
Alaska SAR Facility
Geophysical Institute
University of Alaska Fairbanks
Radiometric Calibration
Presented by
Jeff Lipscomb (7767)
April 24, 2002

Outline

- Calibration Overview
- Physical Antenna Pattern (Why)
- Radiometric Calibration (What & When)
- Procedure (How)
- Discussion

BOTTOM LINE – Radiometric calibration produces an antenna gain pattern to optimize processor output

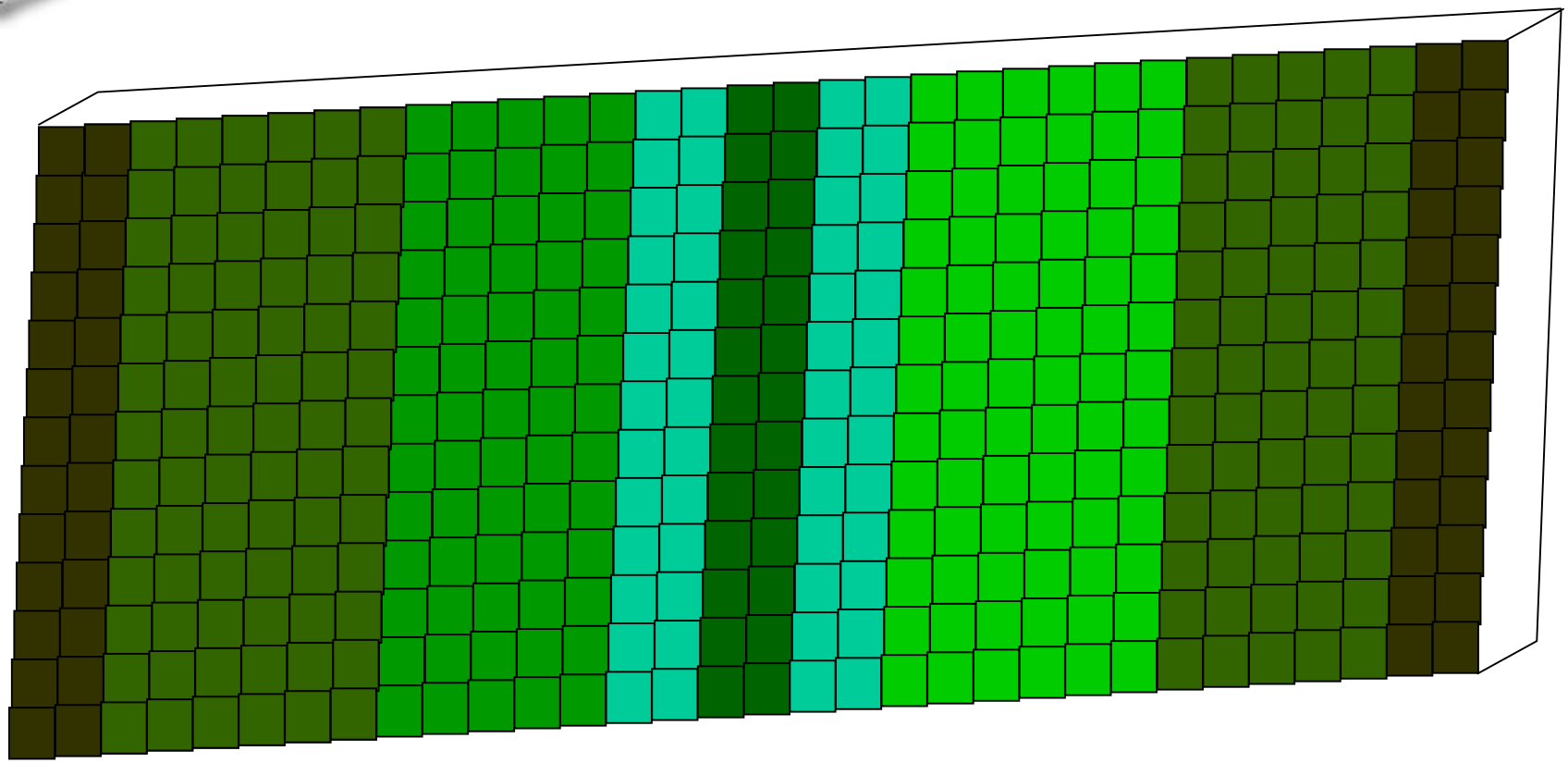
AND

We say “data” calibration, but it is really the processor

CALIBRATION

- Use a common scale as an example: adjust to known “calibration” weights
- **Image Quality** analysis – two weeks ago
  - Impulse Response Functions
  - Geolocation
- **Noise Floor** Analysis – May 8, 2002
- For SAR data, **Radiometric Calibration** adjusts antenna pattern to known backscatter

Antenna Pattern



Glasses for the Satellite

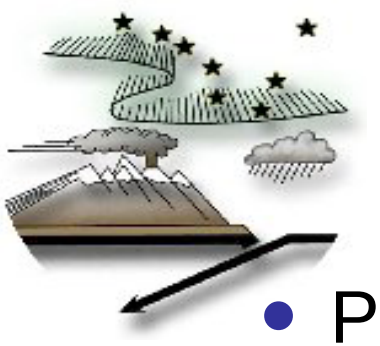
- The SAR antenna doesn't "see" the same thing everywhere on it's surface
- The antenna gain pattern allows us to adjust the processor to compensate for this distortion
- In order to do this we have to have our calibration "weights" – for us Amazon Rainforest

WHAT IS RADIOMETRIC CALIBRATION?

- Sometimes called distributed target analysis
- Done prior to production
- Iterative process
- Two categories of parameters
  - Absolute (typically ±2 dB)
  - Relative (typically ±1 dB)

Absolute & Relative

- Absolute Radiometric specification applies to an average of 2 or more orbits, which are compared to the ground truth of –6.5 dB: No more than 2 dB variation in either direction
- Relative Radiometric specification applies to a single orbit, and is the measure from highest point to lowest point within the pattern: No more than 1 dB total spread



Lather, Rinse, Repeat

- Process the data using a provided or modified antenna pattern
- Adjust antenna pattern based on average of measured results for an area of known backscatter
- Calibration Parameters File (CAL PARMS) modified for use by the processor (PP or AISP)
- Processor Antenna Pattern file (PAP) modified for use by FOCUS processor
- Do it again until we are within specification

RADIOMETRIC CALIBRATION EXAMPLE - MAMM

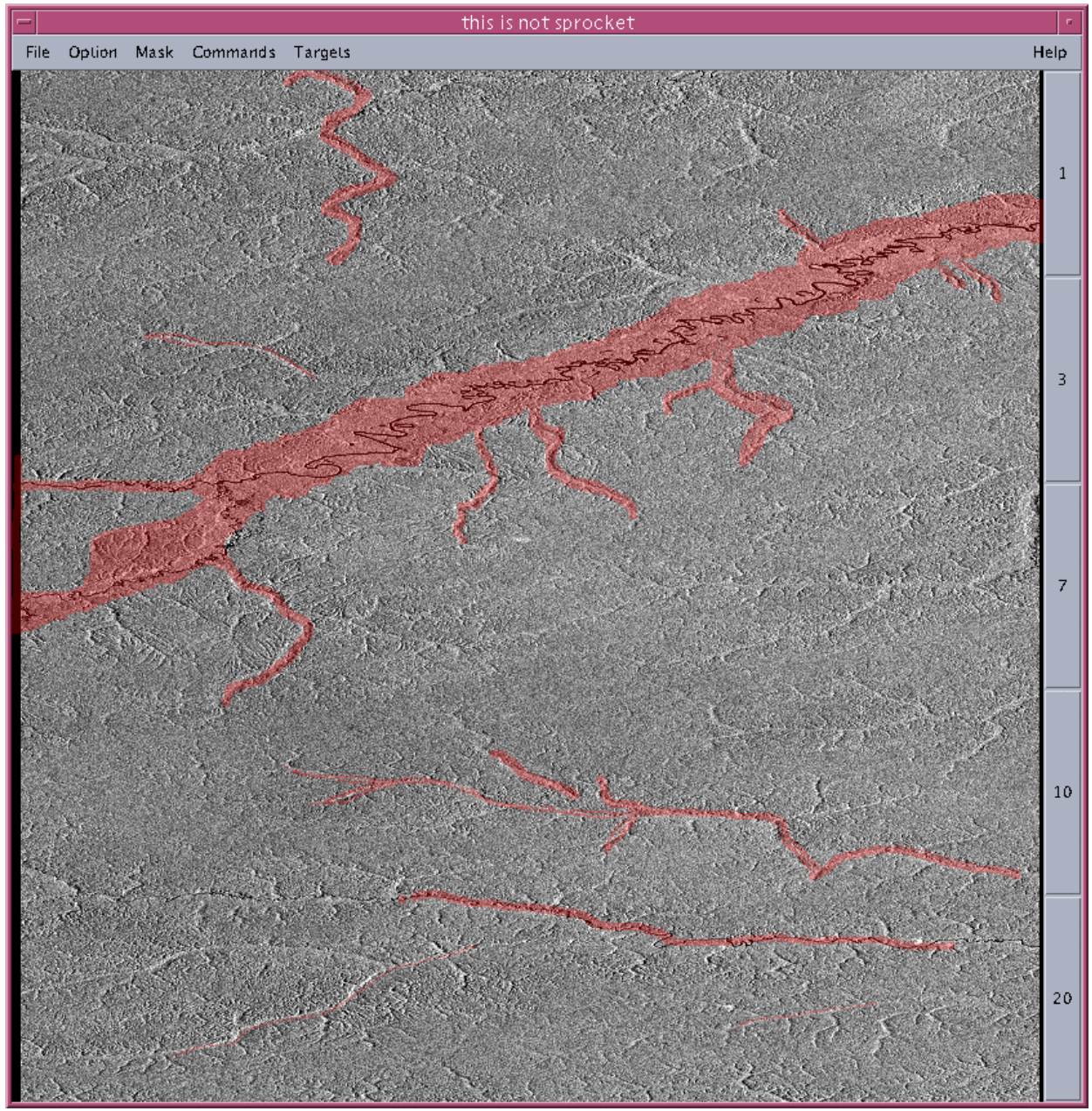
- Choose a homogenous region of the Amazon
- Ordered level 0 Products from MAMM Production String
- *Processed to Level 1* on LZP4
- Deselected rivers and anomalous regions from image
- Sprocket performed Gamma Naught calculation

Radiometric Calibration

- Amazon Rainforest used
  - Uniform
  - Relatively stable
  - Isotropic scatter
  - Known γ° value (-6.5 dB).

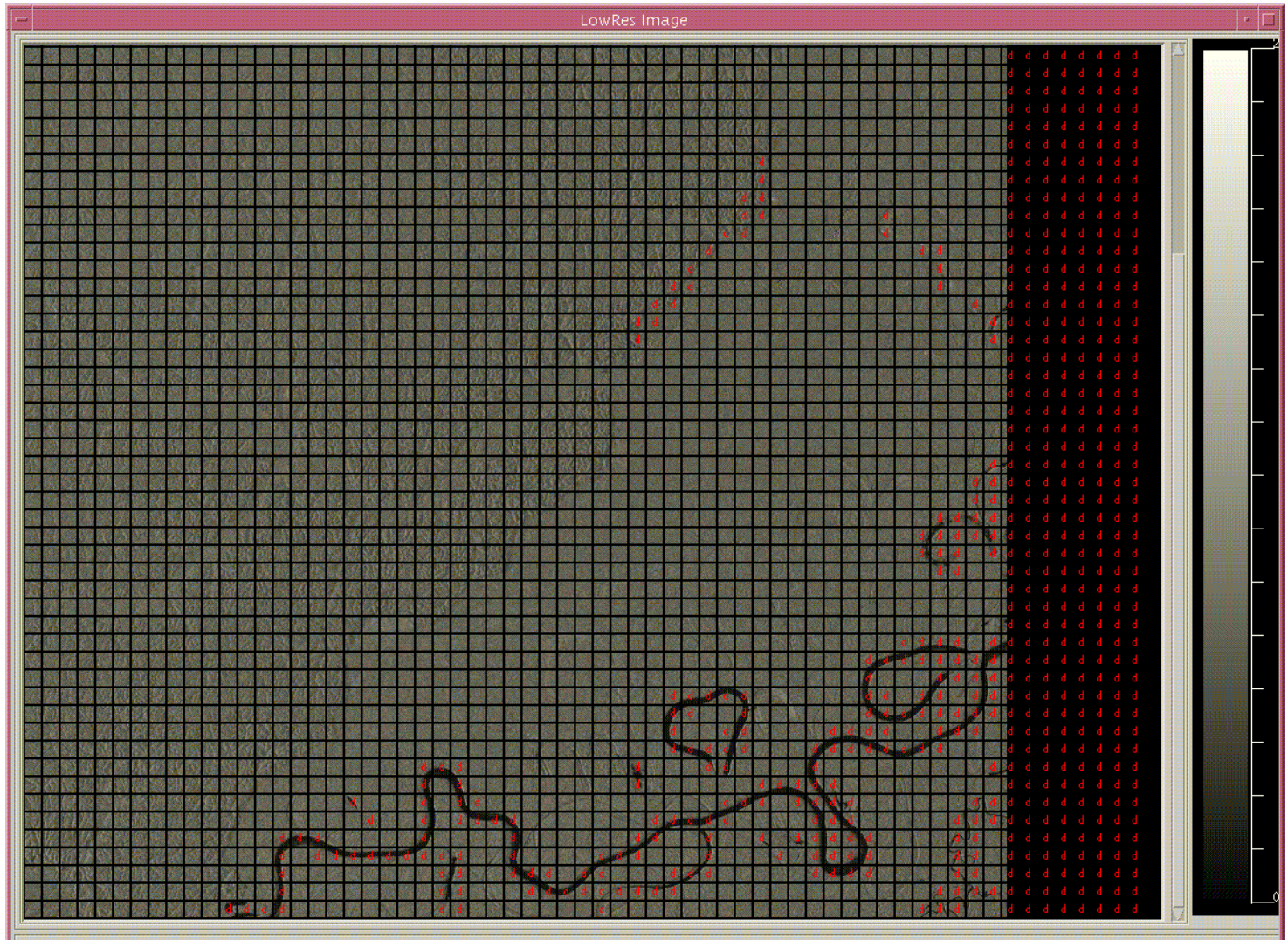
Radiometric Calibration

SPROCKET Masking



Radiometric Calibration

PVS Masking



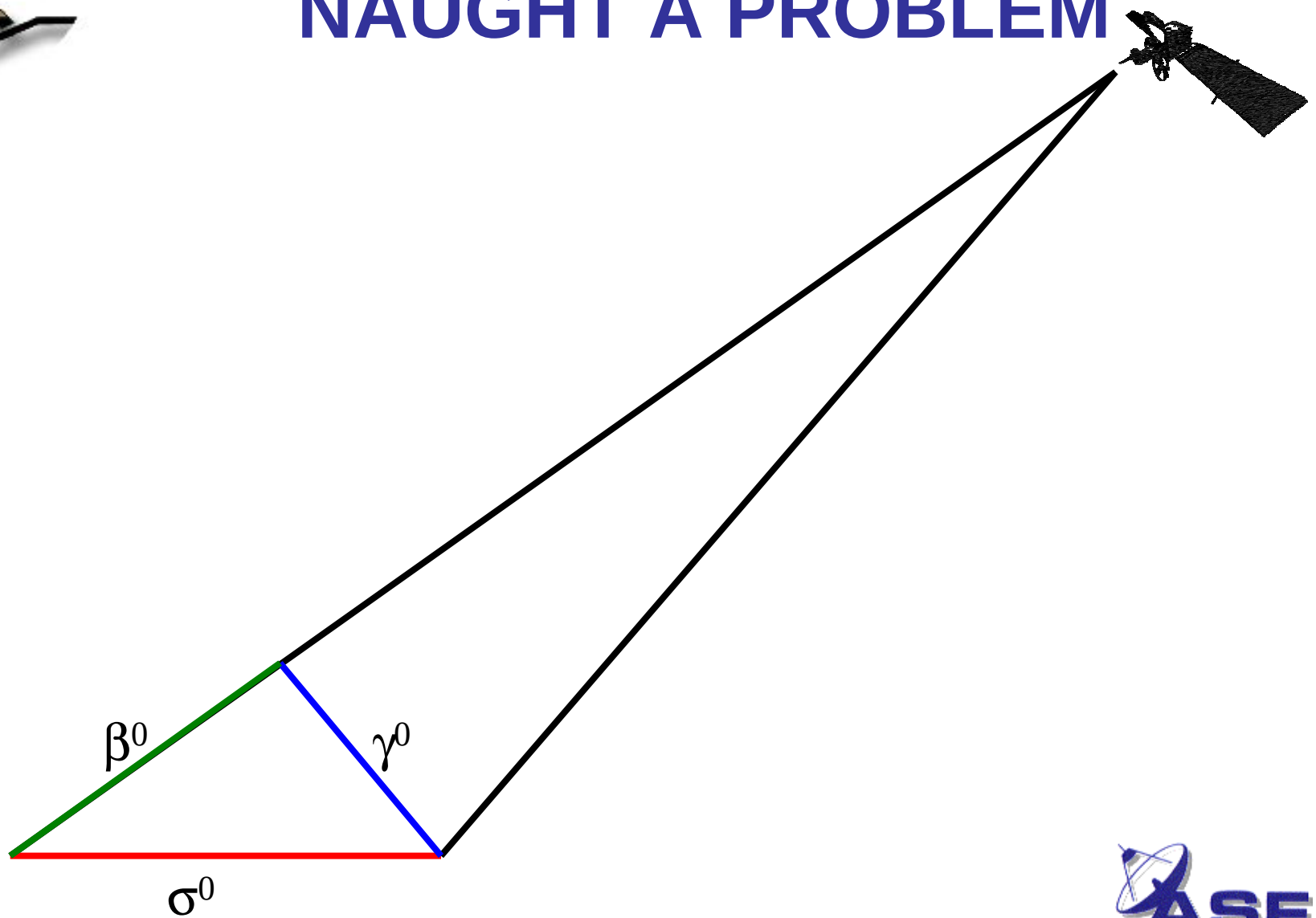
UAF UNIVERSITY OF ALASKA FAIRBANKS

ASF

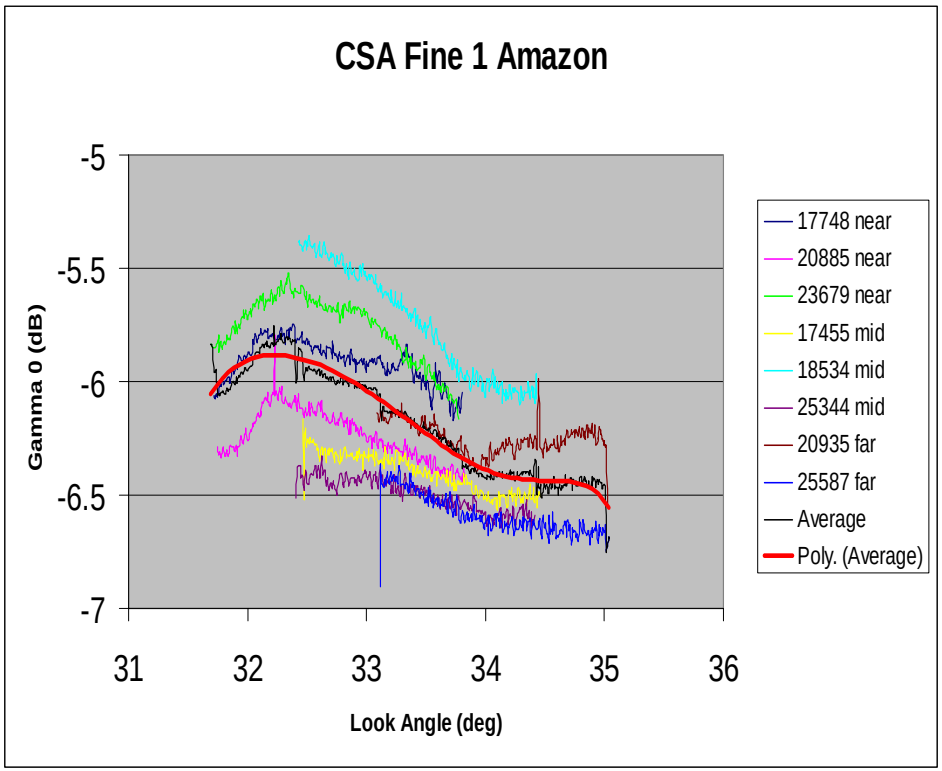
RADIOMETRIC CALIBRATION EXAMPLE - MAMM

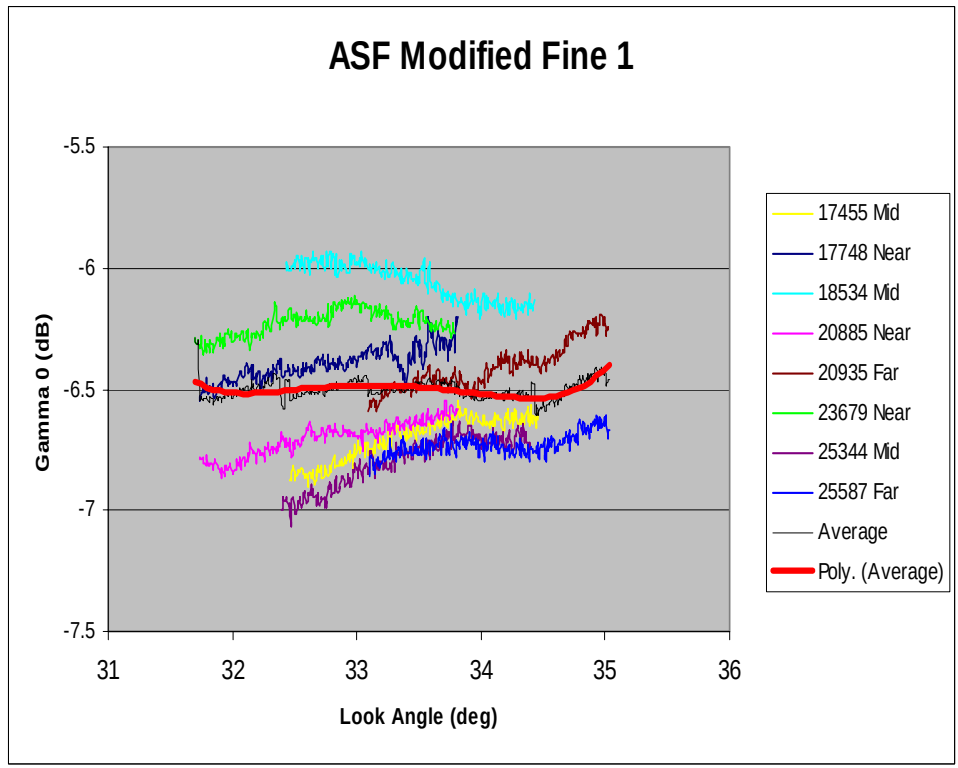
- Sprocket output analyzed with Excel
- Submitted a correction to LZP4
- Repeated above steps until antenna pattern was optimized

SIGMA vs. BETA vs. GAMMA: NAUGHT A PROBLEM



Fine 1 Gamma naught plots





CONCLUSION

Radiometric calibration produces an antenna gain pattern to optimize processor output

We calibrate the PROCESSOR <u>NOT</u> the data

QUESTIONS?
COMMENTS?
OBSERVATIONS?

UAF UNIVERSITY OF ALASKA FAIRBANKS

ASF