

Status of GEO Task DA-09-03d : Global DEM

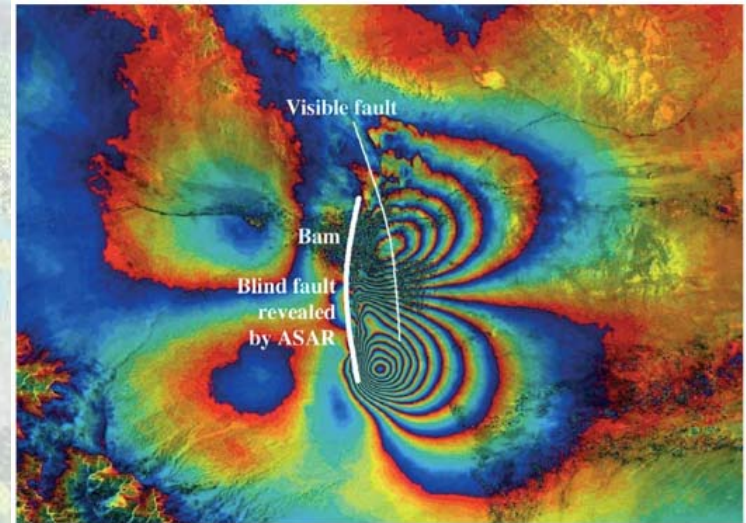
Point of contact
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Why does GEO need global topography/bathymetry?

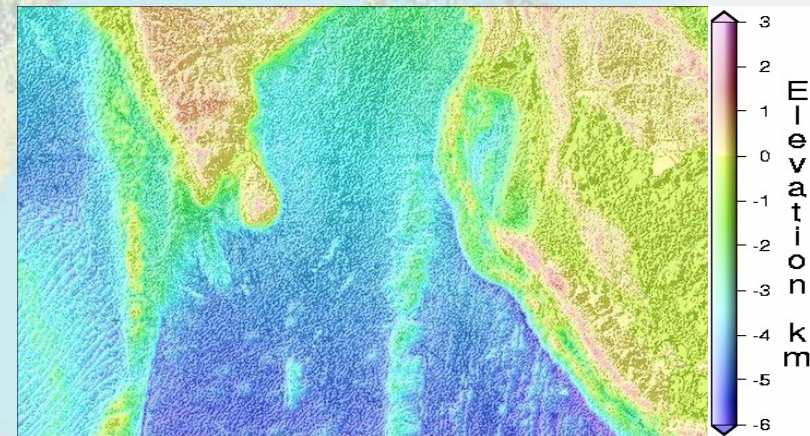
- Global DEM required for 6 of the 9 societal benefit areas identified by the 10 year Implementation Plan of GEOSS
- Natural disasters all require detailed knowledge of topography
 - either directly for volcanic dome monitoring, flood inundation area predictions, landslides
 - or for downstream EO processing, e.g. InSAR for earthquake monitoring and possible prediction
- Poor bathymetric and topography knowledge hinders tsunami forecasts
- Tsunami a main spur for GEO implementation



30m height “flood-fill” based on SRTM-DTED1® 3” (≈90m)



Courtesy of A. Monti-Guarnieri



2' (≈4km) Smith, Walter H.F., and David T. Sandwell, 1997 "Global Sea Floor Topography from Satellite Altimetry and Ship Depth Soundings", Science, 277, 1956-1962, 1997

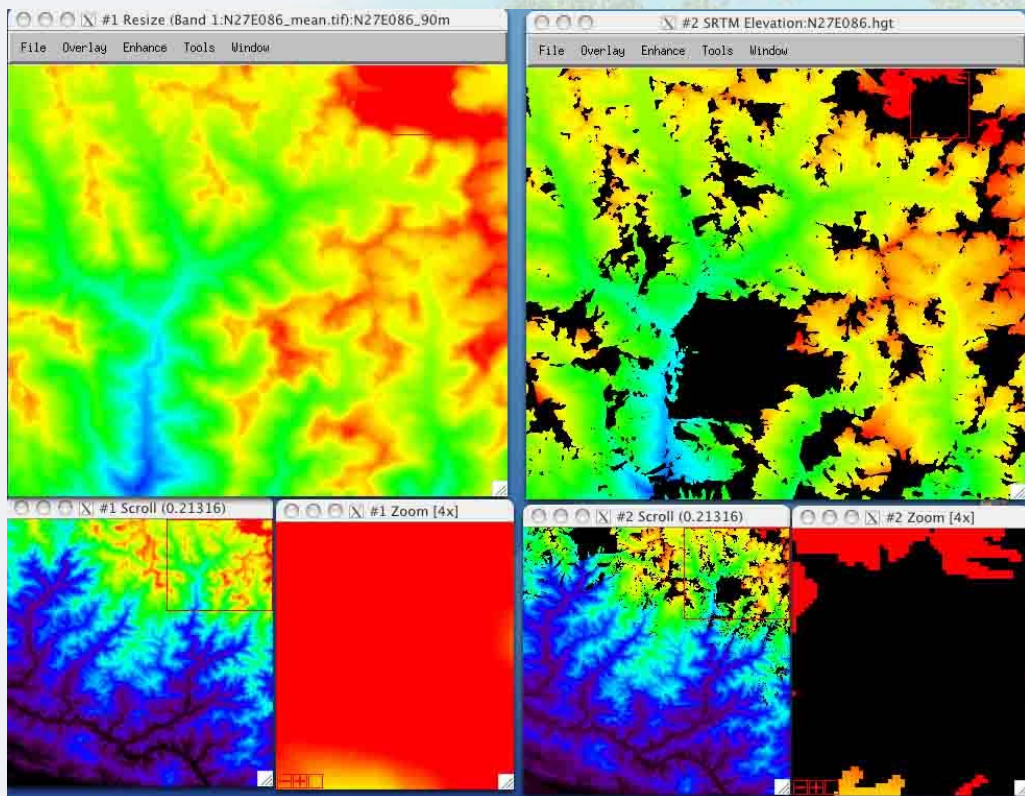
GEO Task DA-09-03d : Global DEM

- Supported by BNSC-CEOS with Point of Contact: Prof. J-P Muller (CEOS-WGCV) and WGISS activities reported by W. Cudlip (BNSC delegate)
- Objectives are to
 - **Facilitate interoperability among Digital Elevation Model (DEM) data sets with the goal of producing a global, coordinated and integrated 30m DEM of the Earth's land surface and continental shelves**
 - Originally envisaged ASTER GDEM to form the land part of this global 30m DEM
 - Continental shelf bathymetry less of a major issue, as appears to be SAR solution
 - **This DEM database should be embedded into a consistent, high accuracy, and long term stable geodetic reference frame for Earth observation.**
- Planned activities include:
 - Successive open calls for **validation of ASTER GDEM quality** (12/08, 3/10) and presentation of results through online proceedings of workshops, subsequent peer review journals.
 - Open display of ASTER GDEM quality through the CEOS-WGISS ICEDS (3/10).
 - Open display of **errors and artifacts through a “Known Product Issues” web service** (3/10).
 - Promotion of **continental shelf bathymetry acquisition starting in north polar region** through ESA/CSA MORSE programme (6/10).
- 40 members involved in Task (UK, US, AU, DE, FR, IT, ES, JP, CN, KR, WMO, OGC)
- Contributes towards 6 of the SBAs with Disaster monitoring most important

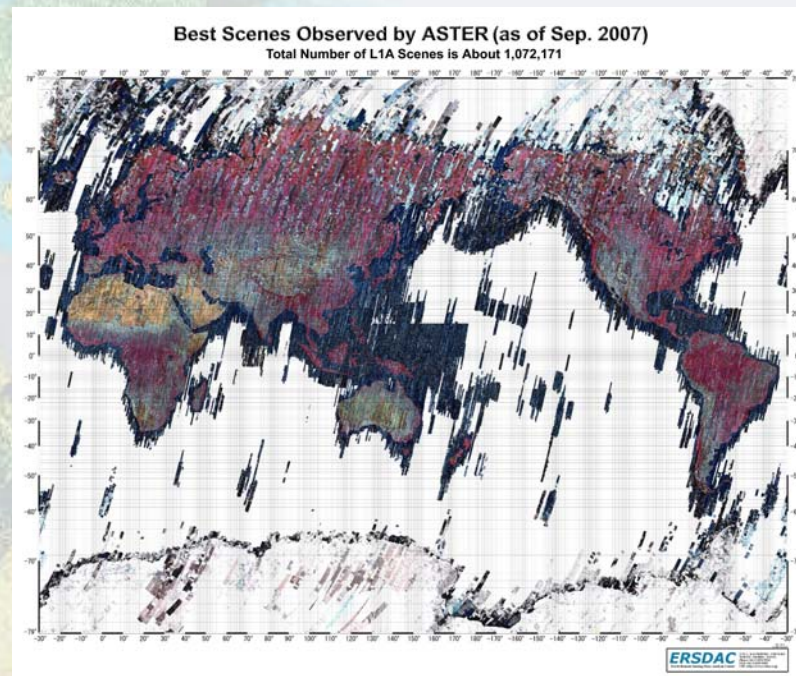
ASTER Global DEM Project

Stacked ASTER

SRTM



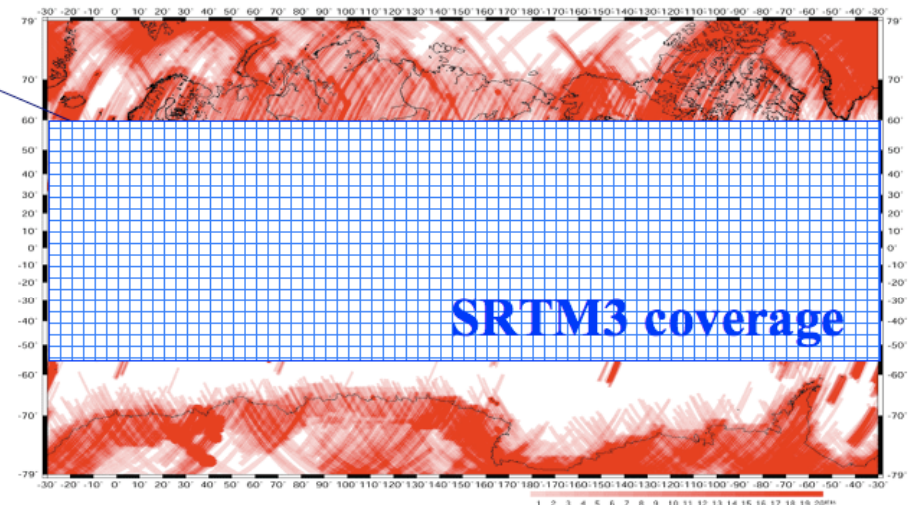
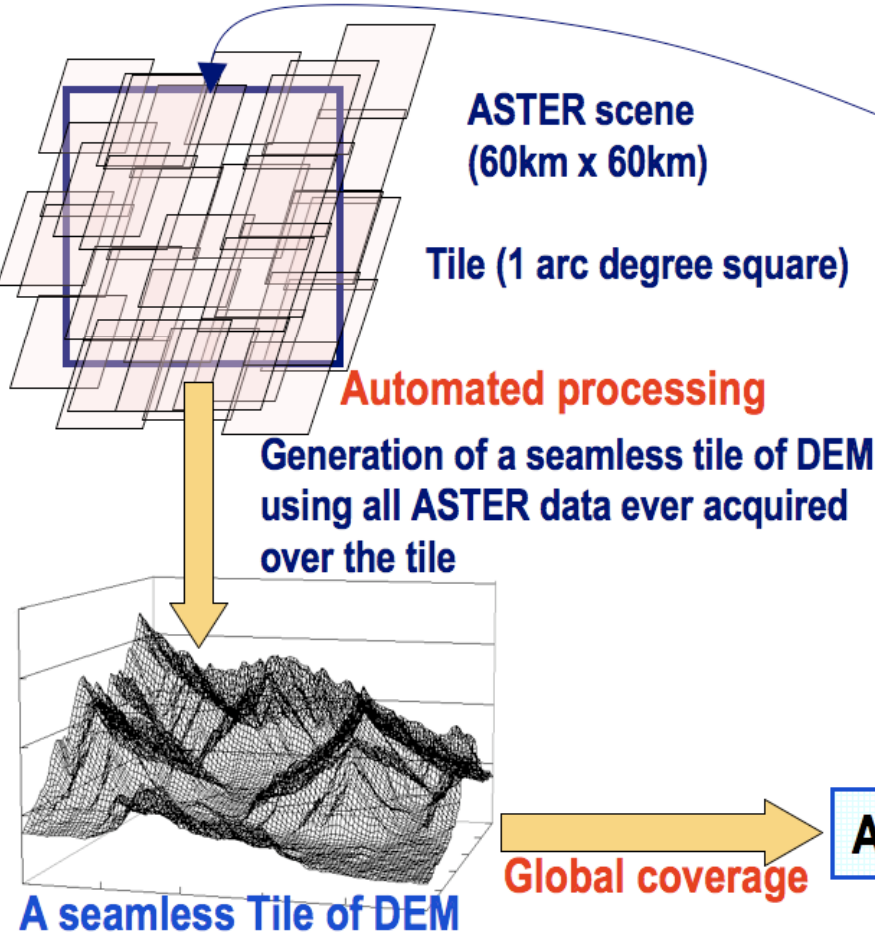
- 203 scenes used
- No holes for ASTER DEM
- Many large holes for SRTM



- 22,895 1° x 1° tiles
- 83° N to 83° S
- 10 m Zrms
- 29/6/2009 release

Methodology

1. Stereo-correlate entire ~ 1.5 million scene ASTER Archive;
2. Cloud mask to remove cloudy pixels;
3. Stack all DEMS & remove residual bad values and outliers;
4. Partition data into 1° x 1° tiles ---



Global coverage → **ASTER GDEM**

Contribution to **GEOSS**
Both US and Japan committed to contribute to GEOSS at Capetown Summit 2007.

Status-Overview : GEO DA-09-03d: Global DEM assessment

- For conterminous U.S. component, 934 CONUS tiles have been compared to National Elevation Dataset (NED) and SRTM1 DEMs.
- Absolute vertical accuracy were measured using 13,300 “GCPs on benchmarks” from the National Geodetic Survey.
- For non-US areas, USGS released an “Announcement of Collaborative Opportunity” on December 2nd, 2008 with a closing date for proposals of January 7th, 2009. JPM circulated AOC around WGCV-TMSG and GEO task group. 21 non-US groups submitted validation results by March 21st, 2009
- India and Thailand both made inquiries but did not submit a formal proposal in the right timescales
- JPM evaluated ASTER GDEM quality for 5 tiles (maximum permitted), 4 of which were over CEOS-WGCV test sites
- Around 1% of the total 22,495 tiles have been evaluated by these 21 groups outside of the US and around 3% by NGA and USGS
- USGS released a joint validation report with the limited distribution of ASTER GDEM on June 29th, 2009 .

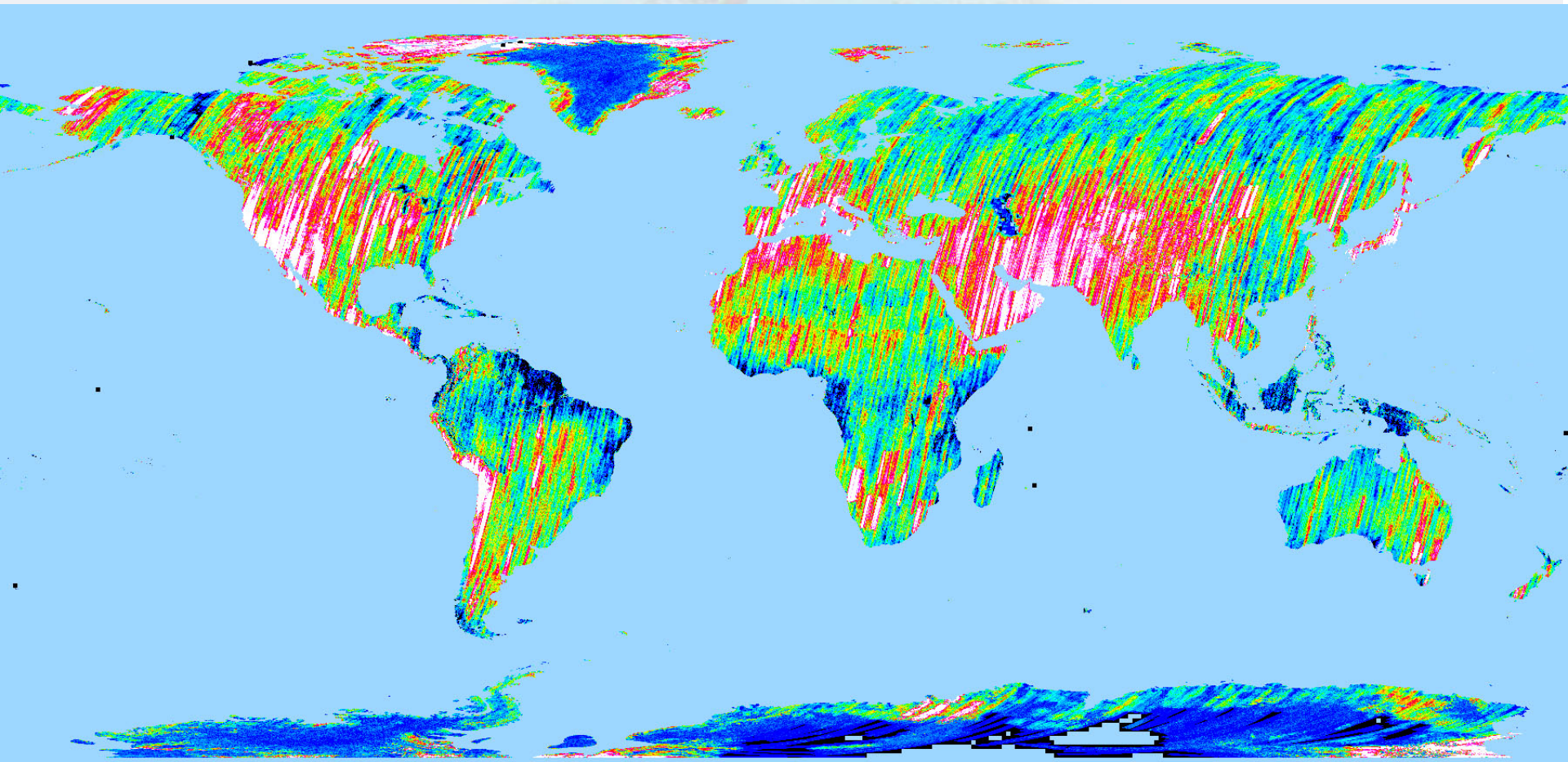
Status-Overview : GEO DA-09-03d: Global DEM : continuing roadblocks

- Current METI/NASA release policy states limits on the maximum number of tiles permitted for each order although all data will be free. USGS/NASA will allow 1,000 tiles at a time, ERSDAC 100 tiles for each order
- This limitation is due to previous ASTER data policy and infrastructure limitations which do not allow anonymous ftp (as for SRTM)
- Only $1^{\circ} \times 1^{\circ}$ tiles to be released to registered users through ERSDAC and USGS-EDC
- During CEOS-GEO-ISPRS workshop at IGARSS09 on 17 July 2009 in Cape Town, Hato-san (ASTER GDS Manager) announced that an updated version would be generated but timescales were then unknown (see later)

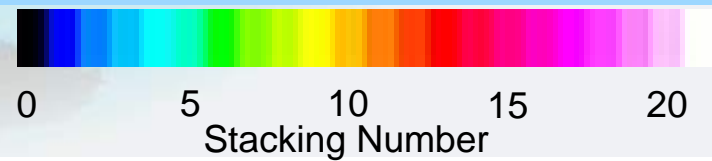
Announcement ASTER Global DEM V2

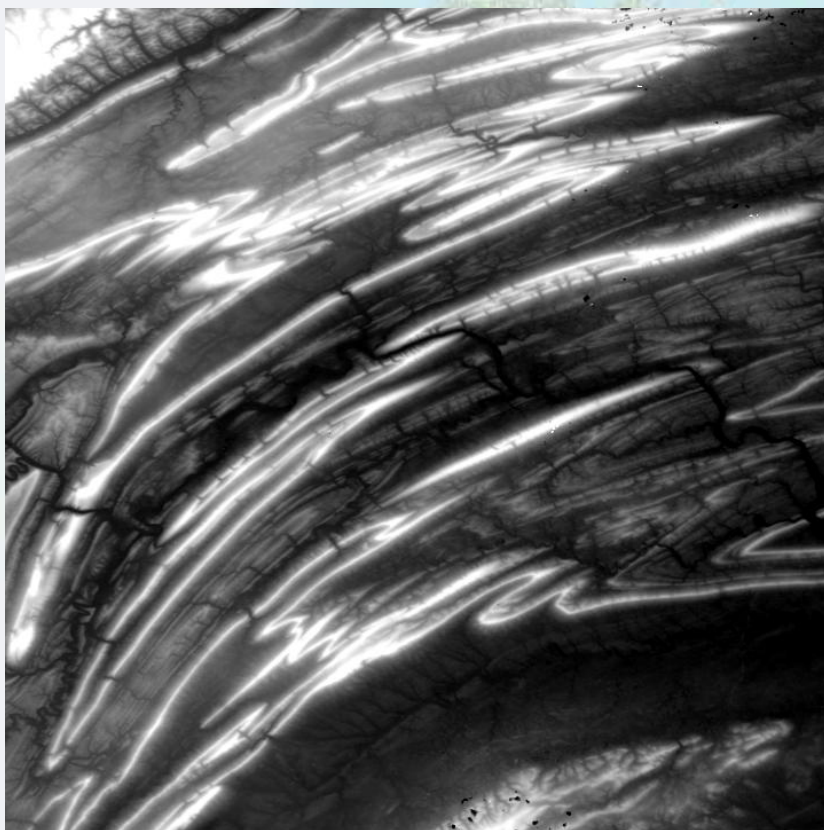
- METI: ASTER GDEM has announced that the ASTER GDEM V2 is likely to be released in Q2/2011. It will include
 - a) updated cloud masking algorithm;
 - b) a further 300,000 scenes will be processed and added to the dataset;
 - c) a new matcher will be applied. Several members of the task team pointed out that co-registration is a critical issue that needs to be addressed to reduce both noise effects and the smearing and resolution reduction observed by many members.

GDEM Stacking Number

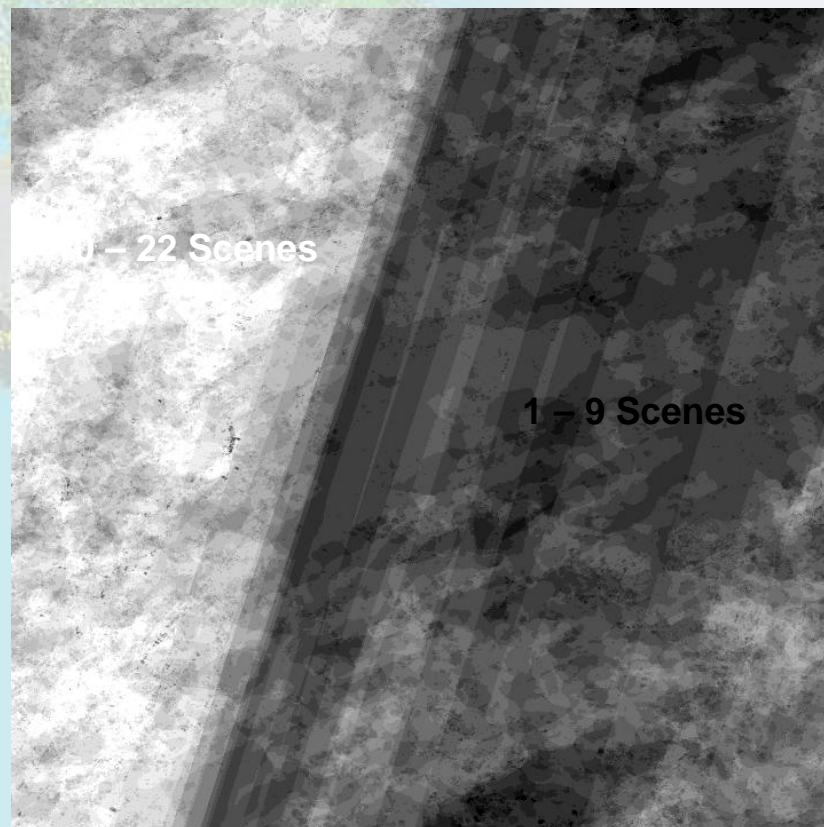


N.B. Experience suggests that accuracy linearly relates to stacking number.





Prototype ASTER GDEM



Number of Scenes Used to Produce
Prototype ASTER GDEM