

Peaks to Pixels

Advancing Automated Satellite DEM Production

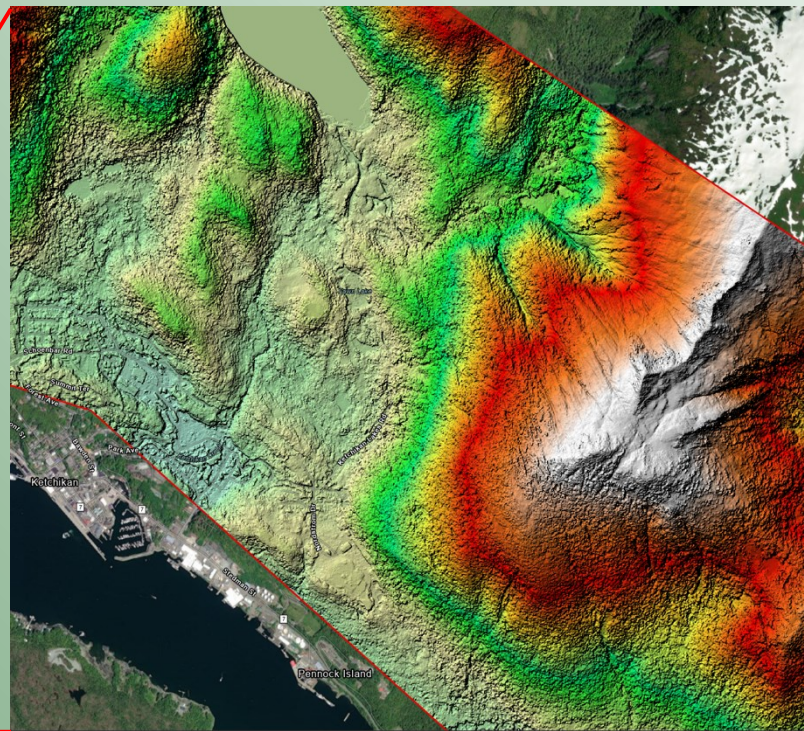
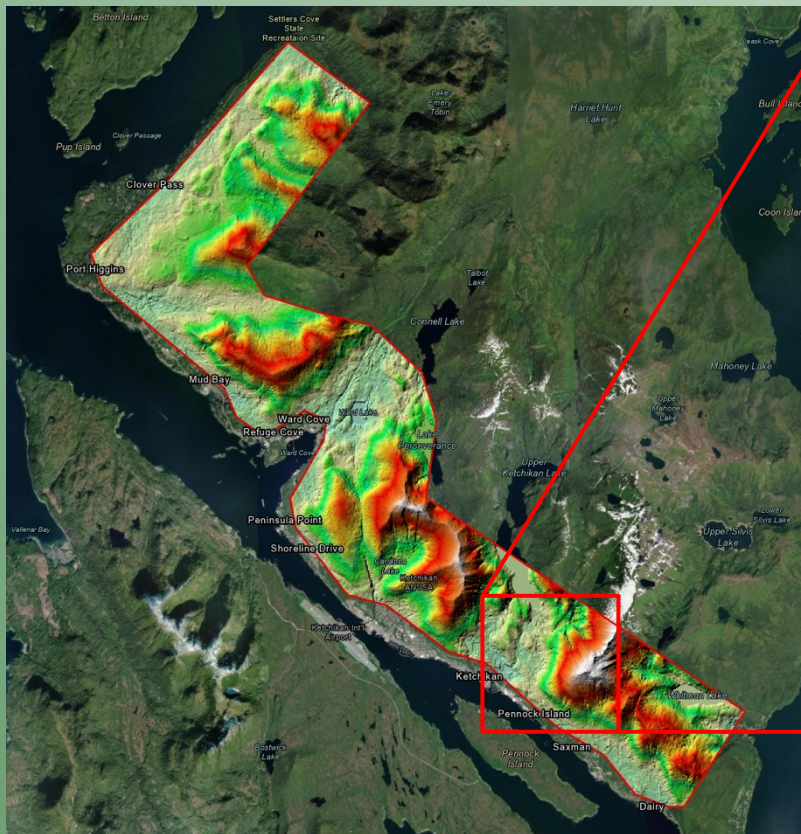




Overview

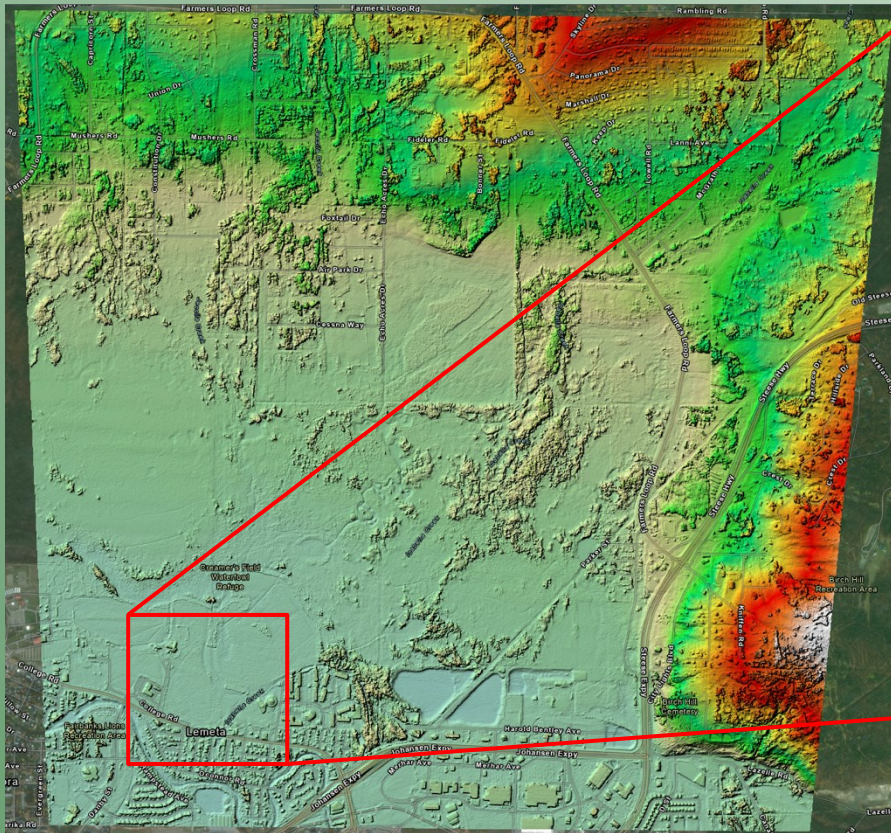
- ◆ Traditional DEM Production using Stereo Imagery
 - ◇ Ketchikan-Gateway Borough
 - ◇ Creamer's Field - Fairbanks
- ◆ Using High Performance Compute (HPC) and Automation to improve DEM Production
 - ◇ Western United States
 - ◇ Alaska

Ketchikan, AK (KGB)



1m DSM derived from Pleiades stereo

Creamer's Field, Fairbanks, AK (AGC)



60cm DSM derived from
Pleiades Neo Tri-Stereo

Advancing production

- ◆ The GeoData Cooperative

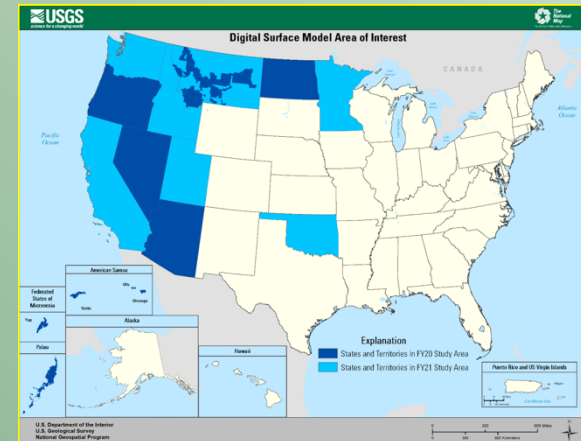


- ◆ Utilization of HPC environment in partnership with UAF
 - ◇ 124 nodes (104 CPU & 20 GPU per node)
- ◆ LMCO OpenRosetta workflow orchestration engine to manage end-to-end production automation
 - ◇ “Best of breed” approach

USGS Production – Western US

- ◆ Source
 - ◇ Maxar Stereo stereo pairs
 - ◇ IceSat-2 (accuracy assessment)
 - ◇ NED (void filling)
- ◆ Delivered Feb 2023
 - ◇ 2.9 Million Square Kilometers
 - ◇ 1m DSM (void free)
 - ◇ 20 x 20km tiles (DGED6):
 - ◆ XML Metadata
 - ◆ Metadata masks

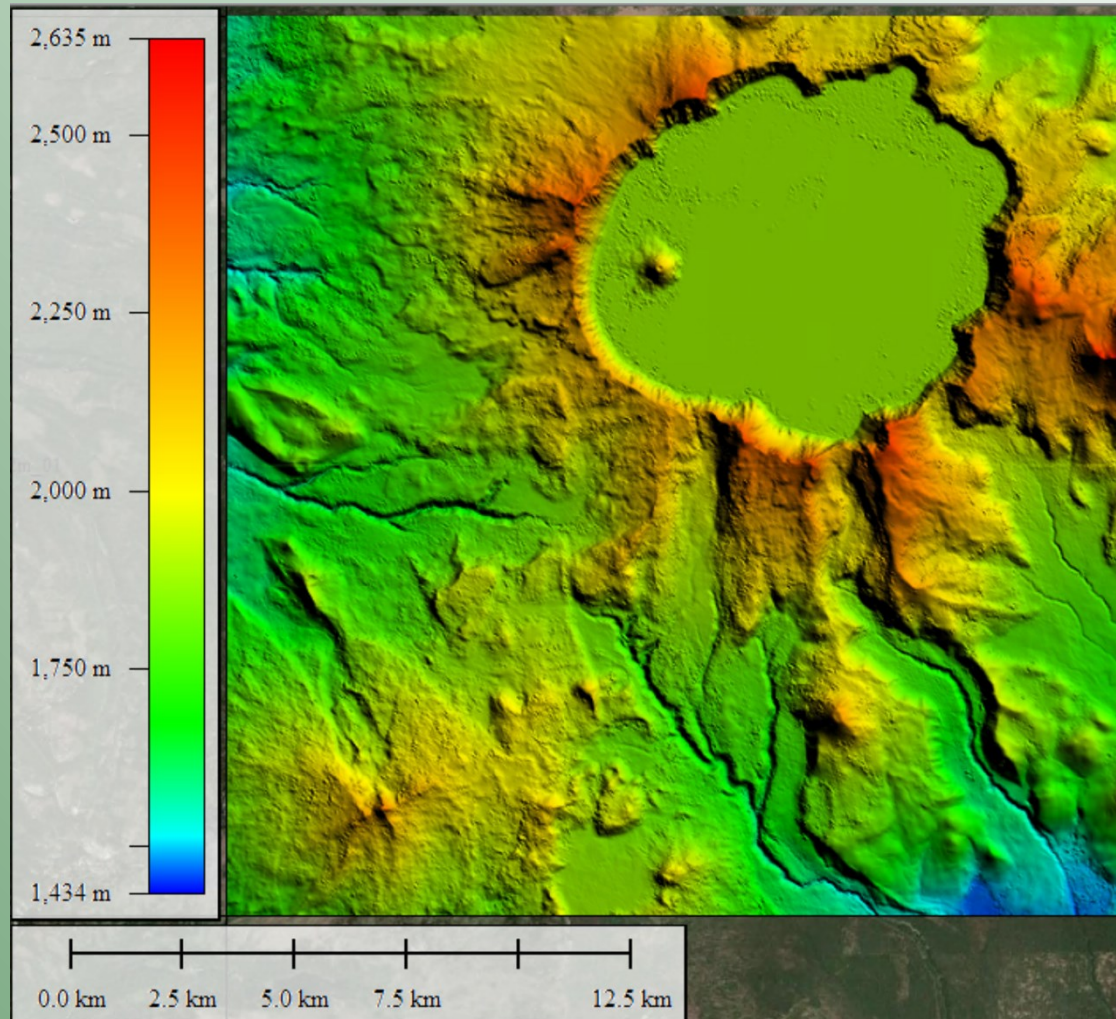
Production Area	State Area (sqkm)	DGED6 Tiles (100 sqkm)
Nevada	286,382	3,075
Arizona	295,234	3,138
American Samoa	199	14
Palau	459	29
Yap	100	7
Oregon	254,806	2,667
North Dakota	183,843	1,955
Montana*	380,800	4,044
California	423,967	4,462
Minnesota	225,163	2,422
Oklahoma	181,037	1,966
Utah	219,882	2,362
Idaho	216,443	2,355
Washington	184,661	1,935
Total	2,852,976	30,431



DGED6 Tiles: Crater Lake, Oregon

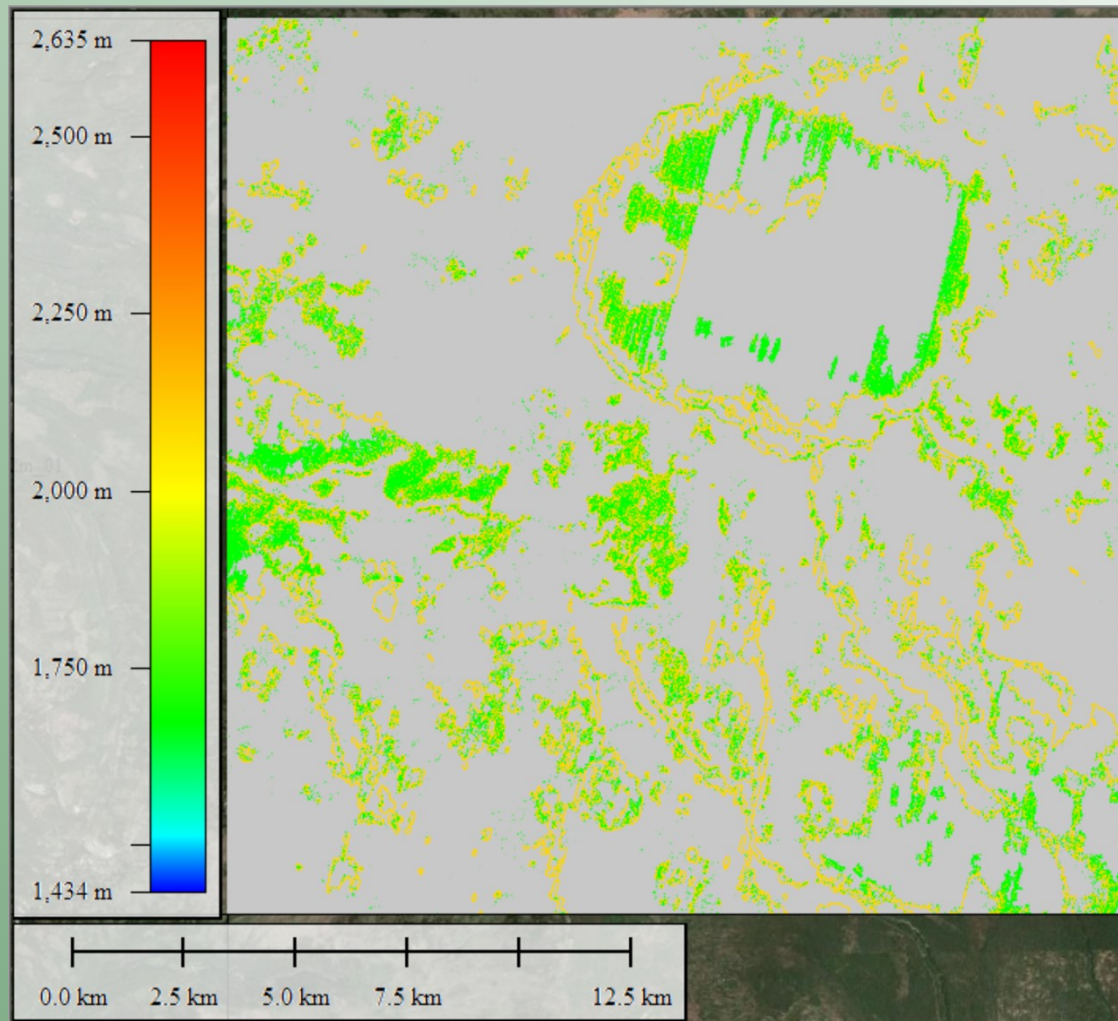
DSMs

10N560000e4740000n
10N560000e4750000n
10N570000e4740000n
10N560000e4750000n
















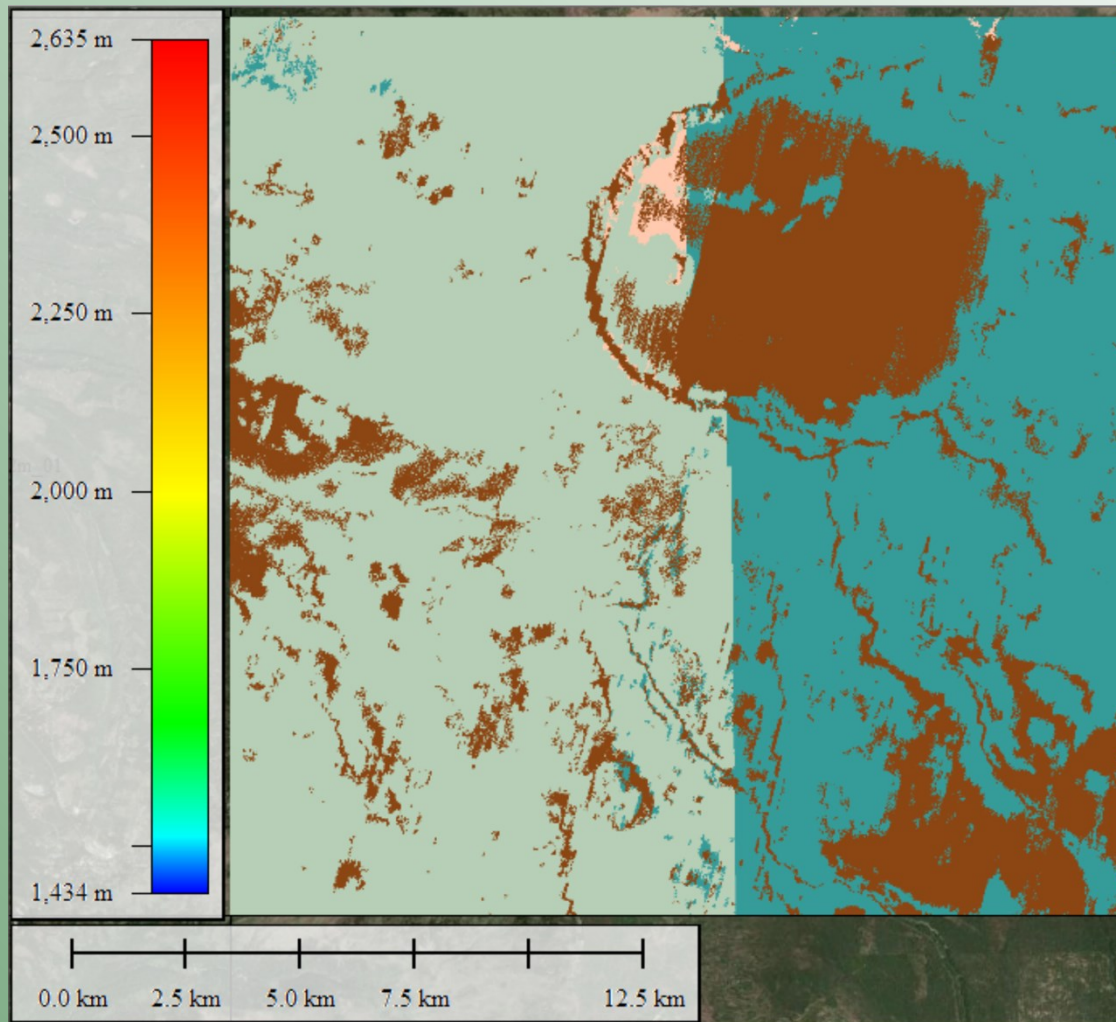
Source Processing Mask

	NoData
	No Editing
	Delta Surface Fill
	Spike/Well
	Interpolation
	DTM Flattening
	Hand Edited
	Ocean
	Lake
	River
	Raised Shoreline / Containment



Source Lineage Masks

	Water	1
	TERRAFORM V4	2
	TREx 90m	3
	USGS Alaska IFSAR	4
	PGC ArcticDEM	5
	NED	6
	Photogrammetrically derived elevation	9
	Copernicus DEM GLO-30	10
	Strip pair #1	21
	Strip pair #2	22
	Strip pair #3	23
	Strip pair #4	24
	Strip pair #5	25










Lineage Mask Values in xml

Can reference stereo pair from xml and view imagery via Maxar API:

```
<mri:distance>
  <gco:Distance uom="http://api.nsgreg.nga.mil/physical-quantity/length/metre">1</gco:Distance>
</mri:distance>
</mri:MD_Resolution>
</mri:sourceSpatialResolution>
<mri:sourceCitation>
  <cit:CI_Citation>
    <cit:title>
      <gco:CharacterString>1020010075C71C00_102001007946ECO</gco:CharacterString>
    </cit:title>
    <cit:alternateTitle>
      <gco:CharacterString>21</gco:CharacterString>
    </cit:alternateTitle>
    <cit:date>
      <cit:CI_Date>
        <cit:date>
          <gco:DateTime>2018-07-14T22:16:37Z</gco:DateTime>
        </cit:date>
      </cit:CI_Date>
    </cit:date>
  </cit:CI_Citation>
</mri:sourceCitation>
```

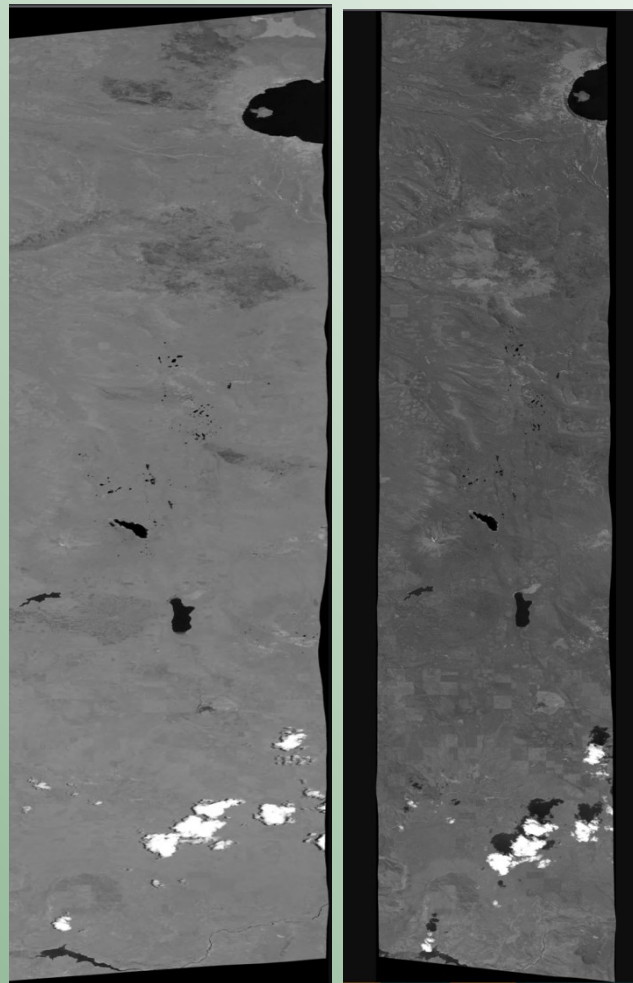
Stereo Pair

Pixel Value in Lineage Mask

	Photogrammetrically derived elevation	9
	Copernicus DEM GLO-30	10
	Strip pair #1	21
	Strip pair #2	22
	Strip pair #3	23

Strip pair #1 is the top layer of the mosaic with a value in lineage mask of 21.

Source strips are viewable at <https://api.discover.digitalglobe.com/show?id<catid>>



Accuracy Assessment

- ◆ IceSAT-2 data is used to provide an accuracy assessment for each DGED6 tile.

```
<gco:Record>
  <swe:Quantity definition="http://nsgreg-api.nga.mil/qual-measure/LinearMapAccuracy90">
    <swe:label>Absolute LE90</swe:label>
    <swe:uom xlink:href="http://nsgreg-api.nga.mil/physical-quantity/length/metre"/>
    <swe:value>1.5538</swe:value>
  </swe:Quantity>
</gco:Record>
```

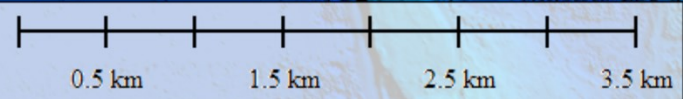
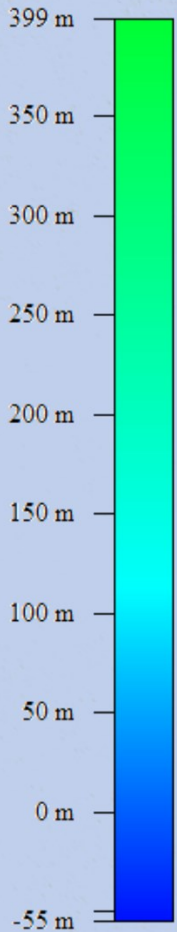
- ◆ Independent Accuracy Assessment performed by CompassData

Ongoing production - 1m DEM for Alaska

- ◆ Total Area = 1 million Km²
- ◆ 5,242 Maxar Stereo Pairs
- ◆ DGED6 (1m) Tiles
- ◆ IFSAR void filled
- ◆ Q2 2024 Est. Delivery



QUESTIONS?



10N540000e4170000n