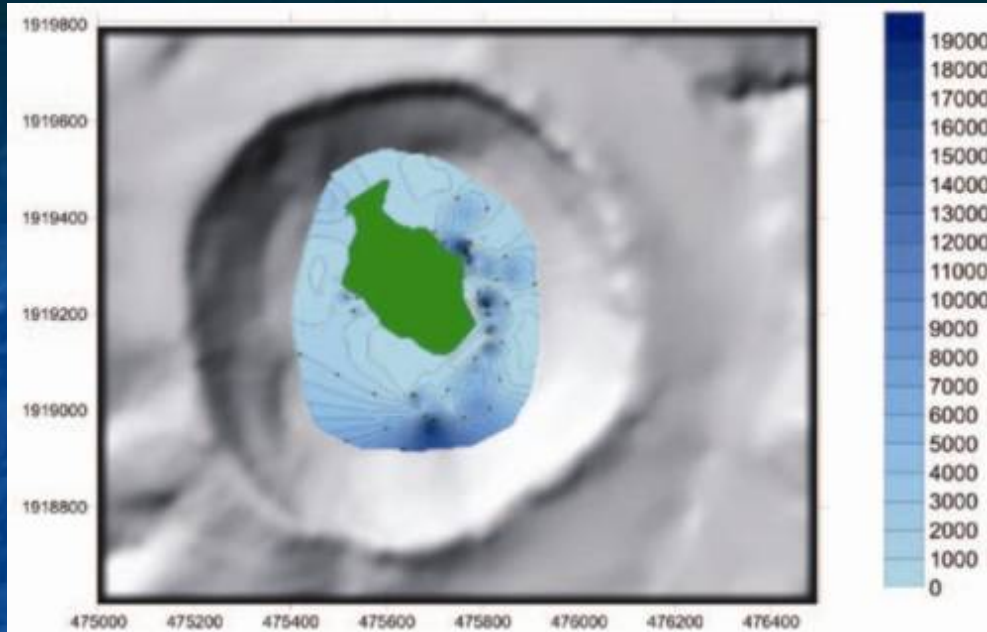
Thermal image from crater rim



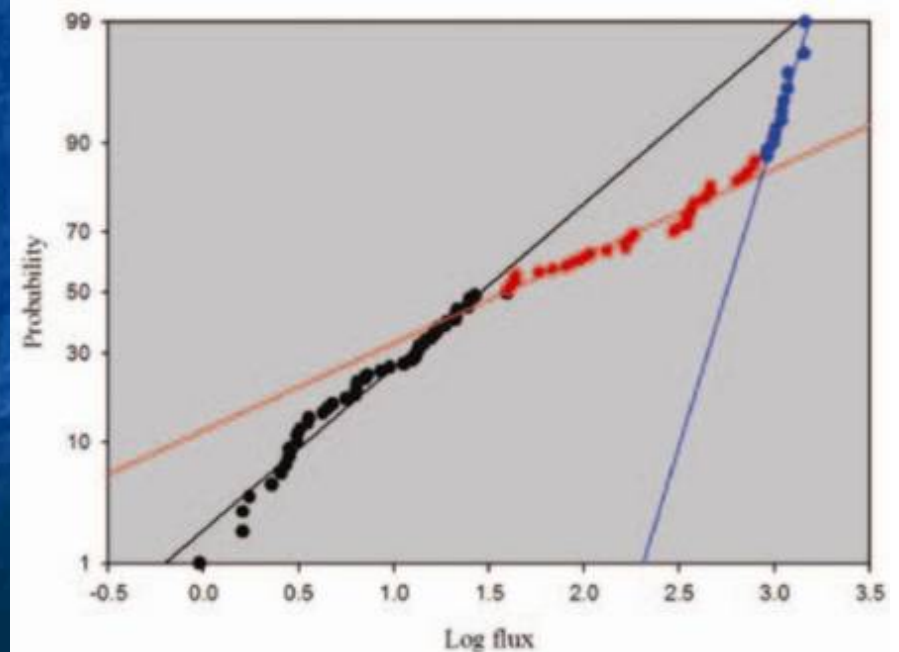


Gas emission from sides  
and beneath lake

# CO<sub>2</sub> flux survey

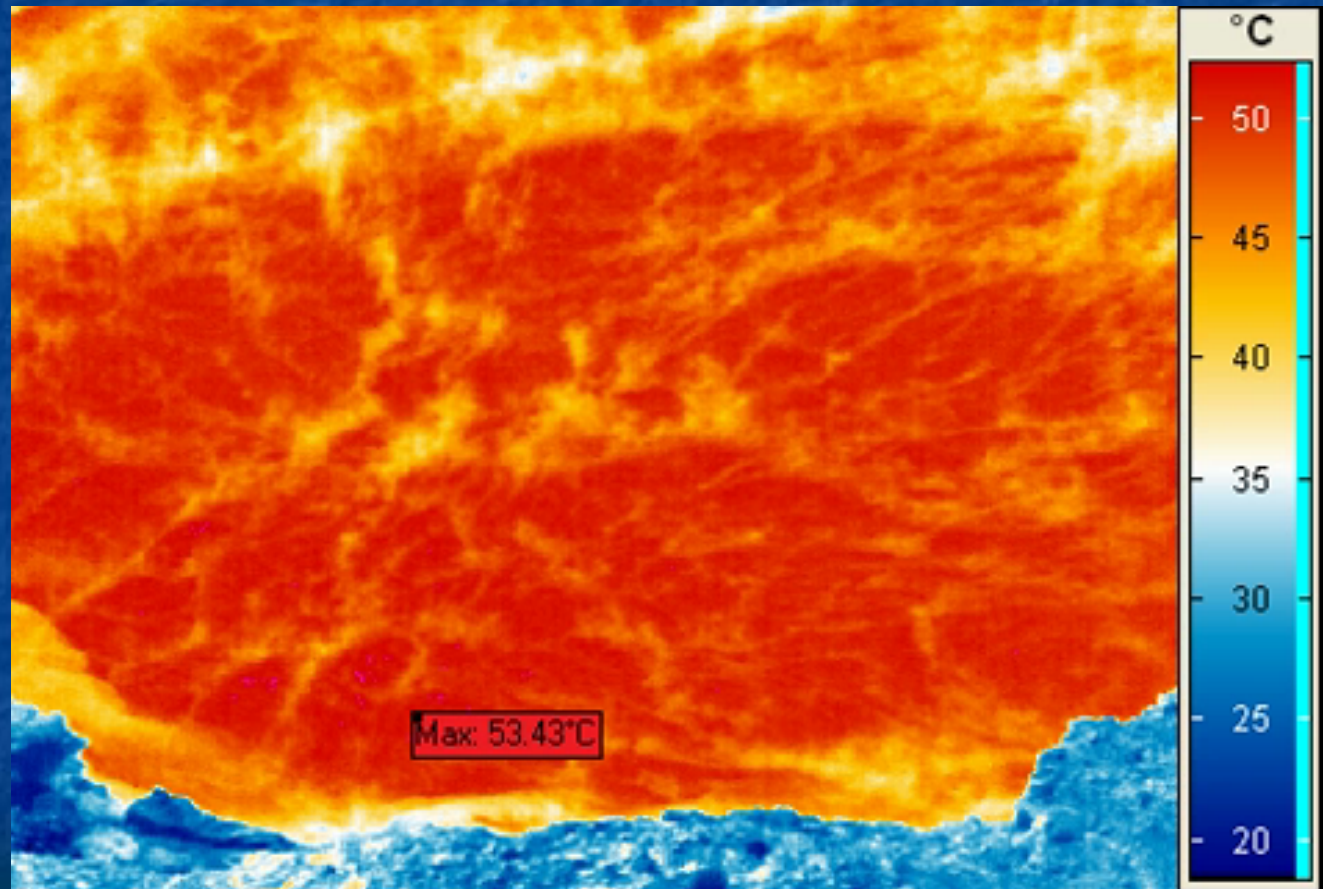


- Survey carried out of crater floor
- Emissions related to deep processes
- Controlled by geological structure
- 3 populations on cumulative flux plot

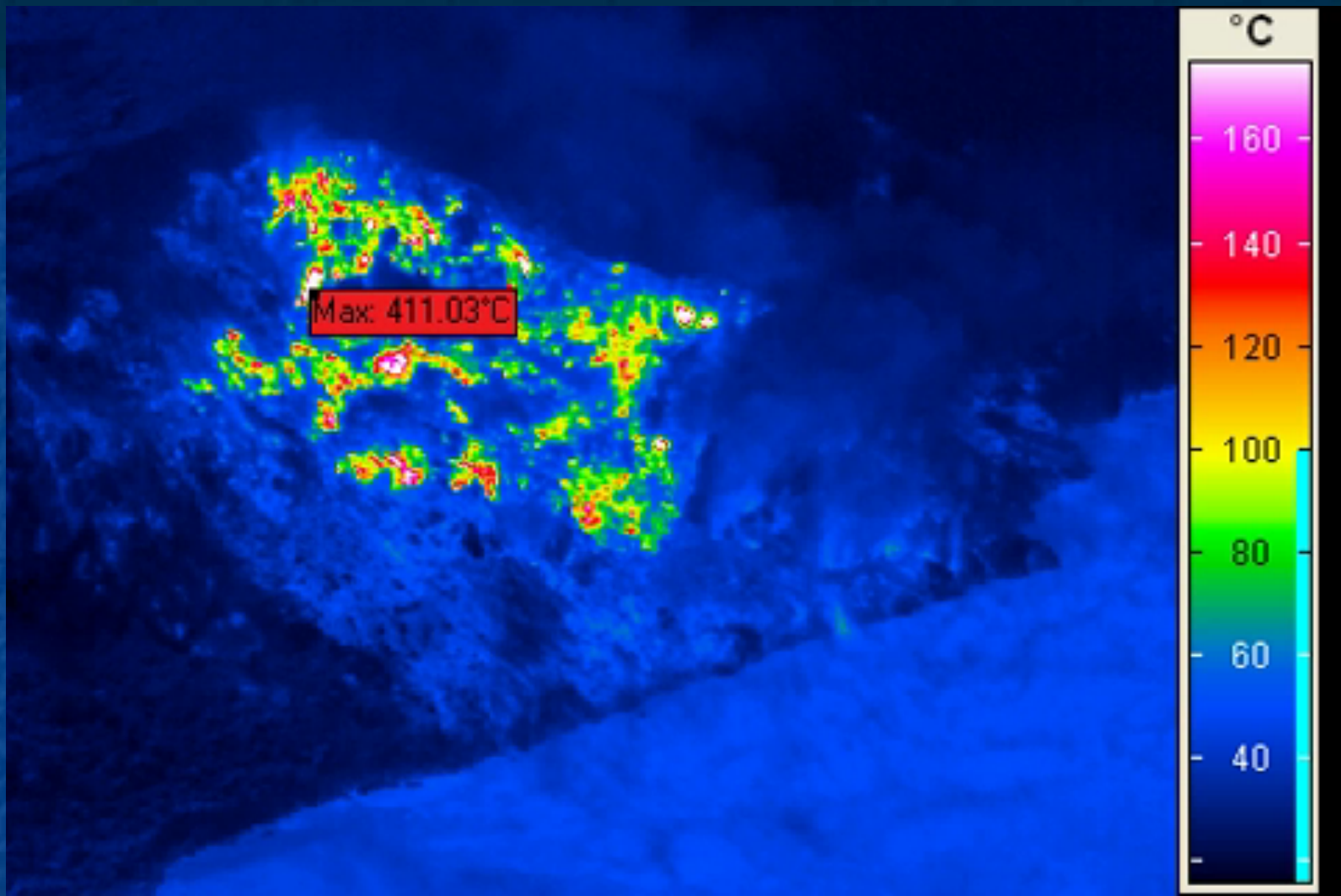




# Poás, Costa Rica



Convection within crater lake



Fumarolic activity



# Isla Socorro, México



# Historical eruptions & geology

## Eruptions:

1993 Submarine eruption  
SW flank

1951 Phreatic eruption W  
of Lomas Colorado

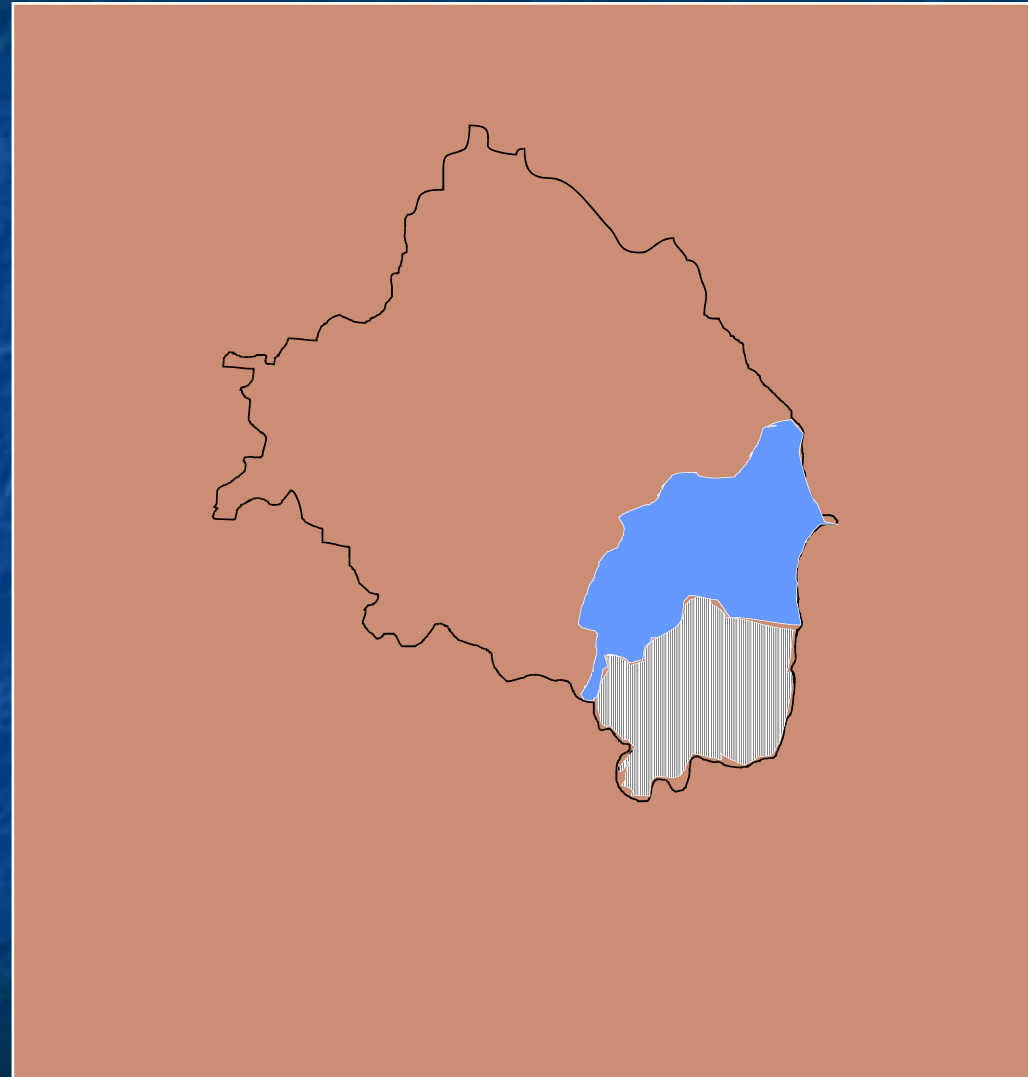
Caldera formed 370 to 182 ka

Post-caldera rocks – silicic  
peralkaline – Cerro  
Evermann formation – 180  
ka to 15 ka

Lomas Colorado Formation –  
alkaline basalt

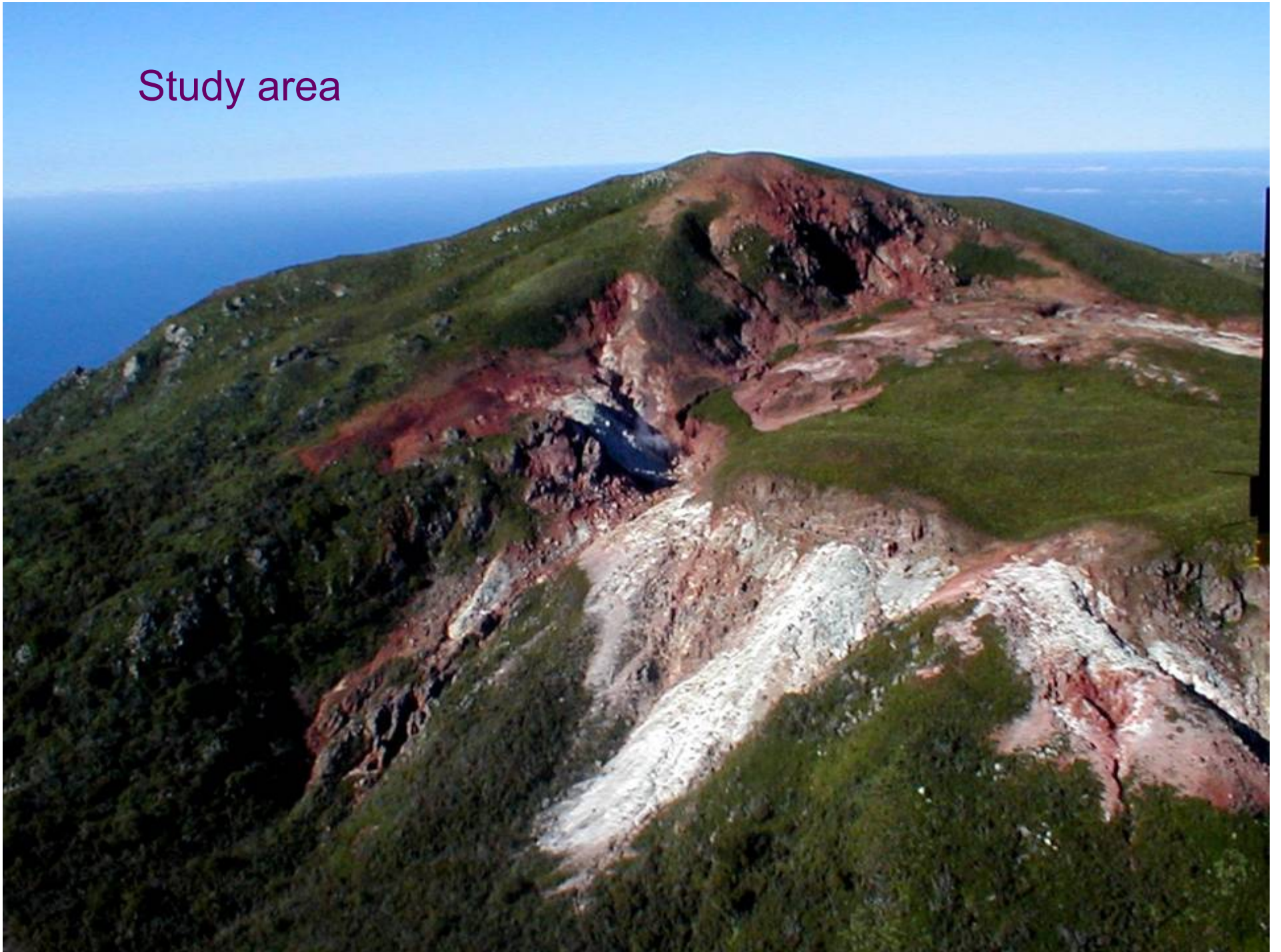
20% of island – 150 – 70 ka

Bohrson & Reid 1995





Study area





# Current activity

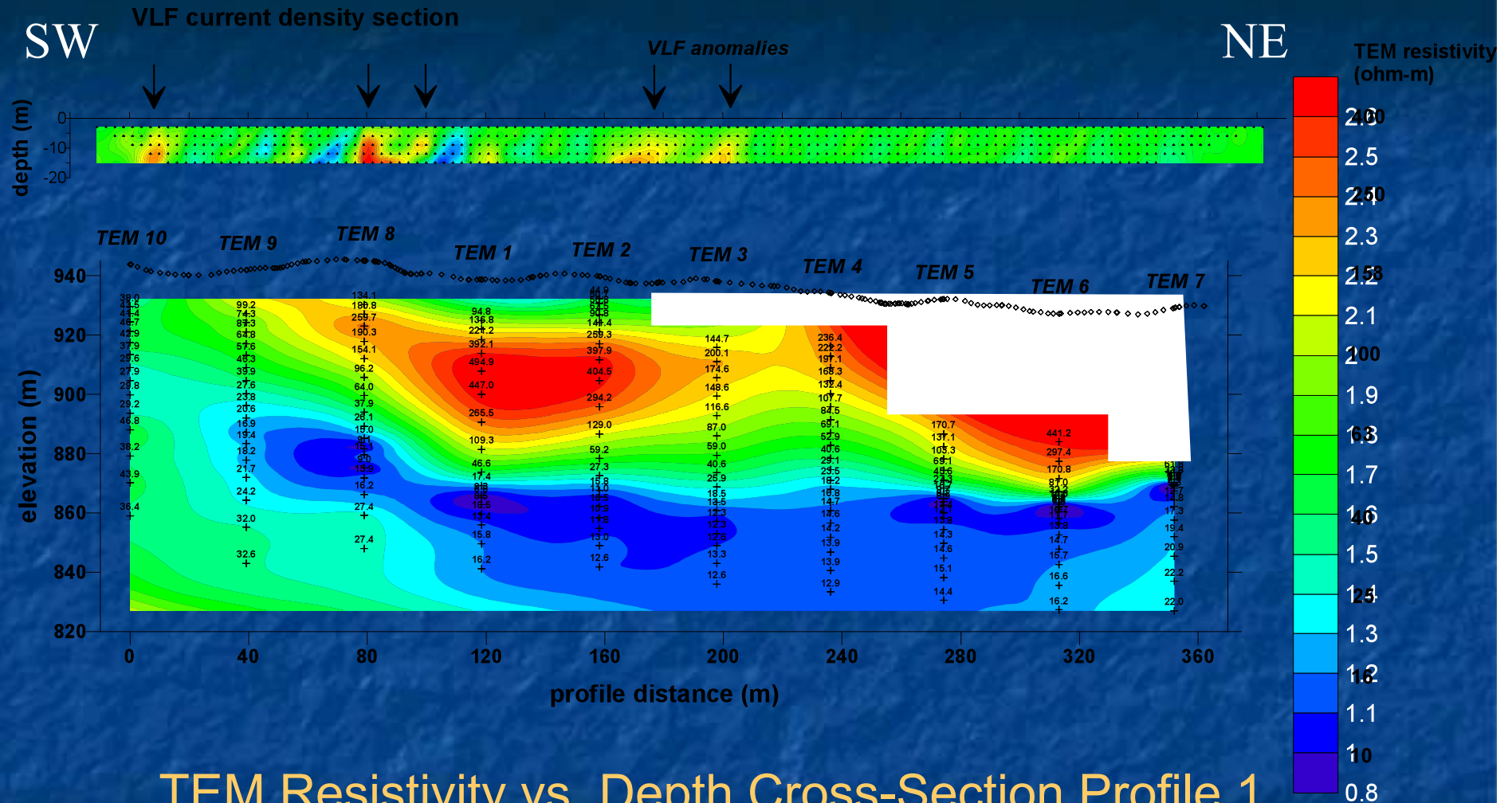
- Fumarolic zone increasing in size over recent years
- Activity limited to two summit domes; network of fractures, extensive hydrothermal alteration



Lower fumarole first formed in 2000



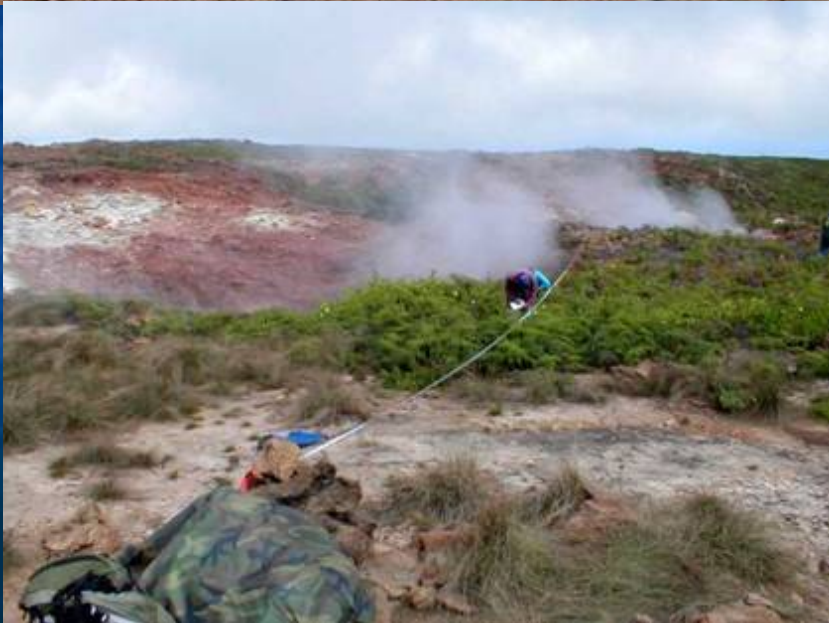
# VLF Current Density Section



## TEM Resistivity vs. Depth Cross-Section Profile 1

- Low resistivity zone possibly represents water body
- High resistivity zones represent unaltered rock

# Study of active dome

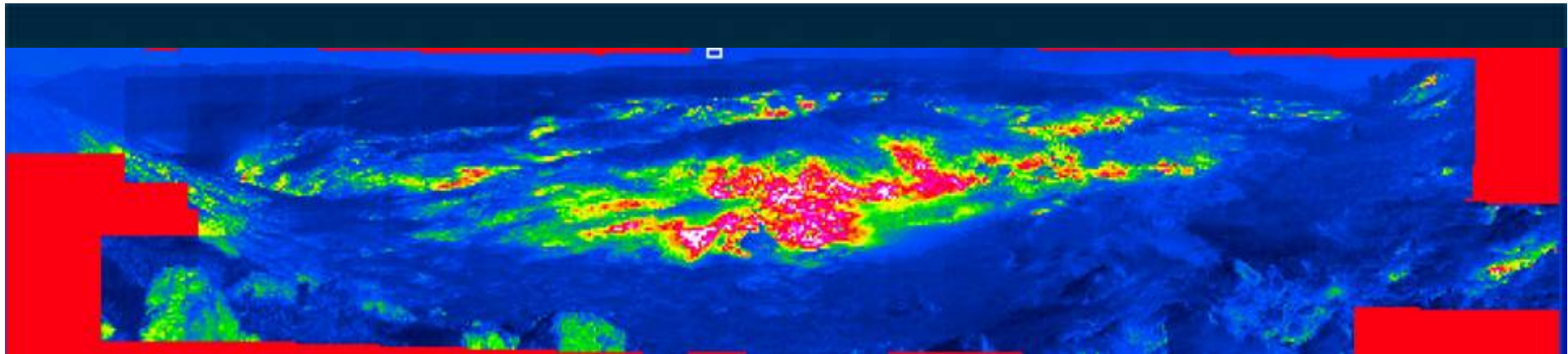




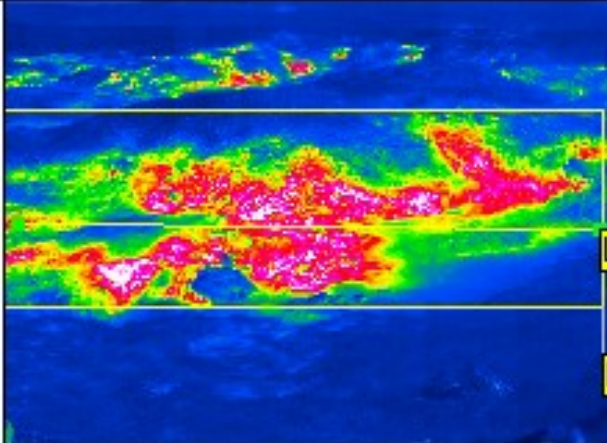
# Thermal monitoring

- Infrared camera used to monitor changes in active dome, calculate energy flux
- Dome is beneath summit – good vantage point for images

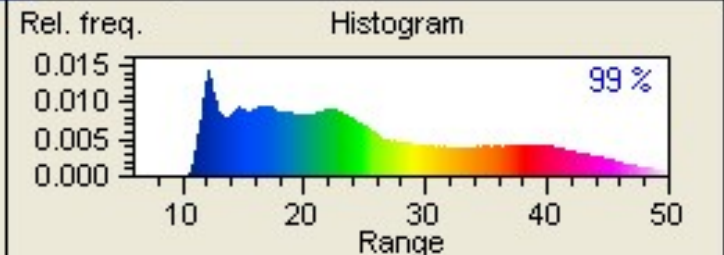
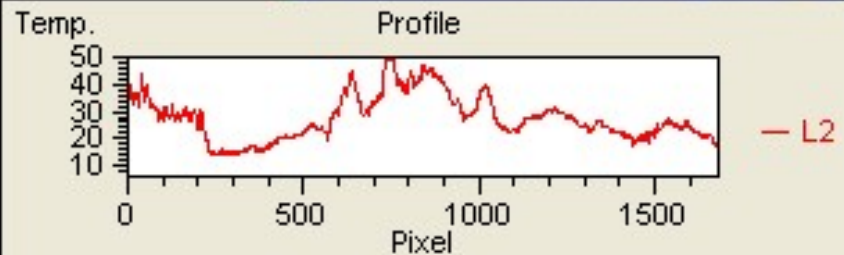




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 Panorama.irb  
 Date:  
 19.11.2010  
 Time: 07:42:49

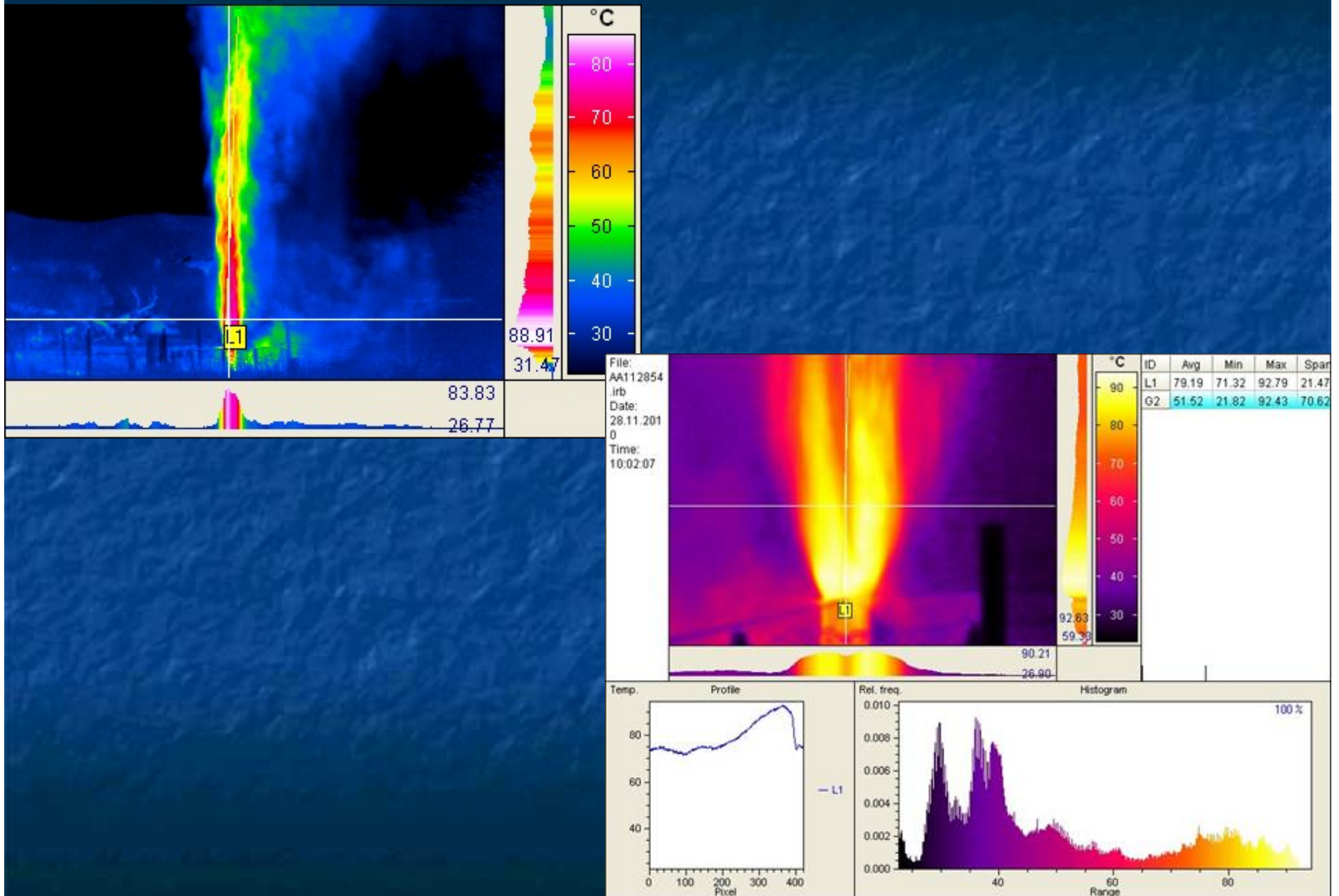


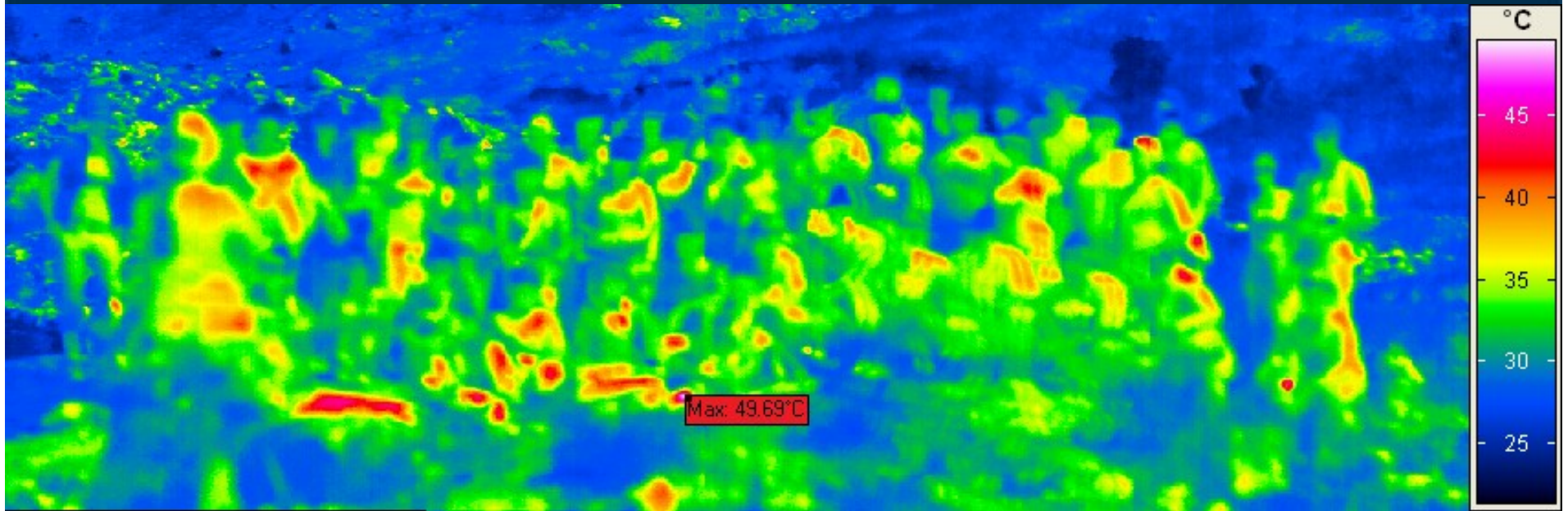
ID	Avg	Min	Max	Spar
R1	25.70	10.08	69.09	59.01
L2	27.56	13.69	50.99	37.30





# Geyser – Ixtlán de los Hervores





PASI Arenal 2011