

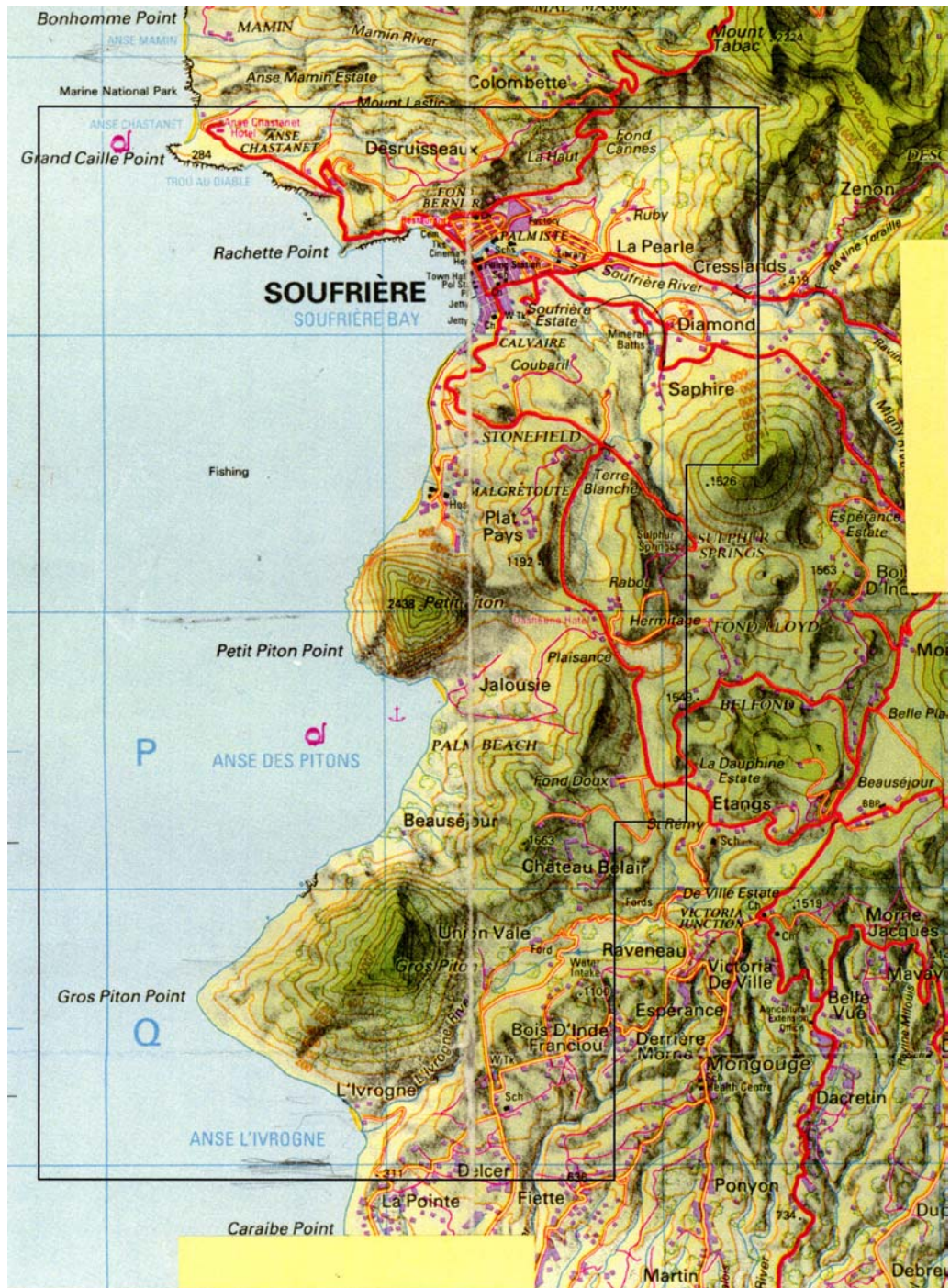
# **Geothermal Resource Prospecting in the Qualibou Caldera, Saint Lucia**

By

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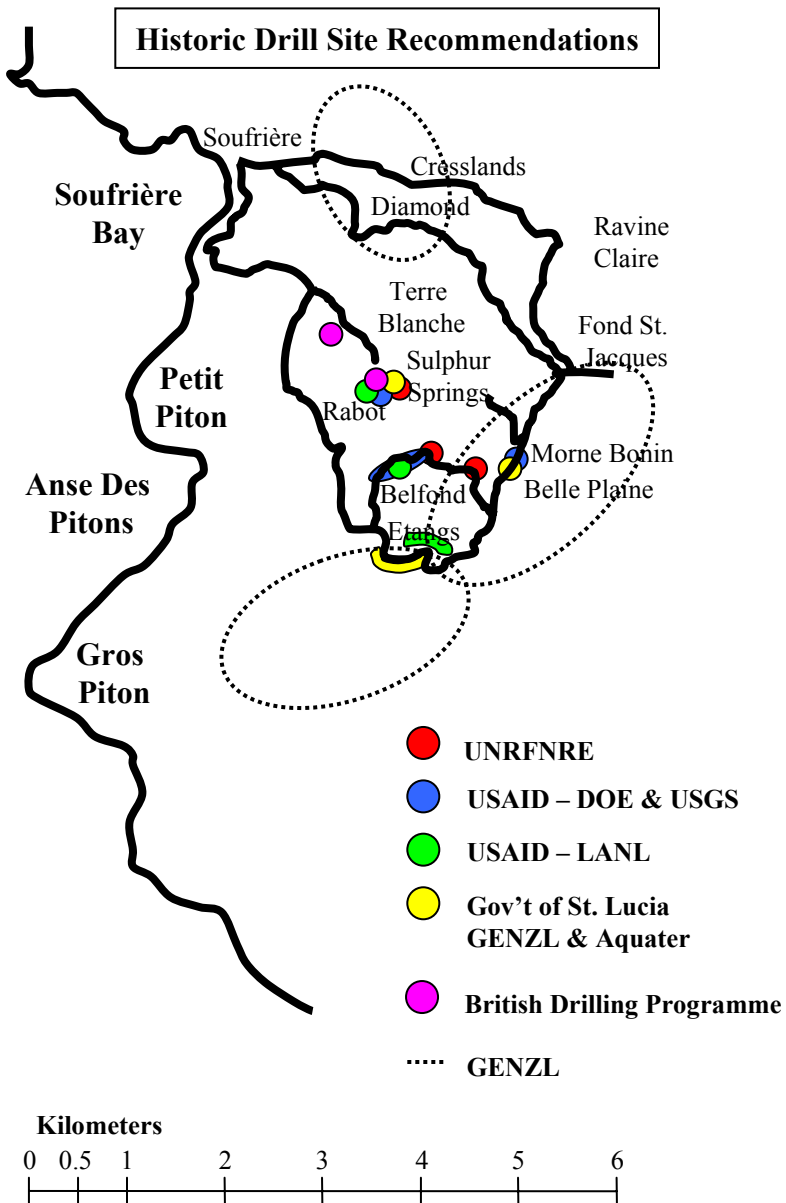


# Outline

- History → Summary
- Brief Review of Four MIT Studies
- Conclusion
- Recommendations

# History

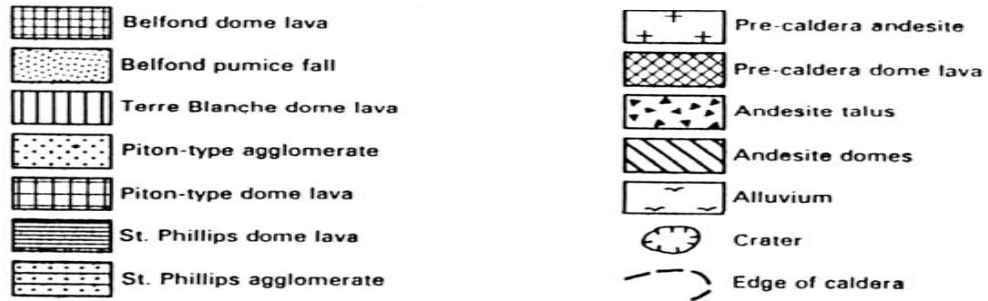
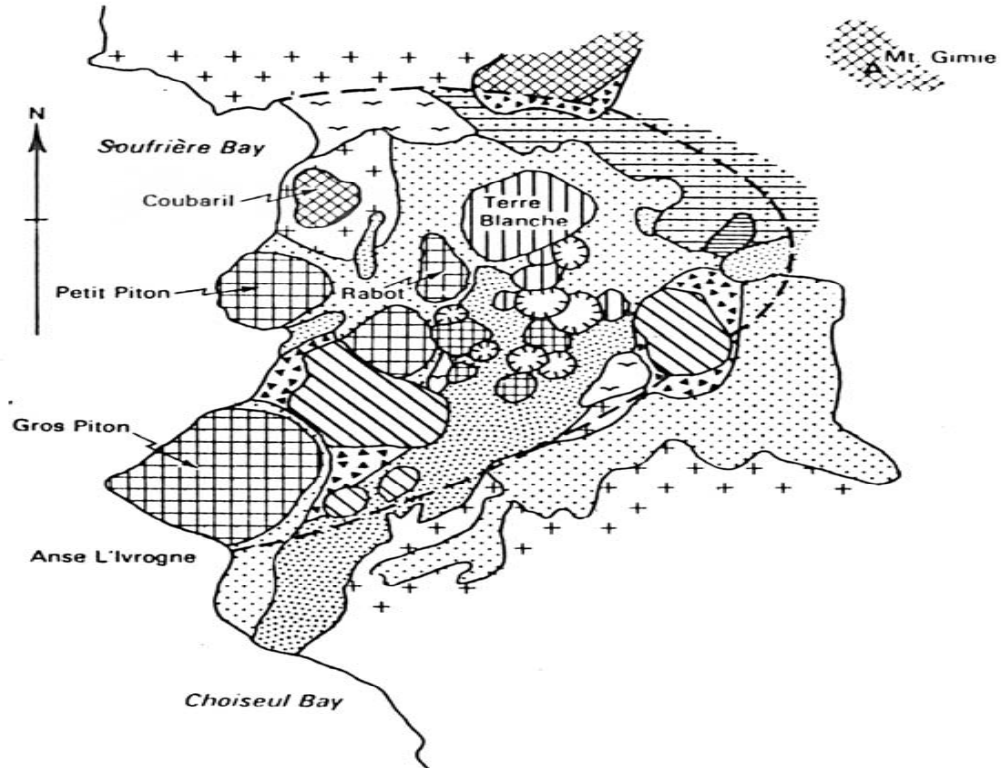
- Serious geothermal resource exploration began in the mid-70s by the British Geological Survey
- After dozens of investigations and nine drilled holes, no real geothermal development has resulted to date.



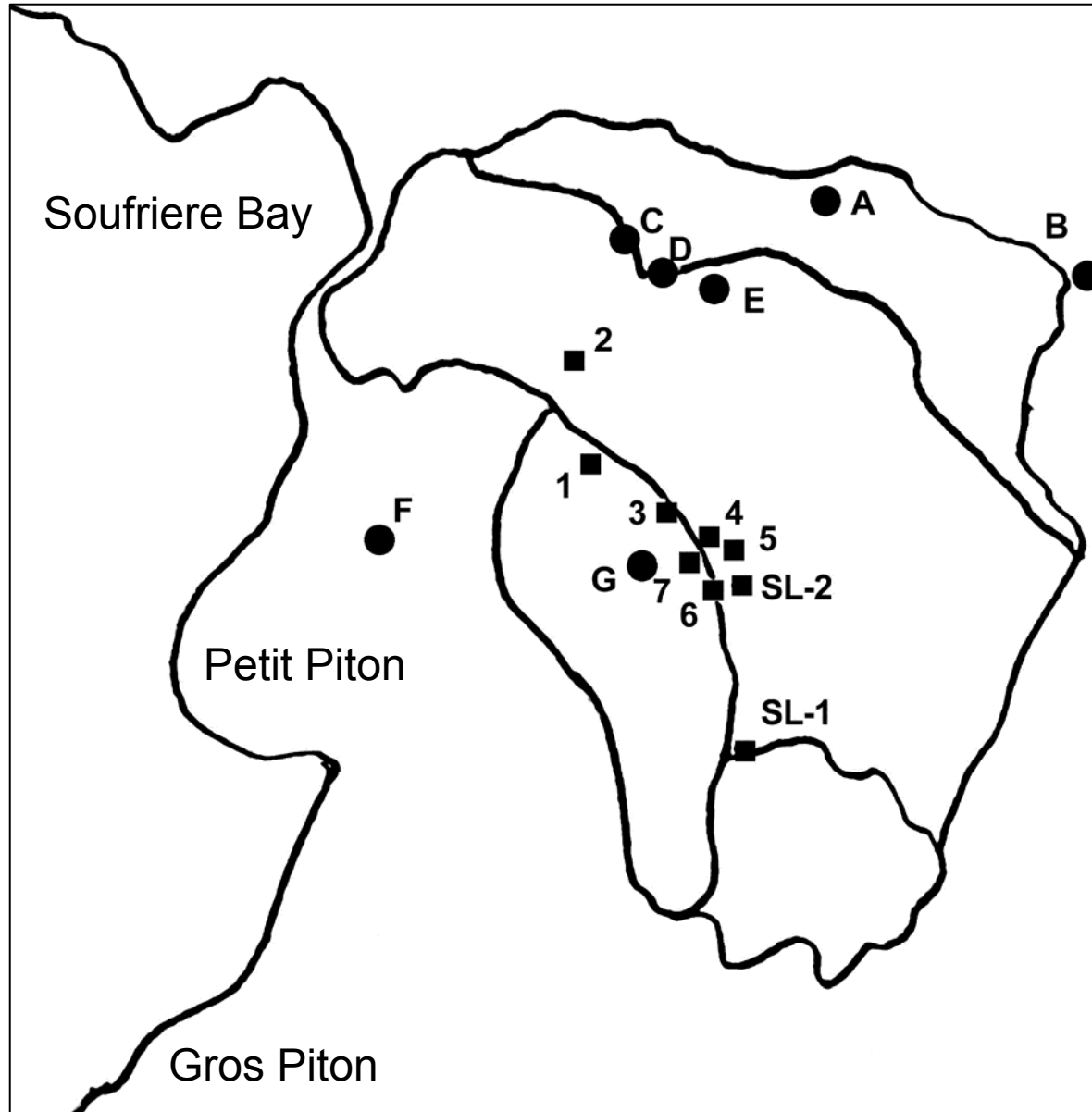
## Time Line

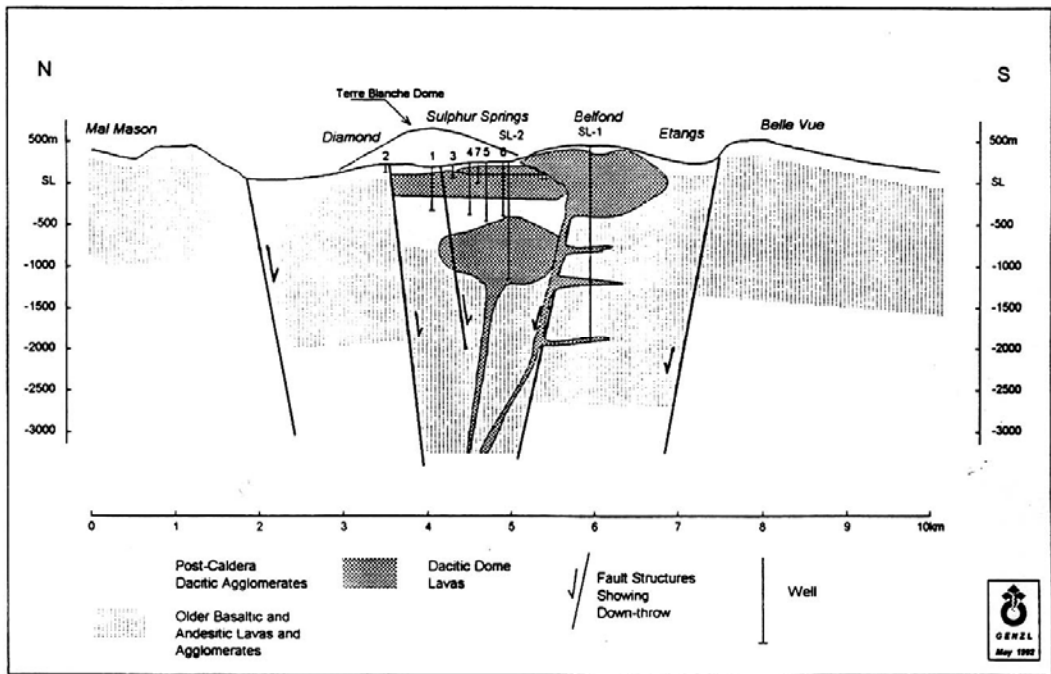
- 1951 British start formal investigation (Willmore)
- 1964 Tomblin performs detailed geology survey
- 1974 Institute of Geological Sciences (IGS) U.K. resistivity survey
- 1975-76 Seven wells drilled by IGS (Wells 1-7)
- 1976 Aspinall et al. perform seismic monitoring
- 1982 Aquater (Italy): Magnetotellurics, gravity, well data evaluation.
- 1983-84 Los Alamos (USA): Geology, geochemistry, geophysics
- 1987-88 USAID/UN: Drill two deep wells (SL1 & SL2)
- 1992 Geothermal Energy New Zealand: Gravity, resistivity, audio magnetotelluric resistivity
- 1998-Pesent M.I.T.: Reinterpretation of British resistivity data, self potential geophysics, decision analysis
- 2004-Present United Network of the Eastern Caribbean is commissioned to develop geothermal resources.

# Geology

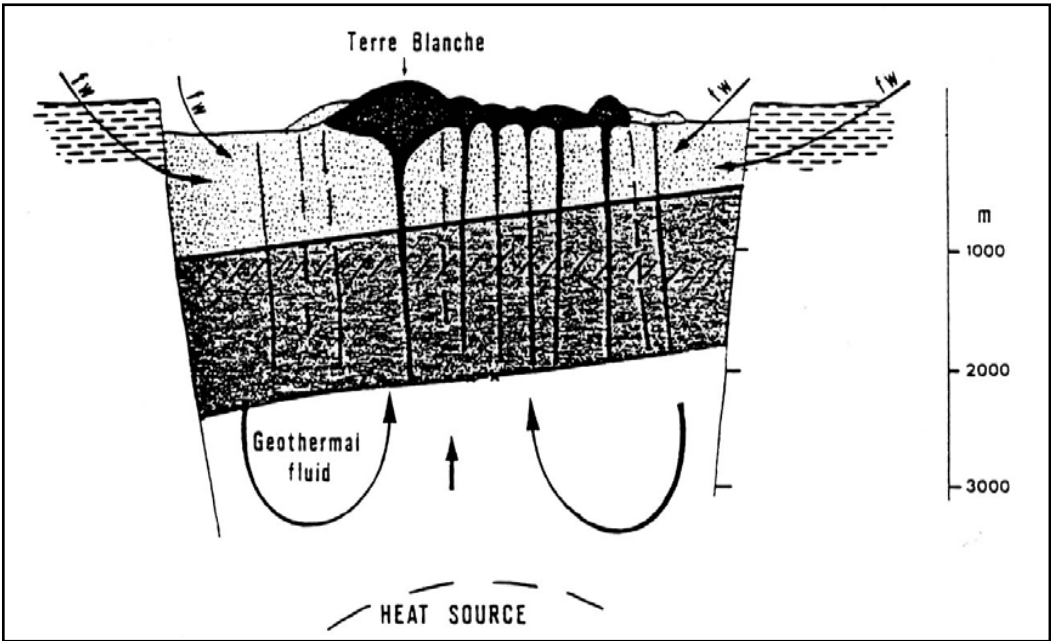


# Geothermal Wells & Hot Springs





GENZL, 1992



USAID  
(Aquater), 1987



# Summary

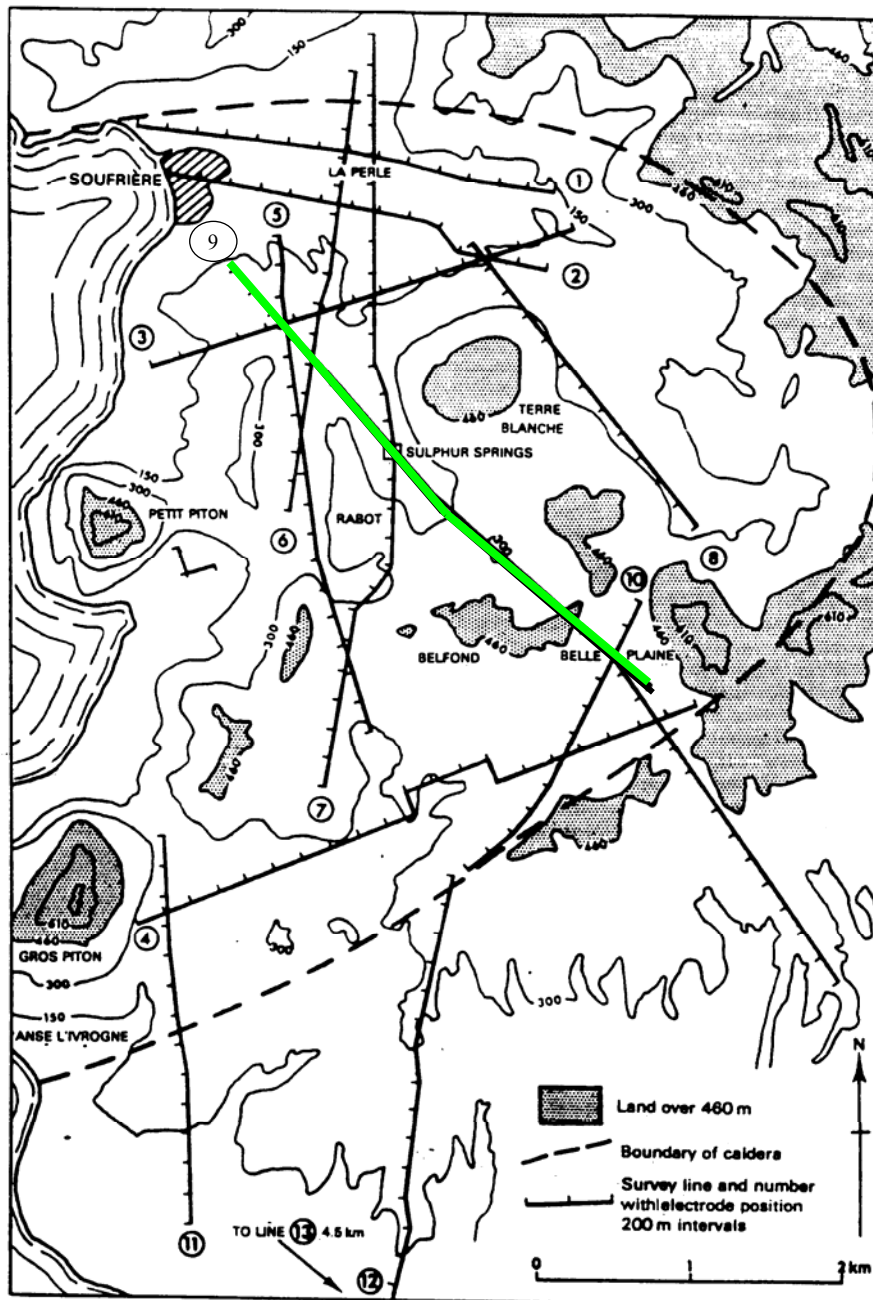
- Very complex geology and hydrogeology
- The chemistry of the geothermal waters beneath the Sulphur Springs is quite severe.
- The geothermal reservoir cap rocks are weak.
- Exploration is best optimized by exploring for less hot – but less corrosive – waters away from the Sulphur Springs.

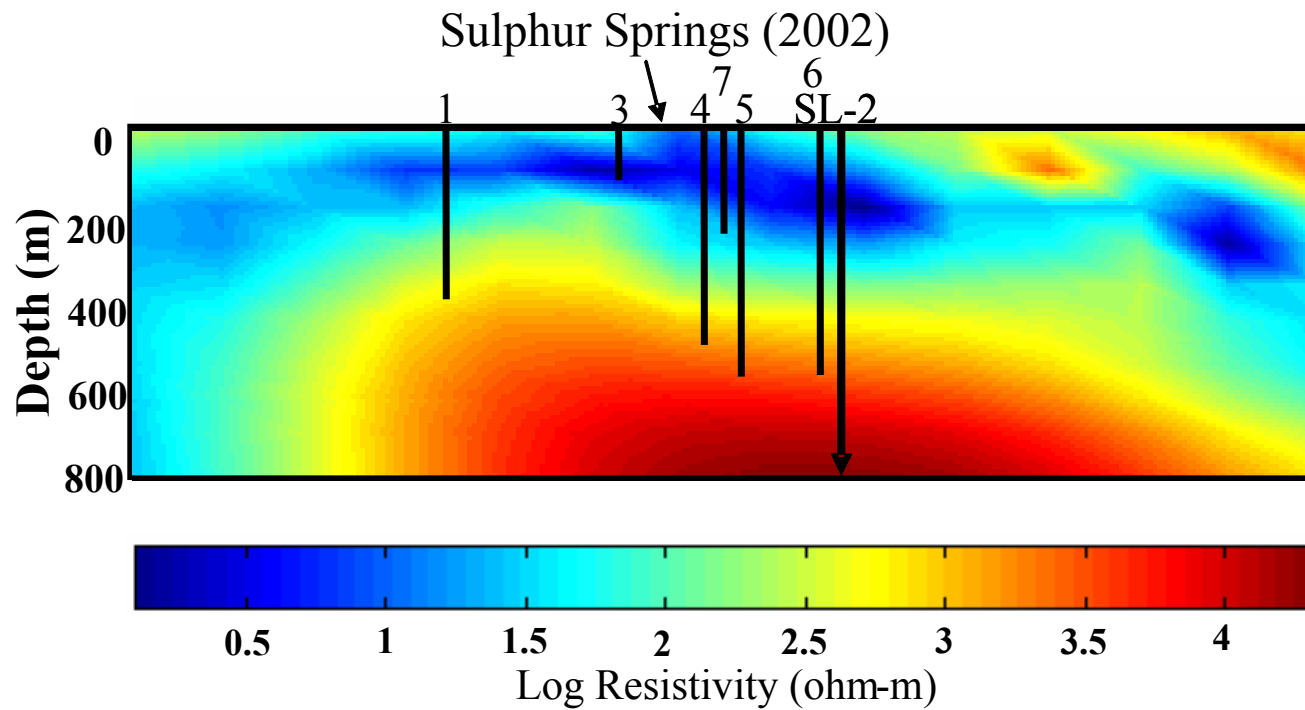
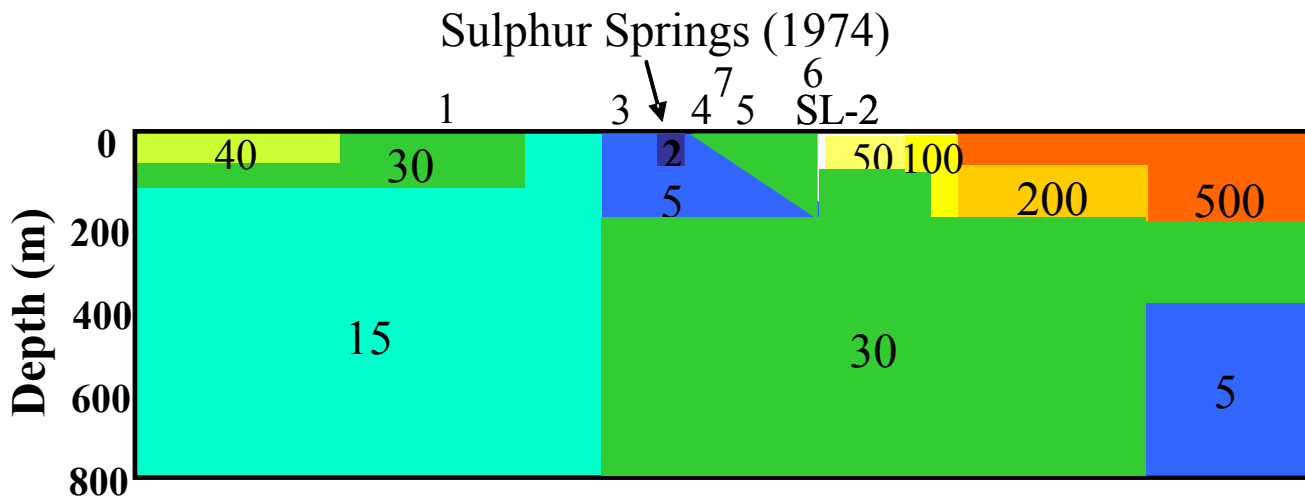
# Synopsis of Four MIT Studies

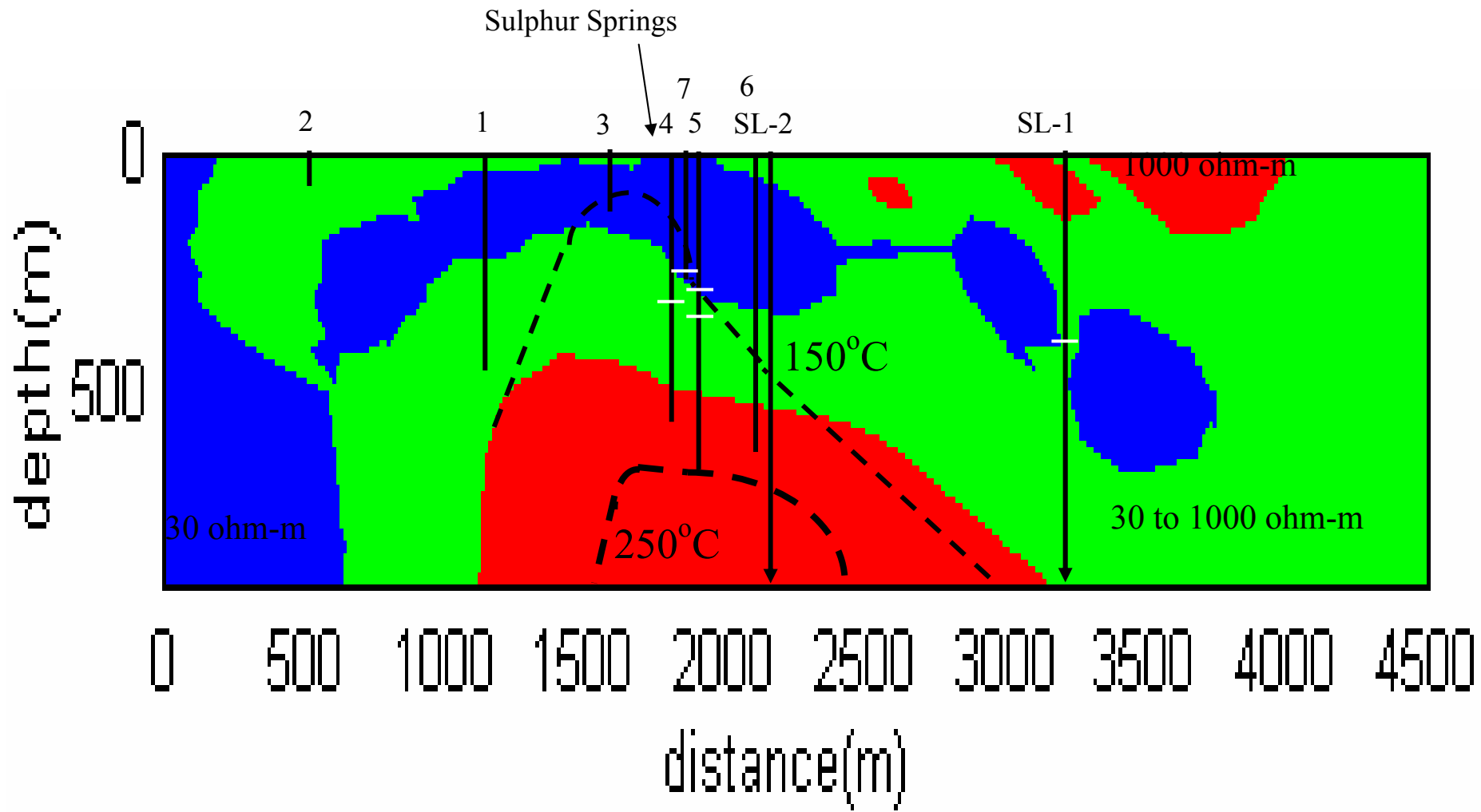
- Reinterpretation of the British Line 9 resistivity data.
- 3D rendering of 2D resistivity inversions.
- Self Potential surveying.
- Geological/Geophysical data integration using a decision analysis method.

# **Reinterpretation of the British Line 9 Resistivity Data.**

Data collected in 1974 by Lee and  
Greenwood, British Geological  
Survey



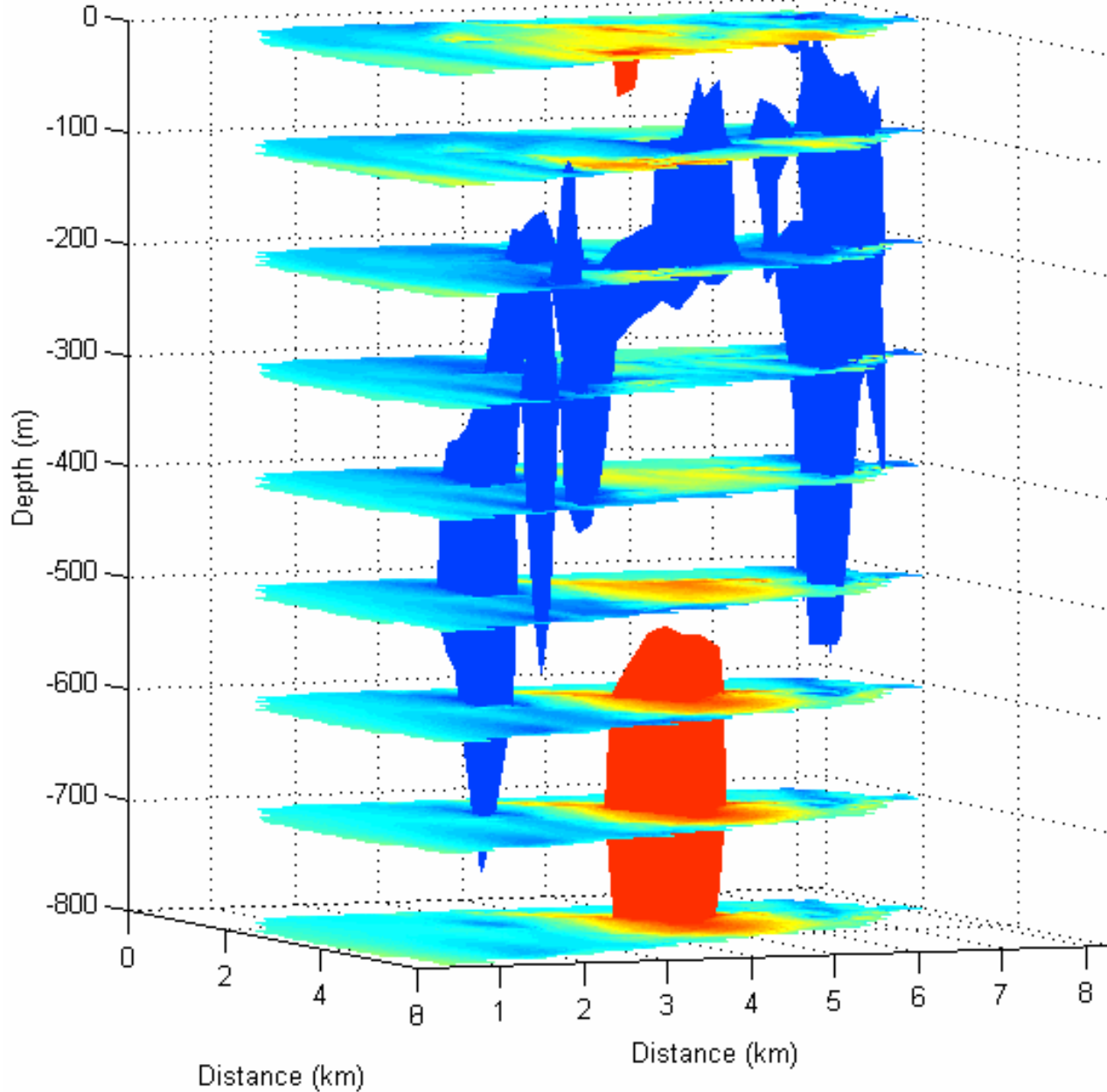




# **3D Rendering of 2D Resistivity Inversions.**

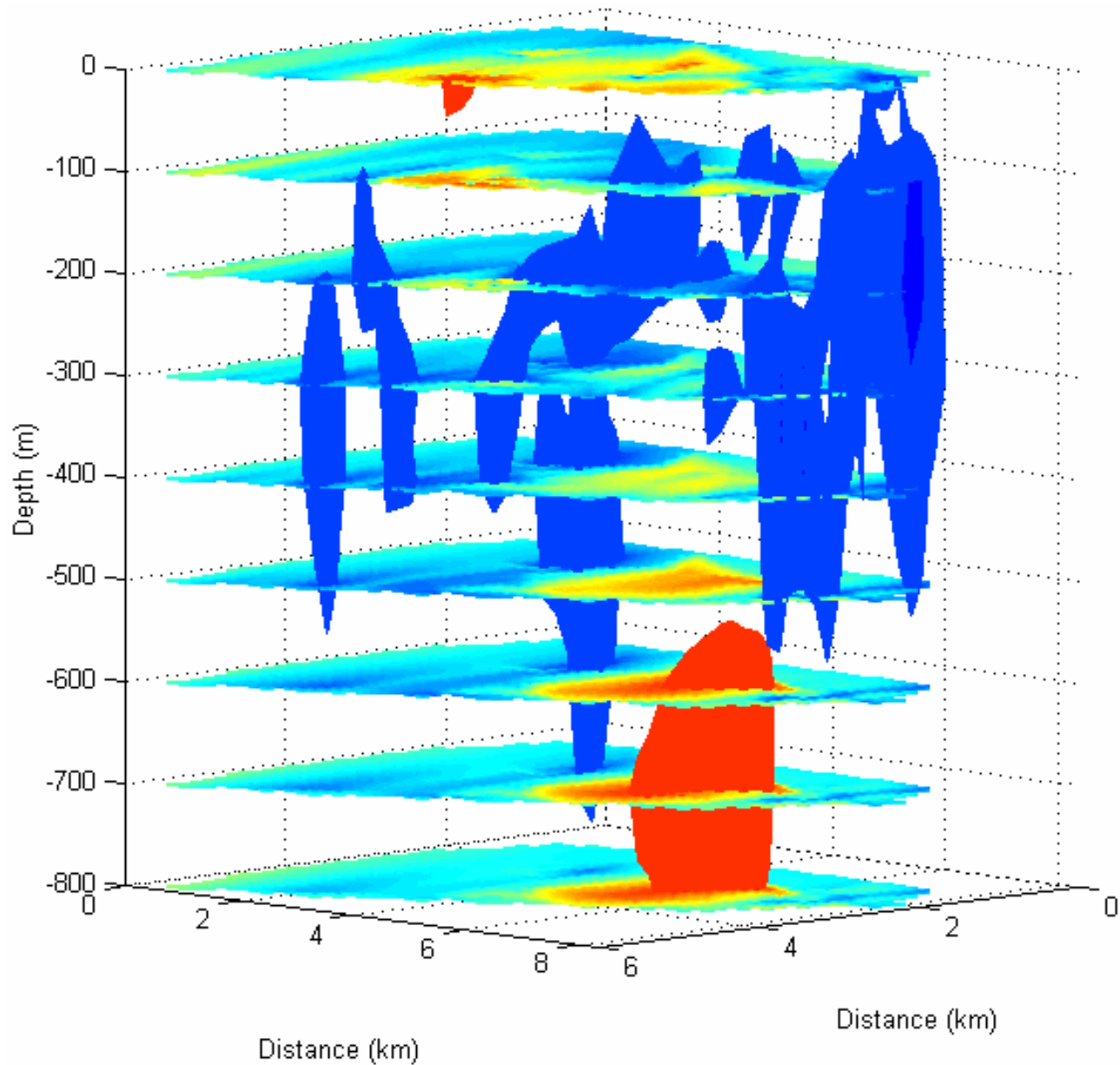
All the British resistivity lines were inverted into 2D cross-sections and then rendered into 3D.

# 3D Resistivity Tomogram Southeast -to- Northwest





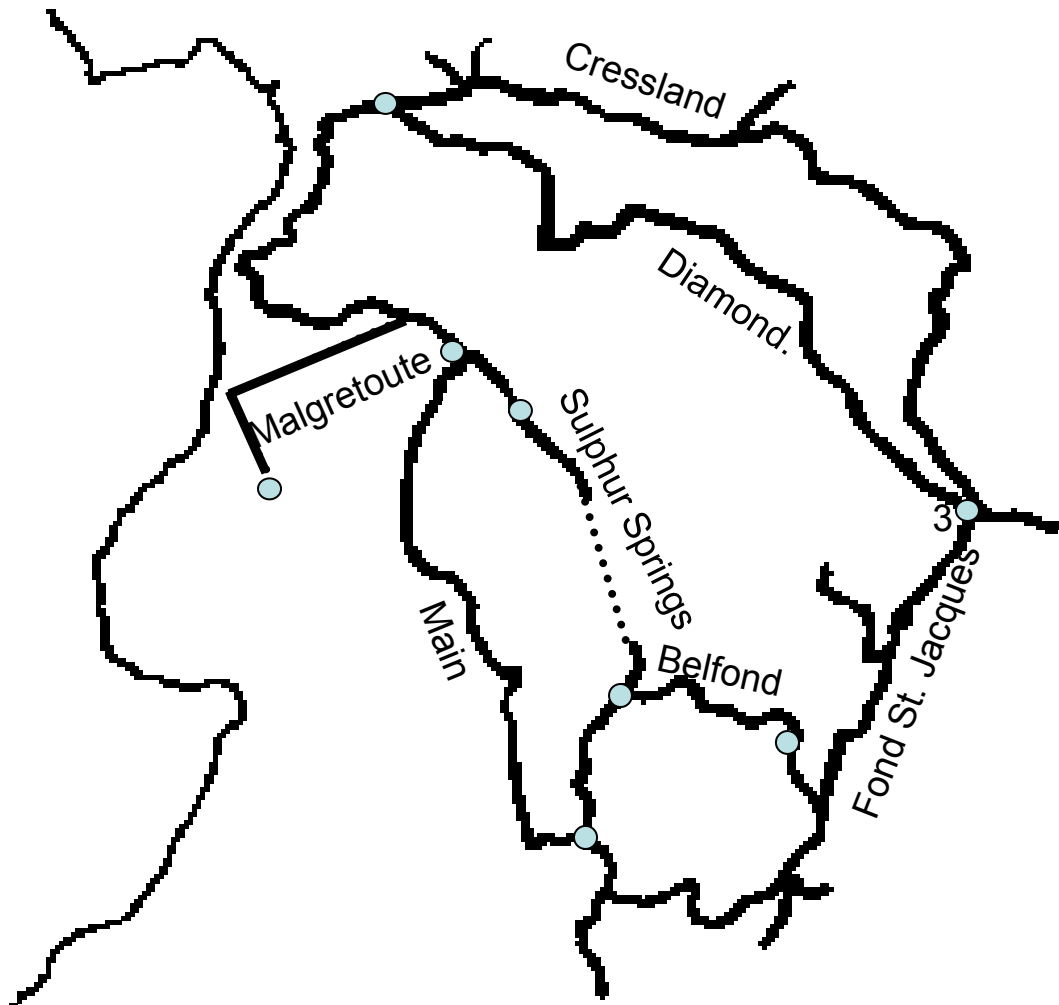
# 3D Resistivity Tomogram Northeast -to- Southwest



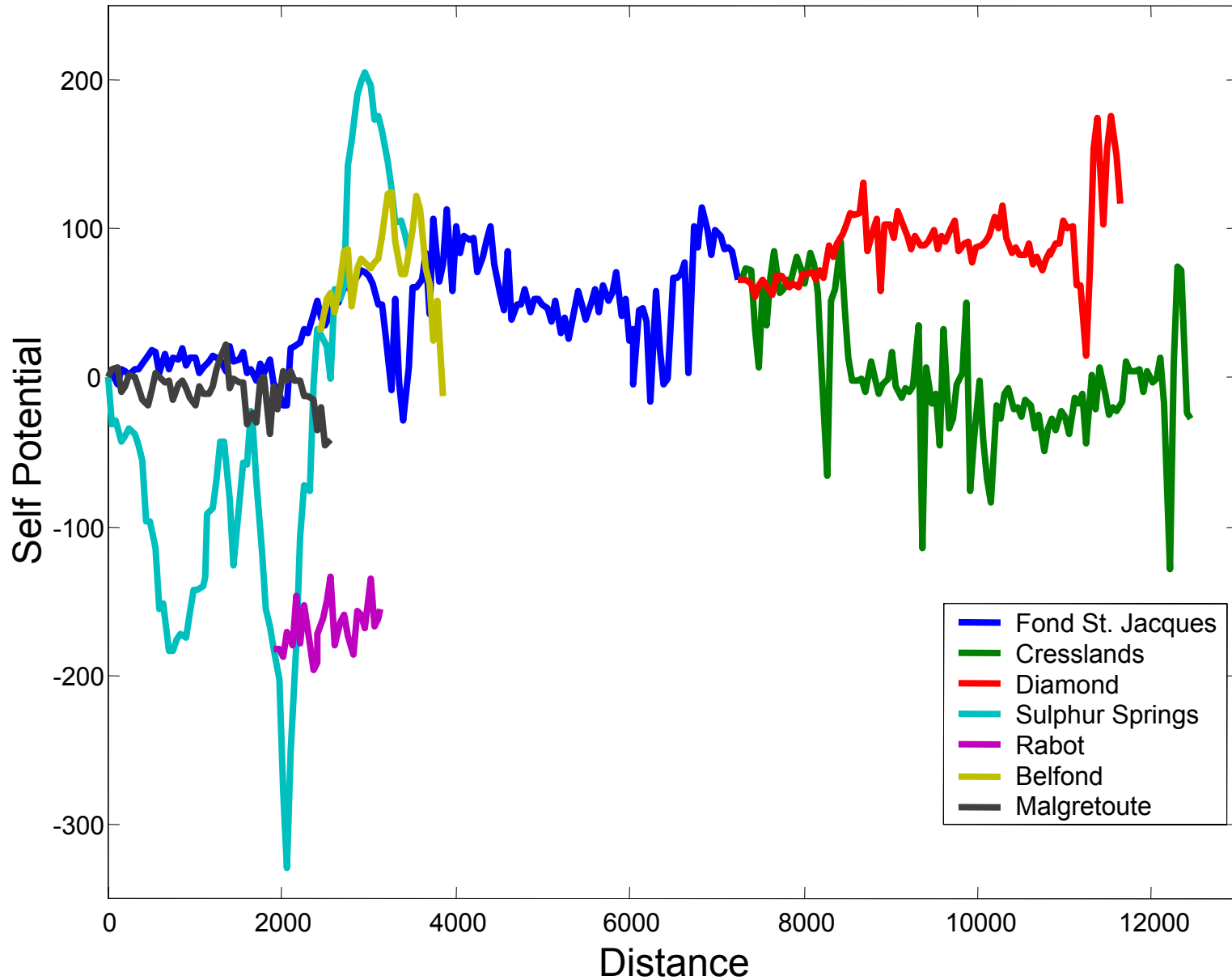
# Self Potential Surveying

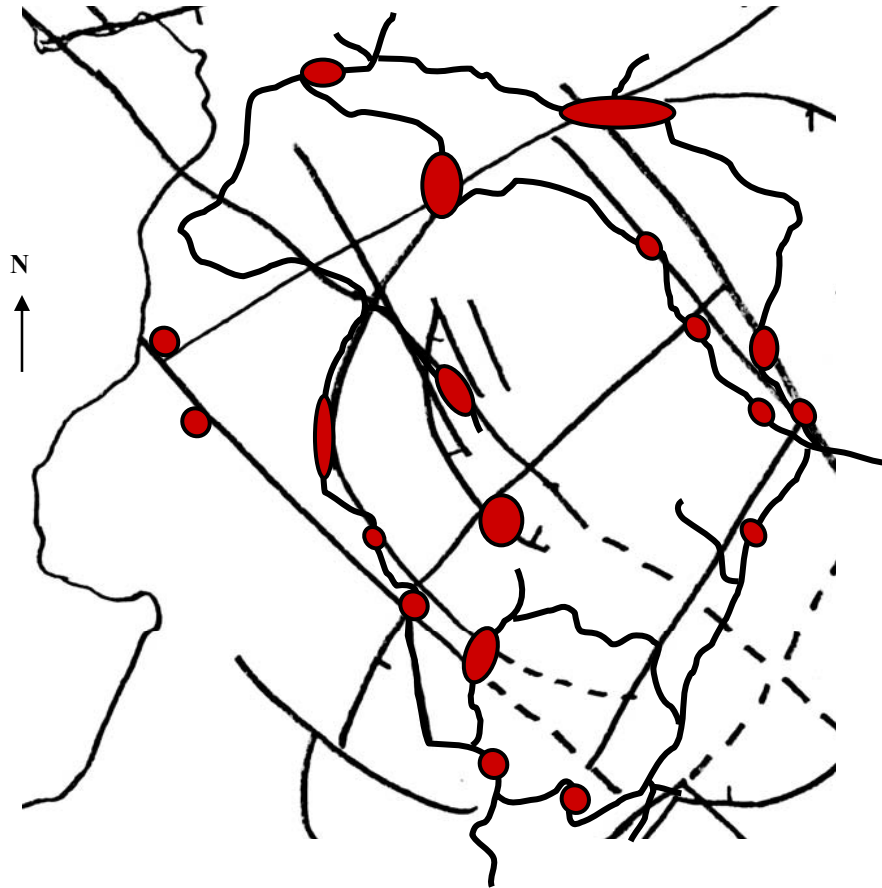
Small, millivolt electrical potentials were mapped, processed and interpreted throughout the Qualibou Caldera.

# SP Survey Lines



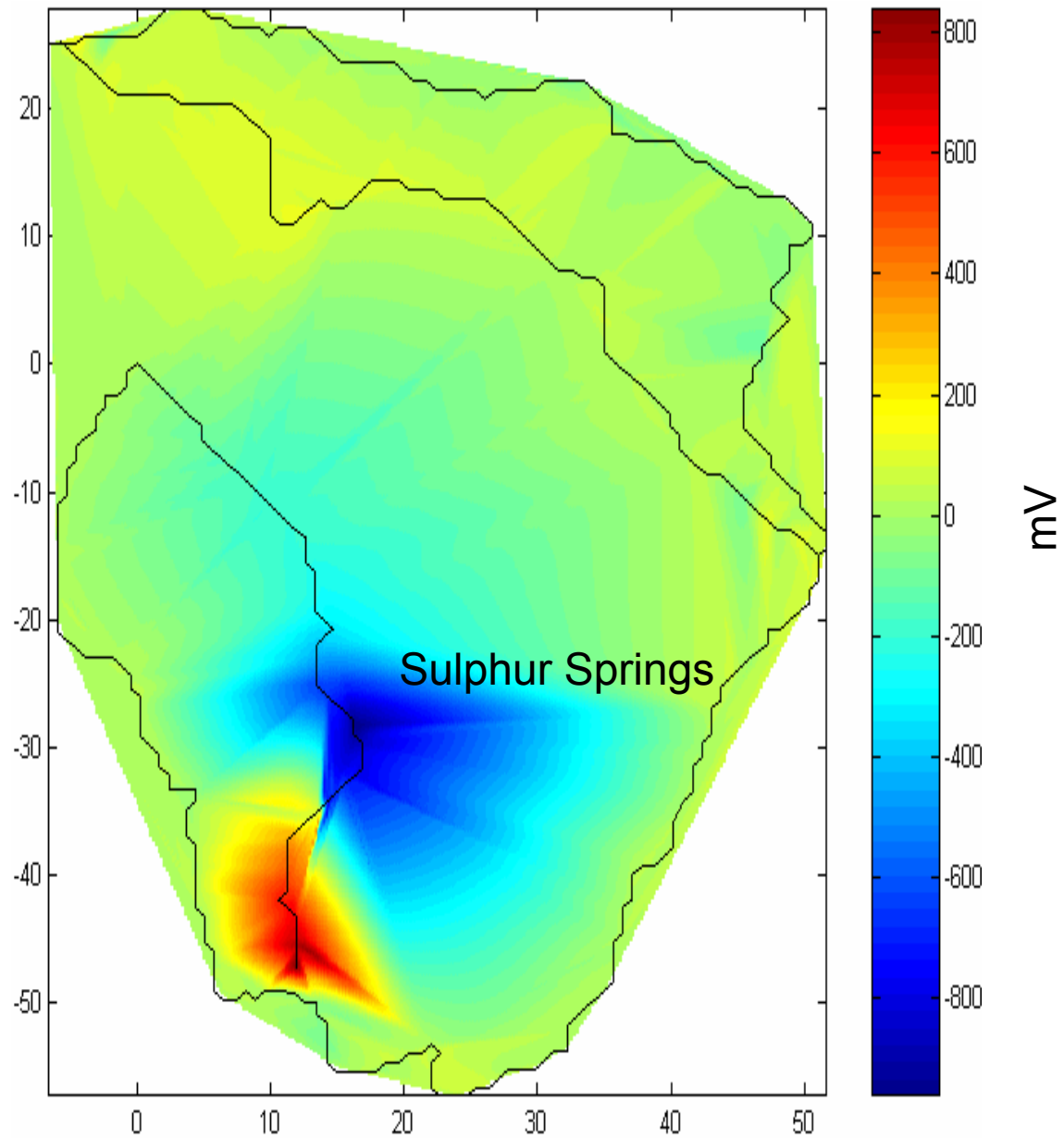
# Individual SP Lines





Correlation of observed SP anomalies and fault locations.

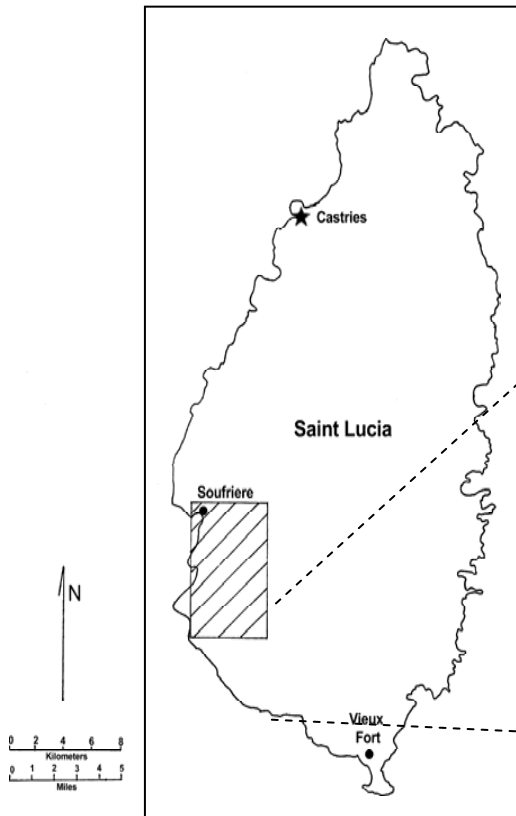
# Interpolated SP Data



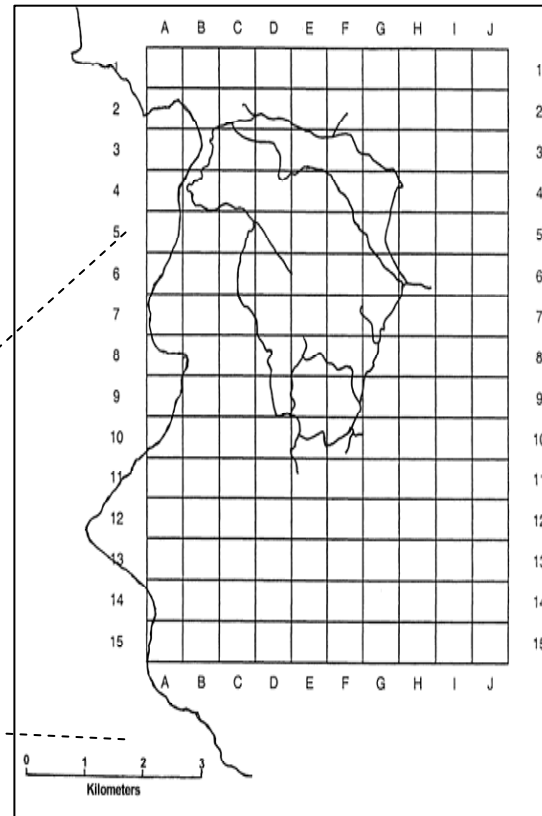
# **Geological/Geophysical Data Integration Using a Decision Analysis Method.**

Eleven disparate data sets were jointly analyzed by a decision analysis methodology to determine possible drilling locations.

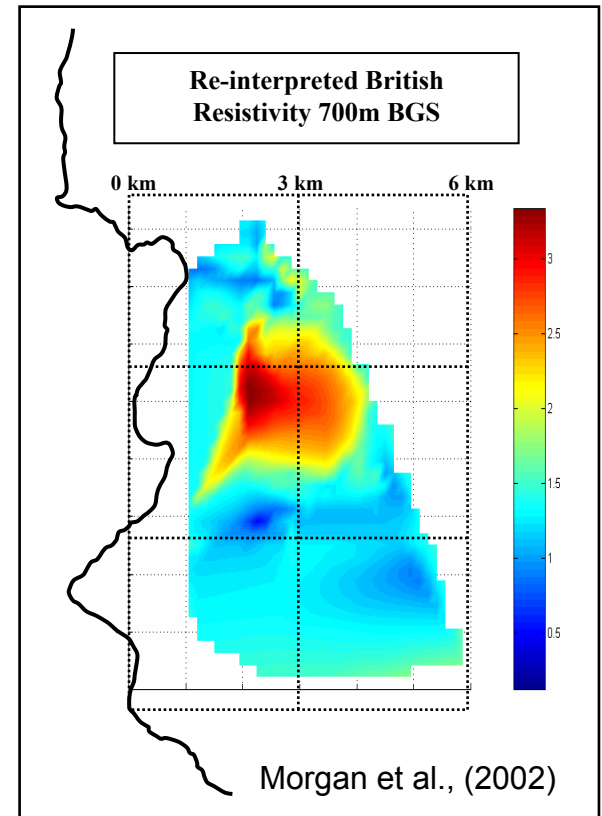
# Method



Target Region



Discretized Caldera

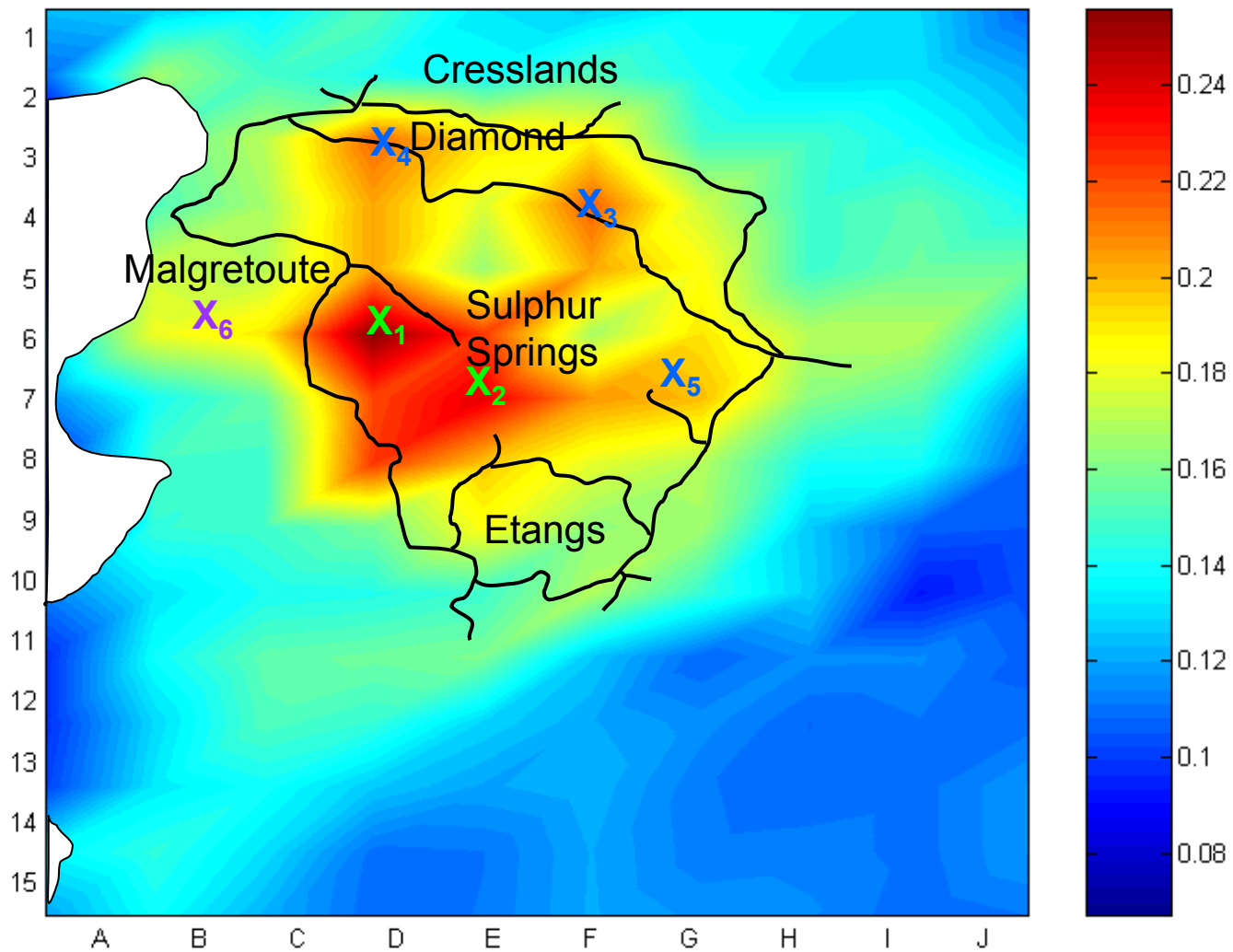


Example Data Map

**Eleven datasets were used:** Seismics, self potentials, fault structure, deep resistivity, shallow resistivity, geology, topography, wells/springs/geochemistry, shallow AMT, deep AMT, and residual gravity.



# Group Result



# Conclusion

Geothermal resource exploration in Saint Lucia is a very difficult endeavor because of:

- Geological complexity
- Highly corrosive geothermal waters.

# Recommendations

- Explore for drilling locations away from the Sulphur Springs to balance improved water chemistry with lower temperatures.
- The probability of success will increase substantially by doing 3D resistivity/self-potential geophysics to accurately locate drilling positions and to avoid the faux pas of the past.