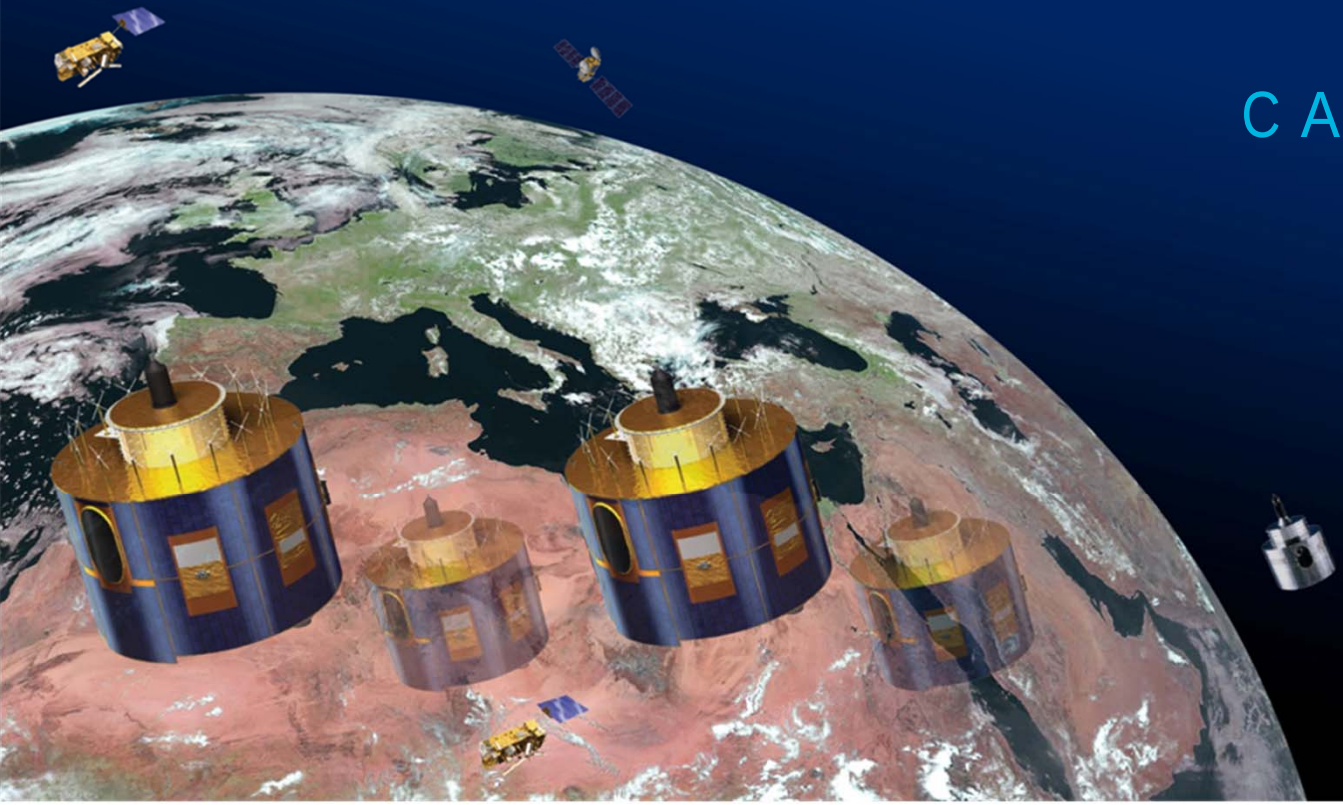
ASCAT-A and ASCAT-B Cross Validation

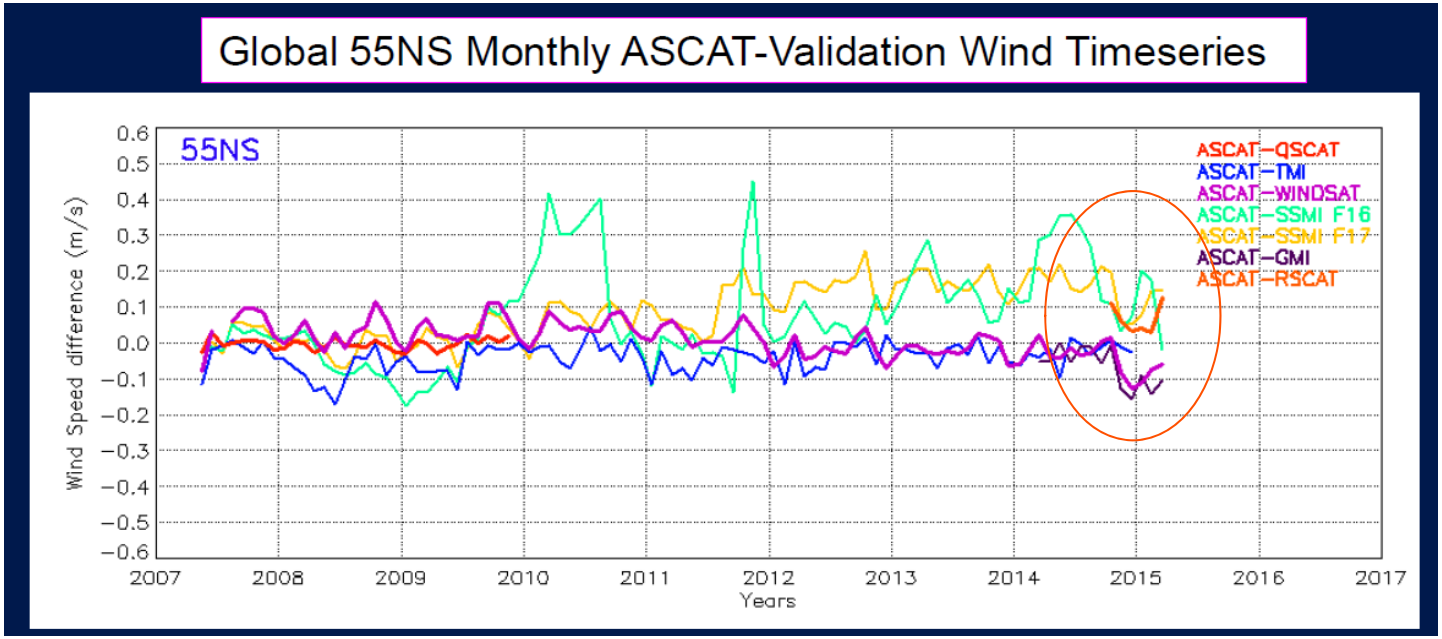
C Anderson, J Figa-Saldaña,

JJW Wilson & F Ticconi



Introduction and motivation

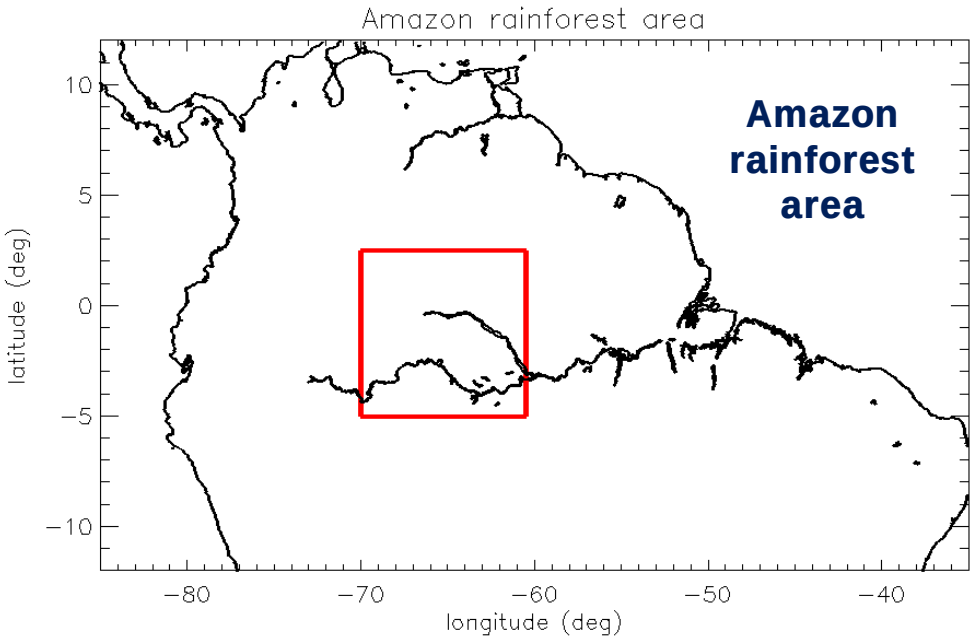
- ASCAT-A & B, fan beam C band scatterometers, launched 2006 and 2012, both still operational
- In dependent calibration with ground transponders
- ASCAT-A has undergone a couple of calibration sudden changes (Sept 2009, Sept/Oct 2014), but both instruments generally well aligned
- Objectives: to monitor their relative calibration during the last year

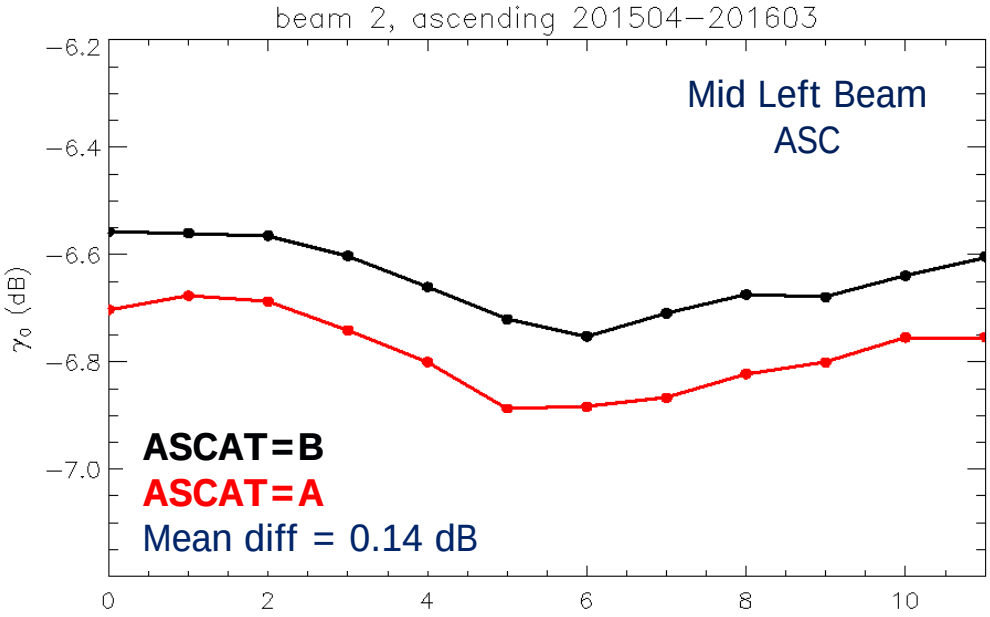


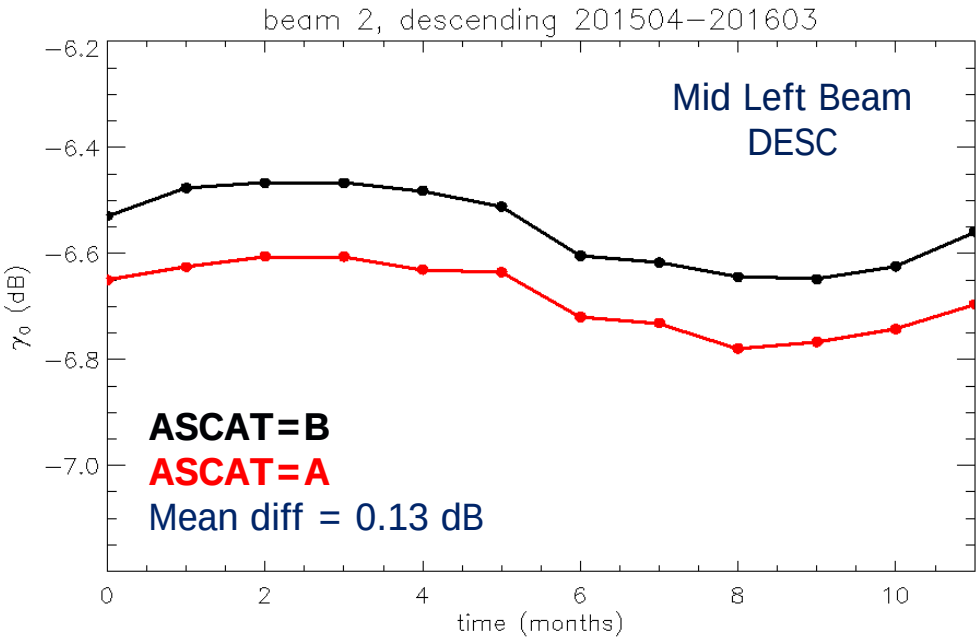
Lucrezia Ricciardulli, RSS

IOVWST 2015

Stability of backscatter over rainforest







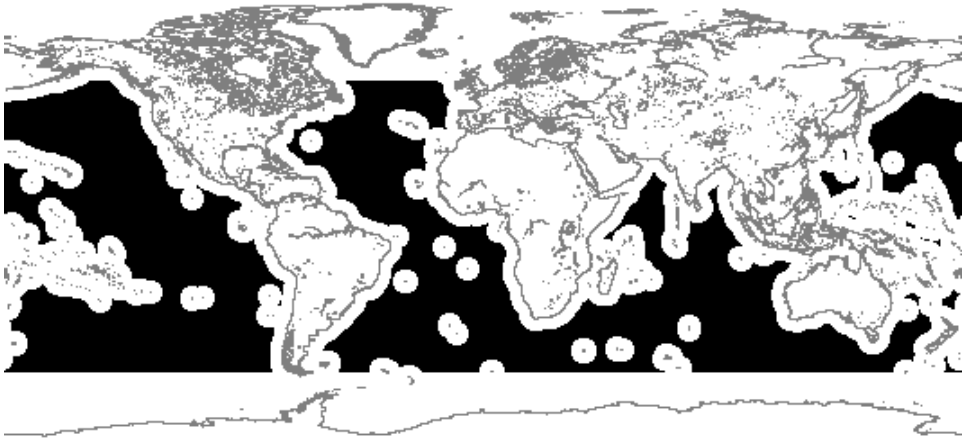
- Over one month, ASCAT-A and B will likely see a similar rainforest, so the time series of mean monthly $\gamma_0 = \sigma_0 \cos\theta$ should be comparable

- Data from April 2015 to March 2016 show that ASCAT-B is around 0.11 to 0.20 dB higher than ASCAT-A

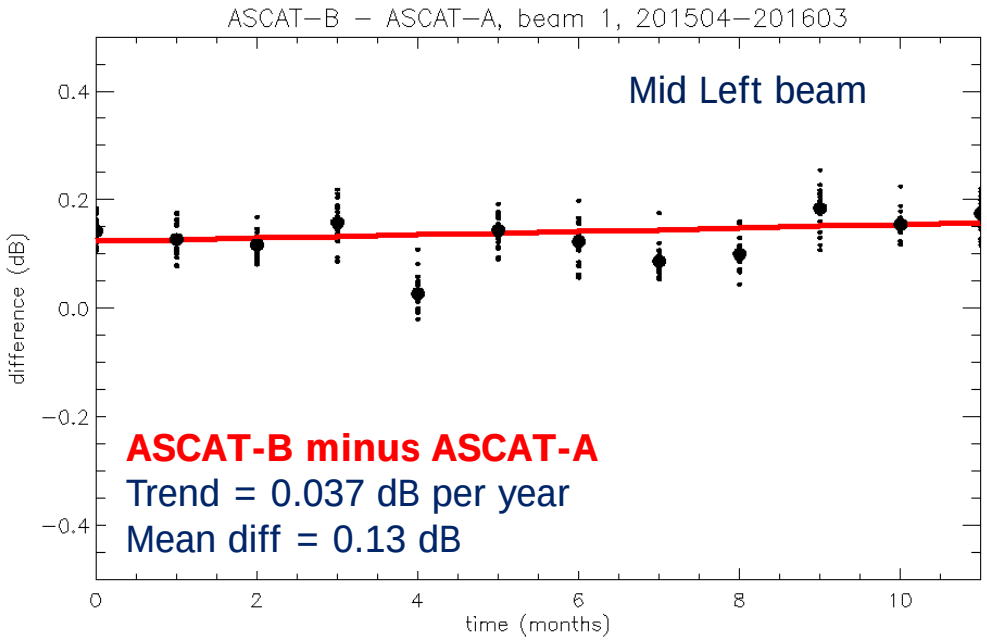
Mean Global Ocean Backscatter

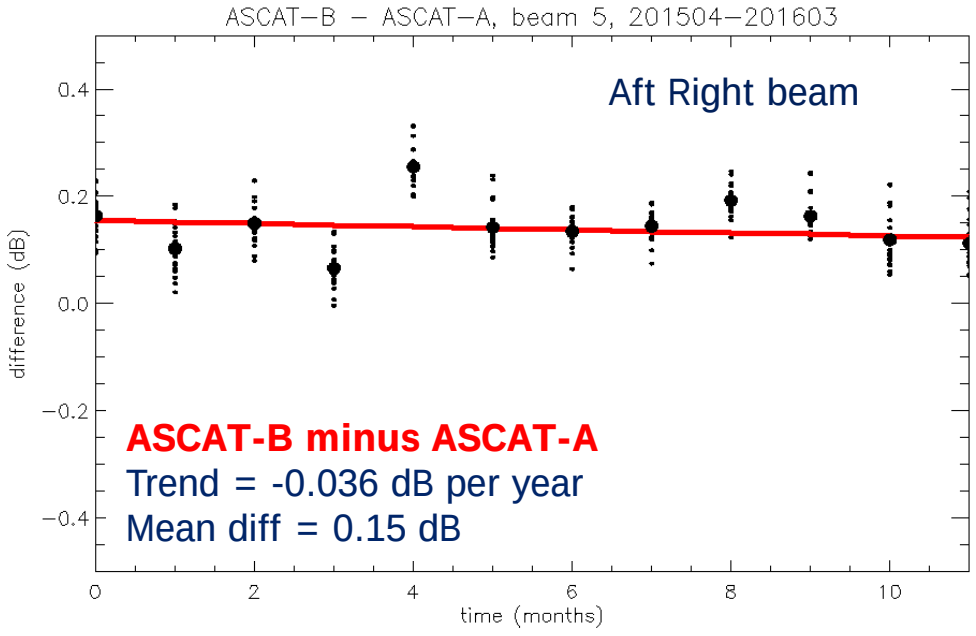
- Over one month, ASCAT-A and B will likely see a similar ocean surface so their mean ocean σ_0 should be comparable

- Data from April 2015-March 2016 show that mean ocean backscatter of ASCAT-B is around 0.13 to 0.19 dB higher than ASCAT-A

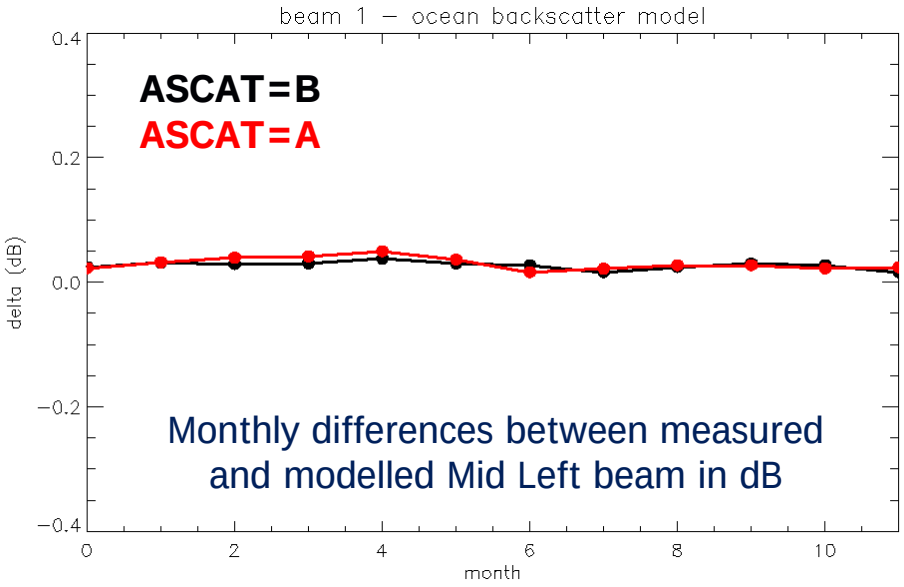


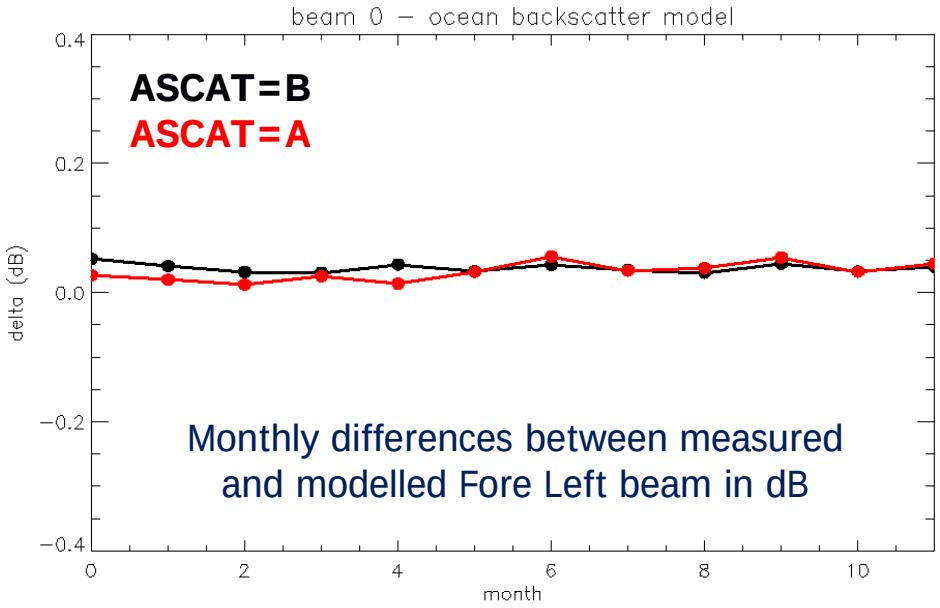
Ocean area used in this method



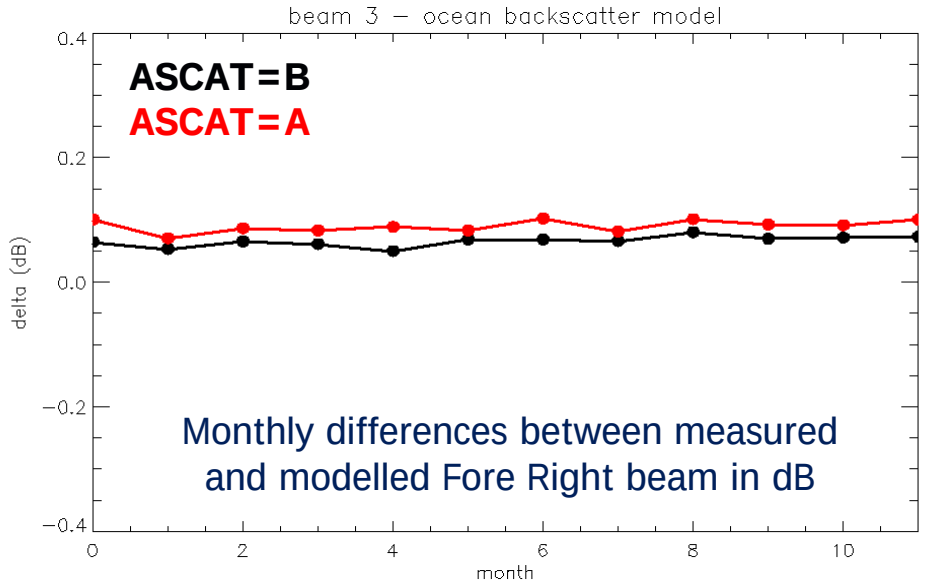


Ocean Backscatter vs Model

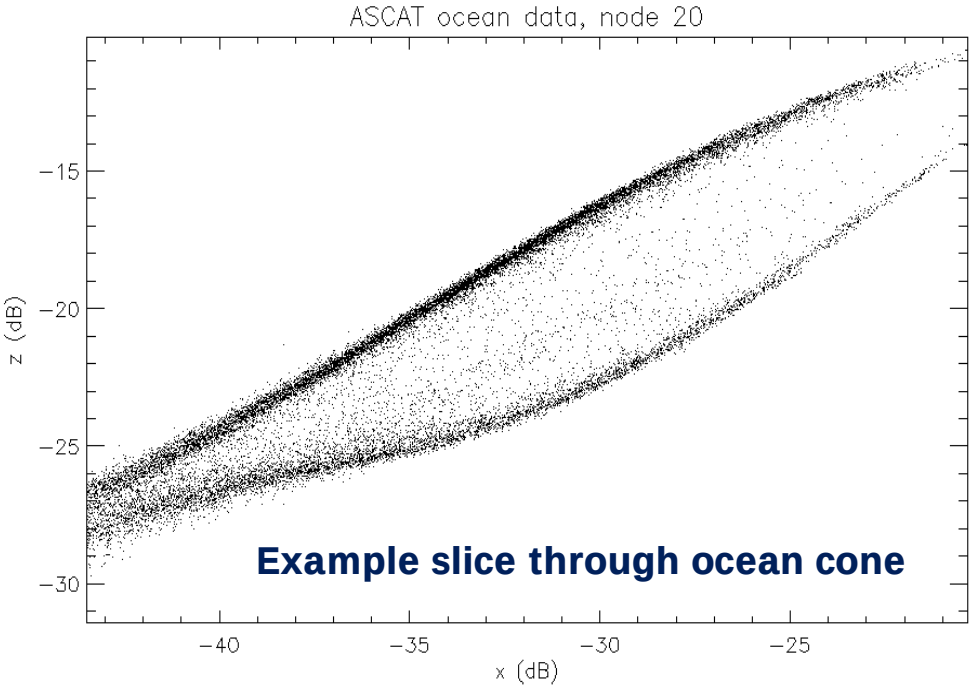


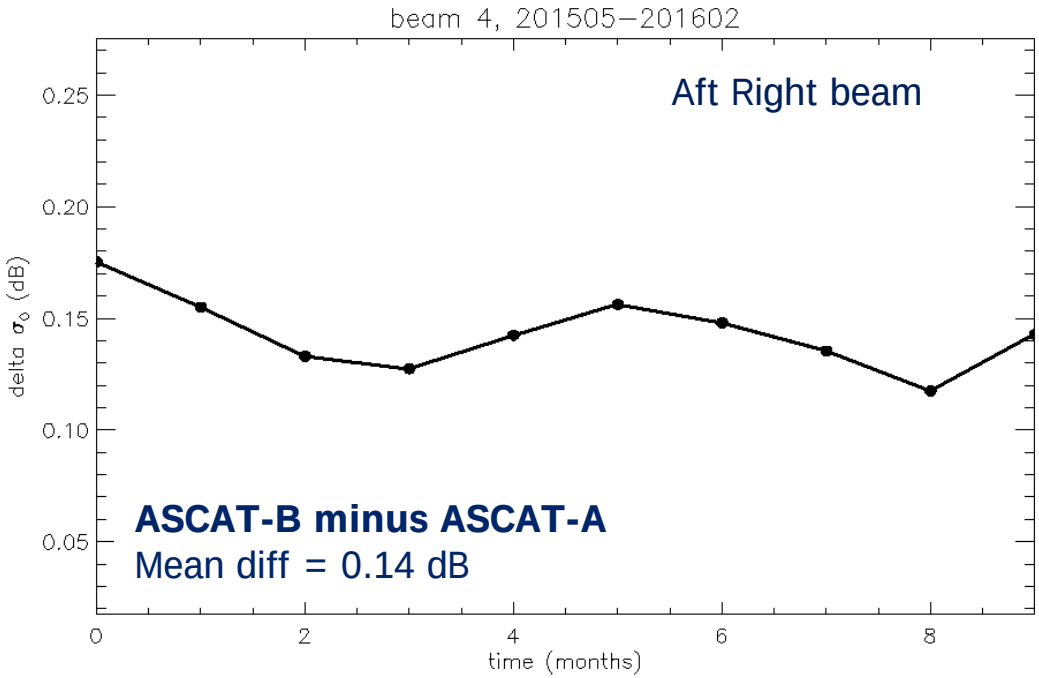


- We retrieve wind vector using two beams and use it to model the backscatter in the third beam. Comparing the estimated with the measured backscatter give us a measure of the inter-beam calibration
- The left swath is better inter-calibrated than the right swath, both across instruments and for each instrument inter-beam
- The differences in the mean wind speed retrieved this way are about 0.05 to 0.17 ms^{-1} which suggest a difference in backscatter of around 0.05 - 0.17 dB



Cross Validation using Ocean Cone



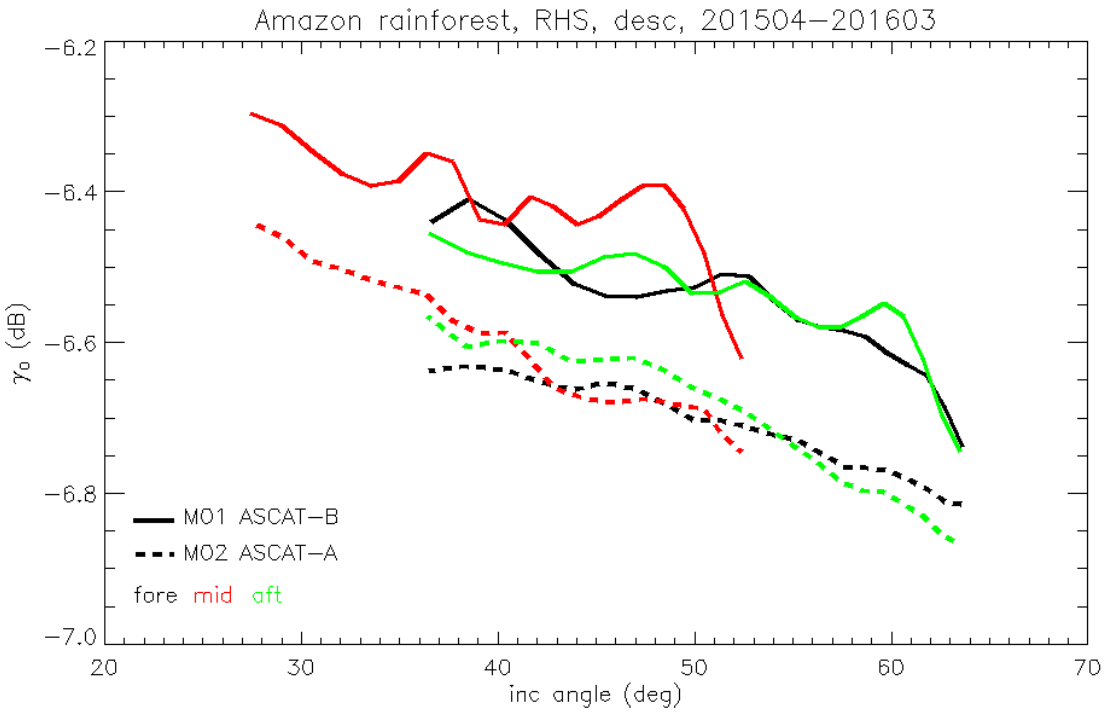


- Ocean backscatter triplets form a cone shape, which can be cut in slices in the three dimensions - the position of the highest density of points is determined for each slice, which characterises the cone position – this technique is known as '**cone metrics**'
- Differences in the position of the cone in data from ASCAT-A and B can be related to differences in the backscatter
- Cone position in monthly data over the last year shows that mean ocean backscatter of ASCAT-B is around 0.12 to 0.19 dB higher than ASCAT-A

Summary, Conclusions and Outlook

- Multiple cross-validation techniques using data from the last 12 months show the same results: backscatter in the operational products from ASCAT-B is around 0.1 to 0.2 dB higher than ASCAT-A
- Inter-beam calibration for each instrument is very good, the results being slightly better for the left swath
- Calibration differences are expected as the instruments are independently calibrated and we deliberately opt to minimise operational calibration updates
- This technique complements the ground transponders view, which is a detailed snap-shot of the antenna beam pattern at a give time, by providing update statistics month by month from the data itself, which can be used for operational monitoring
- We plan to add monthly statistics and this long-term trend analysis to our operational instrument monitoring in http://oiswww.eumetsat.org/epsreports/html/index.php?instrument=ASCA&sat=M02

Extra Rainforest Plot



- Mean rainforest γ_0 over last 12 months in ASCAT-A and B
- ASCAT-B is around 0.2 dB higher
- ASCAT-A shows less variation over incidence angle range