Drone based photogrammetry data at the Geysir geothermal field, Iceland
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1. Licence

2. Citation

When using the data please cite:

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The data are supplementary material to:

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3. Data Description

Geysers are localized hydrothermal vents that periodically erupt with gas bubbles at the surface. Understanding their distribution, dynamics, and conduit geometry is critical to understand the fluid and heat transfer through the crust. To explore this at the Geysir geothermal field in Iceland, we analyzed the spatial distribution of thermal features using high-resolution UAV-based optical and infrared cameras. Based on this, Walter et al. (2020) identified 364 distinct thermal spots. Here we release the high-resolution drone orthomosaic dataset at the Geysir geothermal field, Iceland.

3.1. Sampling method

The field campaign and subsequent findings are derived from UAV data collected between July 27th and August 5th, 2016. We used lightweight cameras mounted on a modified DJI Matrice 100 quadcopter drone, allowing flight durations of over 30 min and simultaneous use of optical and thermal cameras. Flight control was based on GPS, with live video feed to the operator and predefined flight paths. Overflights were conducted at different times to optimize image quality: daylight flights at 5:00 local time for optimal contrast for the optical camera, and cold night flights at 3:00 local time for the infrared camera. Altitudes were 120 meters above ground to ensure comprehensive image coverage. The optical camera, a DJI Zenmuse X5R, captured 16-megapixel images at 2 frames per second, with each image geotagged by GPS. The thermal camera, a FLIR Tau 2, had a fully radiometric resolution of 640 × 512 pixels and a spectral band of 7.5-13.5 µm, with GPS geotagging for each image.

3.2. Preparation procedure:

The optical and infrared images were split into two sets and reprocessed for photogrammetry using Structure from Motion (SfM) using the Agisoft Photoscan Pro software (version 2.1) to convert two-dimensional images into high-resolution three-dimensional surfaces. Data requirements include a constant focal length, proper acquisition geometry, over 80% image overlap, and ground control points (GCPs) for georeferencing. Although we geotagged our drone cameras, we added 20 GCPs using RTK GPS to improve geolocation accuracy. Image alignment uses pixel pairs to estimate the camera projection.

3.3. Data processing

Sparse point clouds are generated from the tie points, resulting in a dense reconstruction of 88.4 million points for optical images and 17.2 million for infrared. The resulting models include 5.9 million and 1.2 million faces for optical and infrared data, respectively, with pixel resolutions of 6.57 and 23.8 cm for digital elevation models and orthomosaics. More information about the data acquisition, data handling, processing of the optical and thermal infrared images and alignment is provided in the paper by Walter et al. (2020).

4. File description

Here the photogrammetrically processed Geyser drone optical and thermal infrared data is provided. This includes orthomosaic maps of the optical and the thermal data. And this also includes two digital elevation models generated from the optical and the thermal data, respectively. We note that due to the higher pixel size of the sensor, the optical resolution is always better than the thermal resolution.

Temperature is always the so-called apparent temperature, for more details and the scale we refer to the paper Walter et al. (2020). Finally, for simplicity we also provide google earth image file formats (.kmz-files).

4.1. File inventory

The zipped folder “2024-001_Walter_Data” contains two subfolders corresponding to orthomosaic maps and DEMs (“2024-001_Walter_GEOTIFF-Files”) and the google earth image files (“2024-001_Walter_kmz-Files”) together with a data description (“2024-001_Walter_Data-Description.pdf”).

4.2.File naming convention

File names include the location, the data type (orthomosaic or digital elevation model), the sensor (optical or FLIR), and the resolution.

4.3. Description of data tables

1) Orthomosaic in WGS84 projection derived from optical drone data, 5 cm resolution, available as GEOTIFF and as a Google Earth KMZ file

- 2024-001_Walter_Geyser_Orthomosaic_DroneOpticaldata2016_5cmres.tif
- 2024-001_Walter_Geyser_Orthomosaic_DroneOpticaldata2016_5cmres.kmz

2) Digital elevation model (DEM) in WGS84 projection derived from optical drone data, 7 cm resolution, available as GEOTIFF file

- 2024-001_Walter_Geyser_DEM_DroneOpticaldata2016_7cmres.tif

3) Orthomosaic in WGS84 projection derived from thermal infrared drone data, 24 cm resolution, available as GEOTIFF and as a Google Earth KMZ file

- 2024-001_Walter_Geyser_Orthomosaic_DroneFLIRdata2016_24cmres.tif
- 2024-001_Walter_Geyser_Orthomosaic_DroneFLIRdata2016_24cmres.kmz

4) Digital elevation model (DEM) in WGS84 projection derived from optical drone data, 7 cm resolution, available as GEOTIFF file

- 2024-001_Walter_Geyser_DEM_DroneFLIRdata2016_24cmres.tif

5. References

Walter, T. R., P. Jousset, M. Allahbakhshi, T. Witt, M. T. Gudmundsson, and G. P. Hersir (2020), Underwater and drone based photogrammetry reveals structural control at Geysir geothermal field in Iceland, J. Volcanol. Geotherm. Res., 391, 106282.
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