UNIVERSITY OF TWENTE.

DETECTING GEOTHERMAL ANOMALIES FROM SPACE

USING ECOSTRESS LST DATA

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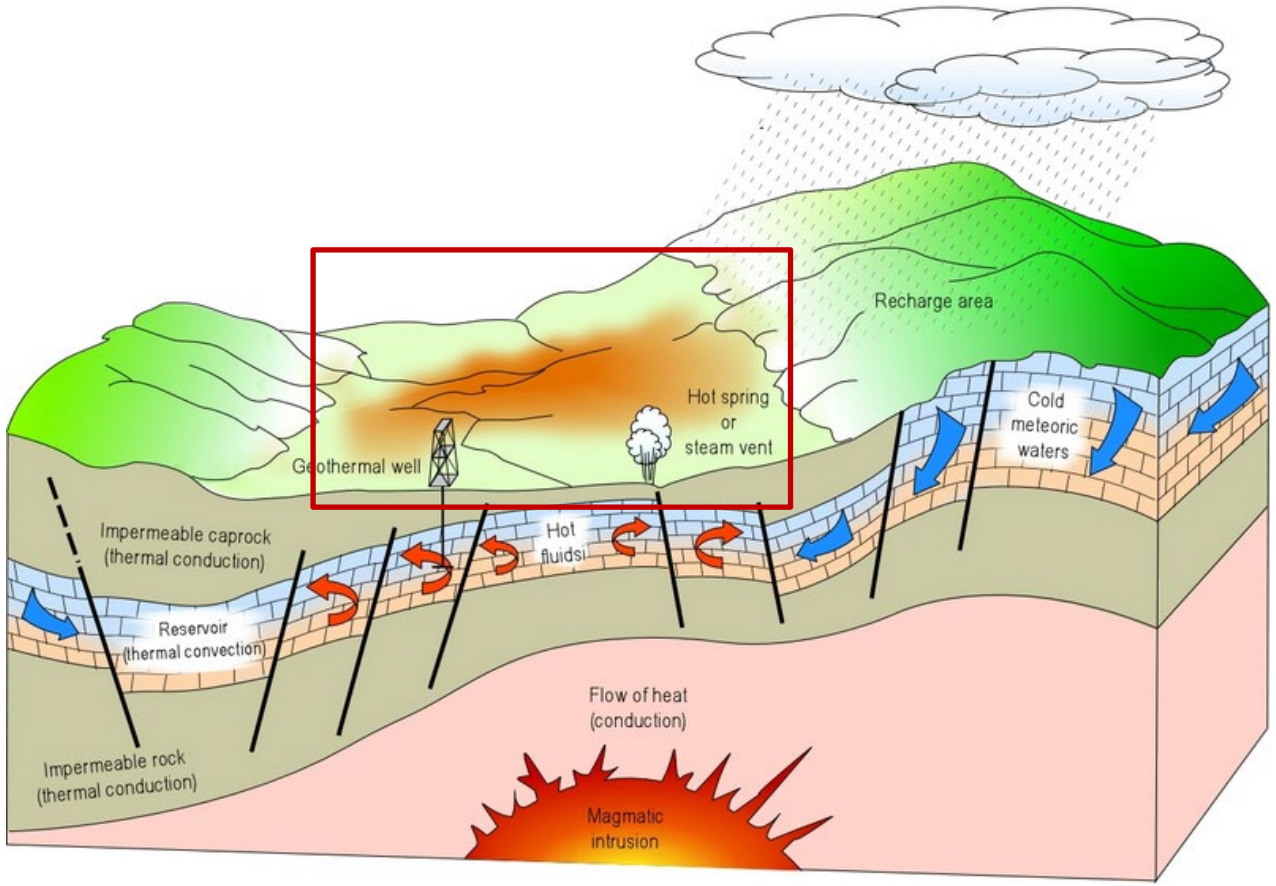
LST_CCI WORKSHOP 2022

ITC FACULTY OF GEO-INFORMATION SCIENCE AND EARTH OBSERVATION

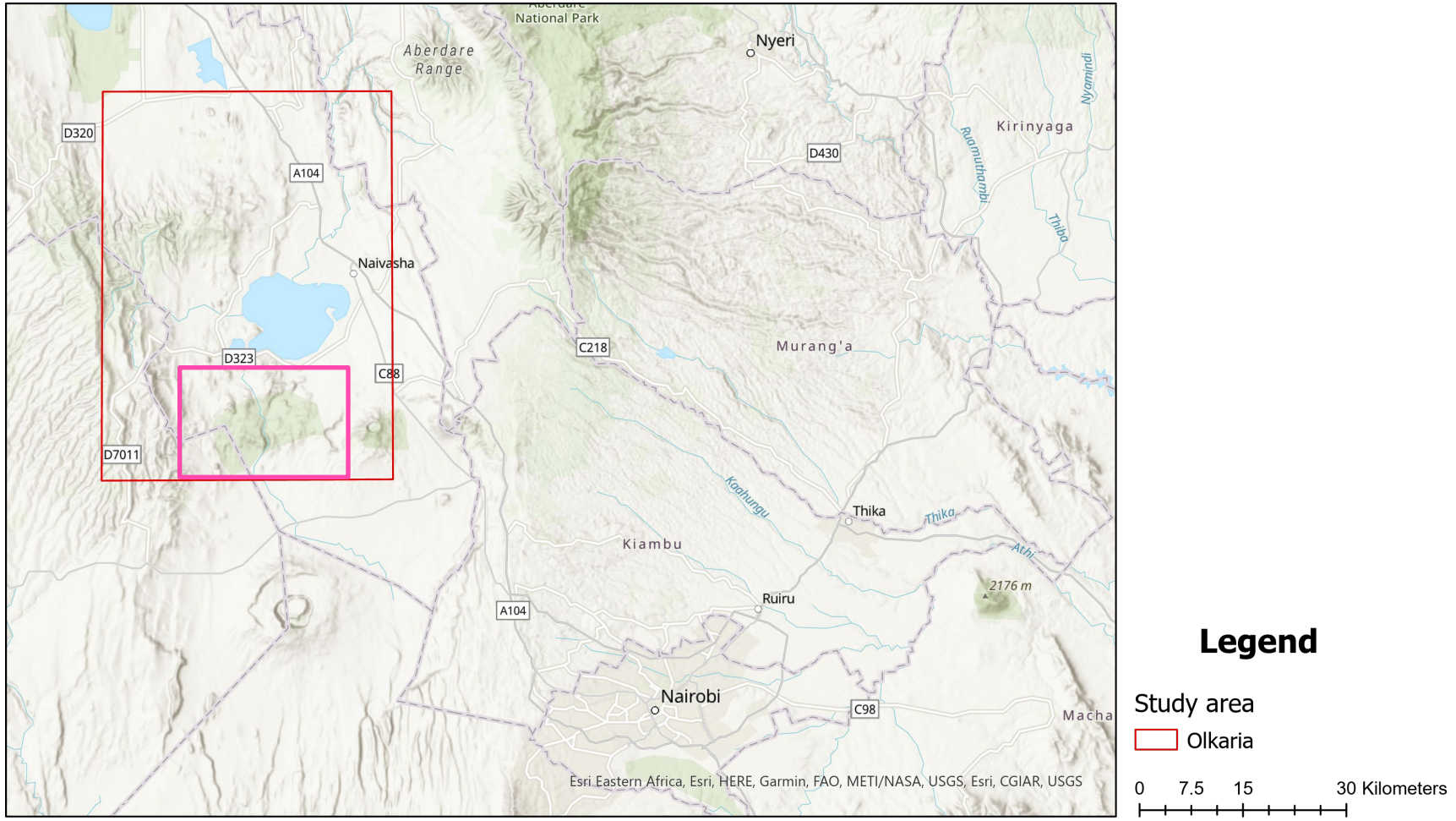
DETECTING GEOTHERMALLY ACTIVE AREAS



Conceptual geothermal system with steam extraction for electricity production and surface manifestations
source: Geothermal-energy.org

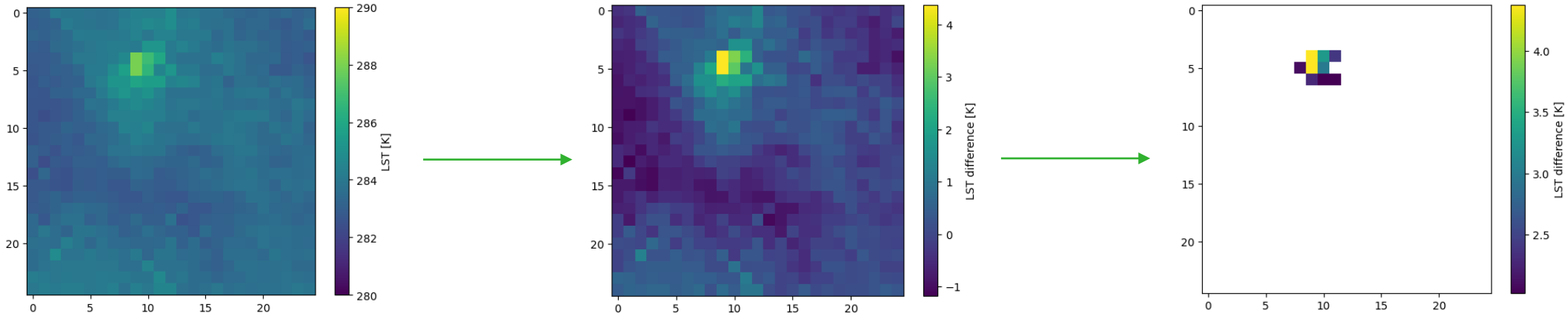
- RS techniques typically focus on surface manifestation such as surface mineral alteration
- Usage of satellite thermal imagery is limited, due to pixel size, and time of overpass
- Using ECOSTRESS can be a solution

STUDY AREA – OLKARIA, KENYA



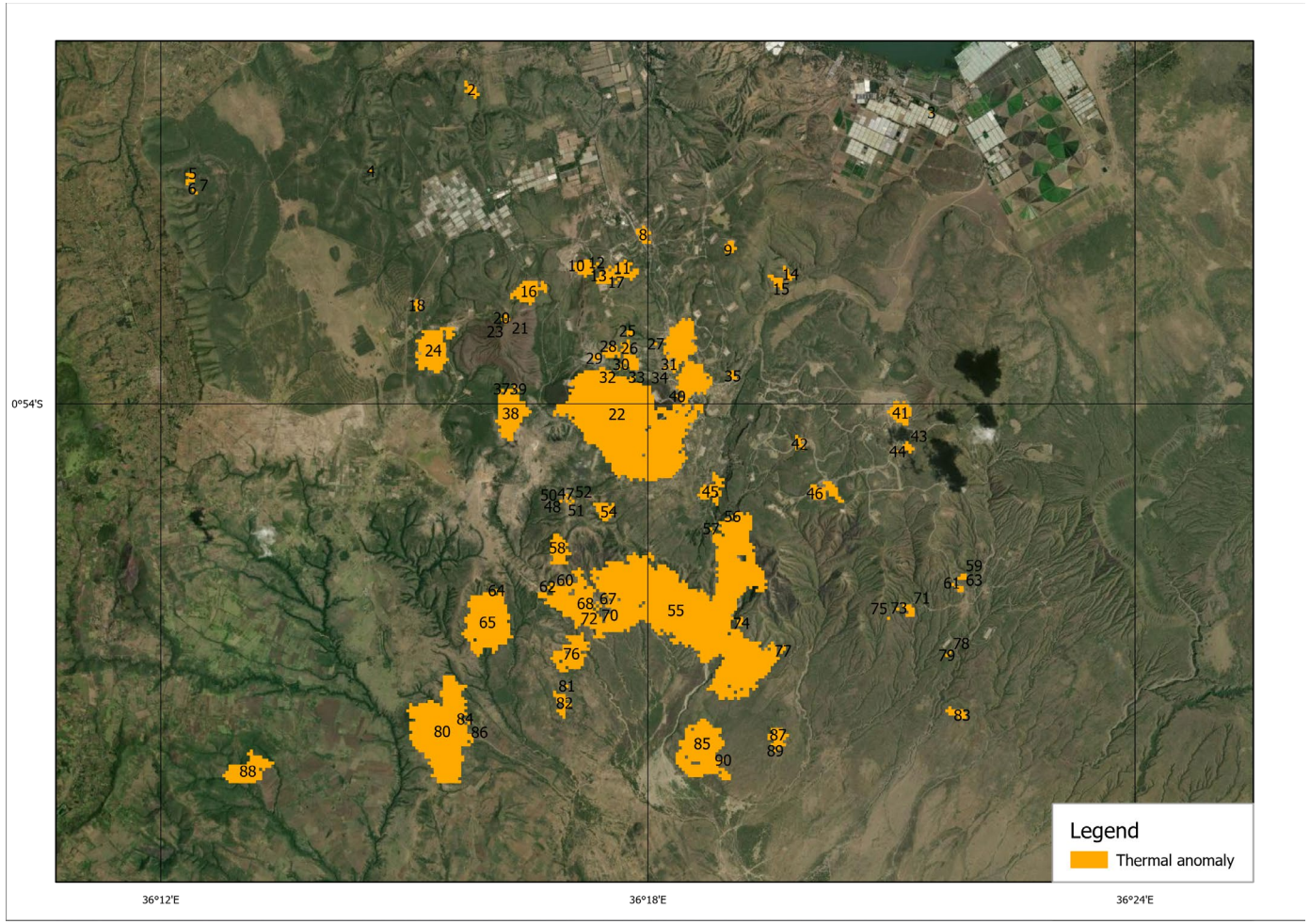
DETECTION USING THERMAL IMAGERY

- The method uses kernel based thresholding



- Parameters can be adjusted to a specific study area
- Consideration of direct neighbourhood of geothermal anomaly
- Even smaller and/or weaker anomalies can be detected

RESULTS



FIELD WORK IN OLKARIA, MARCH 2022

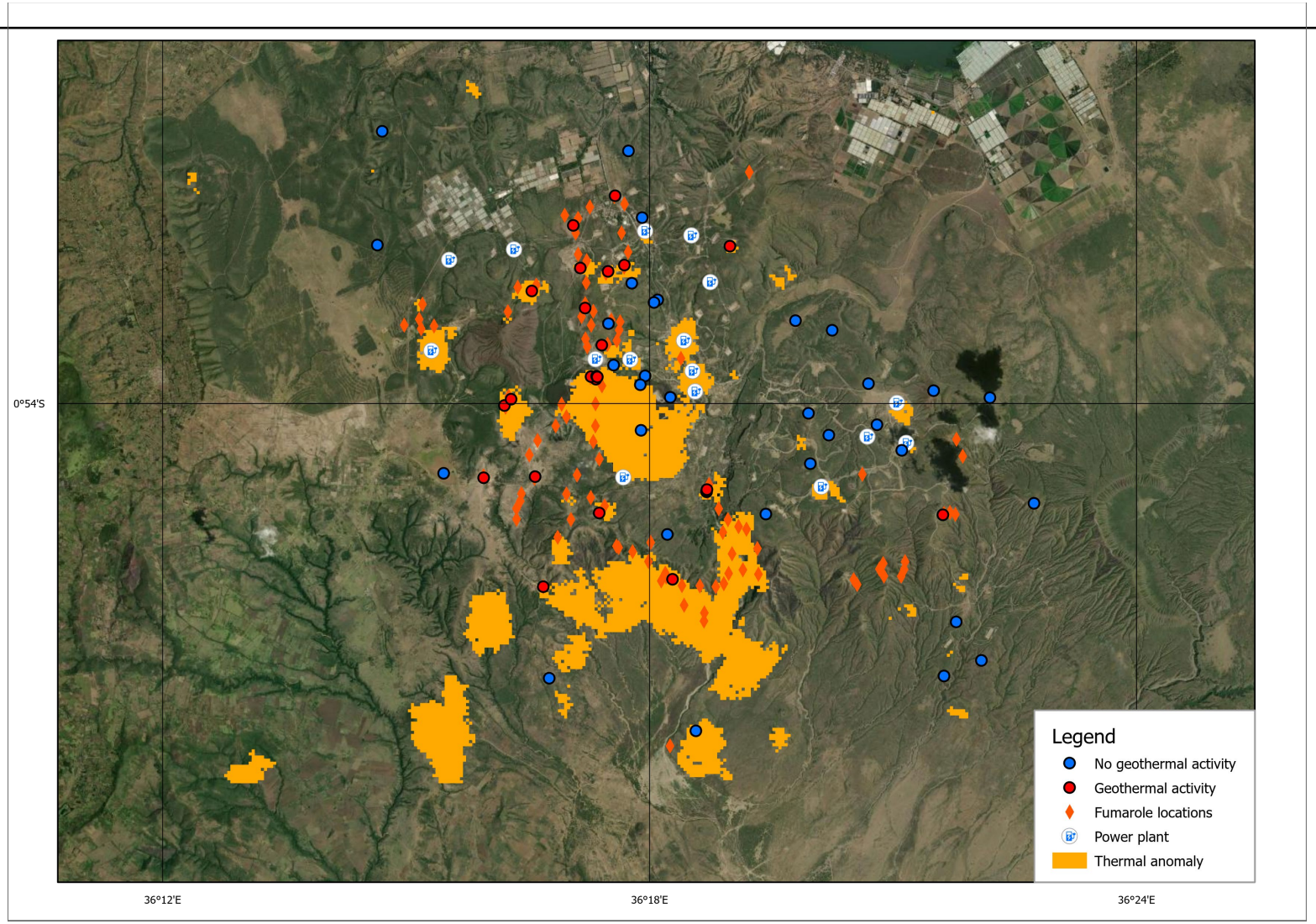
Temperature measurement

- > 50 temperature loggers
- buried at 20 cm depth
- 6-8 weeks measurement time
- 15 minute interval

Heat flux measurement

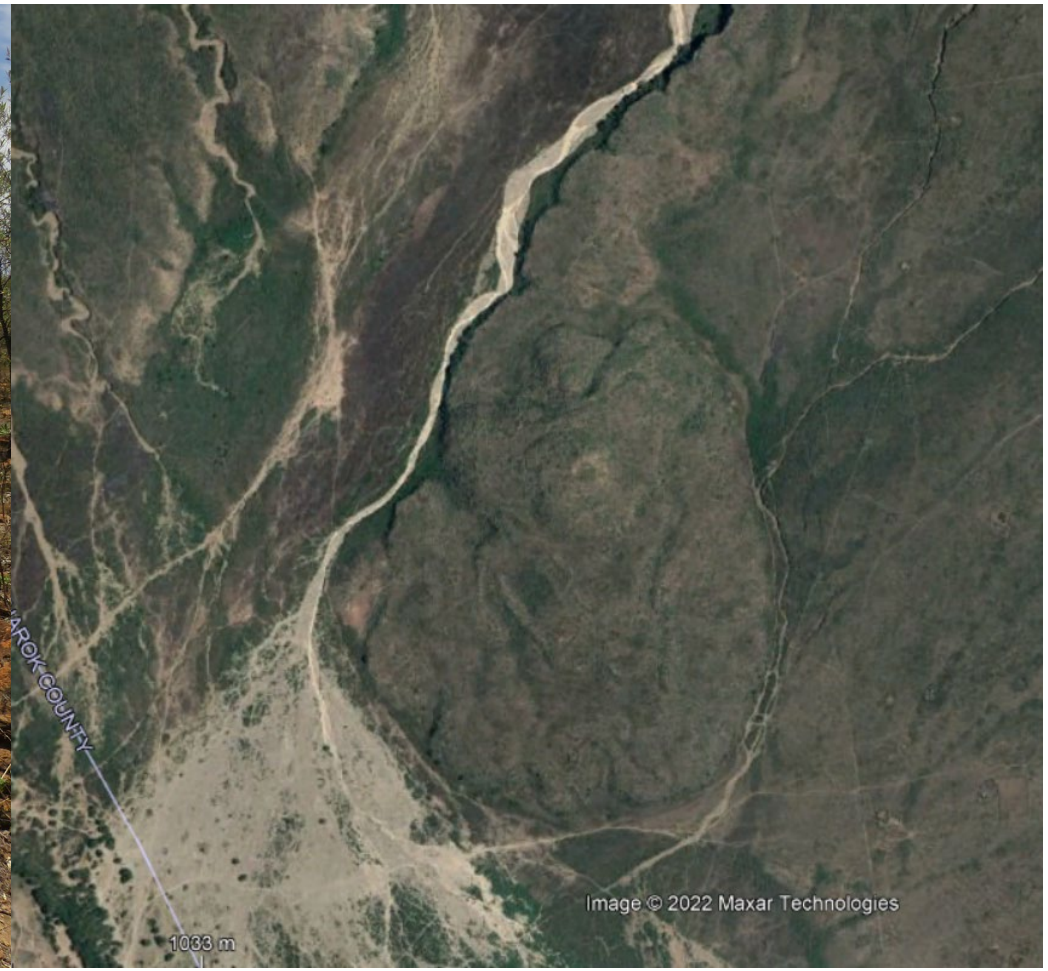
- 3 heat flux plates:
  - at strong geothermal hotspot
  - at weak geothermal hotspot
  - at non-geothermal area
- buried at 20 cm depth
- with a temperature logger above and below (at 10 cm and 60 cm)

VALIDATION DATA



K24 – NOT DETECTED ANOMALY

K36 – FALSE POSITIVE DETECTION



PRELIMINARY VALIDATION - SUMMARY

	Accuracy	Description
Overall accuracy	78.4%	Correctly classified points (both classes)
Producer's accuracy	66.7%	Correctly classified as hot, of all known hot points
User's accuracy	91.1%	Correctly classified hot anomalies of all classified points
Omission error	33.3%	Incorrectly classified as cold, of all known hot points
Commission error	8.9%	Incorrectly classified as hot, of all classified hot points

NEXT STEPS

- Further analysis of the results
  - What are the influencing parameters on the detection errors?
    - Vegetation cover
    - Weather conditions
    - Slope direction
    - Rock formation properties
    - …
  - Can we optimise the methods?
- Wait for the main results: the temperature logger data
- Analyse the heat flux plates data

THANK YOU!