A New MODIS-based Mosaic of Antarctica: MOA

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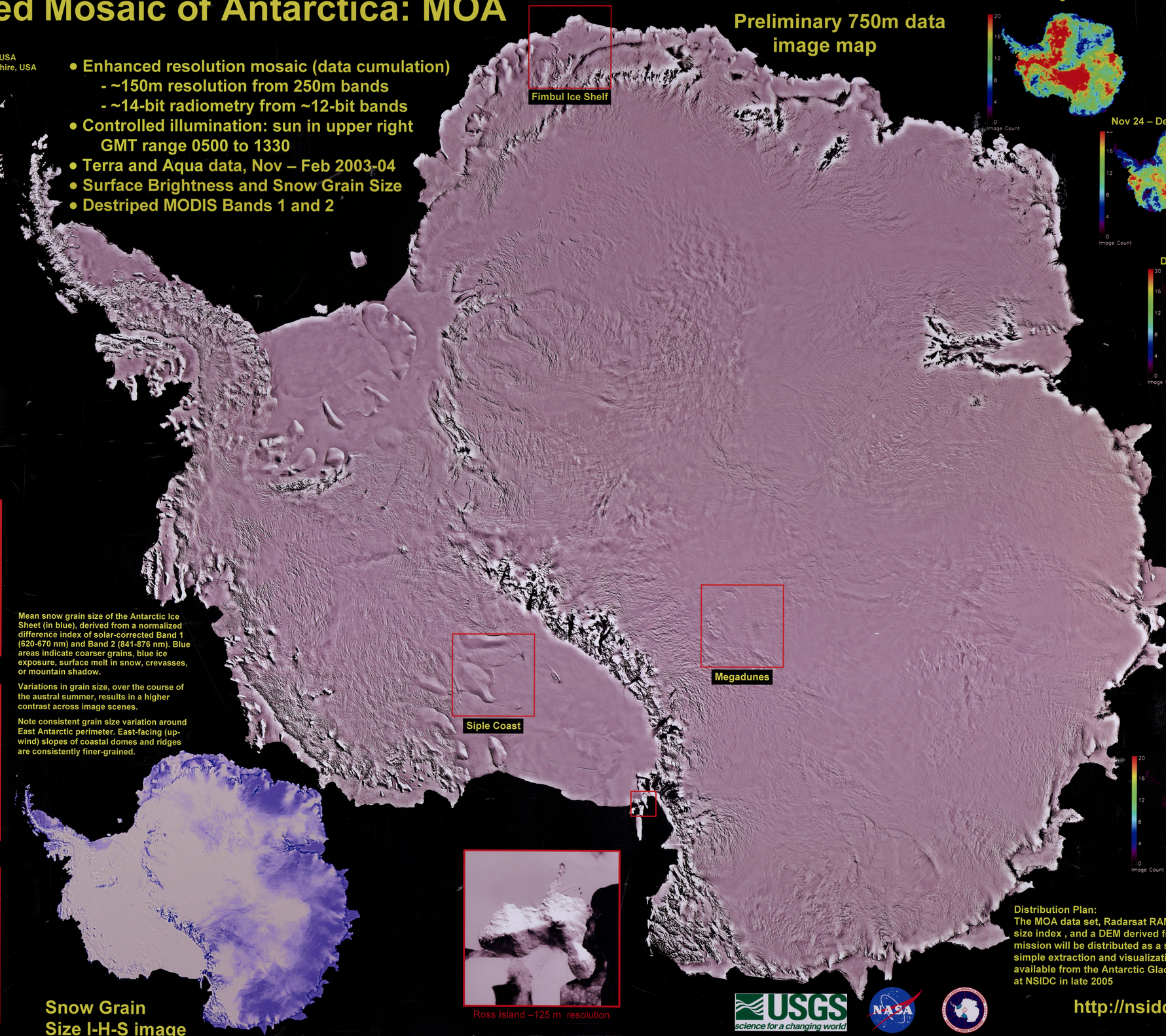
A digital image map of the Antarctic continent assembled from 233 MODIS (Moderate Resolution Imaging Spectroradiometer) band 1 and band 2 orbit swaths is presented. The map is comprised of both Terra and Aqua MODIS images acquired during the 2003-2004 austral summer. Multiple images of all areas are combined in an image-enhancement scheme to provide surface resolutions between 125 and 250 meters. Images were destriped, georeferenced, and resampled using the MS2GT software available at NSIDC. Acquisition times were limited to 0500 - 1330 UT continent-wide to provide a more uniform illumination direction of ice surface morphology across image seams, while at the same time clearly image linear snow features of every orientation. Regions of cloud cover and intense forward scattering from snow were removed. Both channels are compiled and an approximate grain size algorithm is applied in a separate data layer. The mosaic is rendered in a 125-meter grid identical to the RAMP (Radarsat Antarctic Mapping Project) Antarctic Mapping Mission - 1 (AMM-1) 125-meter mosaic. The image map reveals a host of detailed features on the ice sheet, ice shelves and fast ice of the continent, and provides an accurate rendition of mountain and nunatak features. In particular, snow dune features, ice flowlines and streaklines, crevasse regions, and ice shelf rifts are imaged clearly. Mean grain size information was extracted from a normalized difference of the band 1 and band 2 images, highlighting blue ice areas. The MOA image map is complimentary to the radar-image-based RAMP mosaic, highlighting true surface morphology without a subsurface volume backscattering component. This results in a better discrimination between accumulation- and crevasse-related subsurface changes and surface features.

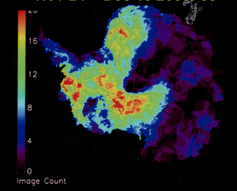
- Enhanced resolution mosaic (data cumulation)
  - ~150m resolution from 250m bands
  - ~14-bit radiometry from ~12-bit bands
- Controlled illumination: sun in upper right
  GMT range 0500 to 1330
- Terra and Aqua data, Nov – Feb 2003-04
- Surface Brightness and Snow Grain Size
- Destriped MODIS Bands 1 and 2

Preliminary 750m data image map

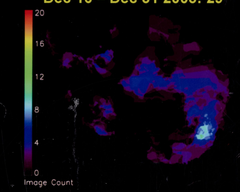


Total image count : 233

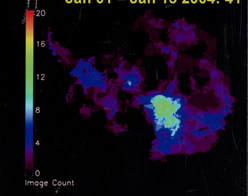
Nov 24 – Dec 15 2003: 83



Dec 16 – Dec 31 2003: 29



Jan 01 – Jan 15 2004: 41



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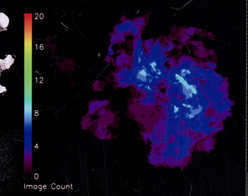

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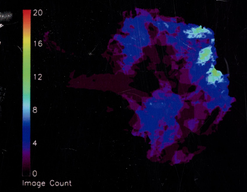
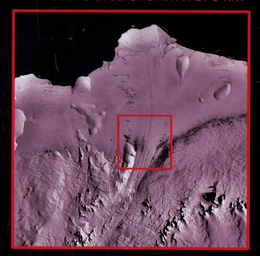
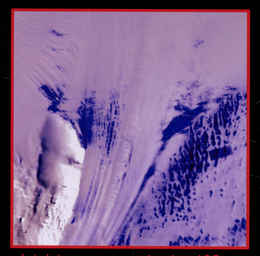


750 m data
Sub-scene area 375 km x 375 km



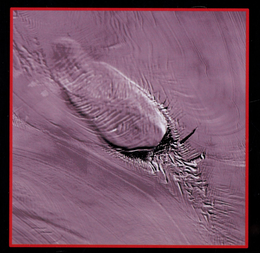
Fimbul Ice Shelf - 750 m resolution

125 m data
Sub-scene area 100 km x 100 km

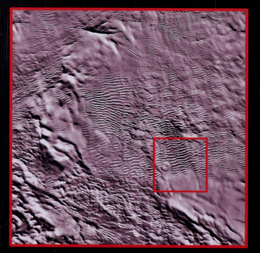


Jutulstraumen - grain size 125 m

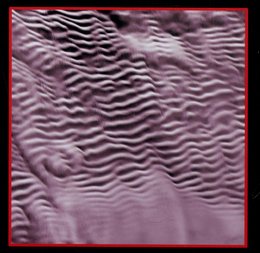
Siple Coast –750 m resolution



Steershead –125 m resolution



Megadunes –750 m resolution



Megadunes –125 m resolution

Mean snow grain size of the Antarctic Ice Sheet (in blue), derived from a normalized difference index of solar-corrected Band 1 (620-670 nm) and Band 2 (841-876 nm). Blue areas indicate coarser grains, blue ice exposure, surface melt in snow, crevasses, or mountain shadow.

Variations in grain size, over the course of the austral summer, results in a higher contrast across image scenes.

Note consistent grain size variation around East Antarctic perimeter. East-facing (up-wind) slopes of coastal domes and ridges are consistently finer-grained.

Snow Grain Size I-H-S image

Ross Island –125 m resolution

Distribution Plan:
The MOA data set, Radarsat RAMP 125m mosaic, MOA grain size index , and a DEM derived from the ICESat laser altimetry mission will be distributed as a series of data layers with simple extraction and visualization software. The data will be available from the Antarctic Glaciological Data Center (AGDC) at NSIDC in late 2005

http://nsidc.org/agdc