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Introduction

College of the Atlantic's two island research stations, Great Duck Island and Mount Desert Rock, are integral parts of student research programs at the College. However, published geologic data are lacking for both islands.

The goal of this project was to conduct field and remote mapping of the two islands to produce baseline geologic and geomorphic maps as well as to obtain geochemical and geochronological data.

These data will serve as a preliminary resource for future geographical, biological, ecological, geological, and historical research on the islands and surrounding region.



Great Duck Island: Geologic Map

GDI Granite
 $238\text{U}/206\text{Pb}$ age:
 $313.3 \pm 3.0 \text{ Ma}$

GDI Bedrock Type

- Felsites
- Granite
- Rhyolite

Legend:

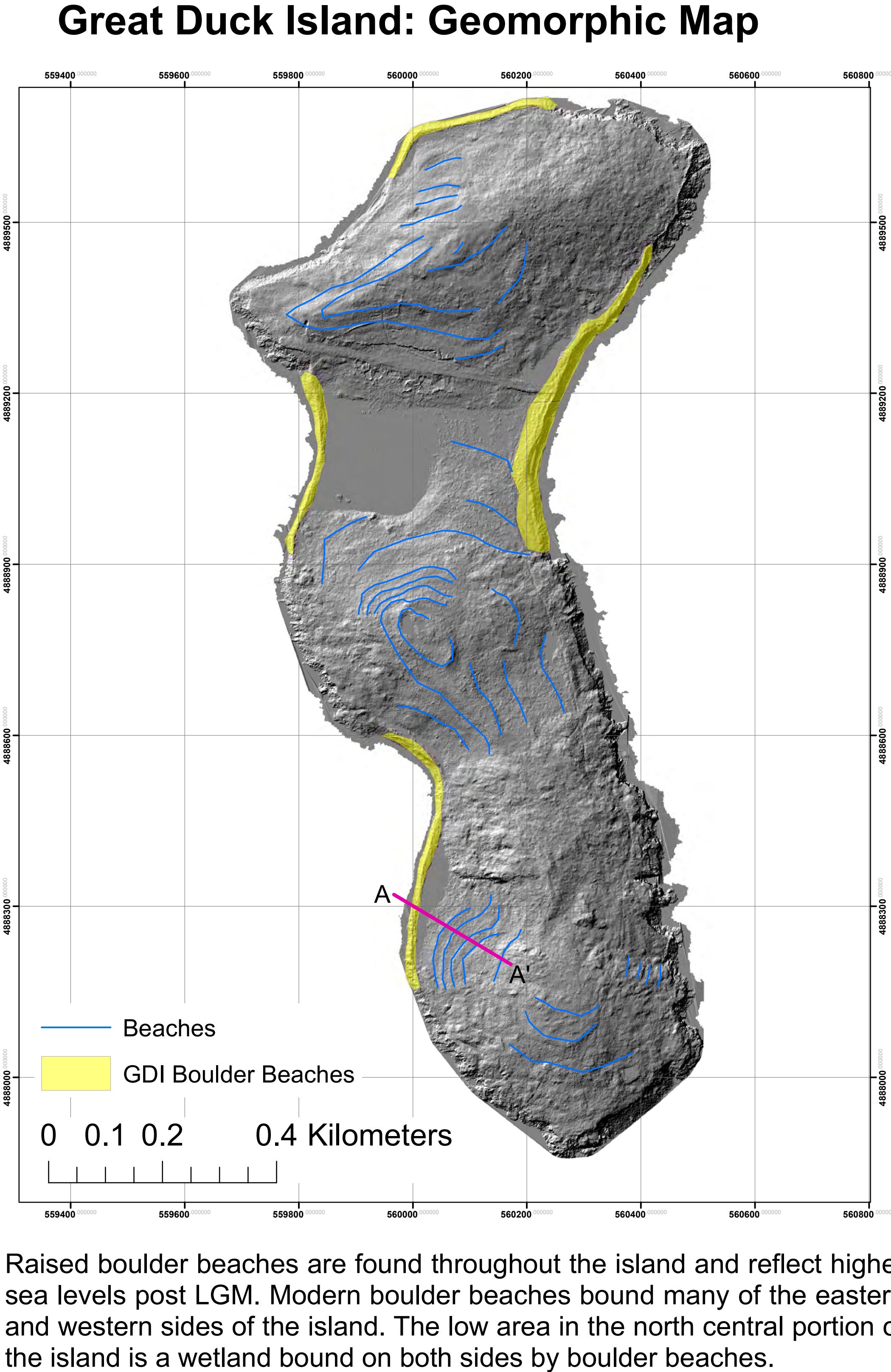
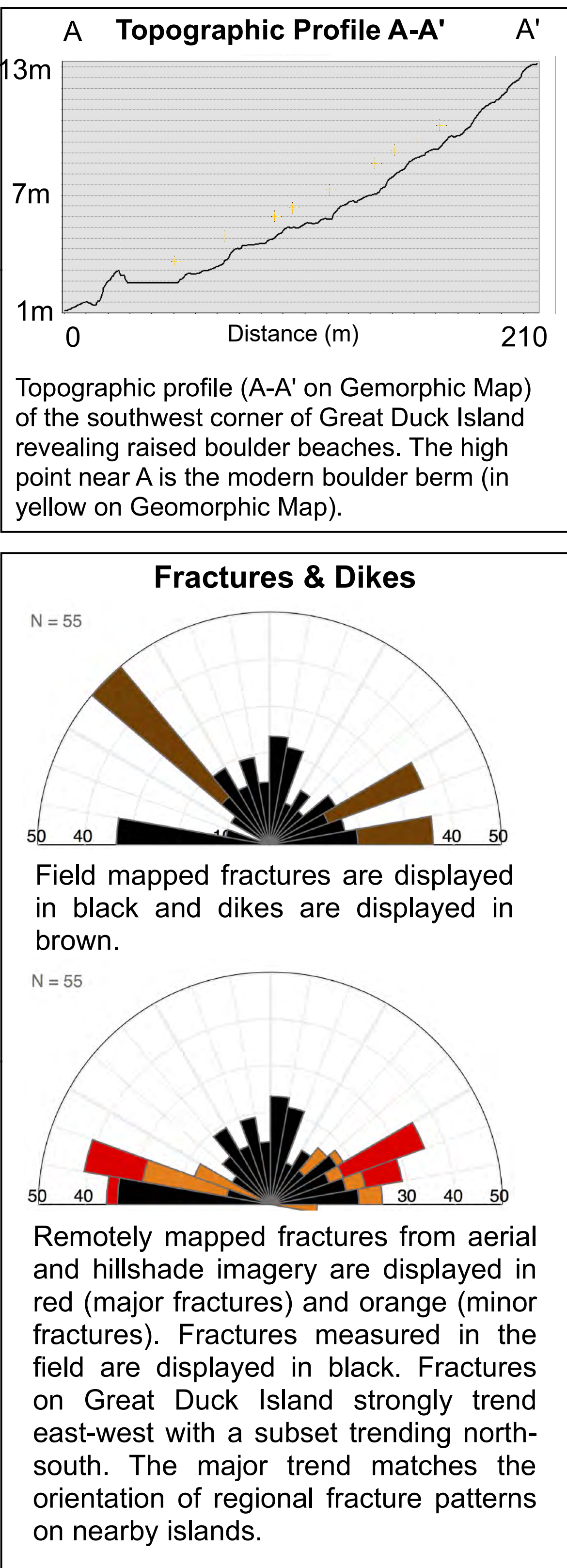
- GDFaults
- GDI Dikes
- GDIContact

Scale: 0 0.125 0.25 Kilometers

Inset 1: 12' wide basaltic dike cut by felsic dike with pegmatitic

Inset 2: Granite contains distinctive euhedral titanite visible in thin section. (Scale: 0.1 mm)

Granite dominates the southern half of the island. Fingers of felsites as well as blocks of altered metasedimentary rocks are found in contact with both the granite and rhyolite. Rhyolite blocks within the granite suggests the granite is younger. The contact between the granite and rhyolite is gradational through the central portion of the island, which is also the site of many basaltic dikes and fracture zones.



Yttrium Vs Niobium

Ytterbium + Niobium Vs Rubidium

Trace Element Abundances

Legend:

- × GDI-8-SG, Rhyolite
- GDI-10a-SG, Granite
- MDR-SG, Granite
- Seawall-SG, Granite

Great Duck Island Granite

Phaneritic

Quartz (QTZ) (30%): Generally anhedral. Greater than 1 mm in diameter. Sometimes undulose.

Potassium Feldspar (36%): Generally anhedral. Larger than 1 mm in diameter. Very weathered.

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Biotite(BTE) (2-5%): Traces of apatite and titanite in biotite grains. 0.1 mm in diameter. Anhedral

Titanite (TNT) (1-2%): Euhedral, .01-.03 mm in diameter

Mount Desert Rock Granite

Phaneritic.

Quartz (QTZ) (30%): Showing undulose extinction. Anhedral. 0.5-1mm in diameter.

Plagioclase and Potassium Feldspar (KSP) (67%): Mostly potassium feldspar. Showing exsolution and twinning in the plagioclase feldspar.

Biotite (2%): Being replaced by iron oxides. Very altered. Anhedral.

Iron Oxides (<1%): Hematite (HMT) and Magnetite. Hematite is distributed along fractures. Less than 0.1mm in diameter.

Mount Desert Rock: Drone Image

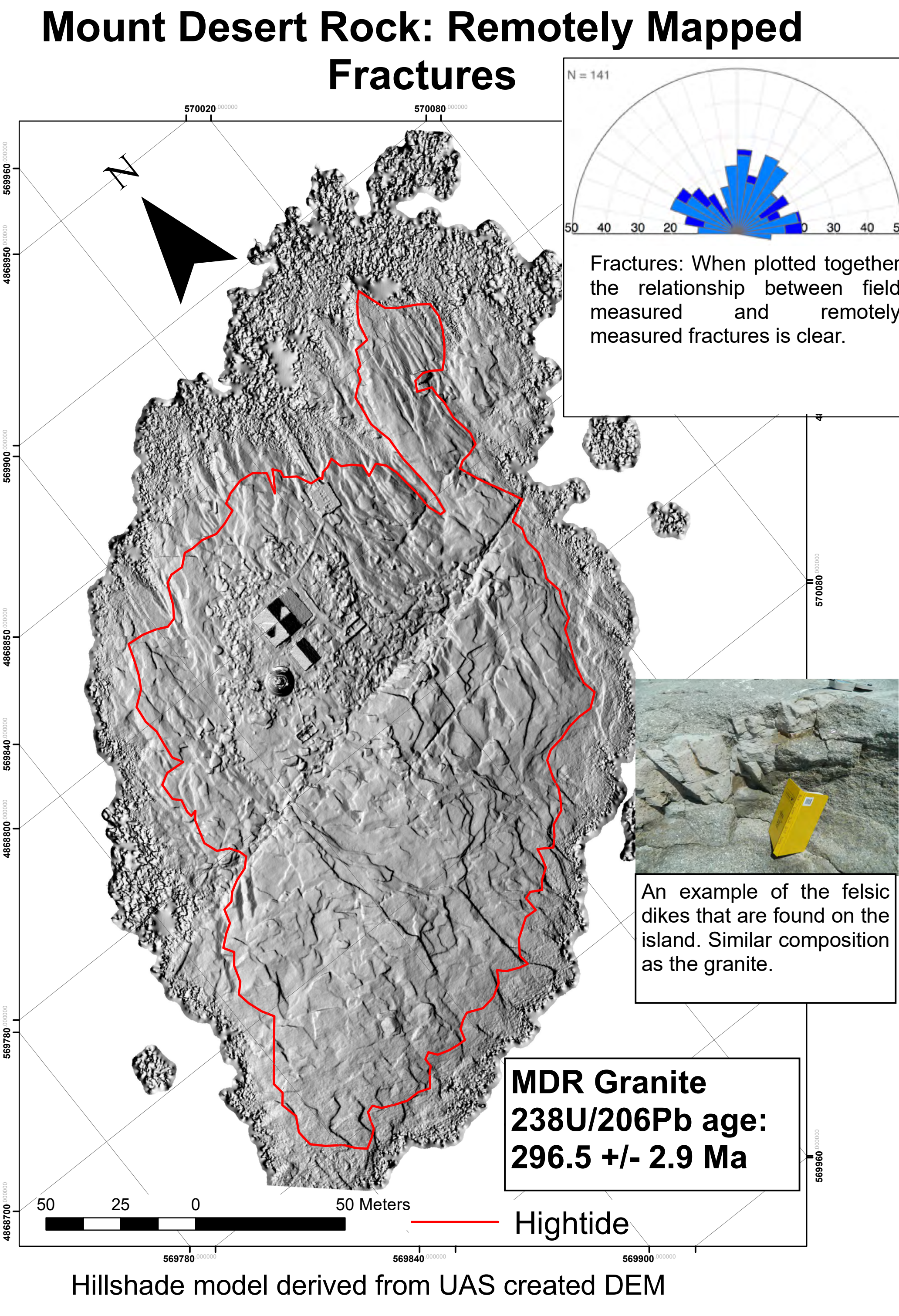
An example of the marker used to georeference the images. Each marker is a one foot diameter circle divided into four quadrants. It is applied to the bedrock with surveyor paint and labeled with a corresponding number.

Keepers House and Light House of Mount Desert Rock. Note the "onion exfoliation" of the granite.

0 15 30 60 90 120 Meters

Hightide

UAS derived orthomosaic. Stitched together from 180 images.



Bedrock fractures on MDR and GDI follow the regional fracture trends of about 90 and 180 with minor NW and NE trends (Engelder, 1989). This pattern is observed on Mount Desert Island. Nearby Swans Island has dominant NW and NE trends with E-W minor trends. (e.g. Gregory, 2014).

U-Pb zircon ages were measured using LA-ICPMS (Laser Ablation Inductively Coupled Mass Spectrometry) on 50 grains per sample. Material was collected for 30 seconds via a 26mm spot size, with wash out times of approximately 20 seconds. Data were reduced in Iolite, and 238U/206Pb ages here are reported here.

Great Duck Island

GDI is dominated by two rock types: pink granite in the south and rhyolite in the north. New preliminary 238U/206Pb zircon age of the granite is 313.3 +/- 3.0Ma, which is significantly younger than other regional igneous rocks (~370-420 Ma). The rhyolite and granite have similar chemical signatures.

Large basaltic dikes are primarily found within the granite. Dikes on the island generally trend east-west and many are located in the central portion of the island which has a higher fracture density than the north and south. Some partially melted blocks of metasedimentary rocks are also found within the fractured contact zone in the central portion of the island.

Mount Desert Rock

Previously unmapped, MDR is a fine-grained gray granite that is cut by many thin felsic dikes. Our new preliminary 238U/206Pb zircon age of the granite is 296.5 +/- 2.9 Ma, the youngest in this region of the central Maine coast.

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Acknowledgements

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