

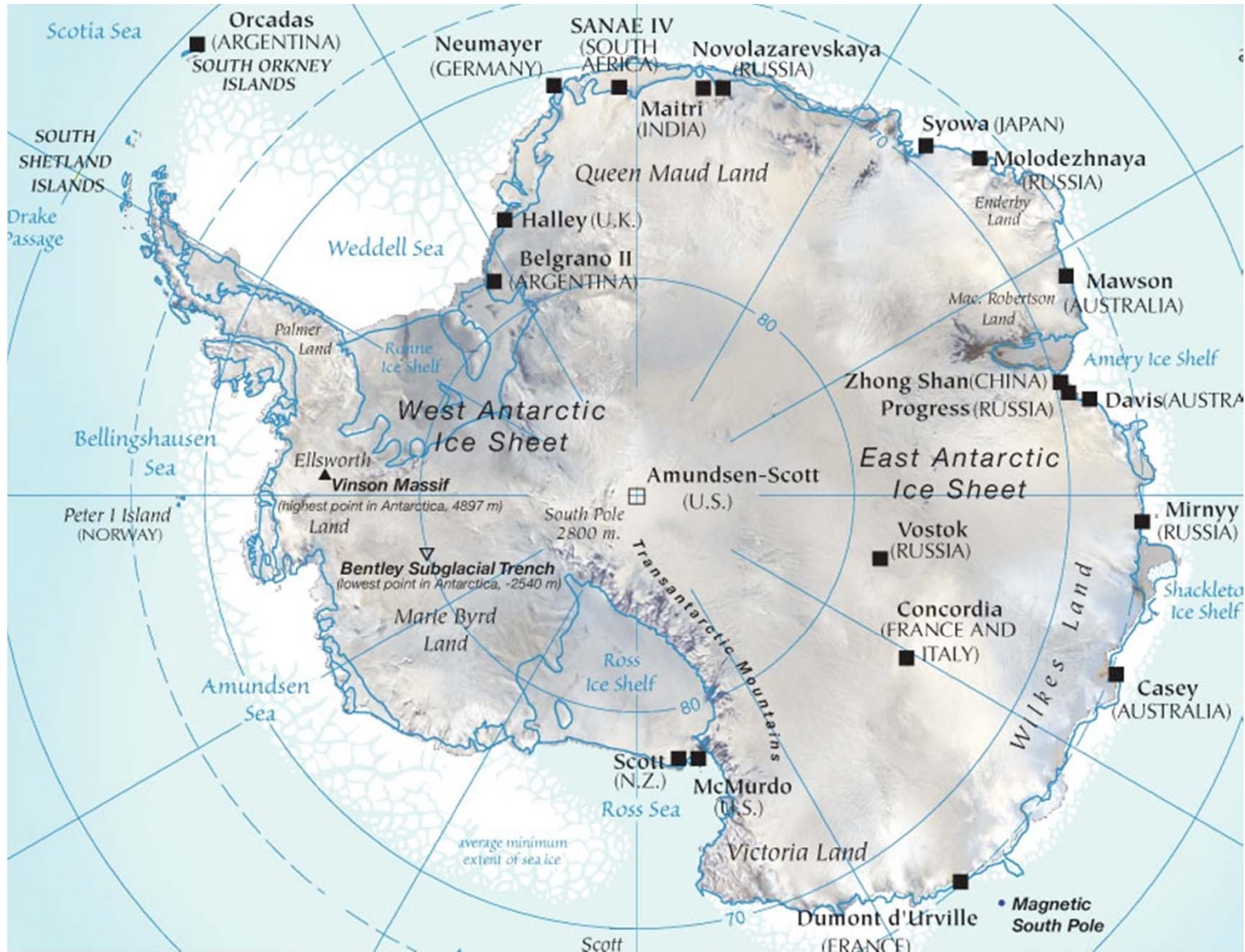
DOMECair Campaign Antarctica, January 2012

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Background / Objectives

- SMOS is a radiometer
- Calibration must be checked via external targets, cold and hot
- Free space is the cold point - only by-weekly, however.
- **Dome-C is candidate for hot point - seen by SMOS many times a day!**
- Temporal stability verified by tower based radiometer
- Spatial homogeneity??
- Measurements at higher frequencies by SMMR, SSM-I, AMSR-E look promising
- But what about details and accuracy at L-band??
- Need area coverage with airborne, stable radiometer

Antarctica



EMIRAD-2 Specifications

- Fully polarimetric (i.e. 4 Stokes)
- $\Delta T = 0.1$ K for 1 sec. integration
- RFI flagging by kurtosis and polarimetry
- 2 antennas - one nadir pointing, one pointing at 40° incidence
- Antennas are Potter horns (no sidelobes) with 38° and 31° HPBW
- Footprints around 450 m from 2000 ft flight altitude

AWI Basler BT-67



Side Looking Horn



Radiometer System in Basler

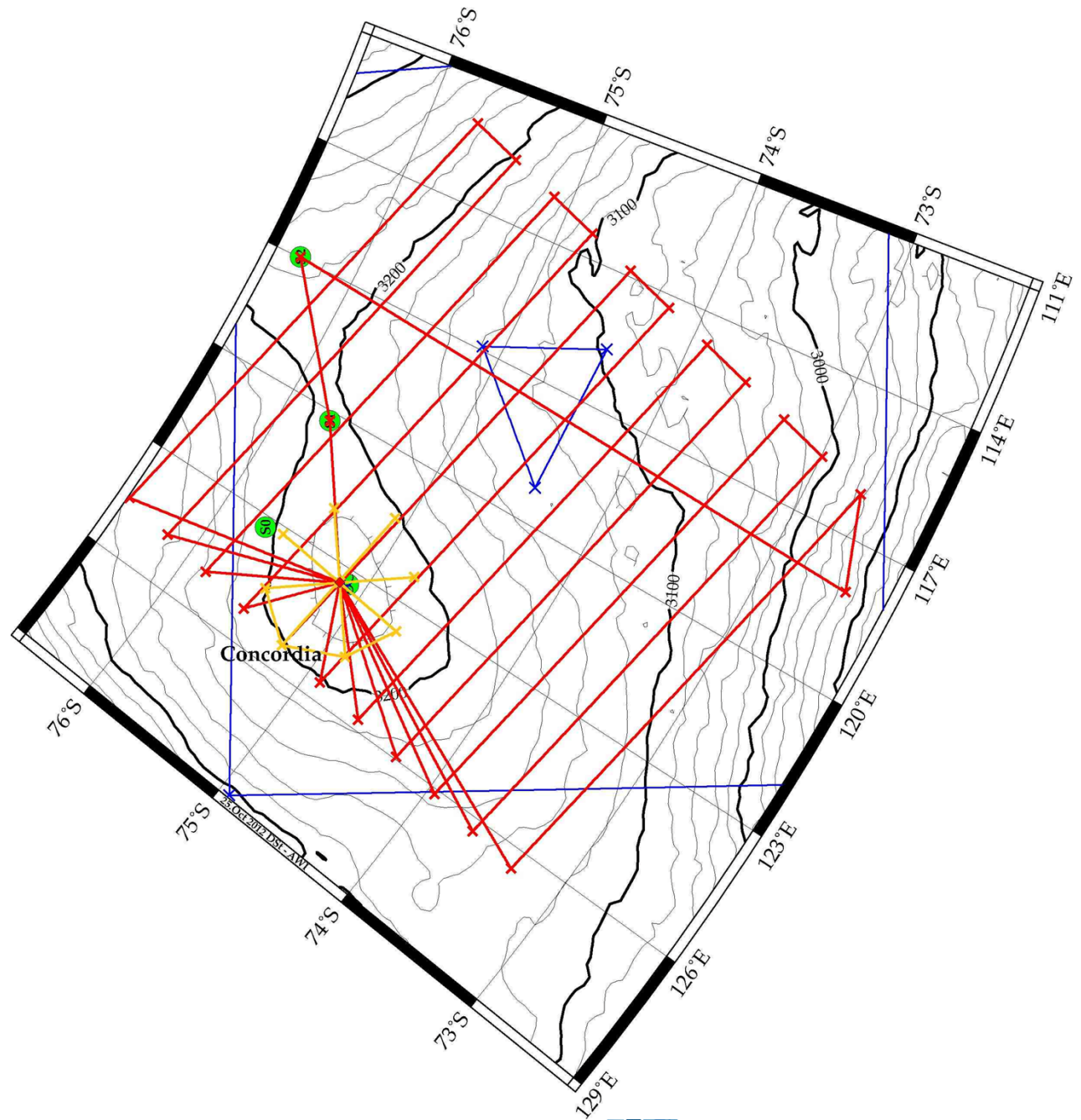


Raster + Star Pattern

- 350 x 350 km area covered
- 11 lines each 350 km
- separation 35 km
- 24 hours of flight
- Altitude \approx 2000 ft above terrain, constant flight level

- Sun must be avoided: never $100^\circ \pm 45^\circ$ compared to track
- No flight 7:20 to 13:20 (raster pattern)

- More intense coverage near Concordia: star pattern
- Also used for azimuth analysis



Azimuth signature? - Circle Flights

- **Constant roll and pitch - drift with wind!**
- **10 + 10 circles, roll + and - 10 deg**
- **Incidence angles: 10, 30, 50 deg.**
- **Circle diameter: 6 km**
- **Two sets of circles (morning / evening) to sort out Sun signature from surface signature**
- **Sun signature also to be used for raster pattern corrections**

RFI Statistics

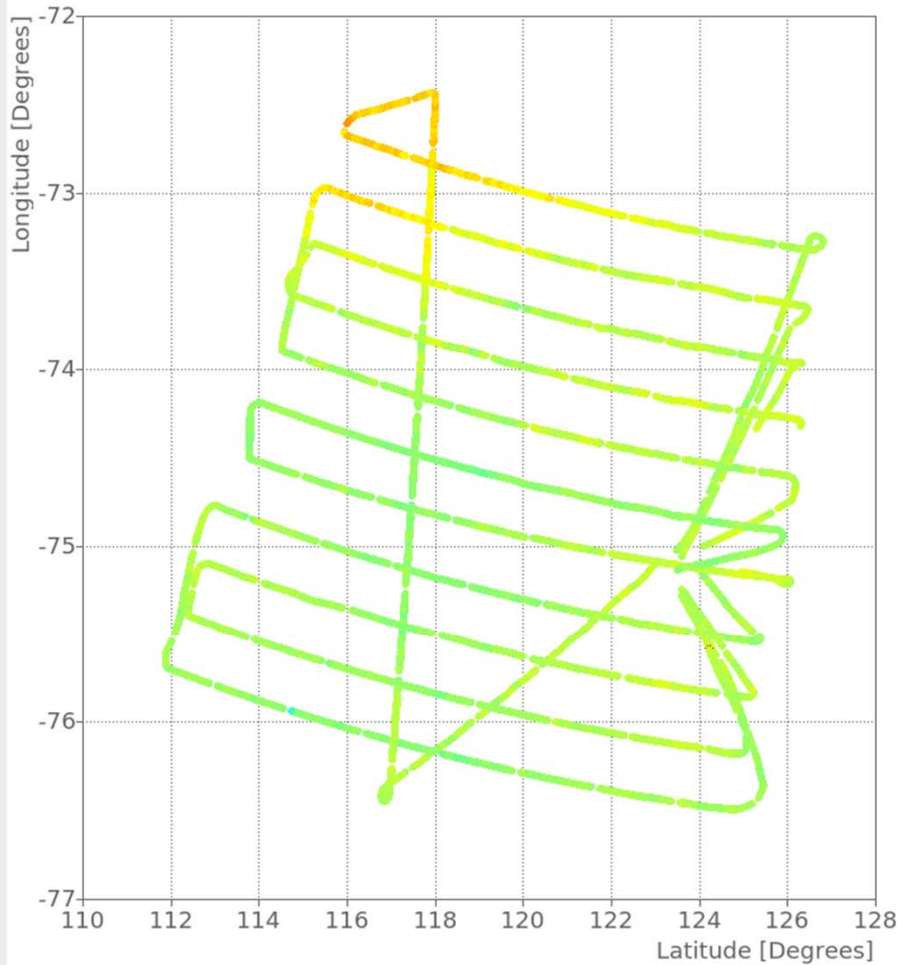
- **Method: > 320 K / Kurtosis / Polarimetry**
- **Global statistics:**
 - Nadir horn: ≈ 3 % flagged
 - Side looking horn: ≈ 1.5 % flagged
- **Track example:**
 - ≈ 3.8 % flagged

	All	Clean
Mean	207.4 K	204.9 K
StD	18.6	3.2

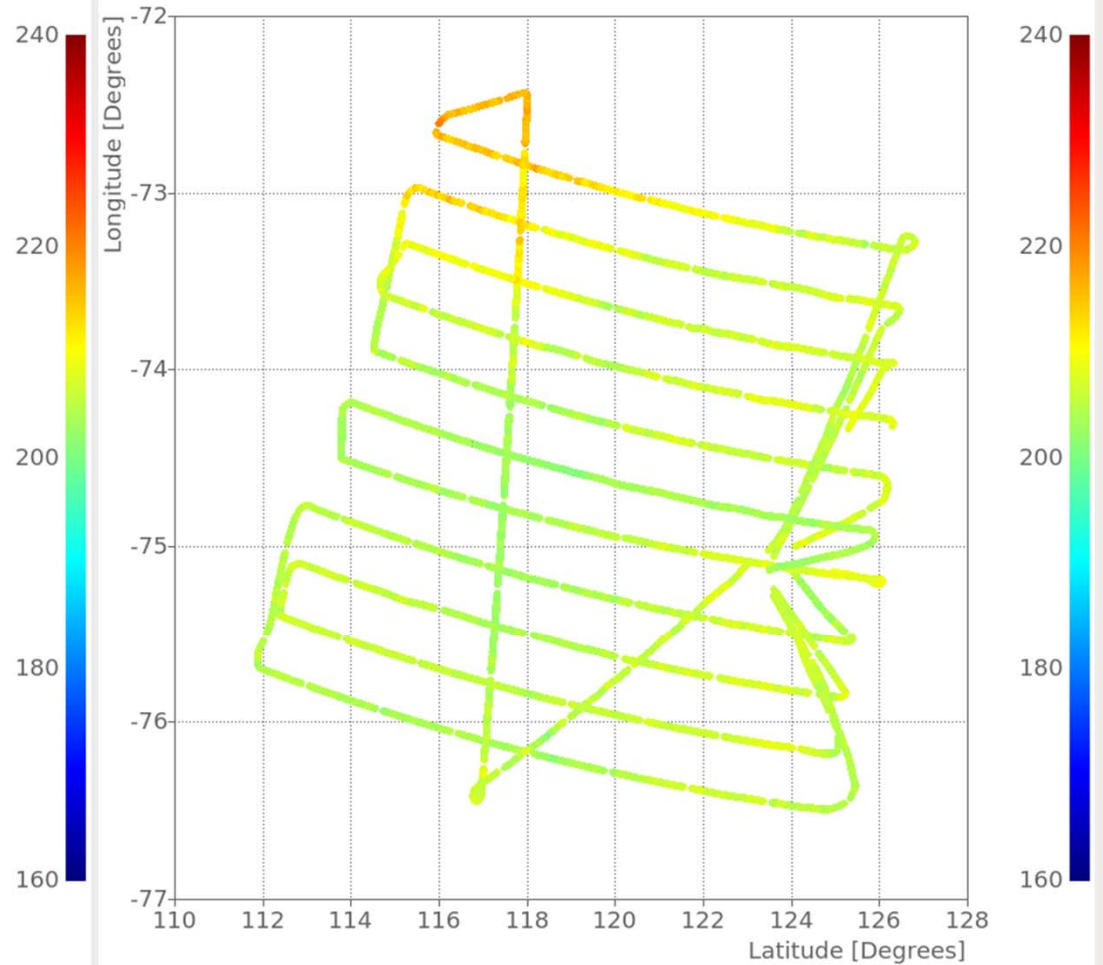
- **There is RFI in Antarctica!!**

TB Plotted on Flight Tracks

EMIRAD nadir looking antenna: Horizontal polarization

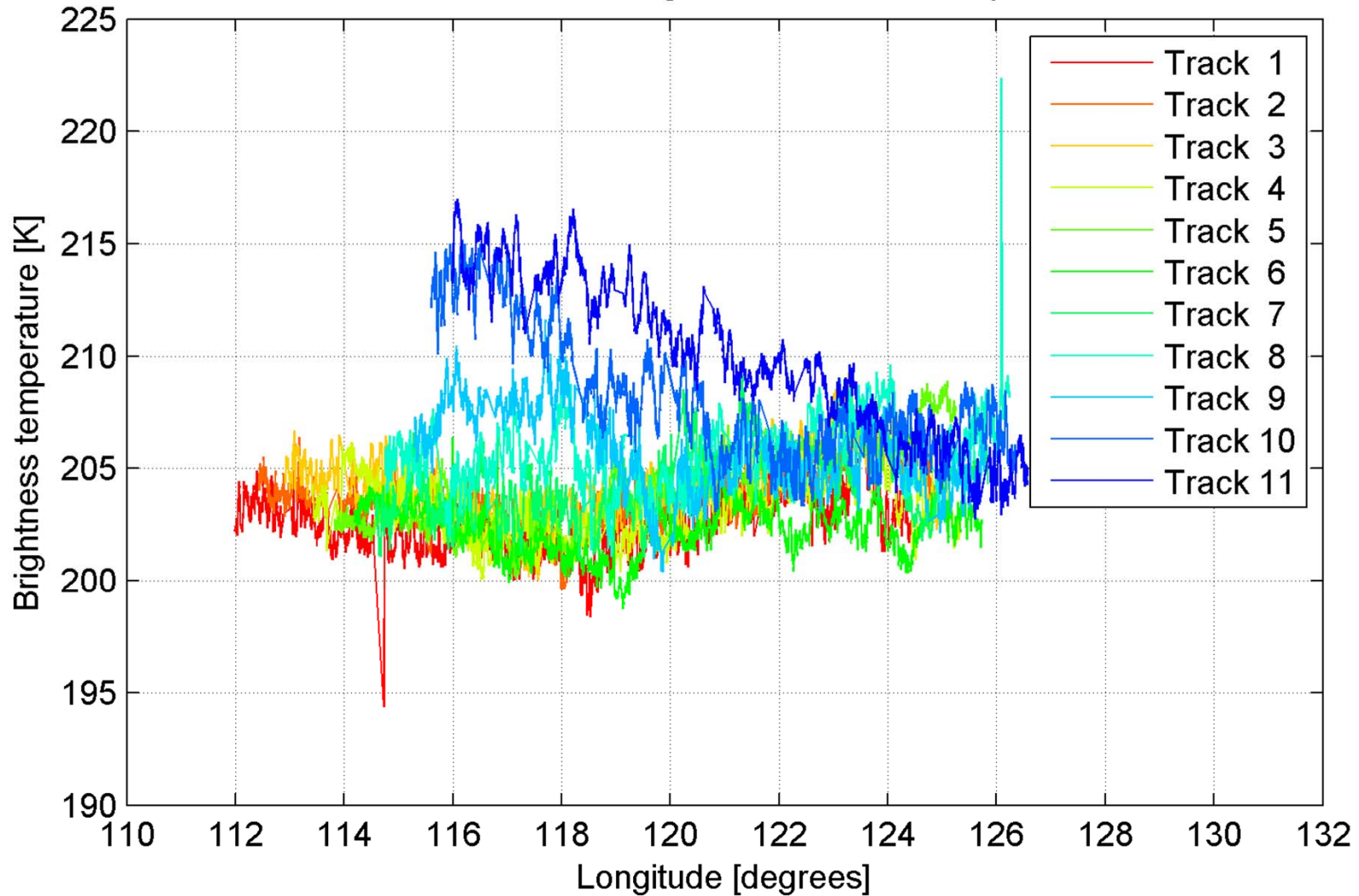


Emirad nadir looking antenna: Vertical polarization



TB: Raster Pattern Tracks

Tracks 1-11: Nadir looking antenna, Horizontal polarisation



Data Processing

- Calibration using the internal calibration loops and external liquid nitrogen cold target calibration carried out in the field before each mission.
- RFI detection and mitigation using kurtosis and polarimetry.
- **Production of TB map of the area covered by the grid pattern, including estimates of measurement uncertainties**
- **Production of the circle flight and star pattern signatures**
- **Analysis of azimuthal signatures in the morning and the afternoon circle flights. Extract Sun signature**
- **Correct raster pattern for Sun**
- **Analysis of the homogeneity of raster pattern map (spatial covariance, correlation lengths, power spectra)**
- **Analysis of azimuthal signatures in the star pattern**
- **Compare tower and airborne measurements**
- **Compare airborne data with ancillary geophysical data**
- **Compare airborne data with SMOS data**