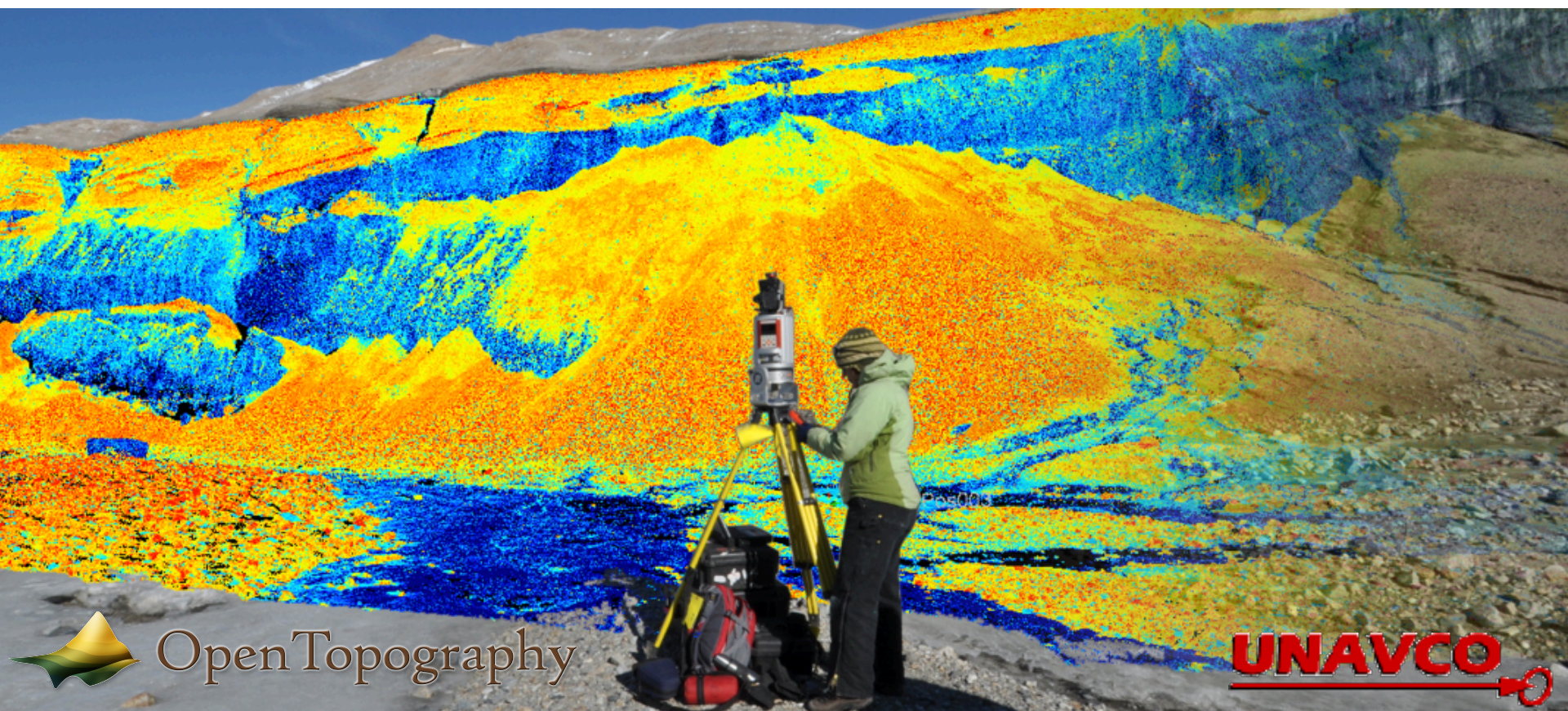


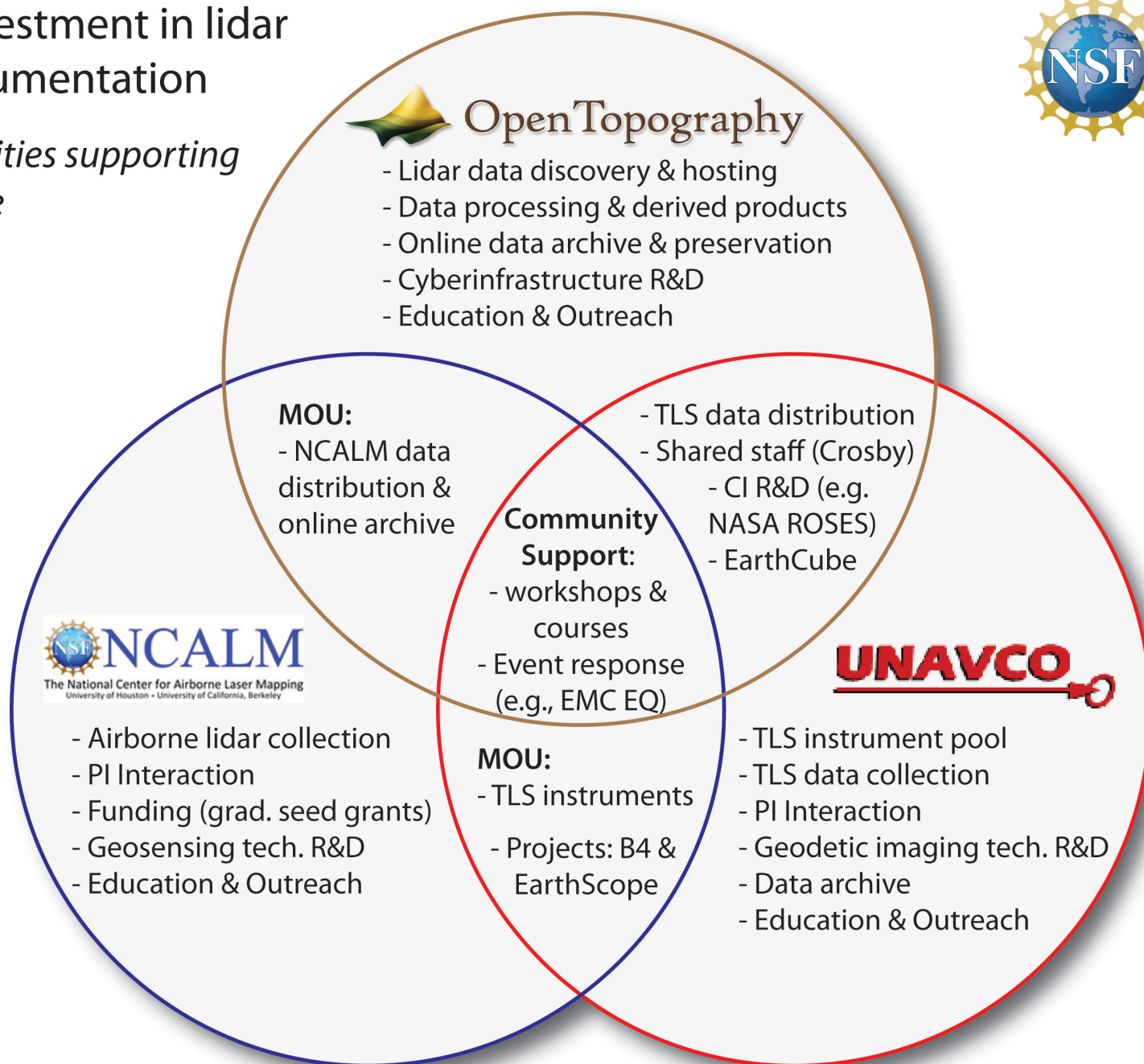
Facilitating Access to High-Resolution Topography: Data Collection Support and Online Data Distribution

*Christopher Crosby
UNAVCO & OpenTopography*



NSF EAR IF investment in lidar data and instrumentation

Cooperative facilities supporting NSF earth science

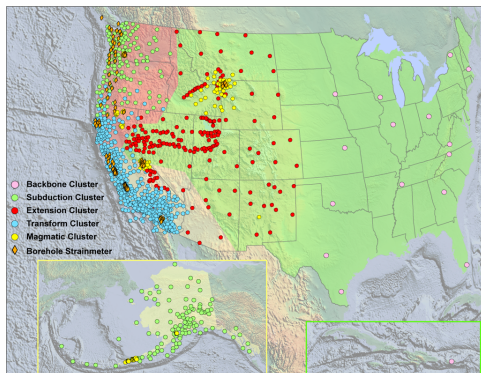


UNAVCO is a non-profit, membership governed consortium of universities that facilitates geoscience research and education using geodesy.

UNAVCO supports GPS, InSAR and LiDAR data acquisition, data archiving, equipment, development & testing, training.

UNAVCO operates and maintains the **Plate Boundary Observatory** network of instruments.

UNAVCO Education & Community Engagement works to promote a broader understanding of Earth science.



Support Resources

- Instrumentation (6 scanners)
- Field engineering
- Data processing
- Training
- Data archiving & dissemination

Community Building

- Workshops
- Inter-Agency collaborations & partnerships

Education and Outreach

- Training courses
- Field camps (~90 students in 2013)

**UNAVCO**

COMMUNITY WORKSHOP ANNOUNCEMENT

Charting the Future of
Terrestrial Laser Scanning (TLS)
in the Earth Sciences

Boulder, Colorado, USA. October 17-19, 2011
Information and registration: www.unavco.org







GSA 2012 UNAVCO TLS short course, Charlotte, NC

UNAVCO TLS Instrument Pool

Scanners funded by the
National Science Foundation



- TLS instrument pool = 6 scanners
 - 3x Riegl VZ400
 - 1x Riegl VZ1000 (full waveform) **NEW!**
 - 1x Riegl Z620
 - 1x Leica C10
- Campaign and RTK GPS, tripods, various power supply options
- Instrument validation range
- License server w/ access to RiScan Pro, Cyclone, Polyworks, ArcGIS, Quick Terrain Modeler, MatLab, etc

	 Riegl VZ-1000	 Riegl VZ-400	 Riegl Z620	 Leica C10
Laser Wavelength	1550 nm (near IR)	1550 nm (near IR)	1550 nm (near IR)	532 nm (green)
Effective Range (max)	1400 m	500 m	2000 m	150 m
High-speed meas. rate	122,000 points/sec	125,000 points/sec	11,000 points/sec	50,000 points/sec
Precision	5 mm	5 mm	10 mm	4 mm
Accuracy	8 mm	5 mm	10 mm	6 mm
Field of View	100° x 360°	100° x 360°	80° x 360°	270° x 360°
Dimensions	308mm x 180mm	308mm x 180mm	463mm x 210mm	238mm x 395mm
Weight	9.8kg	9.8kg	16kg	13 kg

Education and Community Engagement:

- Short courses and workshops
 - *Partners wanted*
- Growing online knowledgebase of TLS tutorials, documentation, best practices.
- Incorporation of TLS into teaching – K-12, undergraduate
 - Geology field camps have momentum

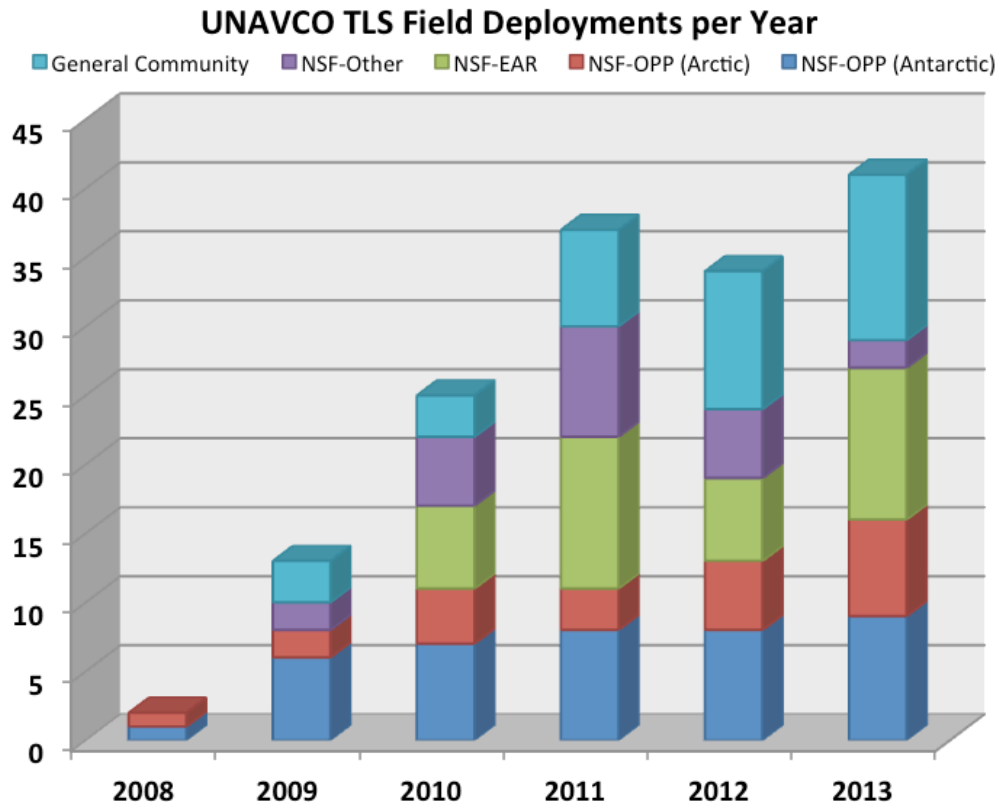


UNAVCO TLS Support Costs:

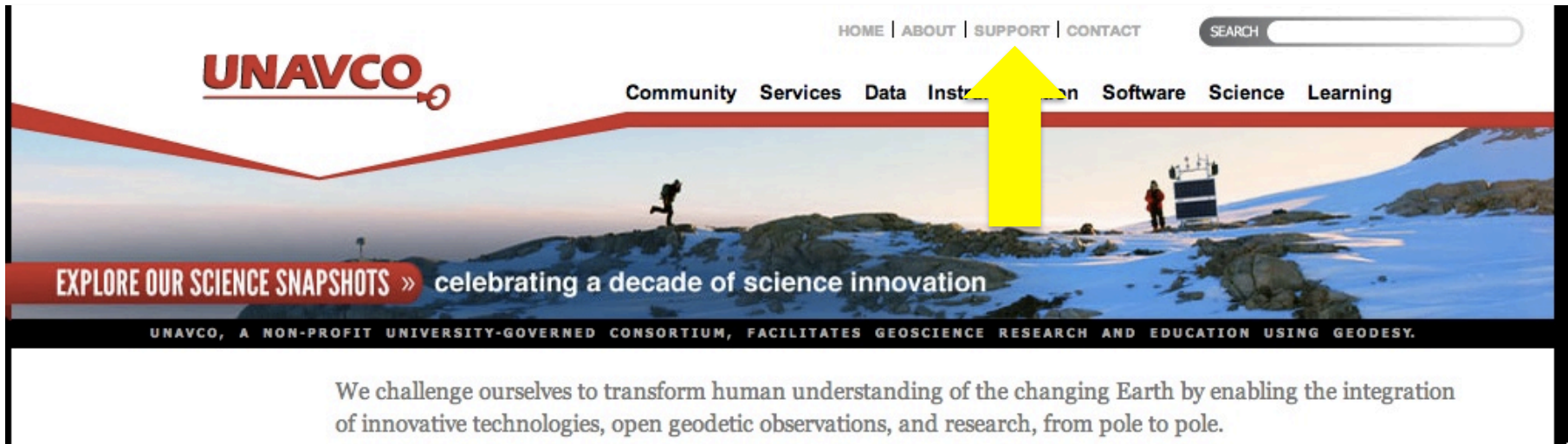
- For NSF-supported projects, PI pays field engineer travel and equipment shipping.
- For non-NSF supported work, full cost recovery required.

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.



<http://achaia.unavco.org/public/newproject/supportform.aspx>

UNAVCO staff will follow up coordinate specifics.

Get in touch at proposal development stage – UNAVCO can provide a budget, letters of support, planning advice

Organization & archive of TLS project data

- Raw scan data
- Point clouds
- Raw & processed GPS
- Metadata & site photos.
- Derived products.

Alpha version online:

<http://tls.unavco.org>

Unavco Repository

TLS Field Project Archive

File | Links | View

TLS Field Project Archive

Welcome to Unavco's Terrestrial LiDAR Scanning (TLS) field projects archive



Antarctica



Bijou Creek - Colorado



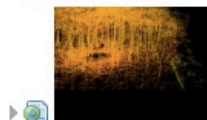
California



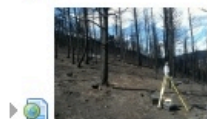
Chimborazo Volcano - Ecuador



Denali Dinosaur Tracks



Everglades - Florida



Four Mile Fire



Position: -50.607, 47.137

TLS Archive Features:

- GPS: RINEX creation, submission to OPUS for position processing, generation of control point lists for georeferencing in RiScan or Cyclone.
- Laptop-based version for use by field engineers (tested summer 2012) to document metadata and manage data during field projects. Content synced with archive server upon return to Boulder.
- On-the-fly:
 - Format conversion (LAS, ASCII)
 - Data thinning and AOI subsetting
 - Simple gridding, visualization, export to Google Earth.

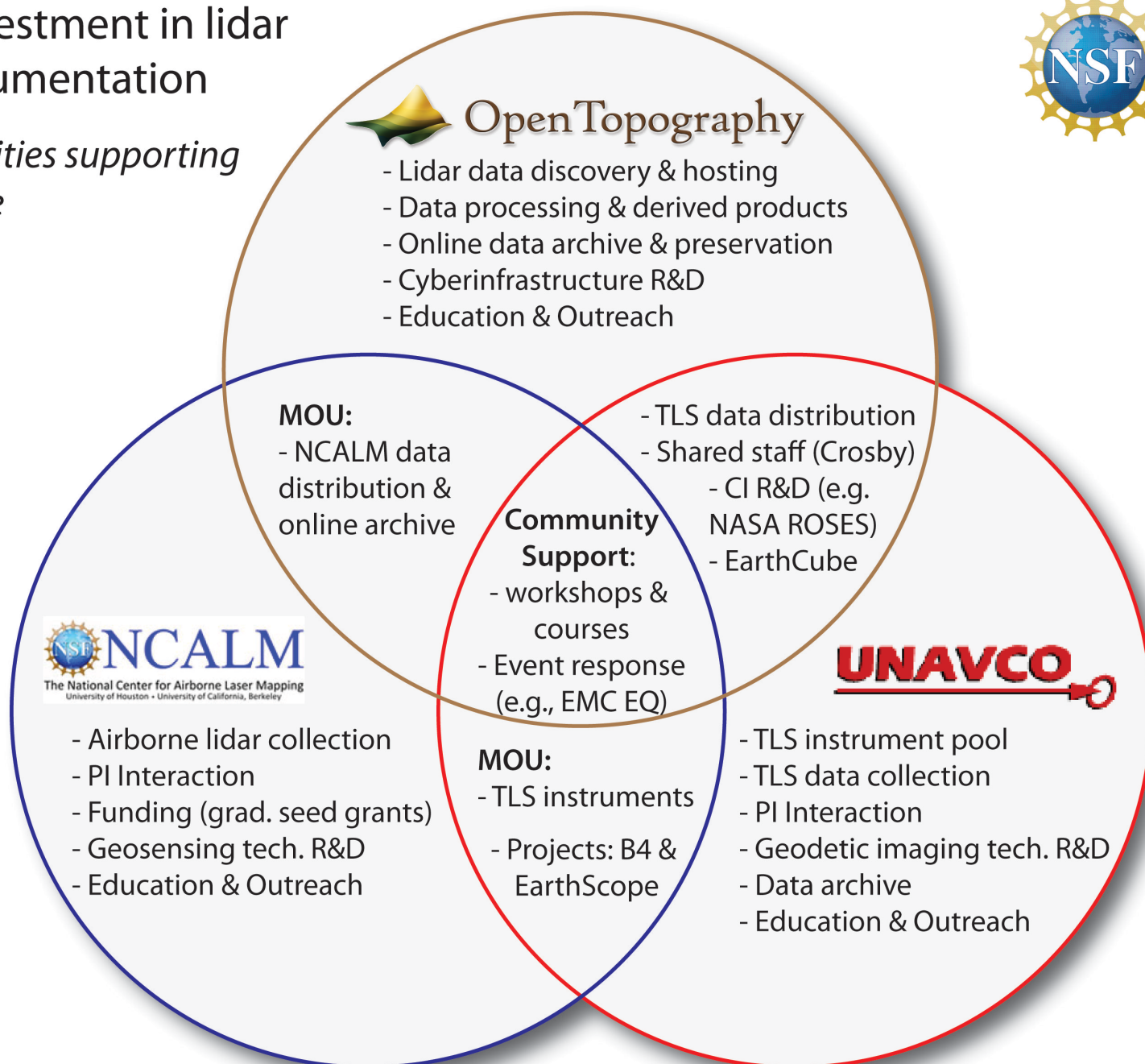
Georeferenced & azimuth oriented field photos



Visualization in Google Earth

NSF EAR IF investment in lidar data and instrumentation

Cooperative facilities supporting NSF earth science



NCALM



THE NATIONAL CENTER FOR AIRBORNE LASER MAPPING

- Based at University of Houston & University of CA, Berkeley
- Funded by NSF EAR-IF program. Initiated in 2003, funded through 2018.
- Cessna 337 Skymaster w/ GEMINI 167 kHz IR topographic & AQUARIUS Green bathymetric/topographic LiDAR,
- Collect data for NSF-funded researchers. Cost integrated into proposal budgets.
- *Seed grant* program provides 40km² of data for graduate students through annual proposal process.

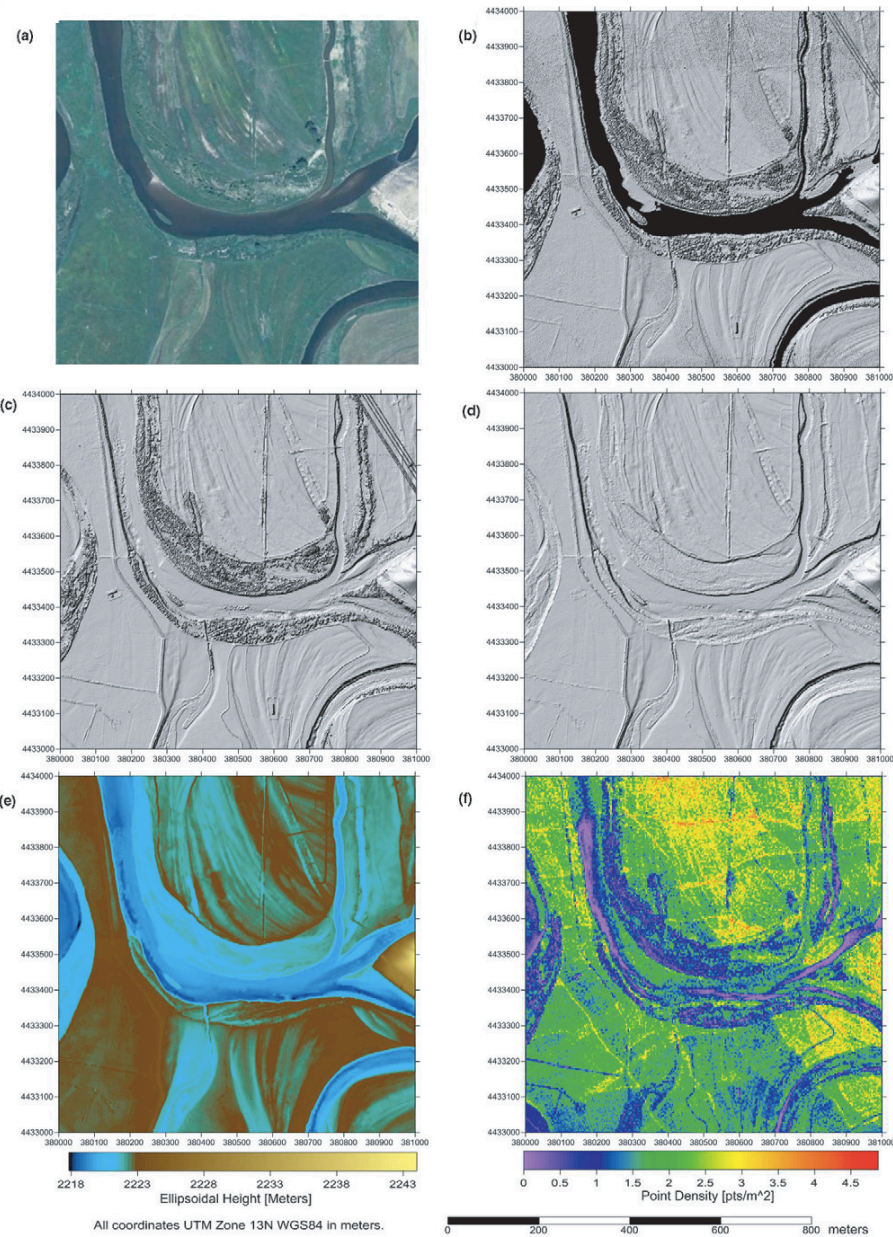


Research grade datasets.

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

Available Data:

- Data openly available after 2 yrs.
- 116 Datasets
- 22,464 km²
- 126,313,774,883 LiDAR pts
- Numerous publications and educational impacts from these data

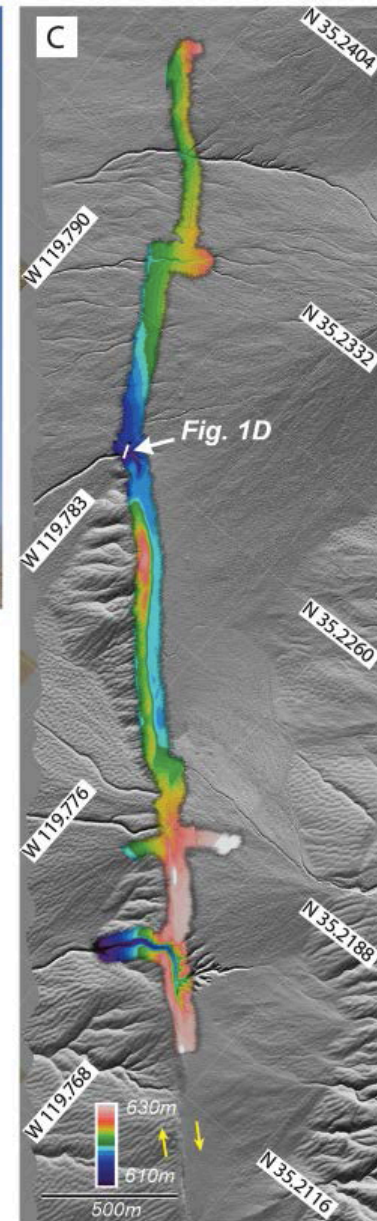
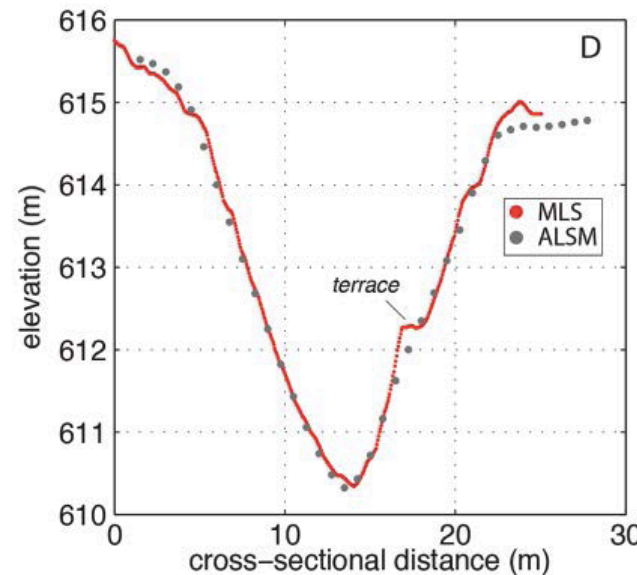


Technology R&D – Mobile Laser Scanning (MLS)

*Brooks et al., 2013, Mobile
Laser Scanning Applied to
the Earth Sciences, Eos,
Vol. 94, No. 36*

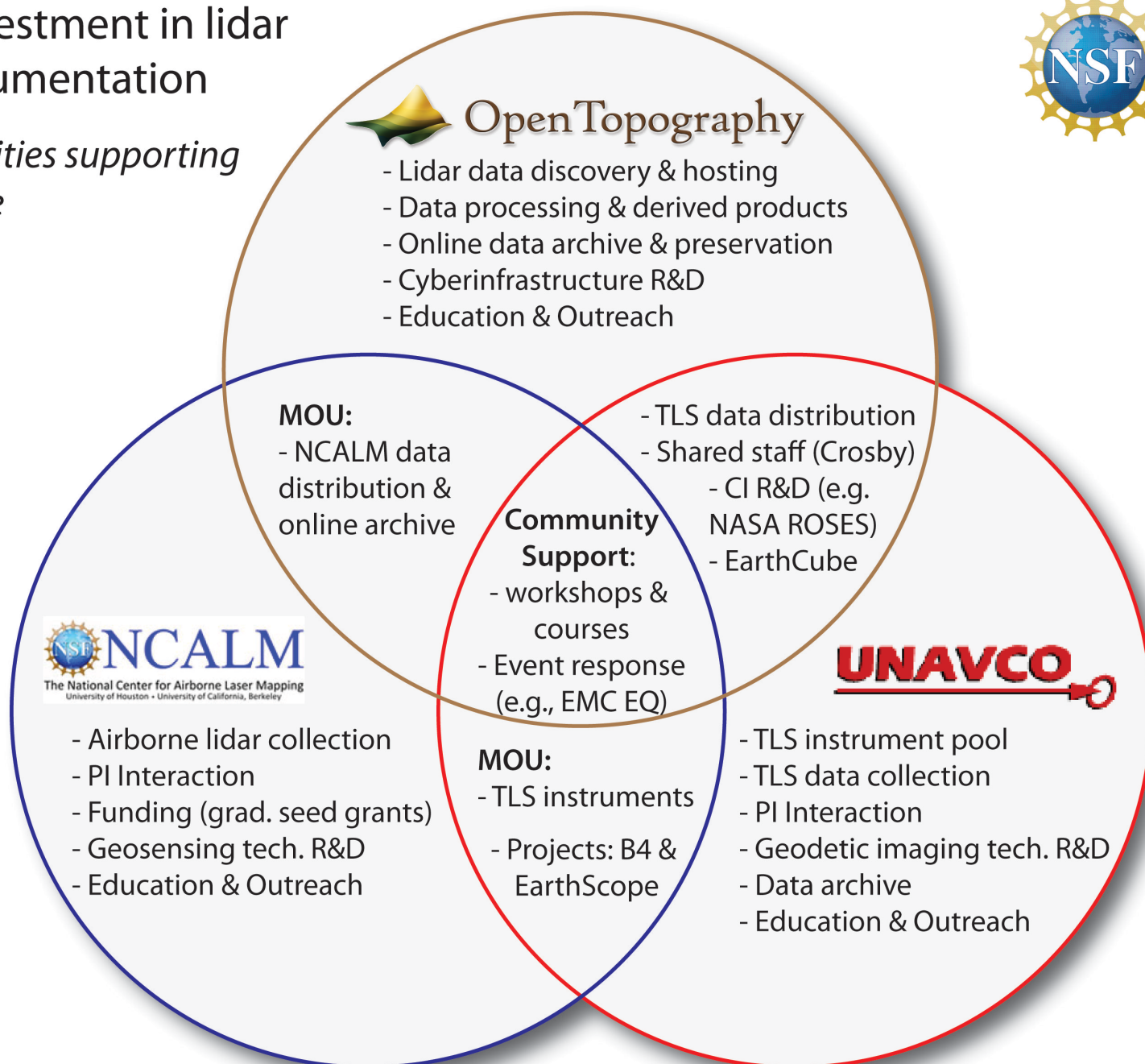
“Blidar” – balloon or
backpack mounted lidar
system.

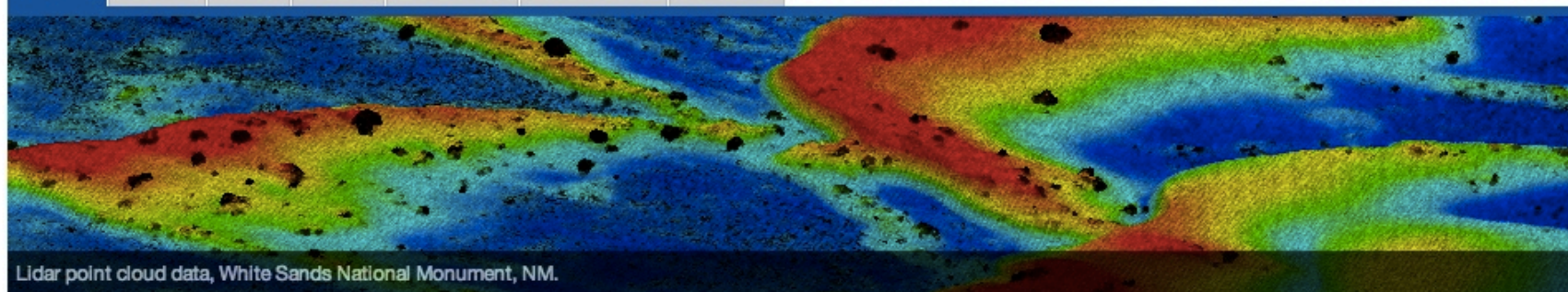
Compact, quickly
deployable, fits in “sweet
spot” between ALS and TLS.



NSF EAR IF investment in lidar data and instrumentation

Cooperative facilities supporting NSF earth science





Overview Video



Find Data



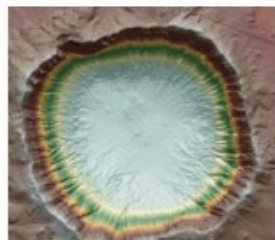
Tools



Learn

Spotlight

NSF Renews Funding for OpenTopography



We are happy to announce that the National Science Foundation (NSF) has renewed funding for OpenTopography. The three-year renewal under the [National Science Foundation's Geoinformatics and Earth Sciences: Instrumentation and Facilities \(EAR-IF\) program](#) follows an initial three-year award from EAR-IF and the Office of Cyberinfrastructure, announced in late 2009.

Latest News

OpenTopography at 2013 European Geosciences Union Meeting

Posted: April 07, 2013

OpenTopography will be at the 2013 European Geosciences Union (EGU) Meeting this week in Vienna, Austria and presenting a talk... [[more](#)]

[10 New Point Cloud Datasets from Brazil, Alaska, California, Montana, North Carolina & Oregon](#)

Connect with OpenTopography



 9 days ago: 10 new #lidar datasets posted - data in AK, CA, MT, NC, OR, PA & Brazil, our 1st dataset from the S. Hemisphere: opentopography.org/index.php/news...

Data Summary

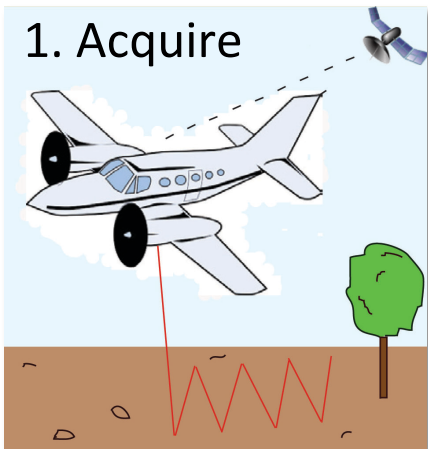
Total Coverage: **93,147 km²**Total Number of Lidar Returns: **533,927,158,741**

Latest Lidar Datasets:

- Flathead Lake Biological Station, MT (September 2005)
- Mojave Desert, CA: Evolution of the Hector Mine Earthquake Surface Rupture
- North Sister, OR: Collier Cone Lava Flow
- Coastal Dune Fields of Garopaba and Vila Nova, Santa Catarina State, Brazil

Airborne Lidar Workflow

1. Acquire



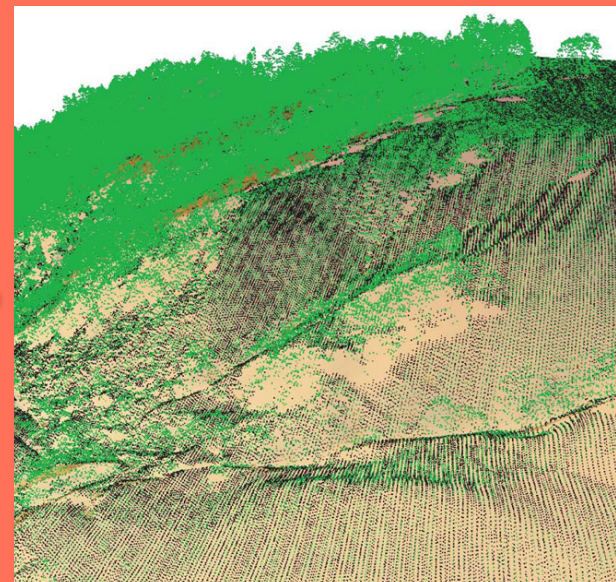
2. Process



Laser
+ GPS
+ IMU



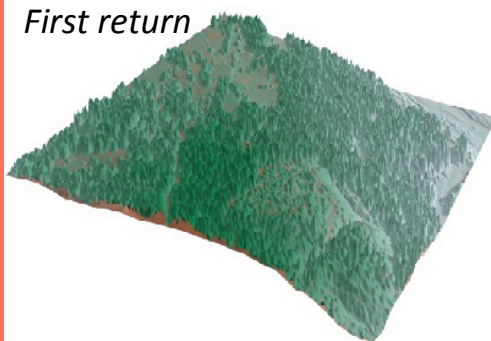
3. Classify
(filter)



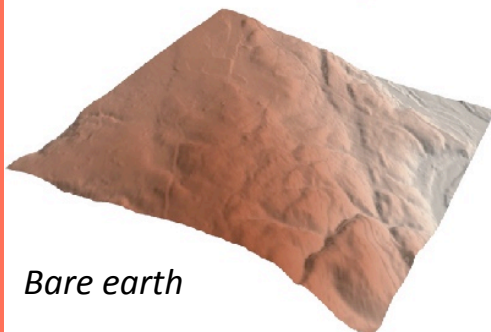
4. Grid



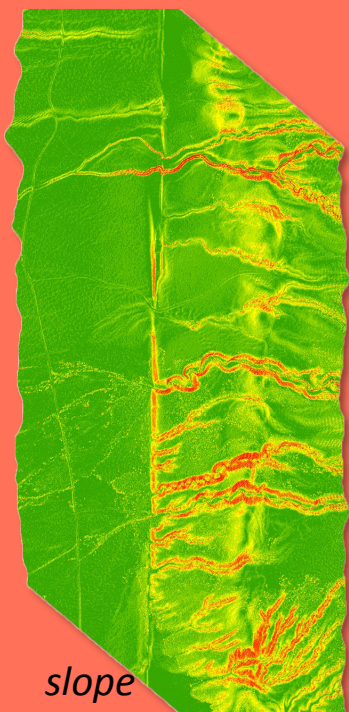
First return



Bare earth



5. Generate
Derivatives

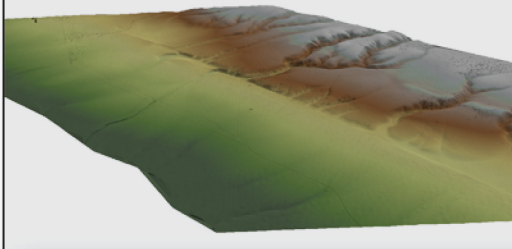


OpenTopography Multi-Tiered Data Products

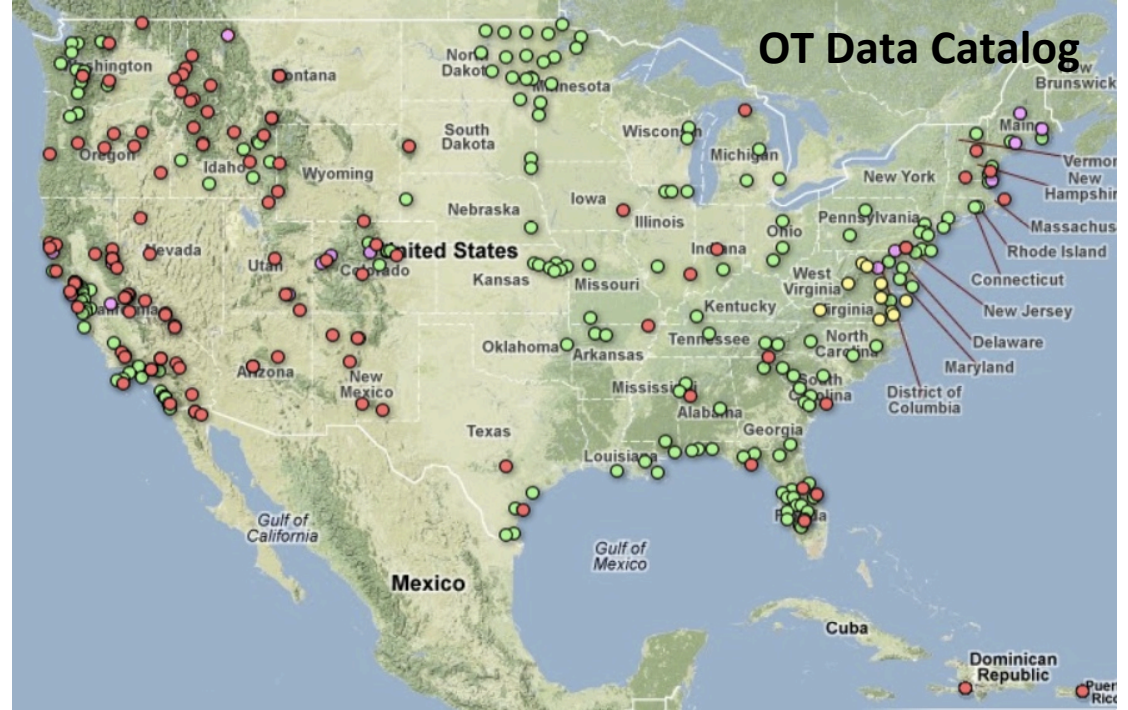
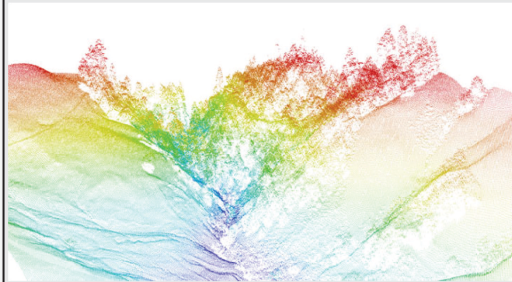
Google Earth (KMZ): *visualization & synoptic data browsing*



DEMs: *qualitative & quantitative analysis, GIS-users, data integration*



Point Cloud & Custom DEMs: *"raw" data access and fully customized data products*



- 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

Data Volume, Computational Demands

Accessibility / Ease of Use



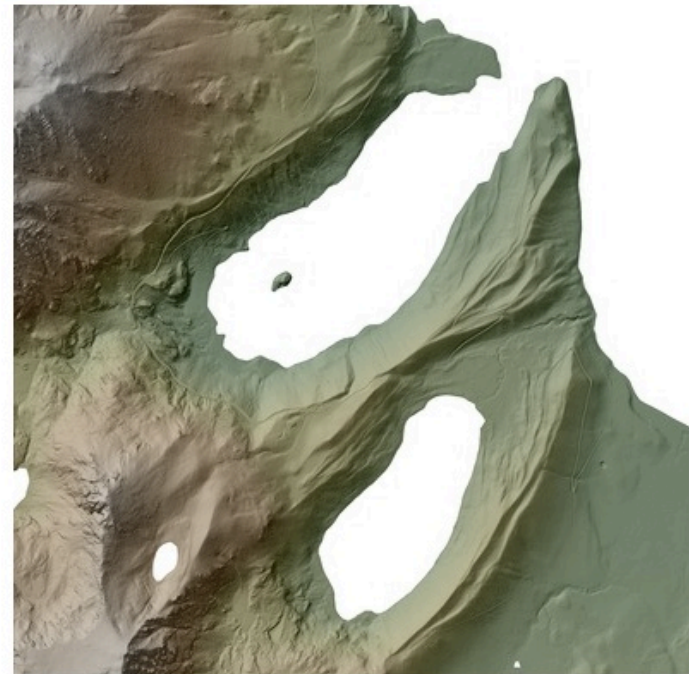
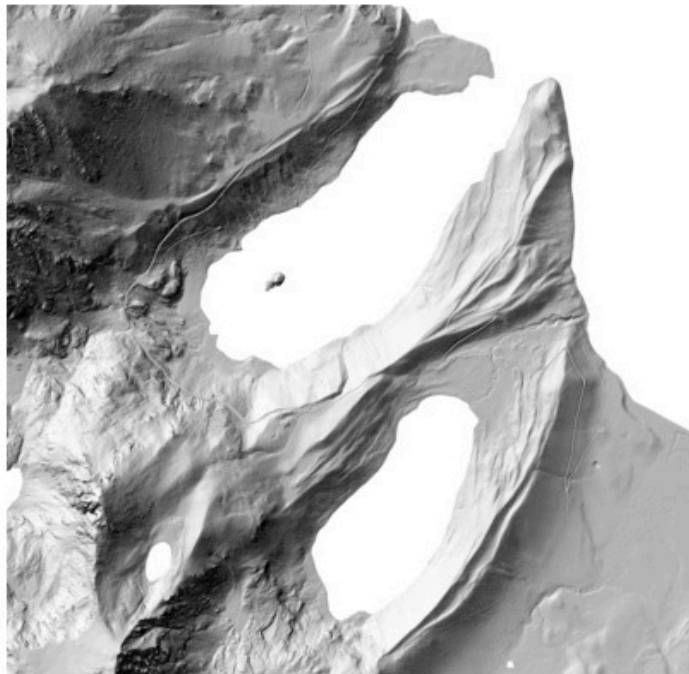
Ztin DEM:



Download KMZ file: [viz.tin.hs.kmz](#)
View with Google Earth browser plug-in



Download KMZ file: [viz.tin.crhs.kmz](#)
View with Google Earth browser plug-in



OpenTopo

Search

s can be



y
er Center
San Diego
0505
5



ASU SDSC



Data Status

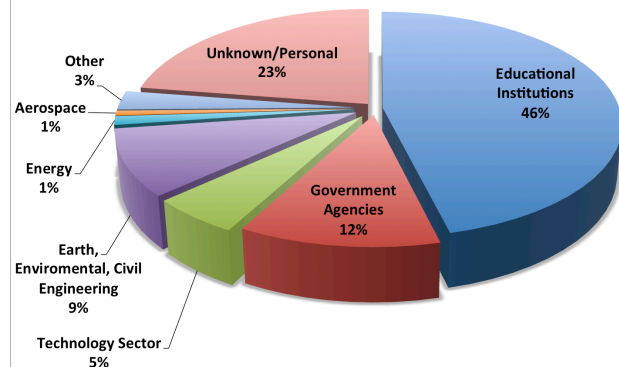
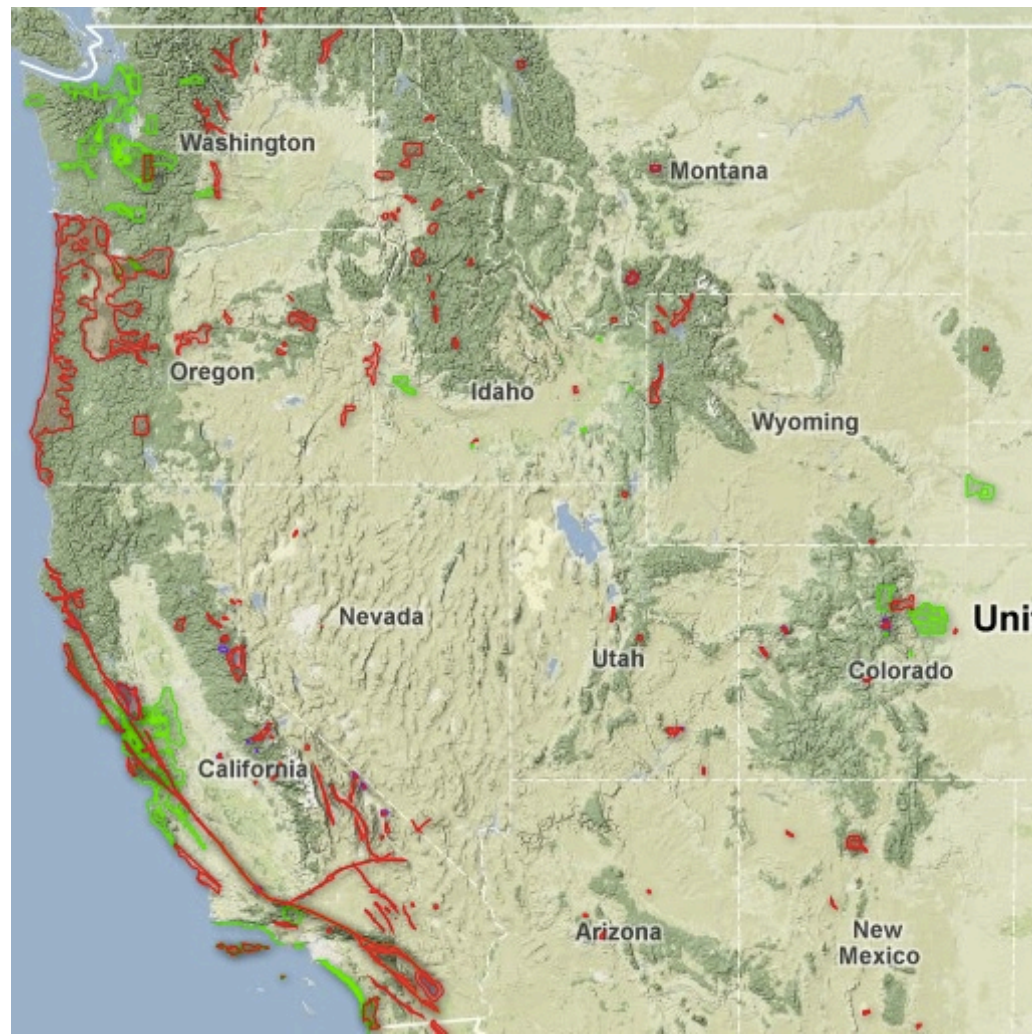
- ~600 billion LIDAR returns
- 158 datasets
- 120,407 km²

MOUs & Partnerships

NSF: NCALM, UNAVCO, CZOs, LTER

Other: World Bank, Tahoe Regional Planning Authority, Teton Conservation District, Oregon Lidar Consortium, Idaho Lidar Consortium, ...

Service Agreements: State of Indiana Watershed Sciences Inc (for PG&E)



Diverse user base for these data, 3470 registered users, 21,000+ jobs, >30 billion pts/month downloaded.

