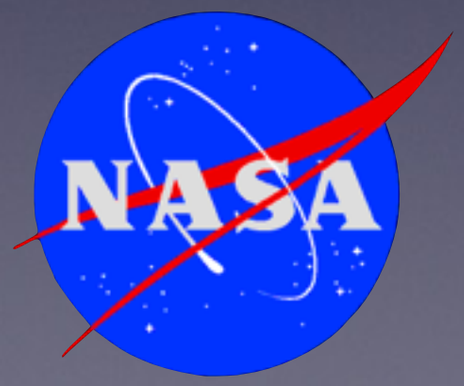
NASA Ames Stereo Pipeline Terrain Generation for Operation IceBridge

Ross Beyer, Oleg Alexandrov, Scott McMichael, and Terry Fong



Who we are

Ross Beyer
Planetary Scientist

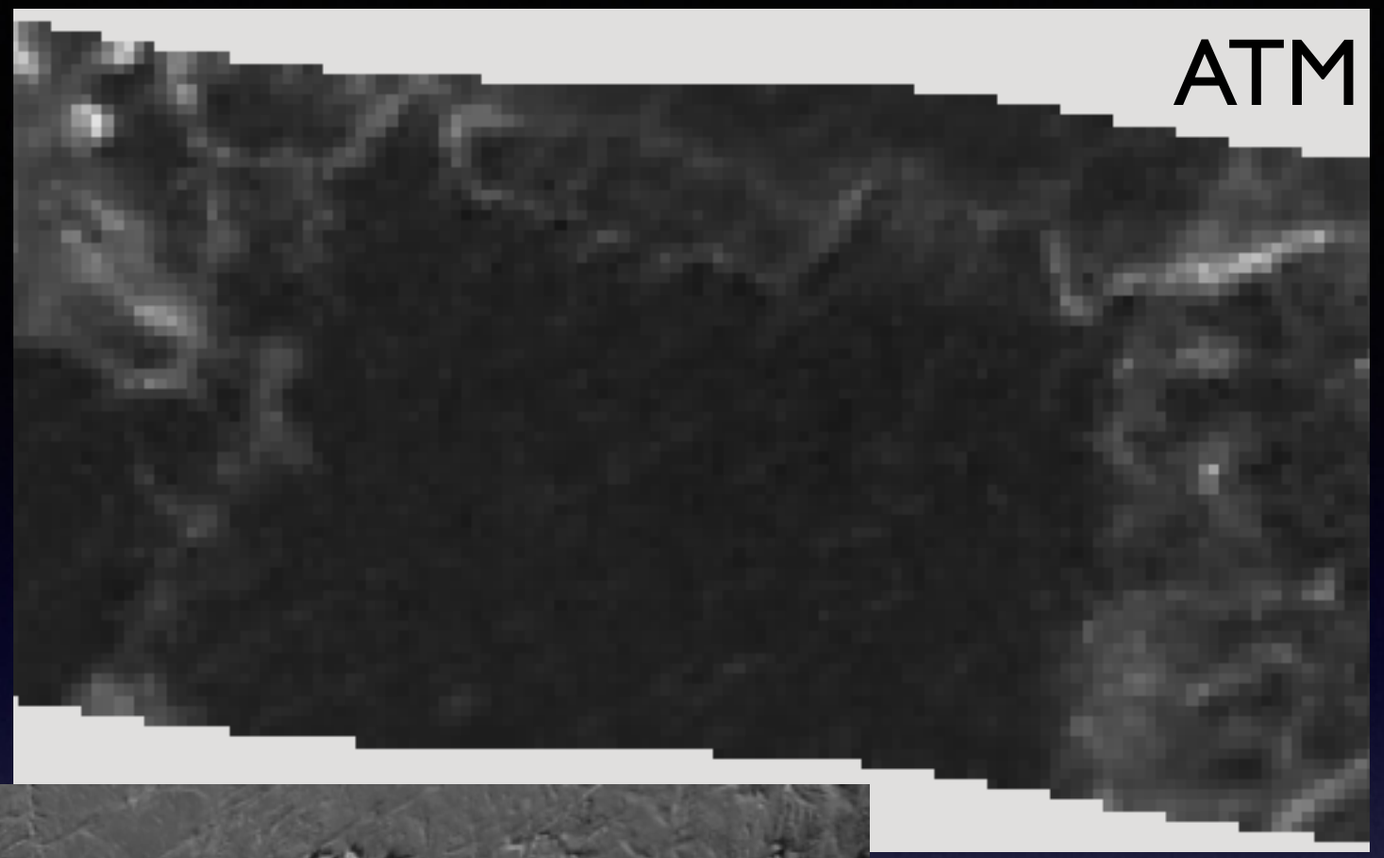
Oleg Alexandrov
Developer

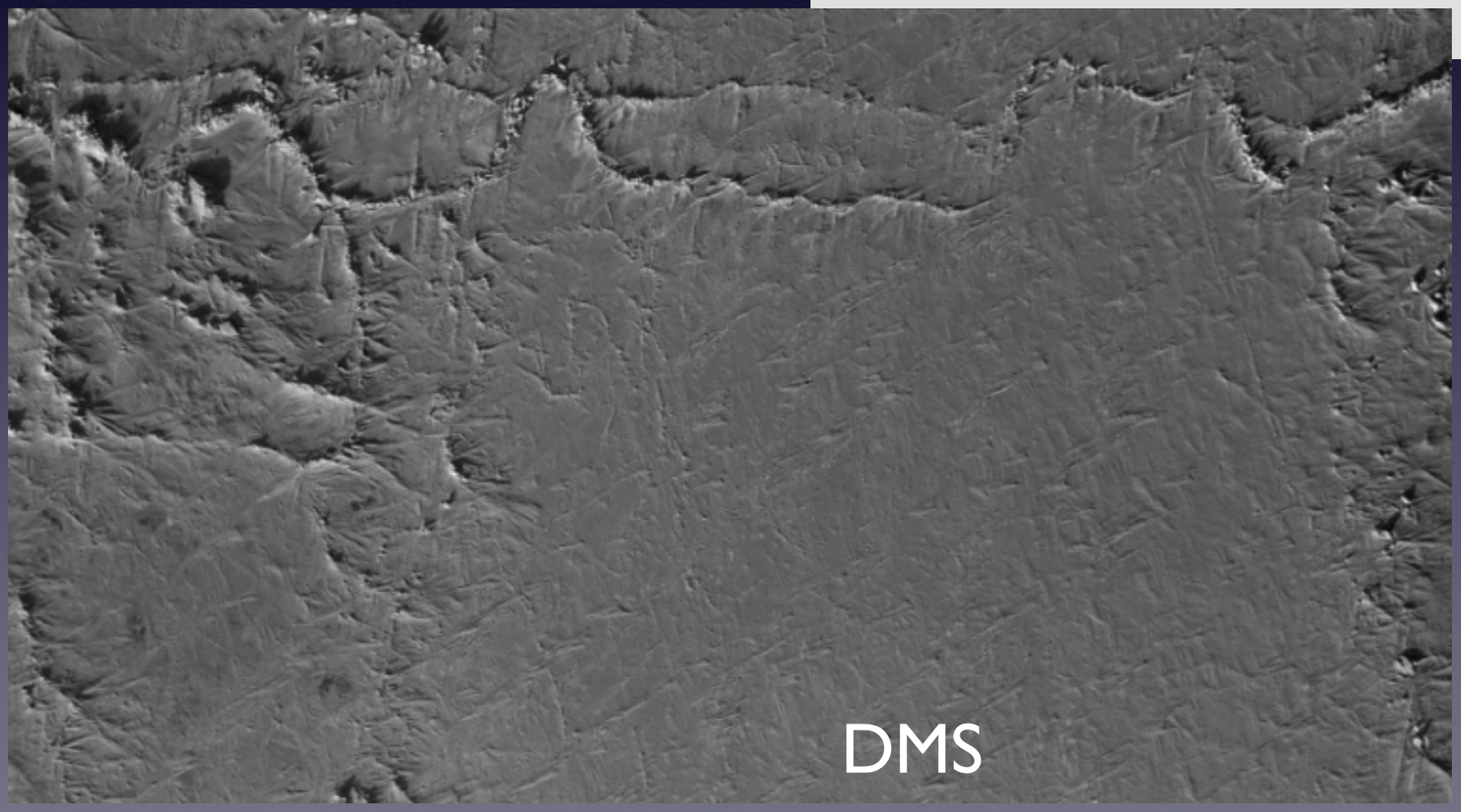
Scott McMichael
Developer

NASA Ames Stereo Pipeline

- Developed by the Intelligent Robotics Group at NASA Ames under Terry Fong
- Has been developed for over a decade
- Open Source (Apache 2.0 license)

What we're going to do

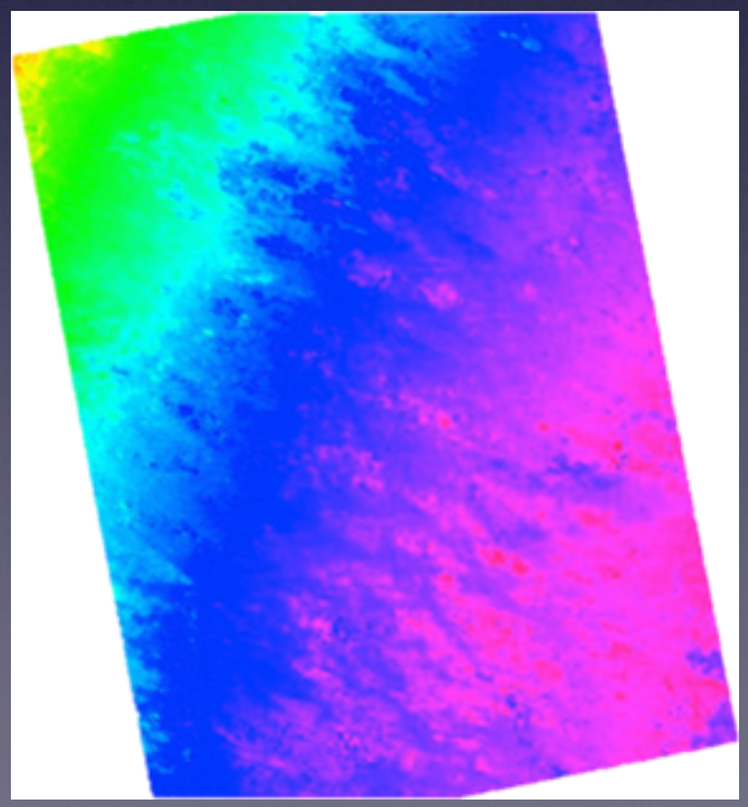




Does that sound familiar?

IceBridge DMS L3 Photogrammetric DEM

available at NSIDC



- 3 of 7 years (2011-2013), ~40% has a broken header
- We will fix header and redeliver to NSIDC
- Allows us to use as a benchmark

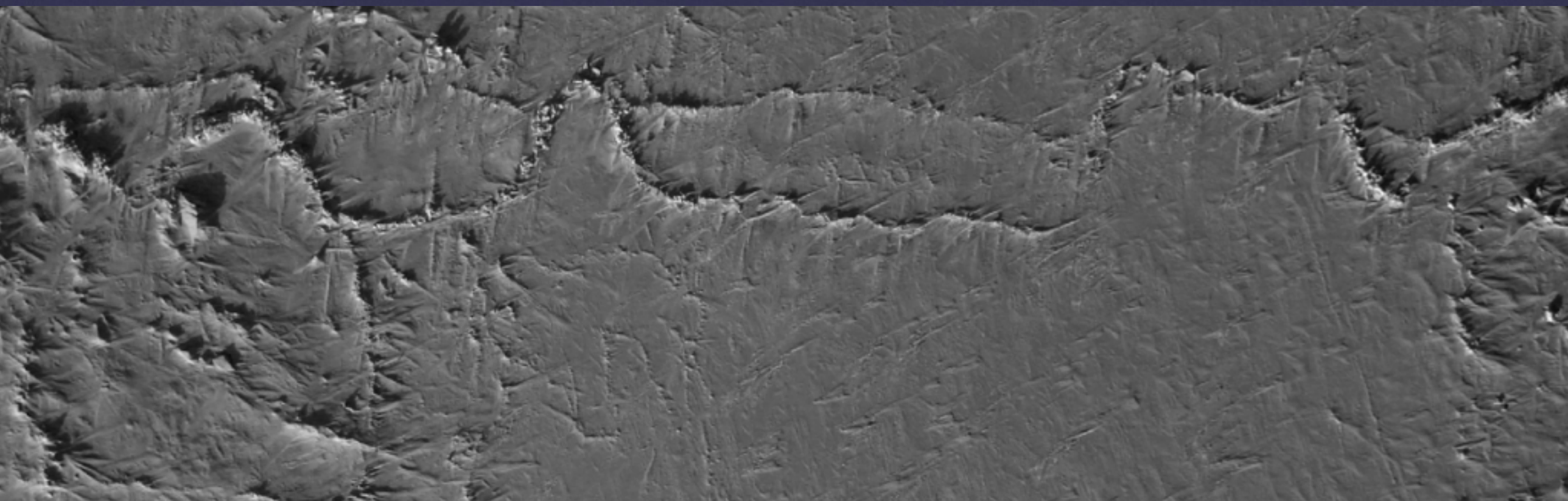
Terrain Quality

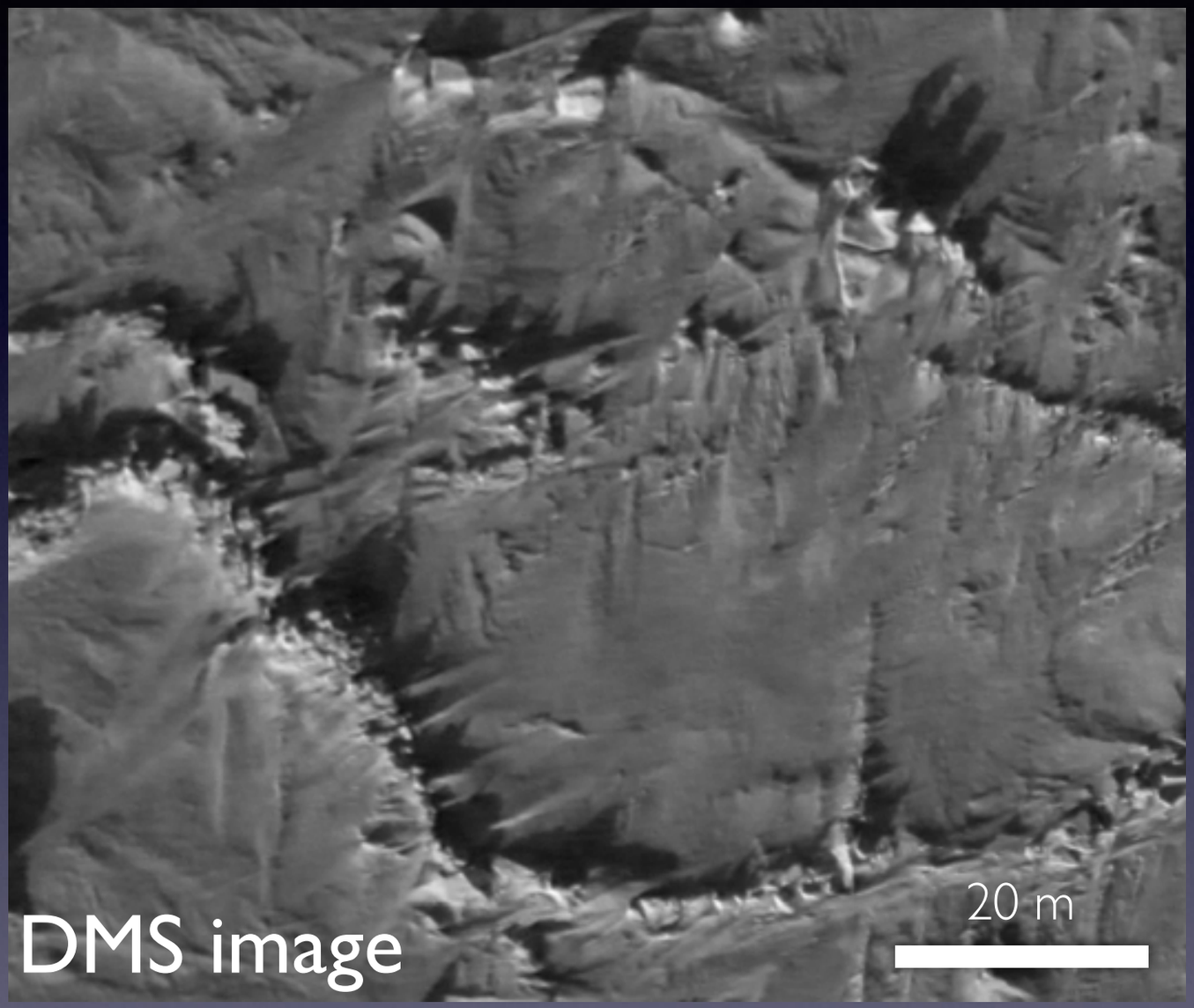
Ground scale:

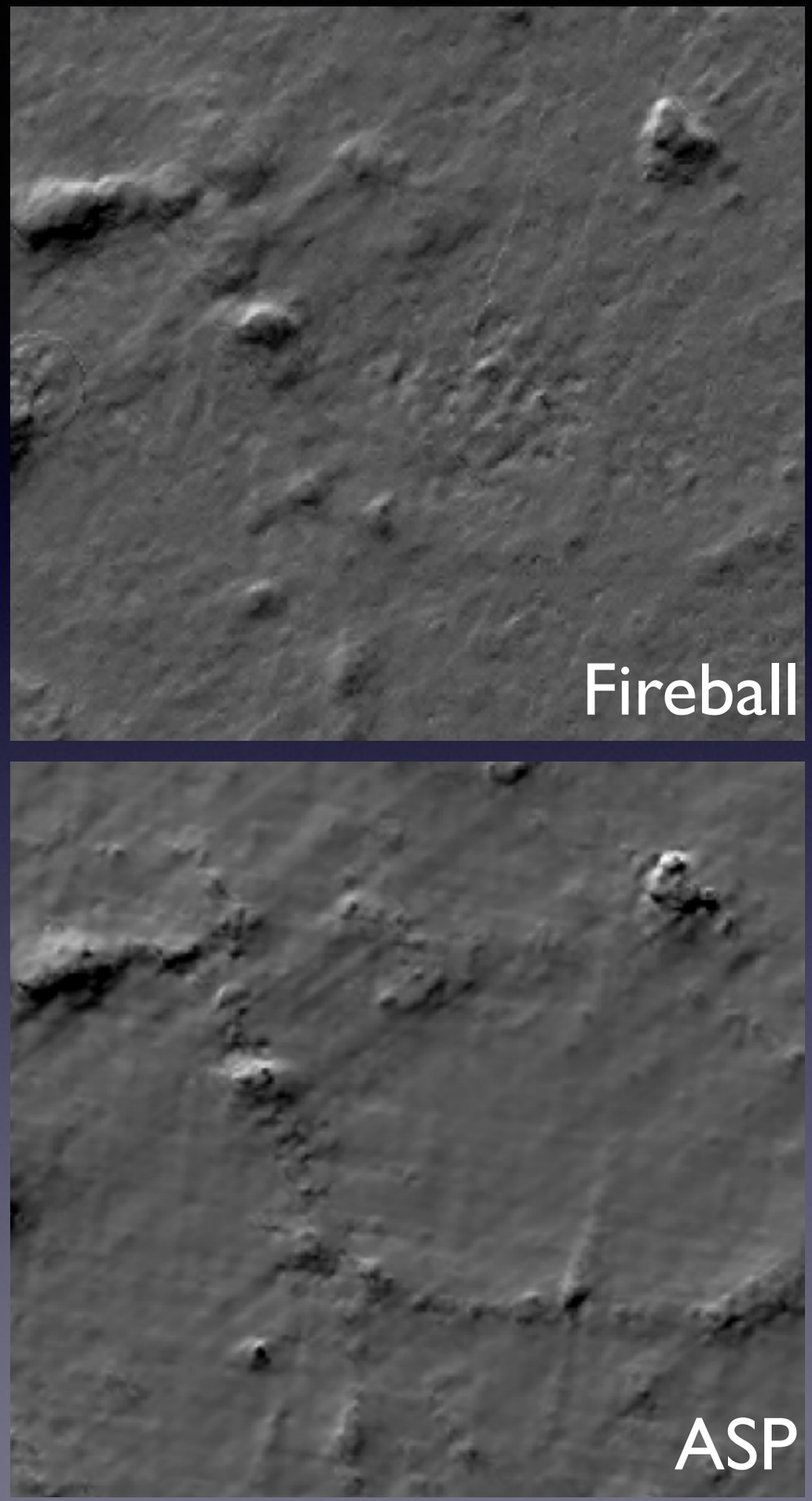
- Image: 10 cm/pixel
- DEM: 40 cm/pixel

Vertical Precision:

- DEM: 10-30 cm




DMS image
20 m


Fireball
ASP

NASA Ames Stereo Pipeline

- Tested several flights both in the North and South
- Parsed NAV files to create initial camera positions
- Refined camera positions/orientations and created DEMs
- Aligned them to ATM LIDAR data
- Multiple-view stereo
- Currently slightly noisier than Fireball (compared to ATM) vertical precisions 27 cm vs 21 cm
- We are working on improvements: level of detail, camera distortion mitigation, vertical accuracy, etc.

How can you increase quality?

- Capture RAW or TIFF instead of JPEG
- Recalibration before each flight
- Ensure camera params don’t change (focal length, etc.)
- A better camera
- Multiple flights over same line at different times of day
- Lower altitude flights

Implementation

- Start processing later in the spring
- NASA Advanced Supercomputing and Google Compute Engine
- We will produce: DTMs and orthoimages (other standard derived products are also possible)
- Will deliver to NSIDC and to Google Earth Engine

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