INVESTIGATING DYNAMIC THERMAL PROCESSES TO OPTIMIZE GEOTHERMAL HOTSPOT DETECTION

“USING ECOSTRESS TO EMPOWER THE ENERGY TRANSITION”

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ECOSTRESS WORKSHOP DECEMBER 1, 2020

UNIVERSITY OF TWENTE.

FACULTY OF GEO-INFORMATION SCIENCE AND EARTH OBSERVATION
GEOTHERMAL SURFACE MANIFESTATIONS

GT surface manifestations:

Clay alteration (SWIR hyperspectral)

Structures (LiDAR DEM)

Surface hotspots (TIR)

=> Starting point for detailed exploration
ECOSTRESS TO THE RESCUE

- Ideal to test new approaches:
  - Precessing orbit (different acquisition times)
  - Diurnal time series
  - Suitable pixel size (<100m)
  - Swath

- Objective 1: Quantify effect overpass time on detections
- Objective 2: Optimize detections through use of time series
STUDY AREAS

Three areas with ground information, airborne TIR surveys and ground-based fumarole monitoring.
PROGRESS?

- COVID-19: Universities prioritize education
- Post-doc position funding (3 years; starting 2021)
- Study areas defined and acquiring data

Example of acquired scenes for Waiotapu until March 7, 2020; their quality and relation to local sunrise/sunset
FUMAROLE MONITORING

Remote fumarole monitoring without telemetry / without remote system health info

WORKING EXAMPLE

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FUMAROLE MONITORING – HARDWARE UPGRADE

Upgraded control units prepared and shipped

On-site hardware upgrade done with the support from partner KenGen

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FUMAROLE MONITORING – DATA COMING IN

Olkaria Fumarole 8: time series of single pixel

Olkaria Fumarole 8: first 3 days of 2020

MSc student Benard Omwenga working on data

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TO BE DISCUSSED

- Plan: rollout of results to (near-) global scale
- Needed: acquisition of sufficient (night) data until end of mission
- Question: is it feasible?

Global distribution of high enthalpy geothermal energy potential

Source: energyeducation.ca
Study areas
- Namibia – Haib & Omaheke areas

Aim
- investigate the surface and sub-surface geological influences on multi-temporal thermal acquisitions

Methodology:
- Compare changes in surface temperature with time over different outcropping and sub-surface geology.
- Calculate the Apparent Thermal Inertia from optimal and proximal day / night ECOSTRESS pairs of surface temperature observations.

=> faults, outcrops, sand covered geology

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SPIN-OFF: THERMAL INERTIA

Omaheke Geology

ECOSTRESS: 20190602T000142
2 June 2019, Local time 02:01 am

Result:
Give a glimpse at physical properties at shallow subsurface
Link between surface rem sens and subsurface geophysics
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