UNAVCO TLS Support Resources:

• What support does UNAVCO provide?
• How do I request support?
• Priorities and scheduling?
• Cost?
• Other resources to be aware of
• Educational resources
• Future trends & technology

C. Crosby, UNAVCO, Boulder, CO
Support Resources

Instrumentation
Field engineering
Data processing
Training
Data archiving & dissemination

Community Building

Workshops
Inter-Agency collaborations & partnerships

Education and Outreach

Training courses
Field courses
### UNAVCO TLS Instrument Pool

#### Scanners funded by the National Science Foundation

<table>
<thead>
<tr>
<th>Model</th>
<th>Laser Wavelength</th>
<th>Effective Range</th>
<th>High-speed meas. rate</th>
<th>Precision</th>
<th>Accuracy</th>
<th>Field of View</th>
<th>Dimensions</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riegl VZ-2000</td>
<td>Near infrared (532 nm green)</td>
<td>2050 m</td>
<td>396,000 pts/sec</td>
<td>5 mm</td>
<td>8 mm</td>
<td>100° x 360°</td>
<td>308 mm x 196 mm</td>
<td>9.9 kg</td>
</tr>
<tr>
<td>Riegl VZ-1000</td>
<td>Near infrared (532 nm green)</td>
<td>1400 m</td>
<td>122,000 pts/sec</td>
<td>5 mm</td>
<td>8 mm</td>
<td>100° x 360°</td>
<td>308 mm x 180 mm</td>
<td>9.8 kg</td>
</tr>
<tr>
<td>Riegl VZ-400</td>
<td>Near infrared (532 nm green)</td>
<td>500 m</td>
<td>125000 pts/sec</td>
<td>5 mm</td>
<td>5 mm</td>
<td>100° x 360°</td>
<td>308 mm x 180 mm</td>
<td>9.8 kg</td>
</tr>
<tr>
<td>Riegl Z620</td>
<td>Near infrared (532 nm green)</td>
<td>2000 m</td>
<td>11,000 pts/sec</td>
<td>10 mm</td>
<td>10 mm</td>
<td>80° x 360°</td>
<td>463 mm x 210 mm</td>
<td>16 kg</td>
</tr>
<tr>
<td>Leica C10</td>
<td>Near infrared (532 nm green)</td>
<td>150 m</td>
<td>50,000 pts/sec</td>
<td>4 mm</td>
<td>6 mm</td>
<td>270° x 360°</td>
<td>238 mm x 395 mm</td>
<td>13 kg</td>
</tr>
</tbody>
</table>
Newest instrument: Riegl VZ-6000 long range scanner for PLR PI project. Chris Polashenski, Dartmouth: *Snow, Wind, and Time: Understanding Snow Redistribution and Its Effects on Sea Ice Mass Balance*

~6km range, NIR class 3B laser. Eye safety considerations make this a limited use instrument.
UNAVCO TLS Support Costs:
• For NSF-supported projects, PI pays field engineer travel and equipment shipping.
• For non-NSF supported work, full cost recovery required.

Project Prioritization:
• UNAVCO sponsors = NSF-EAR and NSF-OPP = highest priority.
• NSF-other and non-NSF = projects supported as resources allow.
  ➢ Schedule flexibility helps
All support requests must be formally logged through UNAVCO support request system.


UNAVCO staff will follow up to coordinate specifics.

Get in touch at proposal development stage – UNAVCO can provide a budget, letters of support, planning advice
## NSF-EAR’s investment in high resolution topography

<table>
<thead>
<tr>
<th>Facility</th>
<th>Services</th>
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</thead>
<tbody>
<tr>
<td><strong>UNAVCO</strong></td>
<td>• Terrestrial laser scanning (TLS) instrumentation and expertise</td>
</tr>
<tr>
<td></td>
<td>• PI &amp; graduate student support</td>
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<tr>
<td></td>
<td>• Data archiving</td>
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<tr>
<td></td>
<td>• Education and training</td>
</tr>
<tr>
<td><strong>NCALM</strong></td>
<td>• Airborne lidar data collection</td>
</tr>
<tr>
<td></td>
<td>• PI &amp; graduate student support</td>
</tr>
<tr>
<td></td>
<td>• Graduate student seed grants (funding)</td>
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<tr>
<td></td>
<td>• Education</td>
</tr>
<tr>
<td><strong>OpenTopography</strong></td>
<td>• Online data discovery and access</td>
</tr>
<tr>
<td></td>
<td>• Custom data products and processing</td>
</tr>
<tr>
<td></td>
<td>• Cyberinfrastructure R&amp;D</td>
</tr>
<tr>
<td></td>
<td>• Education and training</td>
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</tbody>
</table>
- Based at University of Houston & University of CA, Berkeley


- Cessna 337 Skymaster:
  - Titan three wavelength (532, 1064, and 1550 nm), 300 kHz (per wavelength) lidar
  - AQUARIUS Green bathymetric/topographic lidar

- Collect data for NSF-funded researchers. Cost integrated into proposal budgets.
Research-oriented data

Typically 8+ pts/m², 0.5 - 1 meter resolution DEMs.

Data openly available after 2 yrs via OpenTopography.

152 datasets collected through 2015

Numerous publications and educational impacts from these data

*Seed grant* program provides 40km² of data for graduate students through annual proposal process.
Democratize online access to Earth science-oriented high-resolution topography

- Lidar (ALS & TLS), Structure from Motion, satellite (e.g., SRTM)
• Large user community with variable needs and levels of sophistication.

• Goal: maximize access to data to achieve greatest scientific impact.

• Big data – treat data as an asset that can be used and reused
Two dozen field education projects since ‘09

- Indiana University (8x)
- University of Michigan (7x),
- University of Houston (3x)
- UC Santa Cruz, Cal Poly Pomona, U. Saint Thomas, Stanford, NM State University, Montana State University, Rocky Mountain College
Part of GETSI Field Collection: Geodetic imaging technologies have emerged as critical tools for a range of earth science research applications from hazard assessment to change detection to stratigraphic sequence analysis. In this module students learn to conduct terrestrial laser scanner (TLS) and/or Structure from Motion (SfM) surveys to address real field research questions of importance to society. Both geodetic methods generate high resolution topographic data and have widespread research applications in geodesy, geomorphology, structural geology, and more. The module can be implemented in four- to five-day field course or as several weeks of a semester course. Prepared data sets are available for courses unable to collect data directly. Instructors can request support for some types of technical assistance from UNAVCO, which runs NSF’s Geodetic Facility.
• Faster & longer data collection
• Full waveform
• More streamlined workflows
• Better & more powerful analysis software
• Error analysis
• Continuous scanning deployments
• Mobile/kinnematic laser scanning
• Integration with other datasets (ALS, GPR, terrestrial radar/INSAR, etc.)
Structure from Motion: another way to gather high resolution topographic data

Nissen, et al. in prep.
STRUCTURE FROM MOTION: PHOTOGRAMMETRIC HIGH RESOLUTION TOPOGRAPHIC DATA

Fig. 1. Camera locations and image overlap.

Nissen, et al. in prep.
Unmanned Aerial Systems