EXPLORING HYPOTHESES ON KAREZ INITIATION AND DECLINE IN THE FLAMING MOUNTAINS FROM A PHOTO MODELLING CAMPAIGN

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1. INTRODUCTION

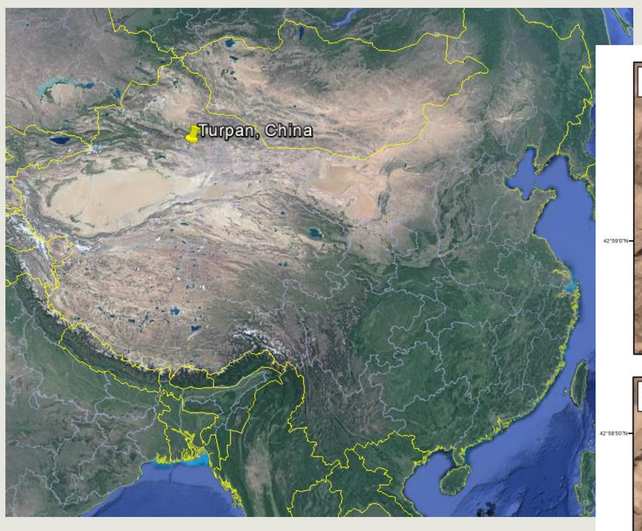
Objectives

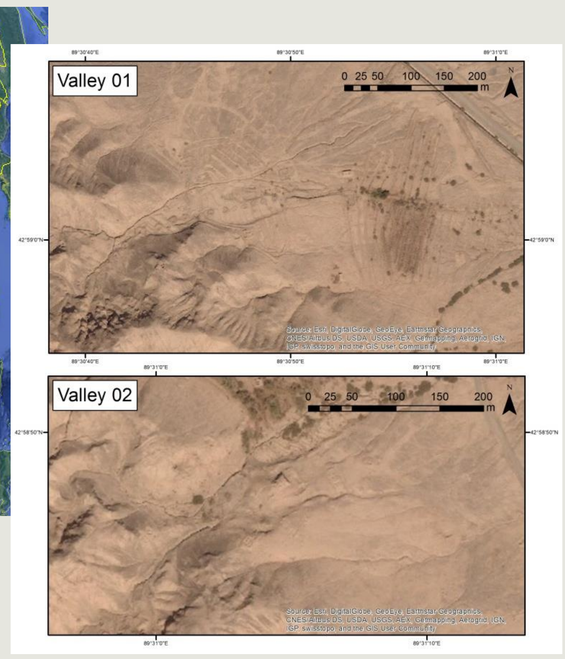
The main objective was to map two areas that contain karez systems in 3D in order to link surface topography and gully incision levels to the underground karez systems.

Application of the 3D models

The 3D models will be used to assess the evolution and dynamics of the karez systems. In this way, the presence of hydrogeomorphic forcing will be examined that may have resulted in gully incision with deeper floors than the first-generation karez system leading to the necessity of excavating a newer and deeper karez system.

2. STUDY AREA





Valley 1

outflow of valley: terraces

central part of valley: karez system(s)

Valley 2

well preserved karez

deep gully erosion

sub-valleys with narrow valley floor

remnants of watch tower

3. DATA ACQUISITION AND PROCESSING

SURVEY

May, 2016	Prospection and selection of valleys near Turpan, China
August, 2016	Photographing valley floor, Karez and buildings

MATERIALS

Camera

Sony Nex 5R

Platform

Fishing pole (4 to 6 meters)
Hand

Topographic measurements

Tape measure
- Distances for scale
- Depths of Karez

DIGITAL IMAGES → 3D SPATIAL DATA

Agisoft PhotoScan: photogrammetric processing
(‘*structure from motion*’)

4. RESULTS

- > 25,000 usable photographs
- point clouds of valley floors and slopes

dense point cloud of the central part of valley 1
karez holes and gully near mountain slope are visible

6. FUTURE RESEARCH

DATA PROCESSING

- Based on the dense point clouds and scale measurements, 3D models will be constructed that will form photorealistic representations of the valleys.
- The measured depths of the karez will be integrated in the 3D models in order to model the karez shafts to allow a comparison with the modelled gully.

ANALYSIS

Based on the finalised 3D models, underpinned assumptions can be made with respect to the need of developping a deeper karez system in response to the gully incision.

7. ACKNOWLEDGEMENTS

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