3D Modeling of Glacial Erratic Boulders in the Haizi Shan region, eastern Tibetan Plateau

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Abstract:

The purpose of this project is to search for what caused the great global warming at the end of the last ice age. Such information will improve understanding of how the climate system may respond to the human-induced buildup of fossil carbon dioxide. To reconstruct past glacier behavior, boulders deposited by past glaciers were sampled to find the rate of recession. Each sample is tested to determine the age of the boulder using Beryllium 10 cosmogenic-nuclide dating. This portion of the research focuses on creating 3D models of the sampled boulders. These high-resolution 3D models afford visual inspection and analysis of each boulder in a virtual reality environment after fieldwork is complete. Also, a model can be useful for recognizing patterns between age and boulder morphology. Lastly, the models can be used for those who wish to review the data after publication.

Procedure:

To create the 3D models, a Hero4 GoPro and a Canon PowerShot digital camera were used to collect photographs or video of each boulder from different angles with a measuring tape laid out to 2 meters beside the boulder. Then the digital imagery was processed using 'structure-from-motion' techniques and Agisoft Photoscan software. Stills from the video were pulled using a program written by a member of the University of Maine. Lastly, the other members of the research team added them to an environment that can be accessed through virtual reality technology.

Concluding thoughts:

Due to the GoPro requiring an extra step of pulling still frames from the video with a frame extract program, the camera was simpler to work with. Small discrepancies in the video affected the final model. In sample LGT-17-02 , the video had several obstructions in the background. One advantage of the GoPro was the ability to document larger boulders with an extension stick attached to the GoPro. However, adding an extension stick to the camera would have also had the same effect. Overall, using the camera's photos was a more ideal process, for it was less trouble and the models show as much, if not more in some cases, detail as those originating from a video.
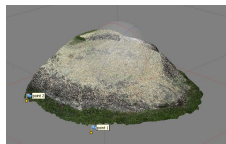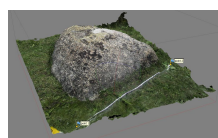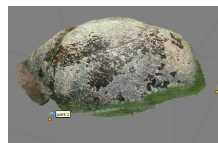
Original Pictures   **Camera 3D Images**   **GoPro 3D Images**

Sample LTG-17-07

Sample LTG-17-01

Sample LTG-17-125

Sample LTG-17-02

Image 1- Global view of study site
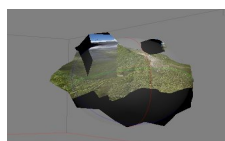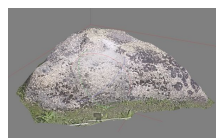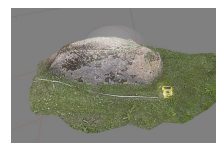
Additional Photos From the Field

Image 2- Drilling out a sample for the first time.

Image 3- Deciding if a boulder was to be sampled.

Image 4- Preparing to cross a river to get to the next moraine of study.

Image 5- Beginning the process of hammering out the sample after making a drill hole for shims and wedges