

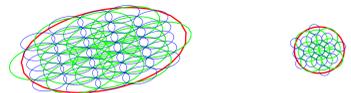


# Footprint Matching for the Advanced Technology Microwave Sounder

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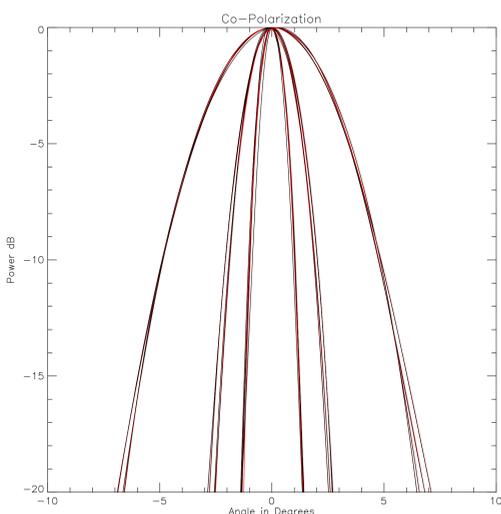


**The Problem:** To enable footprint matching of the higher frequency ATMS fields of view with the two lowest frequency fovs.



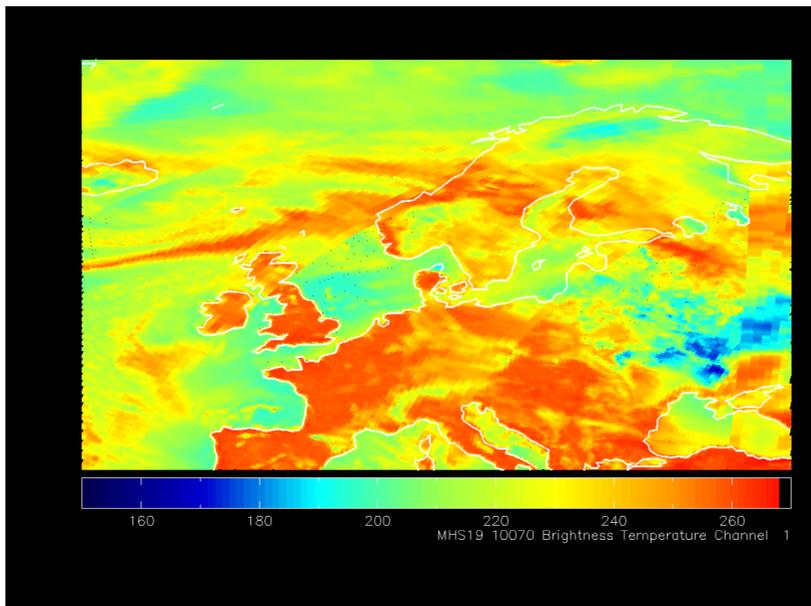
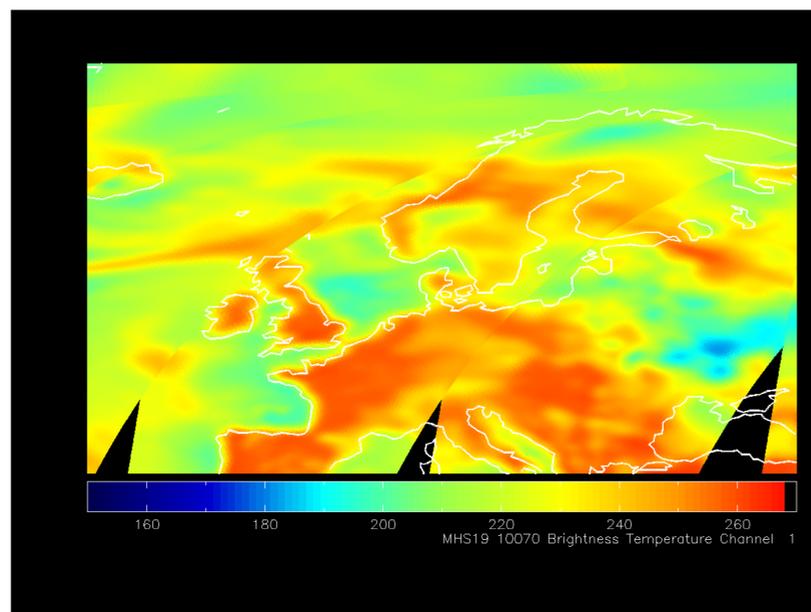
Layout of relative fields of view for ATMS. Red is 5.2°, green is 2.2° and blue is 1.1° fields of view. Left is for near edge of scan, and right is near nadir.

A solution: As an alternative to Backus-Gilbert, fit the measured antenna patterns, and convolute the higher frequency fovs with the lower frequency fovs, and integrate the convoluted values to find the weights.



ATMS Antenna Patterns and Polynomial Fit

See Kleespies oral presentation 5.1 "Modeling of inhomogeneous surface properties for the ATMS"

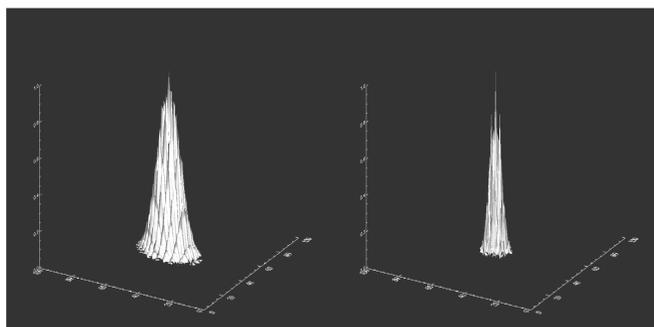


ATMS 1.1° fov matched to the 5.2° fov size using MHS 89 GHz data as a proxy. Shown are ATMS fovs 10-87. This is because MHS has 90 fovs vs the ATMS 96 fovs, and fovs 4-6 and 88-93 were insufficiently filled with the 1.1° fovs. Note the usual damping of high and low antenna temperatures, and blurring by reducing the resolution.

The apparent mis-geolocation is an artifact of the plotting method. The plot is drawn in the southward direction, and the new fovs greatly overlap the older fovs.

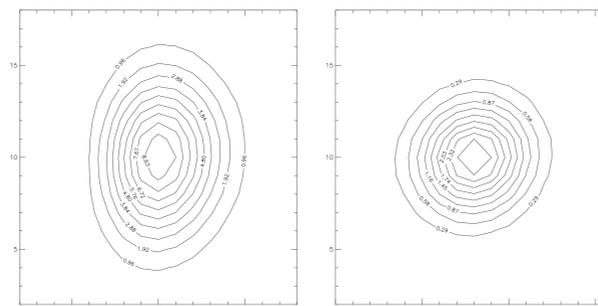
Original MHS 89 GHz data used as proxy for 1.1° ATMS data.

1.1 deg fovs convoluted with 5.2 deg fov  
FOV 10      FOV 48

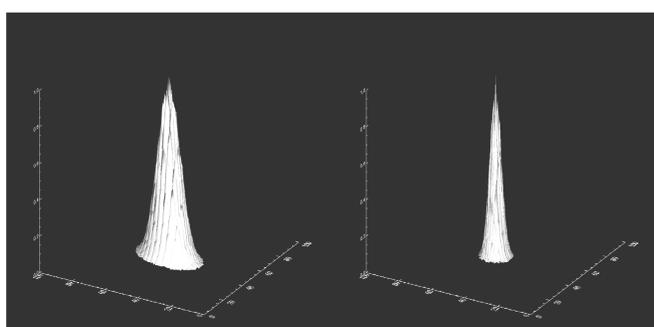


1.1 deg Coefficients 5.2 deg fov

FOV 10      FOV 48

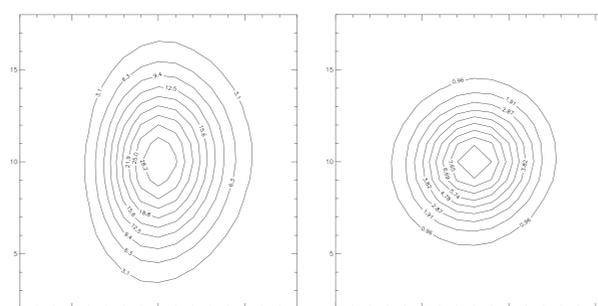


2.2 deg fovs convoluted with 5.2 deg fov  
FOV 10      FOV 48



2.2 deg Coefficients 5.2 deg fov

FOV 10      FOV 48



Asymmetry is due to stretching of crosstrack fov size approaching edge of scan.

Comments: Many footprint matching schemes use the nominal -3dB fov, which is the 50% power level. Half of the energy received by the instrument comes from outside this area. This method uses the -20dB level, which accounts for 99% of the received power.

Many footprint matching schemes use a nominal Gaussian antenna pattern. This method uses a polynomial fit to the measured antenna patterns. It was found that a Gaussian does not fit the measured antenna patterns well.

This technique ignores side-lobes. It is assumed that an antenna correction algorithm will pre-process the antenna temperatures.

Footprint matching from the large fov to smaller fovs is an entirely different problem, and is not addressed here.