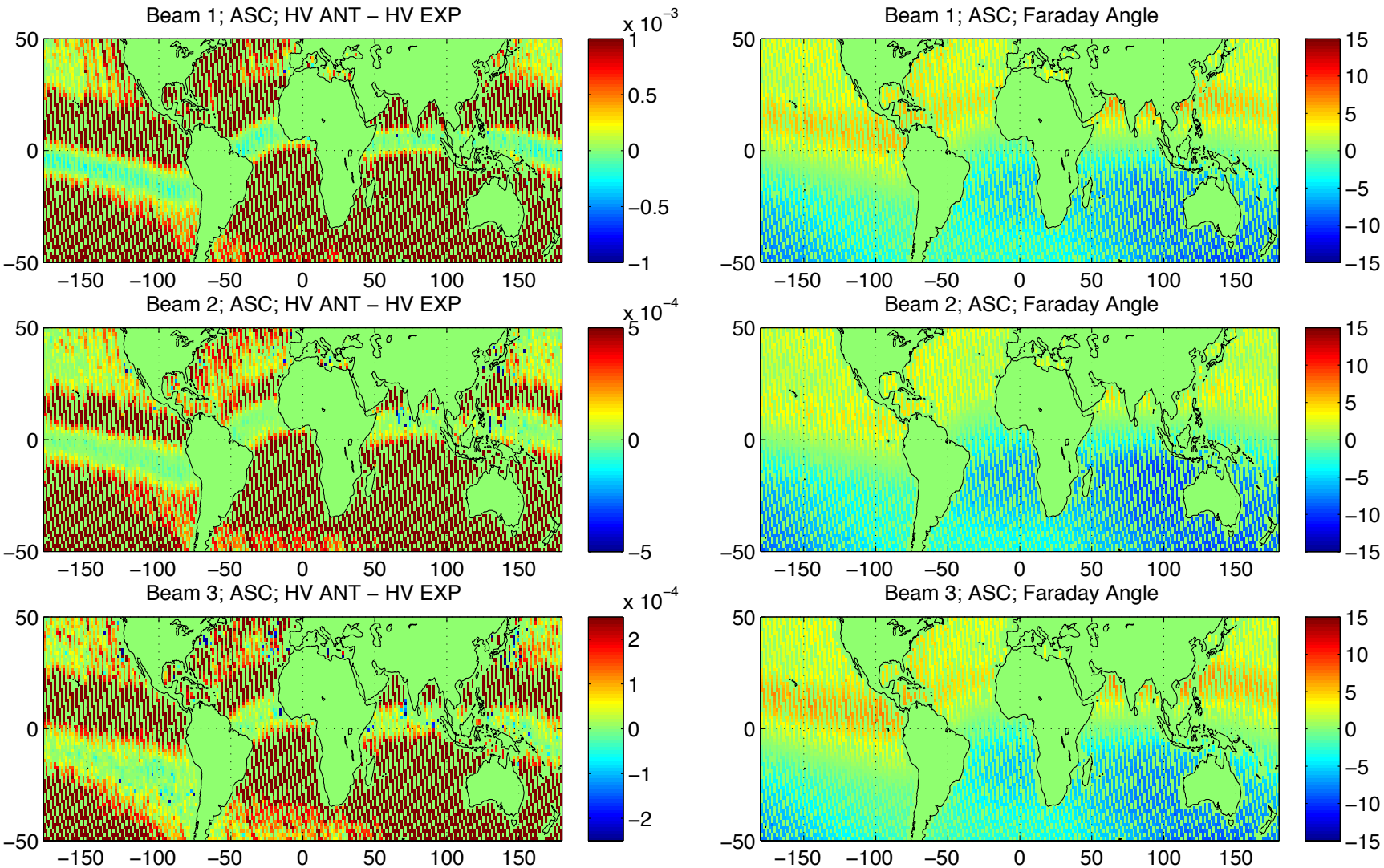
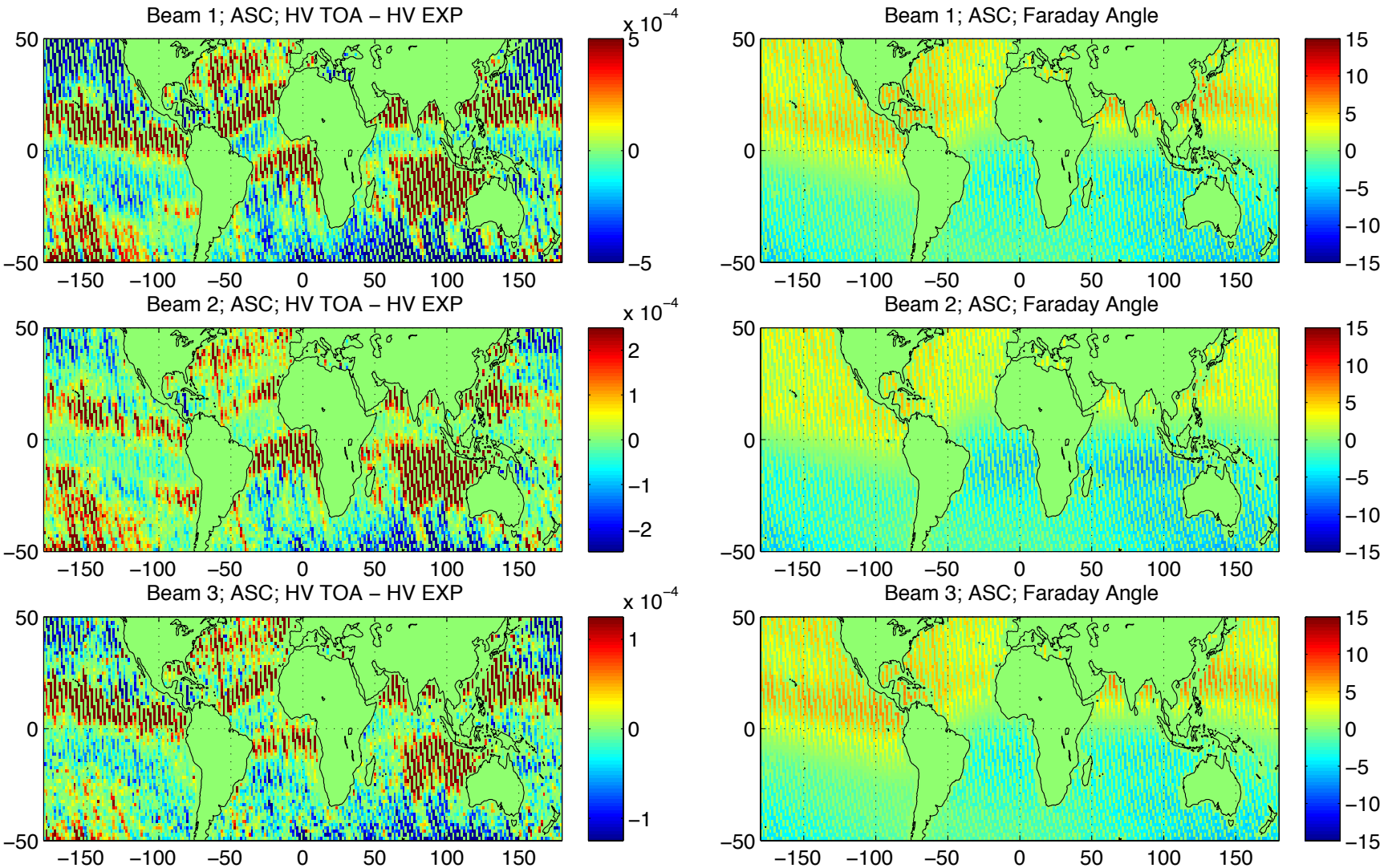
Aquarius Cross-Pol Calibration

March 27th 2012

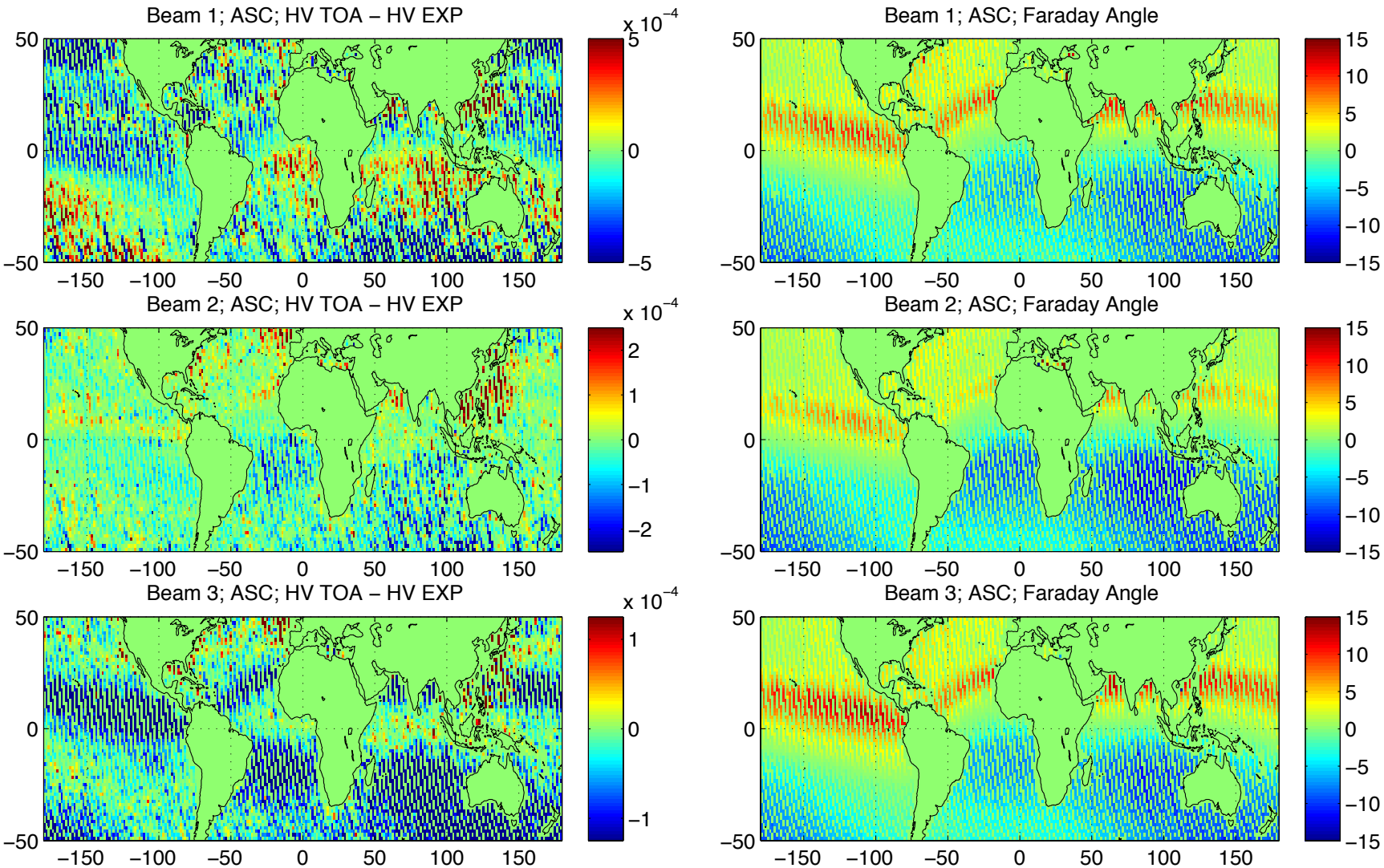
HV ANT – HV expected; Ascending; 2011-323 to 2011-352
Model Faraday angle plotted on left



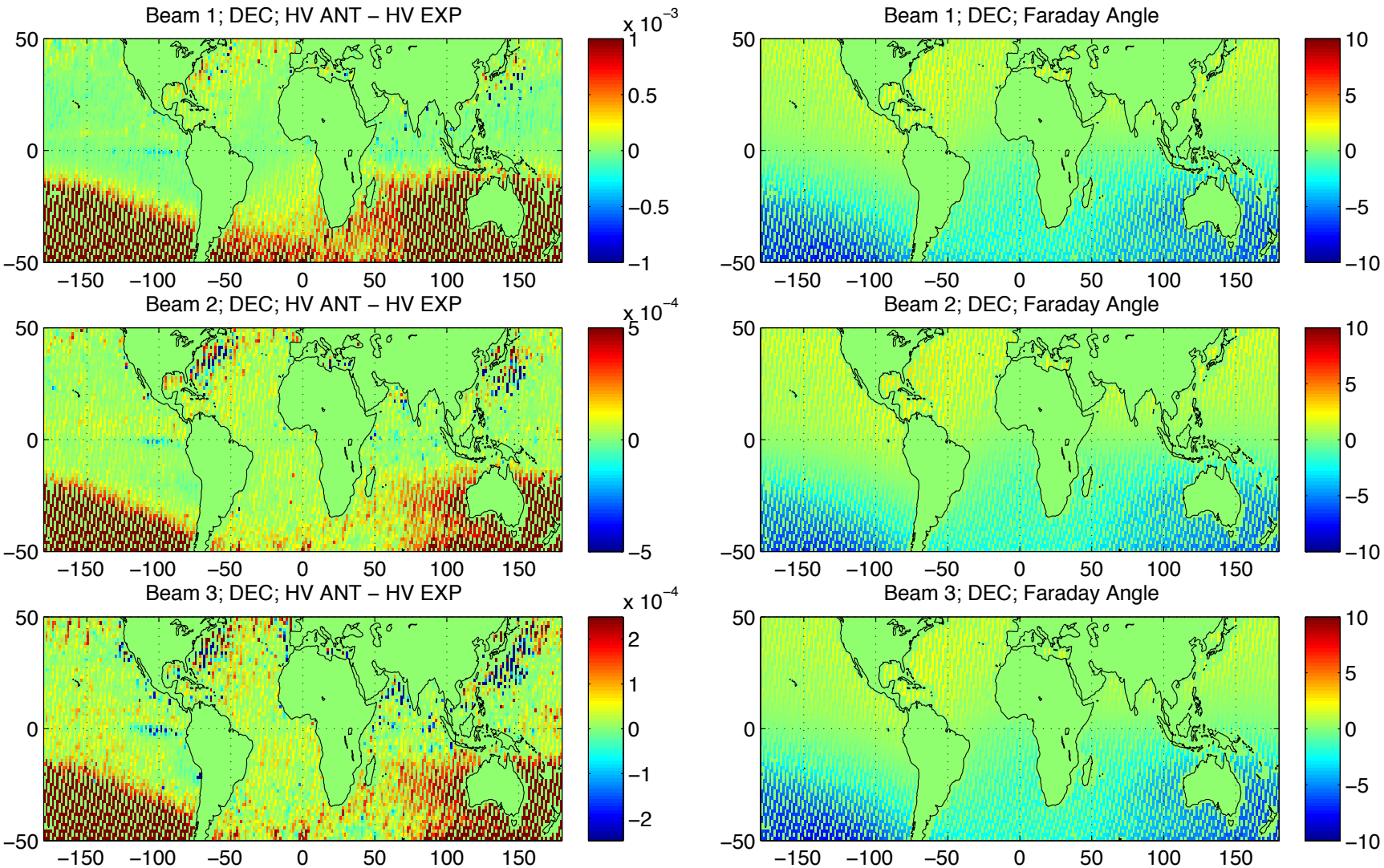
HV TOA – HV expected; Ascending; 2011-323 to 2011-352
ANT to TOA computed using model Faraday Angle



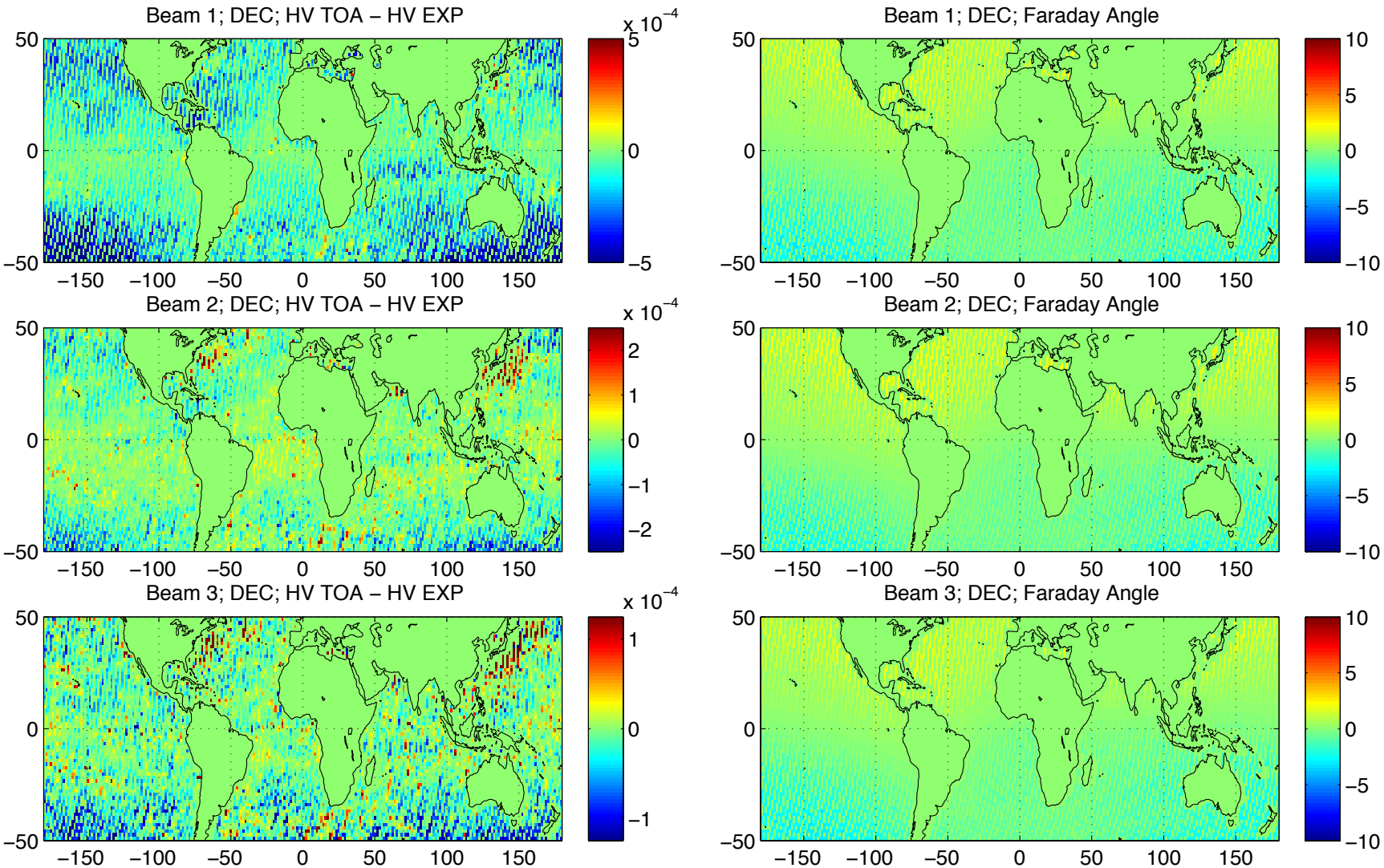
HV TOA – HV expected; Ascending; 2011-323 to 2011-352
ANT to TOA computed using radiometer Faraday Angle



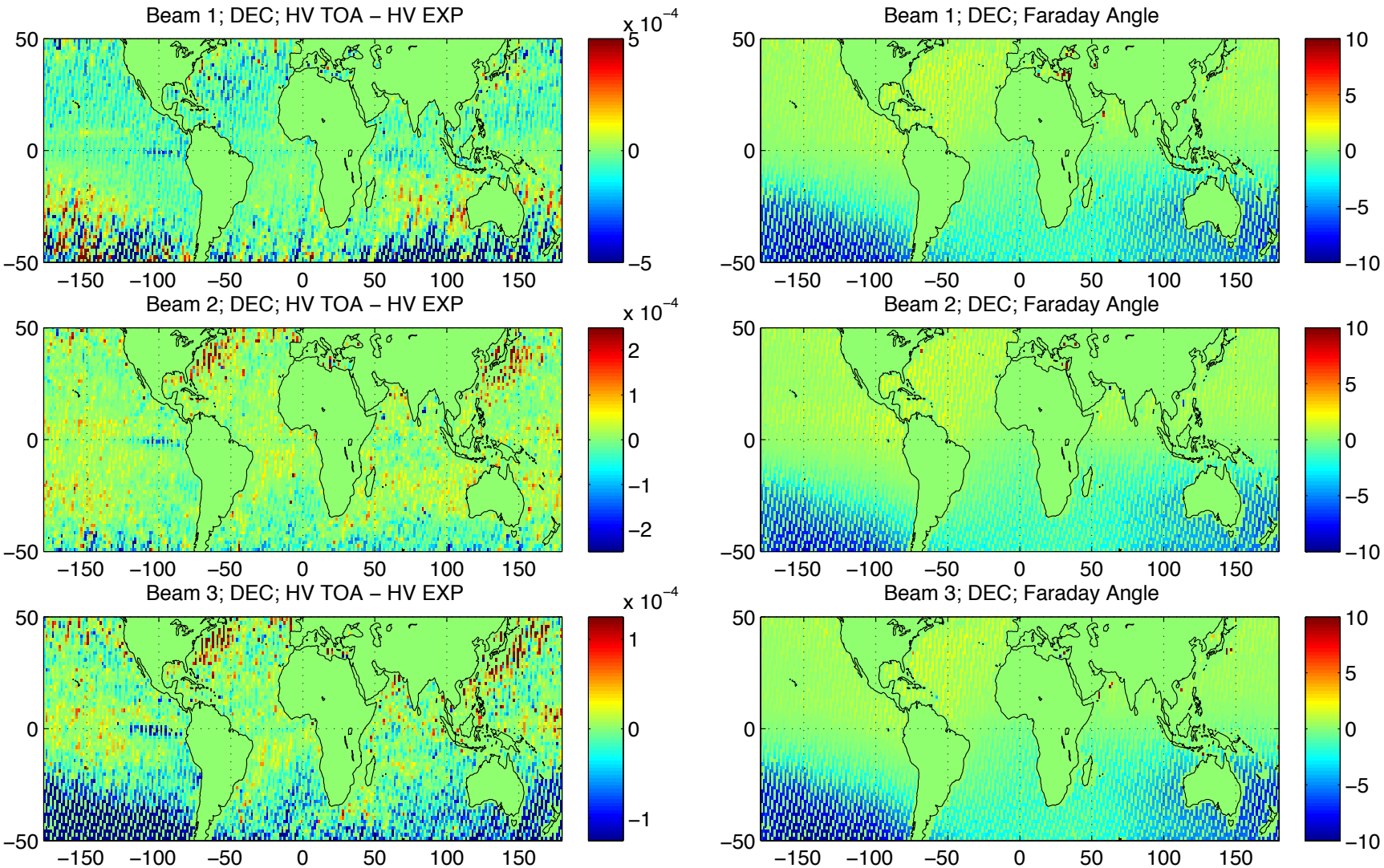
HV ANT – HV expected; Descending; 2011-323 to 2011-352
Model Faraday angle plotted on left



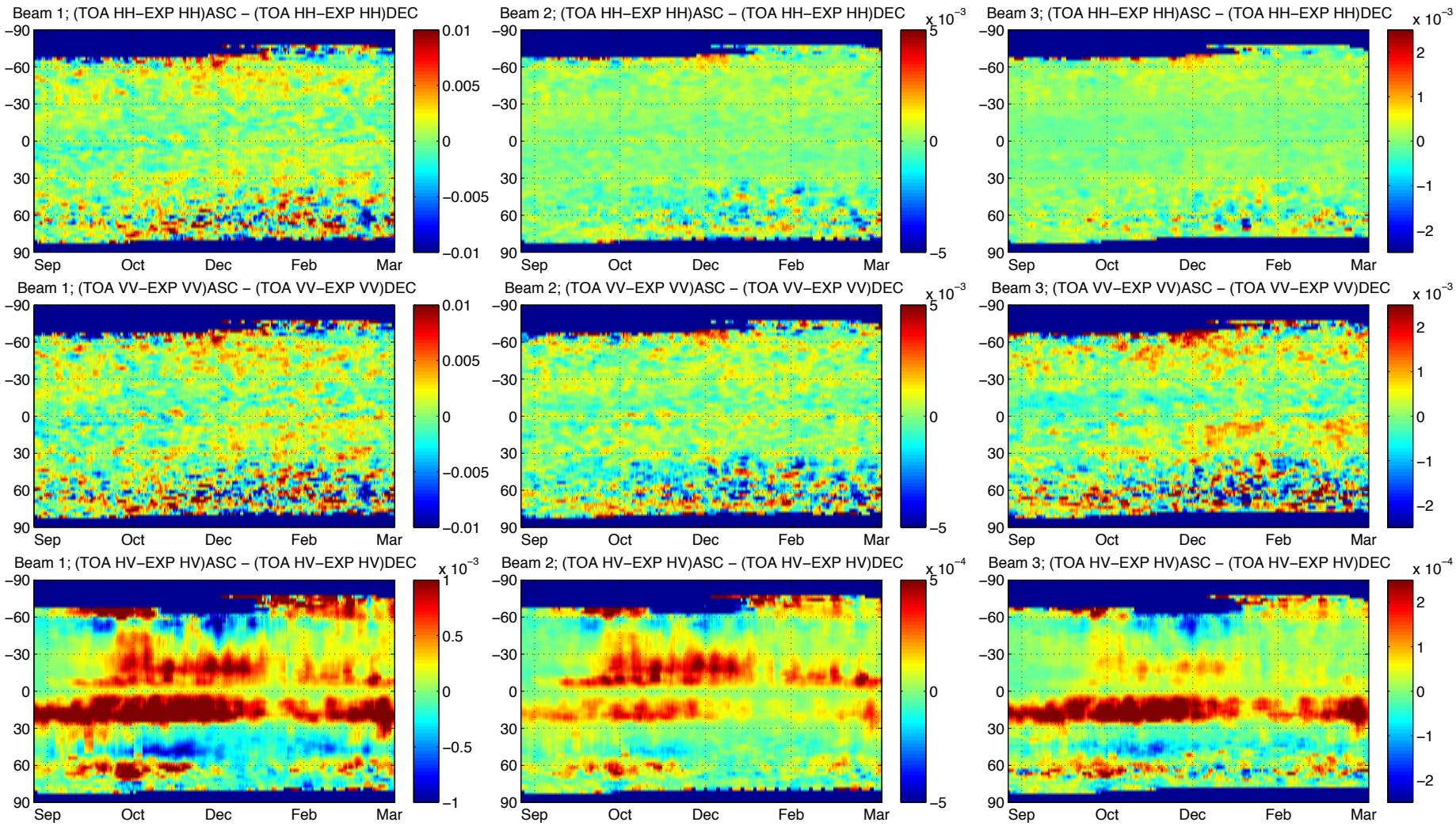
HV TOA – HV expected; Descending; 2011-323 to 2011-352
ANT to TOA computed using model Faraday Angle



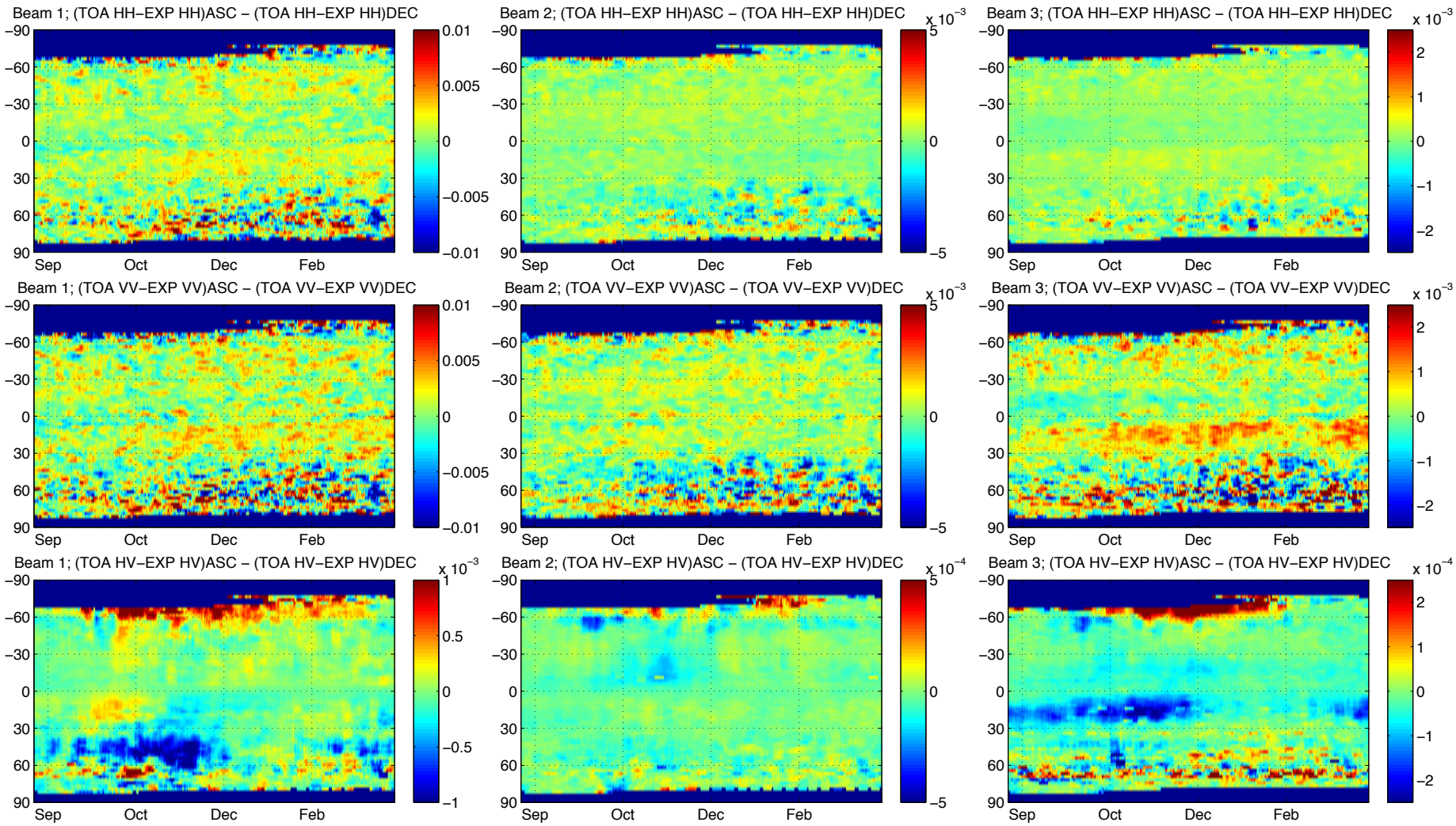
HV TOA – HV expected; Descending; 2011-323 to 2011-352
ANT to TOA computed using radiometer Faraday Angle



ANT to TOA conversion using model Faraday Angle



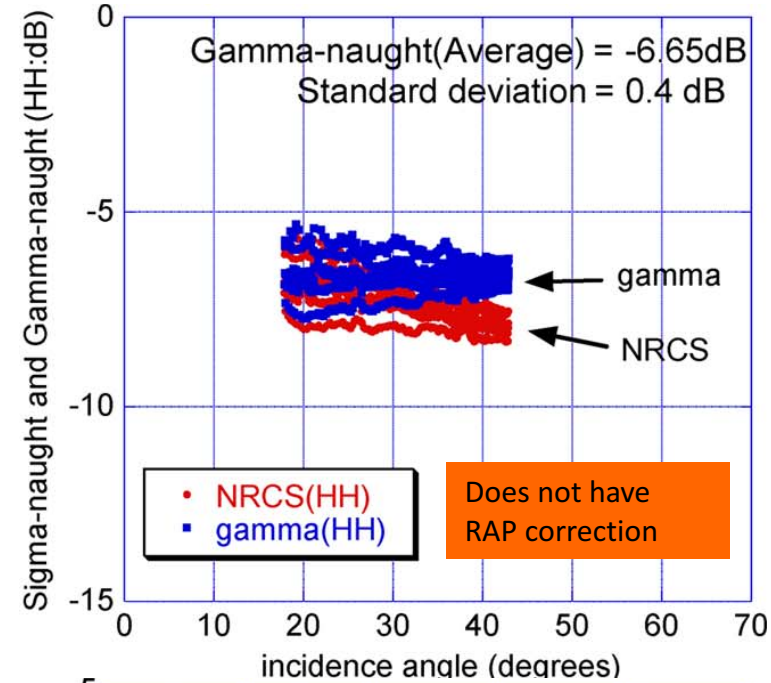
ANT to TOA conversion using radiometer Faraday Angle

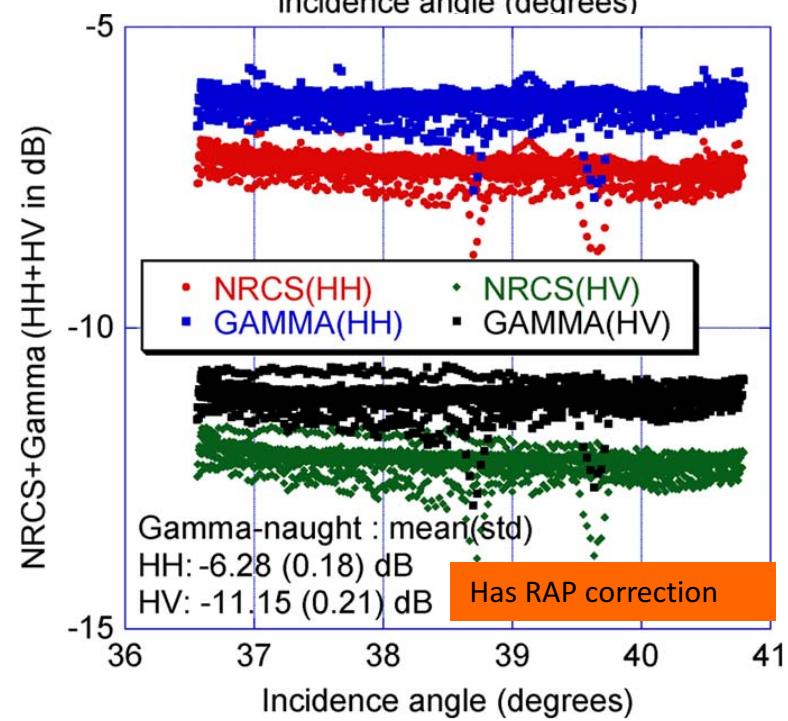


Amazon γ_0

$$\gamma_0 = \sigma_0 / \cos(\theta_{inc})$$

- PALSAR found γ_0 values in the Amazon stable across 20-45 degrees in incidence angle*
  - Wet-dry seasonal difference of ~ 0.27 dB**
  - Wet season is approx. Nov-April.
- Best estimates are:
  - HH ~ -6.28 dB (std 0.18)
  - HV ~ -11.15 dB (std 0.21)
  - Not clear which season this is from!



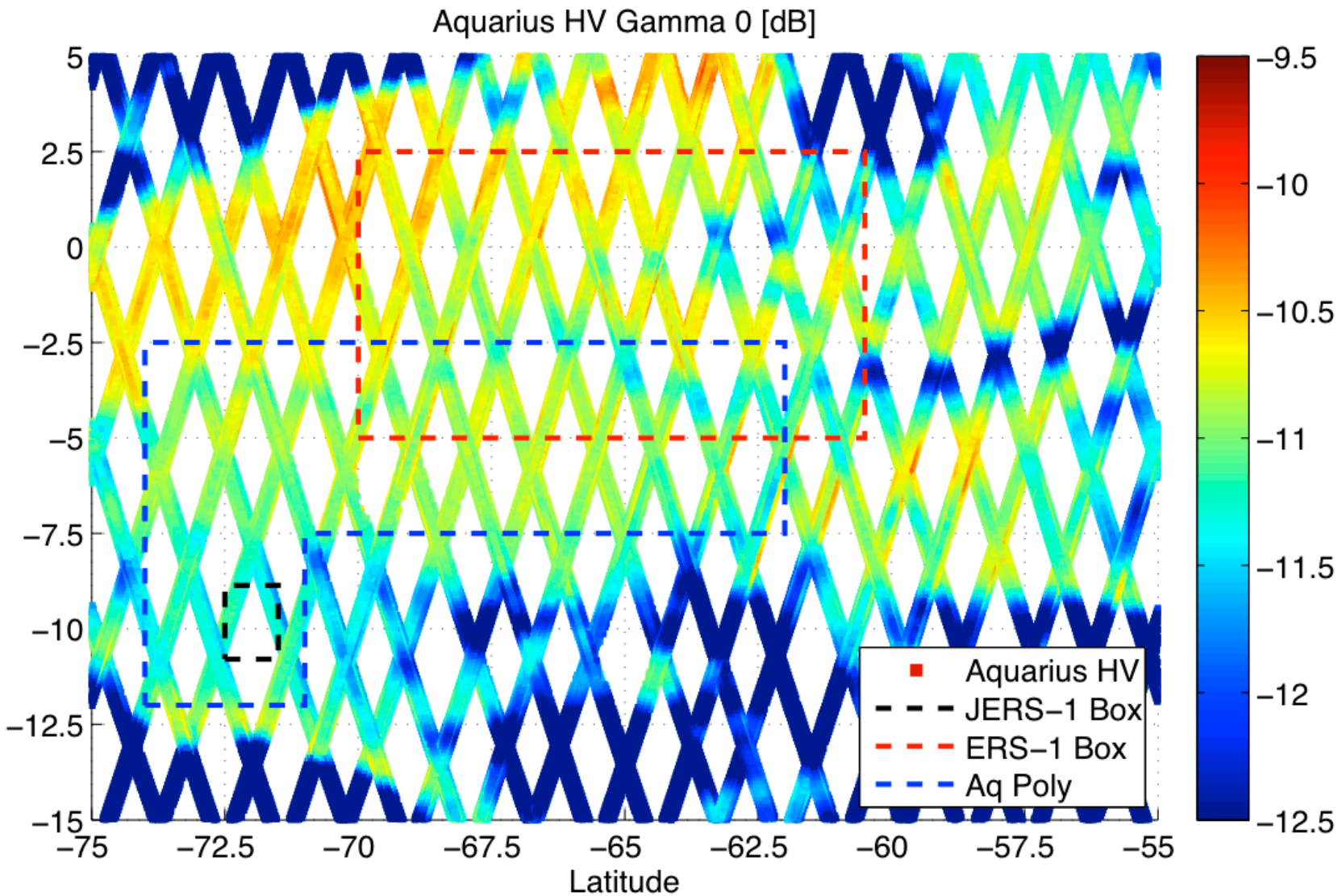


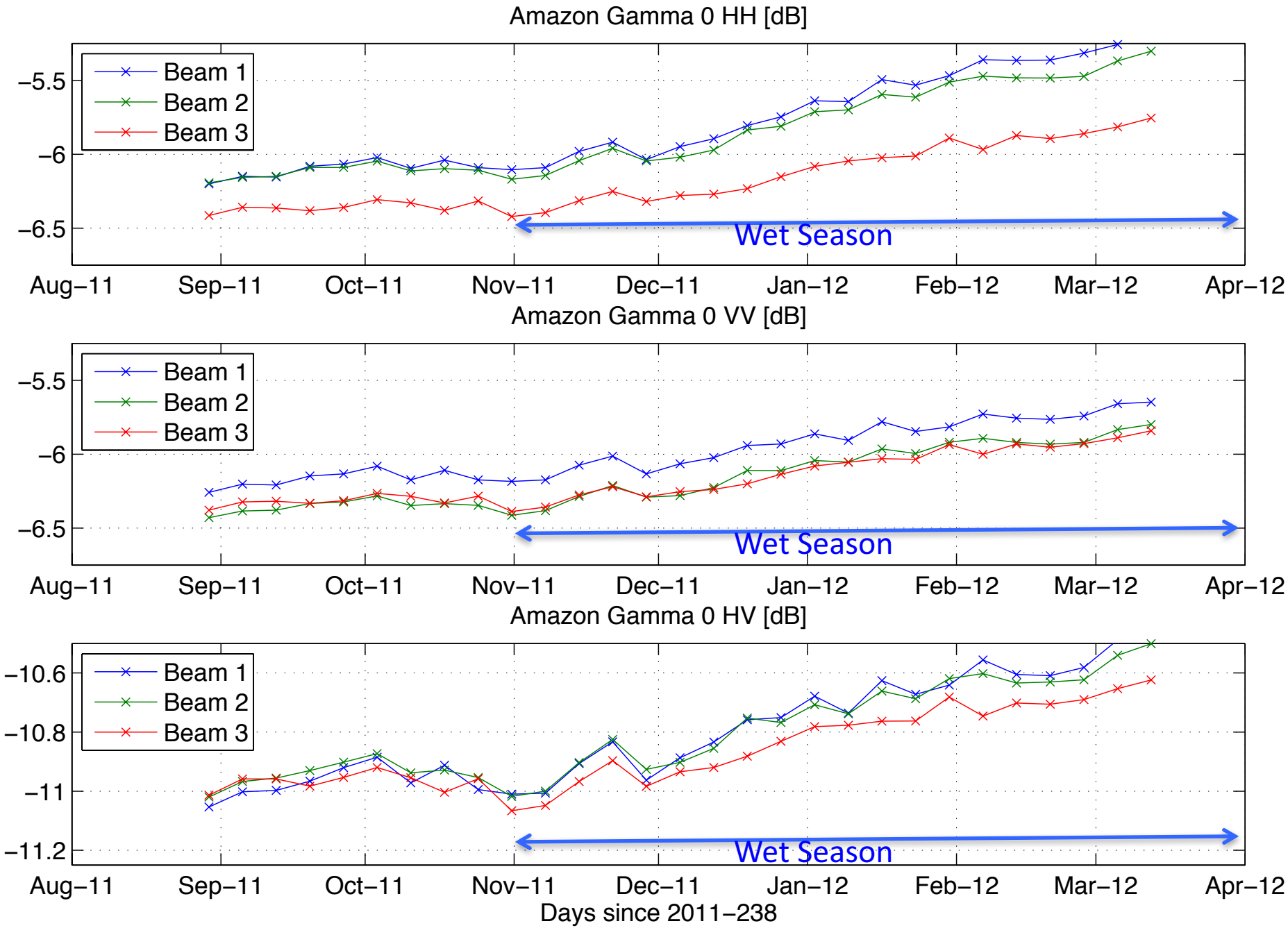
*M. Shimada, O. Isoguchi, T. Tadono, and K. Isono. Palsar radiometric and geometric calibration. Geoscience and Remote Sensing, IEEE Transactions on, 47(12):3915 – 3932, dec. 2009 (Images from this source)

**M. Shimada. Long-term stability of l-band normalized radar cross section of amazon rainforest using the jers-1 sar. Canadian Journal of Remote Sensing, 31(1):132–137, 2005.

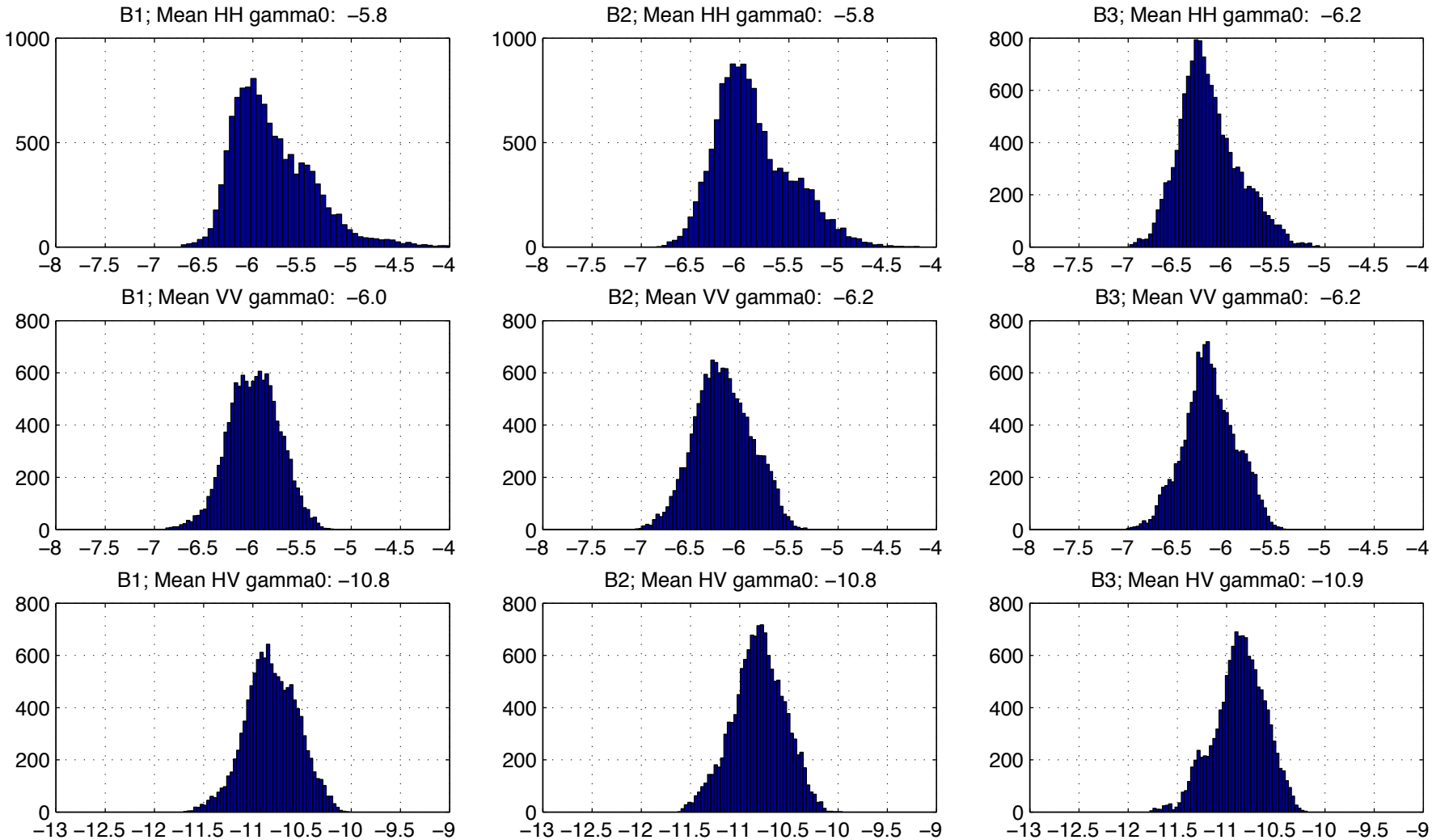
RAP correction is range antenna pattern correction

We included data contained in the blue polygon for the Aquarius Gamma 0 analysis

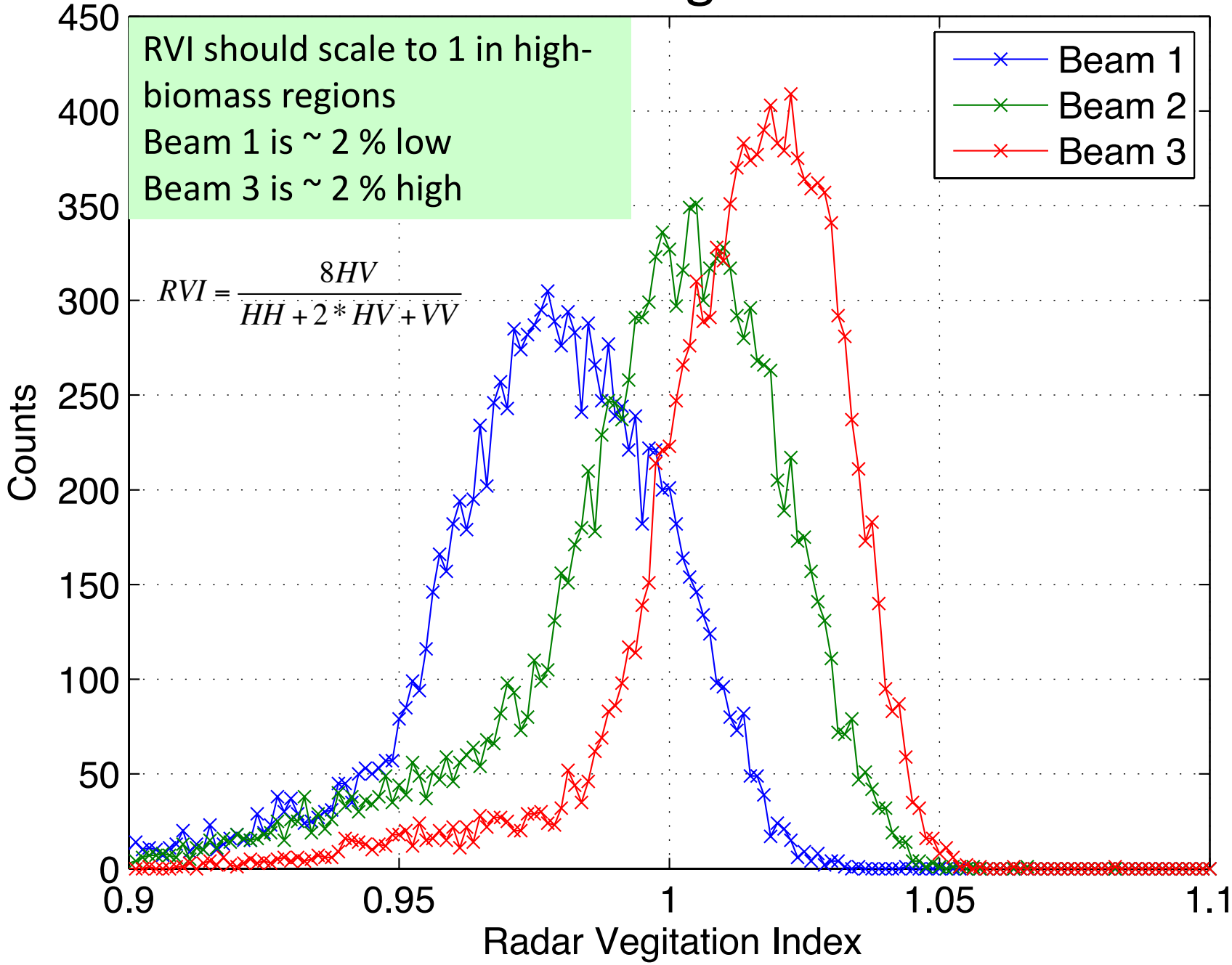



Amazon Gamma 0 HH [dB]
Beam 1
Beam 2
Beam 3
−5.5
−6
−6.5
Wet Season
Aug−11
Sep−11
Oct−11
Nov−11
Dec−11
Jan−12
Feb−12
Mar−12
Apr−12
Amazon Gamma 0 VV [dB]
Beam 1
Beam 2
Beam 3
−5.5
−6
−6.5
Wet Season
Aug−11
Sep−11
Oct−11
Nov−11
Dec−11
Jan−12
Feb−12
Mar−12
Apr−12
Amazon Gamma 0 HV [dB]
Beam 1
Beam 2
Beam 3
−10.6
−10.8
−11
−11.2
Wet Season
Aug−11
Sep−11
Oct−11
Nov−11
Dec−11
Jan−12
Feb−12
Mar−12
Apr−12
Days since 2011−238

Aquarius Amazon γ_0 Histograms



Amazon Radar Vegetation Index

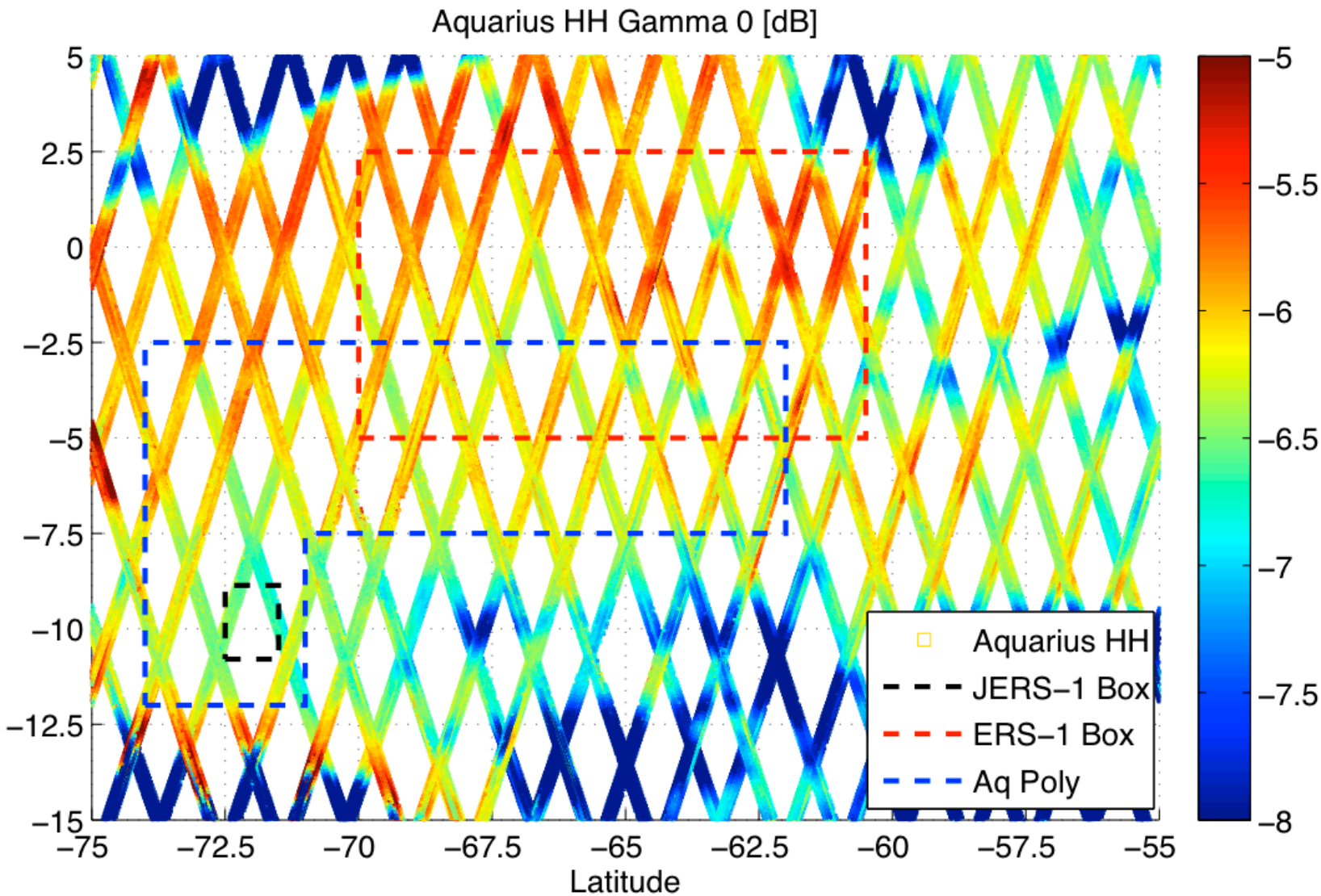


Summary

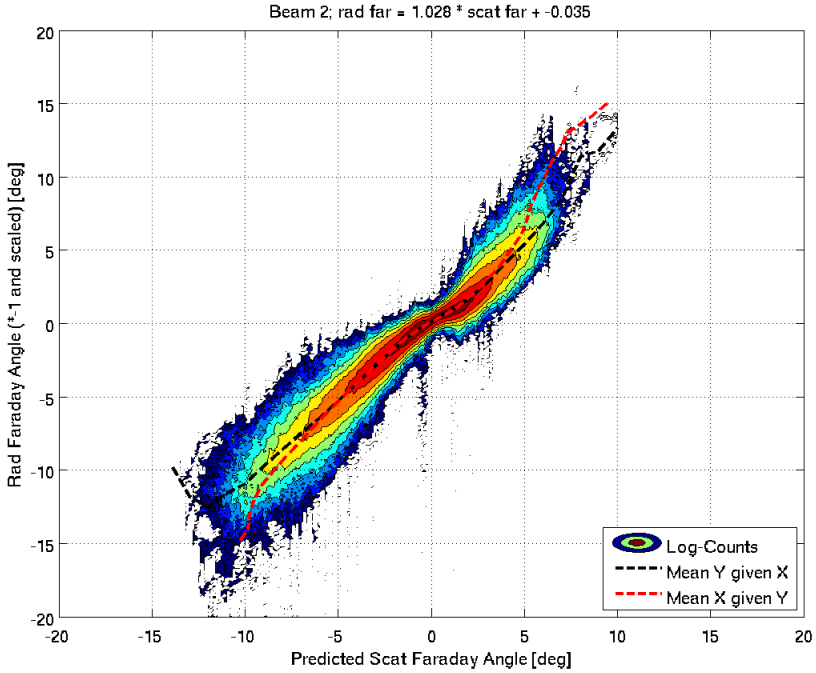
- The Faraday rotation correction seems to be improved when using the radiometer Faraday angle instead of model.
  - Beam 2 seems to perform the best.
  - Beams 1 and 3 still need some work
- The Aquarius Amazon has gamma 0 that agrees well with PALSAR and JERS-1.
  - HH calibration could be off by ~ 0.3 dB for beams 1,2
  - VV calibration could be off by ~ 0.2 dB for beam 1.
  - HV calibration could be off by ~ 0.3 dB for all beams.
- However, we have not seen the entire annual variation in Aquarius observations over the Amazon.
  - It is not clear if the PALSAR gamma 0 is reference to the wet, dry, or average season.
  - JERS-1 saw ~ 0.27 dB in seasonal variation, which is the same order of magnitude the indicated biases.

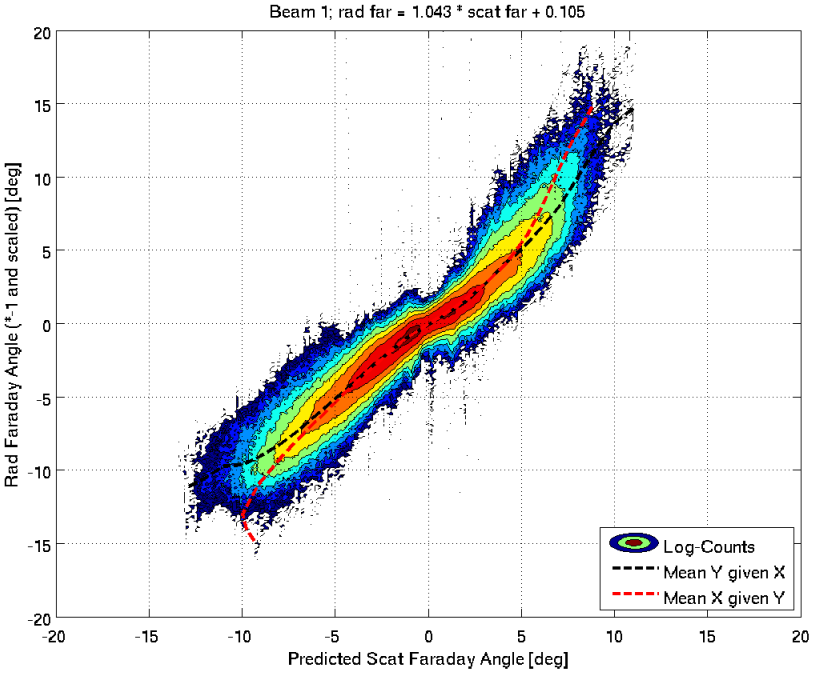
BACKUP SLIDES

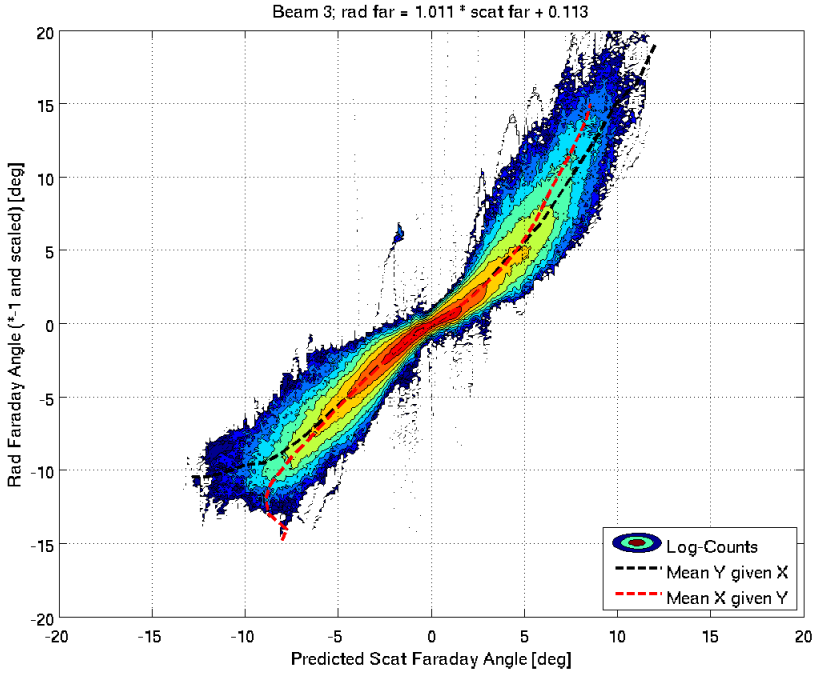
We included data contained in the blue polygon for the Aquarius Gamma 0 analysis

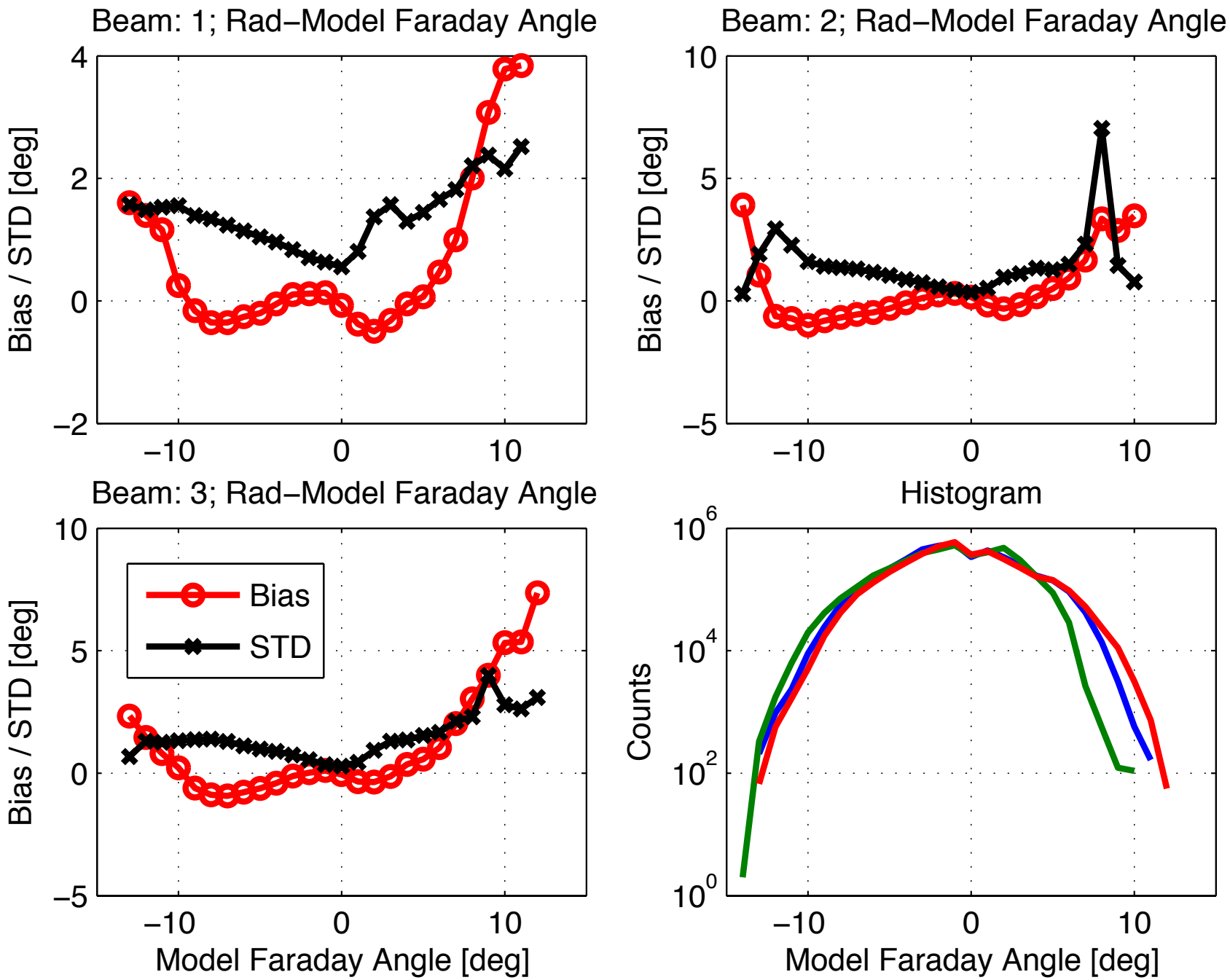


- Collect model (scat s/w) and derived Faraday Rotation angles.
  - Land Fraction == 0
  - Abs(lat)<55
  - Abs(Polarization roll) < 0.5 deg
  - Abs(TaH-TfH)<1

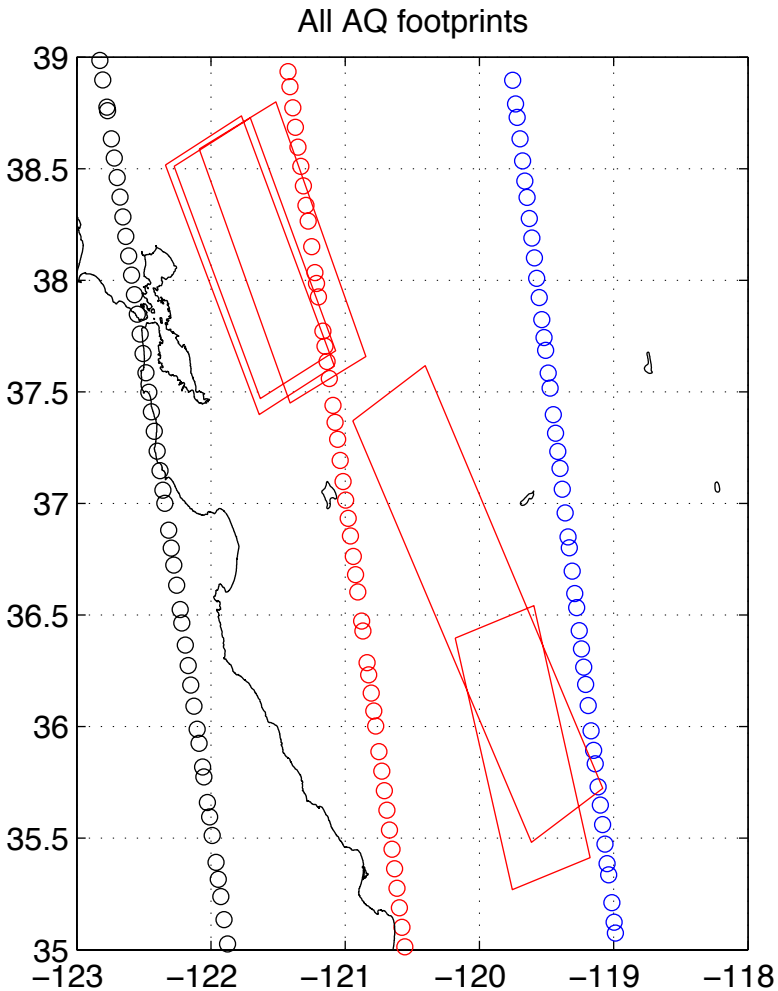


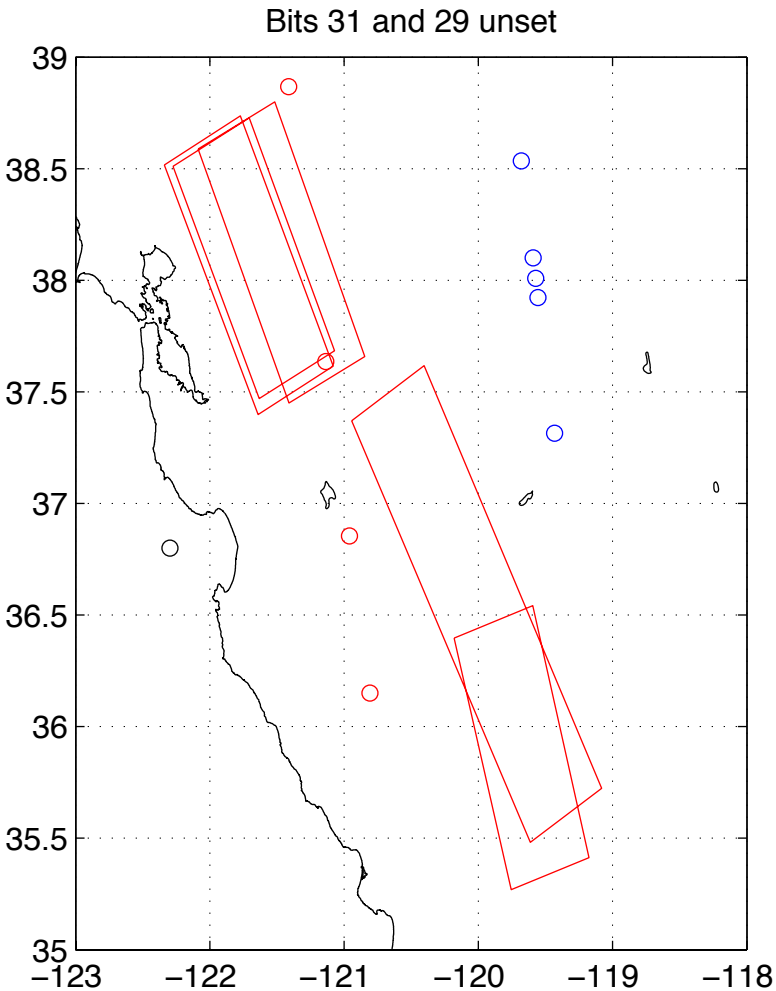


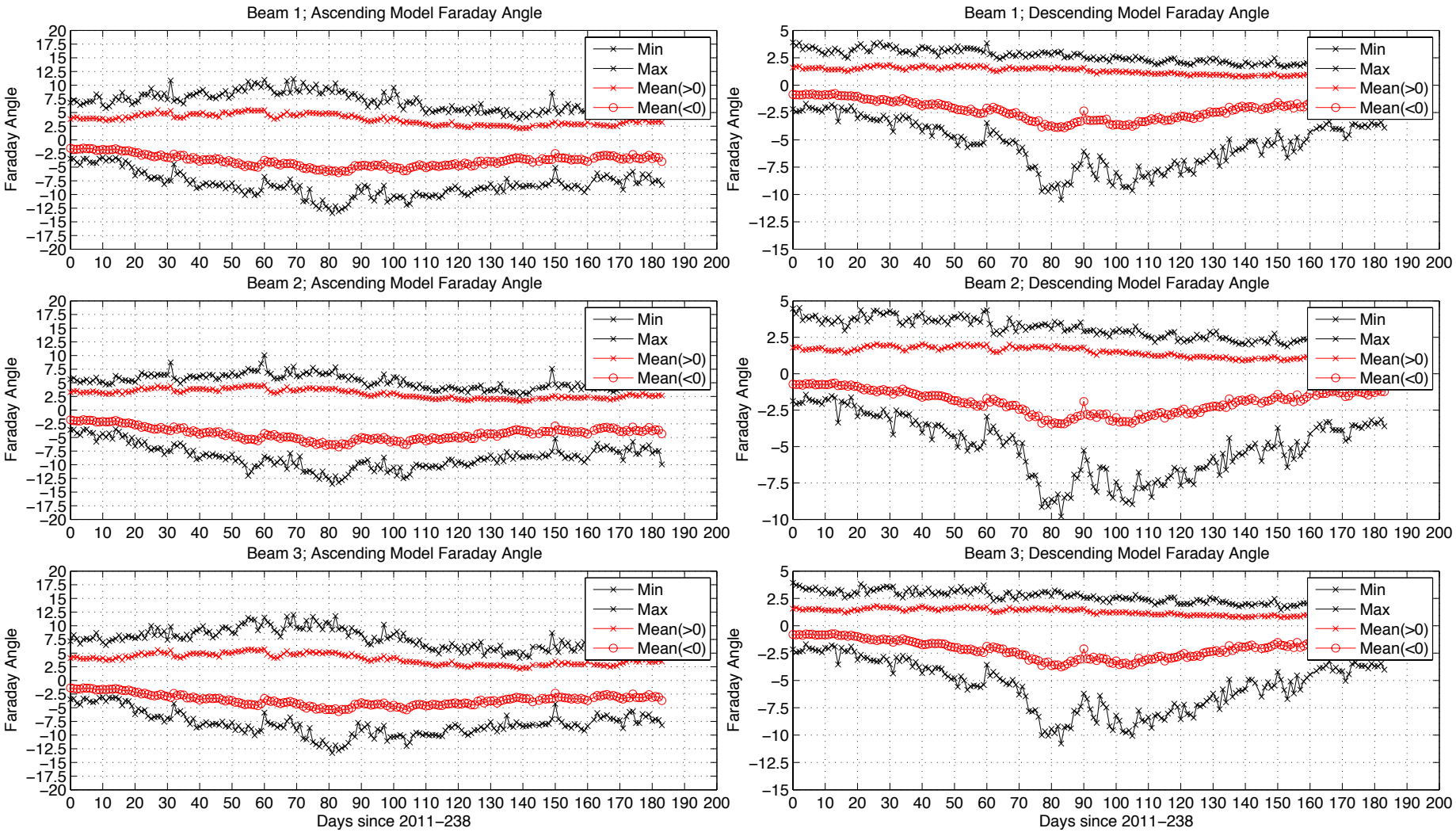


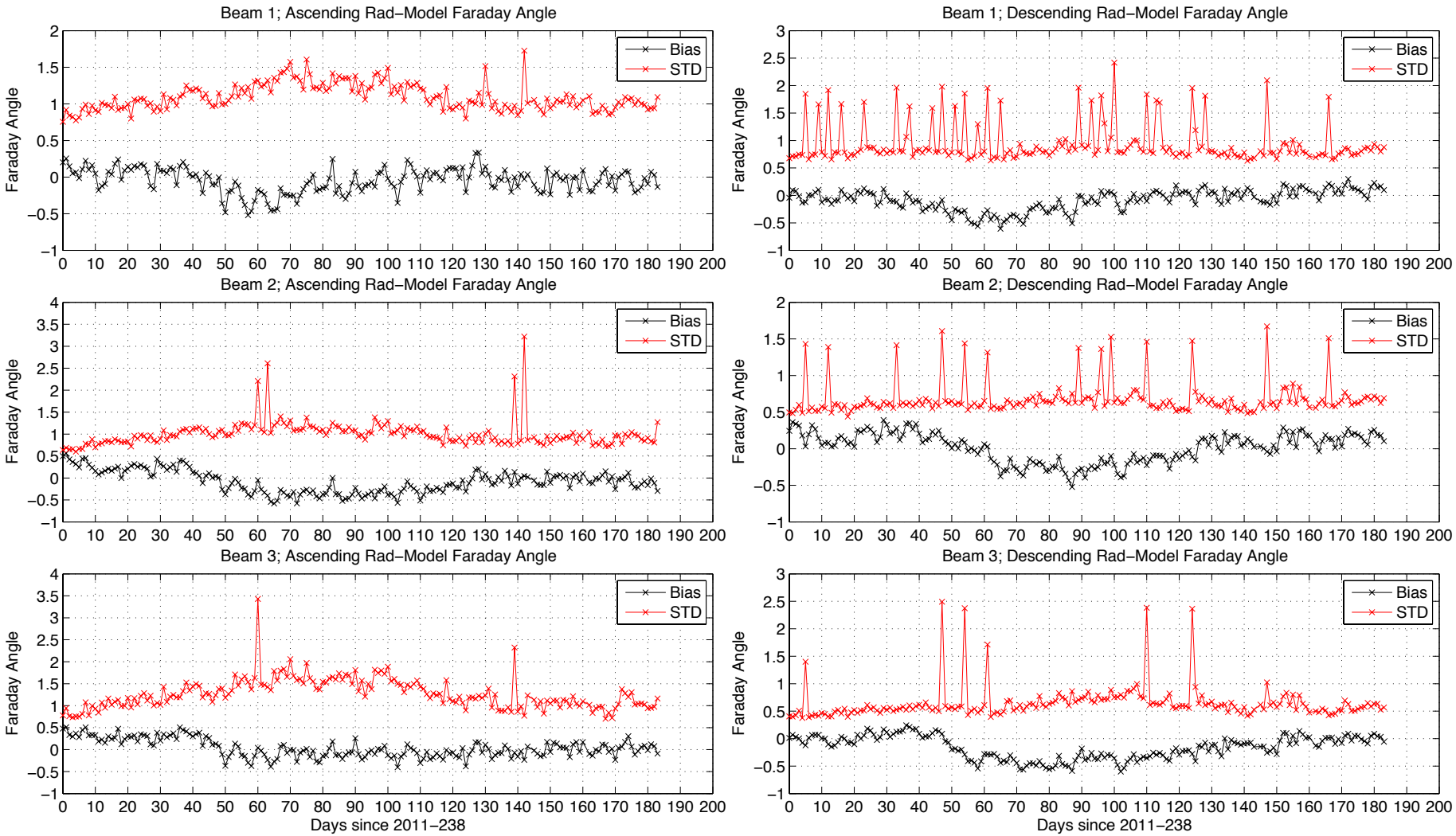

Beam: 1; Rad−Model Faraday Angle
Bias / STD [deg]
Beam: 2; Rad−Model Faraday Angle
Bias / STD [deg]
Beam: 3; Rad−Model Faraday Angle
Bias / STD [deg]
Bias
STD
Model Faraday Angle [deg]
Histogram
Counts
Model Faraday Angle [deg]

UAVSAR Matchups
August 29th 2011 Flights over the Central Valley






Beam 1; Ascending Model Faraday Angle
Beam 1; Descending Model Faraday Angle
Beam 2; Ascending Model Faraday Angle
Beam 2; Descending Model Faraday Angle
Beam 3; Ascending Model Faraday Angle
Beam 3; Descending Model Faraday Angle
Faraday Angle
Days since 2011−238
Min
Max
Mean(>0)
Mean(<0)


Beam 1; Ascending Rad−Model Faraday Angle
Beam 1; Descending Rad−Model Faraday Angle
Beam 2; Ascending Rad−Model Faraday Angle
Beam 2; Descending Rad−Model Faraday Angle
Beam 3; Ascending Rad−Model Faraday Angle
Beam 3; Descending Rad−Model Faraday Angle
Faraday Angle
Bias
STD
Days since 2011−238