

L-band brightness temperature at Dome-C Antarctica: intercomparison between DOMEX-3, SMOS and Aquarius data

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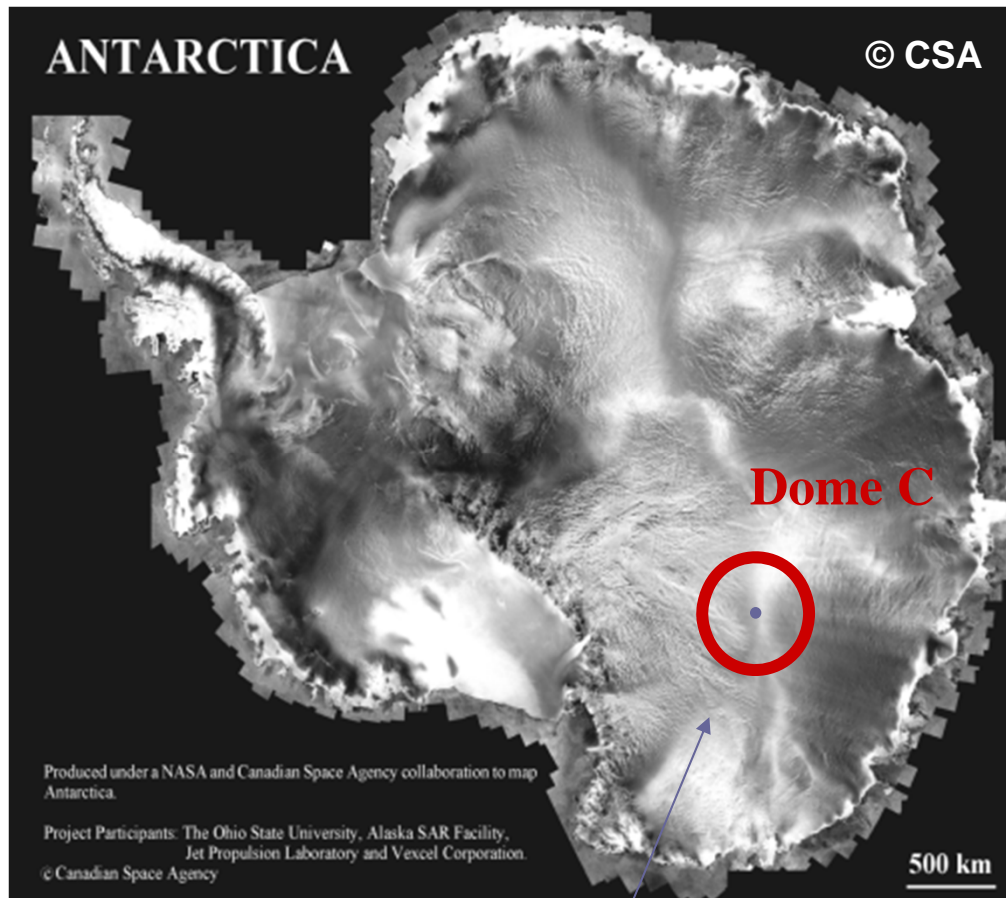
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Introduction

- In the last years an experimental ground activities (DOMEX-1, DOMEX-2) started in Antarctica – Dome-C with the aim of characterizing the East Antarctic plateau as a potential extended target for calibrating and monitoring low frequency microwave radiometers.
- Measurements demonstrated that V polarization is very stable at annual scale (standard deviation < 1K over several months) whilst H polarization exhibits some fluctuations and a good agreement with SMOS data.
- Moreover a ground long-term experiment is recommended in order to provide a continuous data record of ground-based radiometric measurements covering the SMOS – Aquarius – SMAP era and verify target stability over time and to monitor changes in target characteristics that may affect the long-term reference signal
- In spite of these promising results an airborne Survey is fundamental to verify if the observed Tb is representative of the Tb observed by SMOS – Aquarius and to investigate on the pixel spatial variability

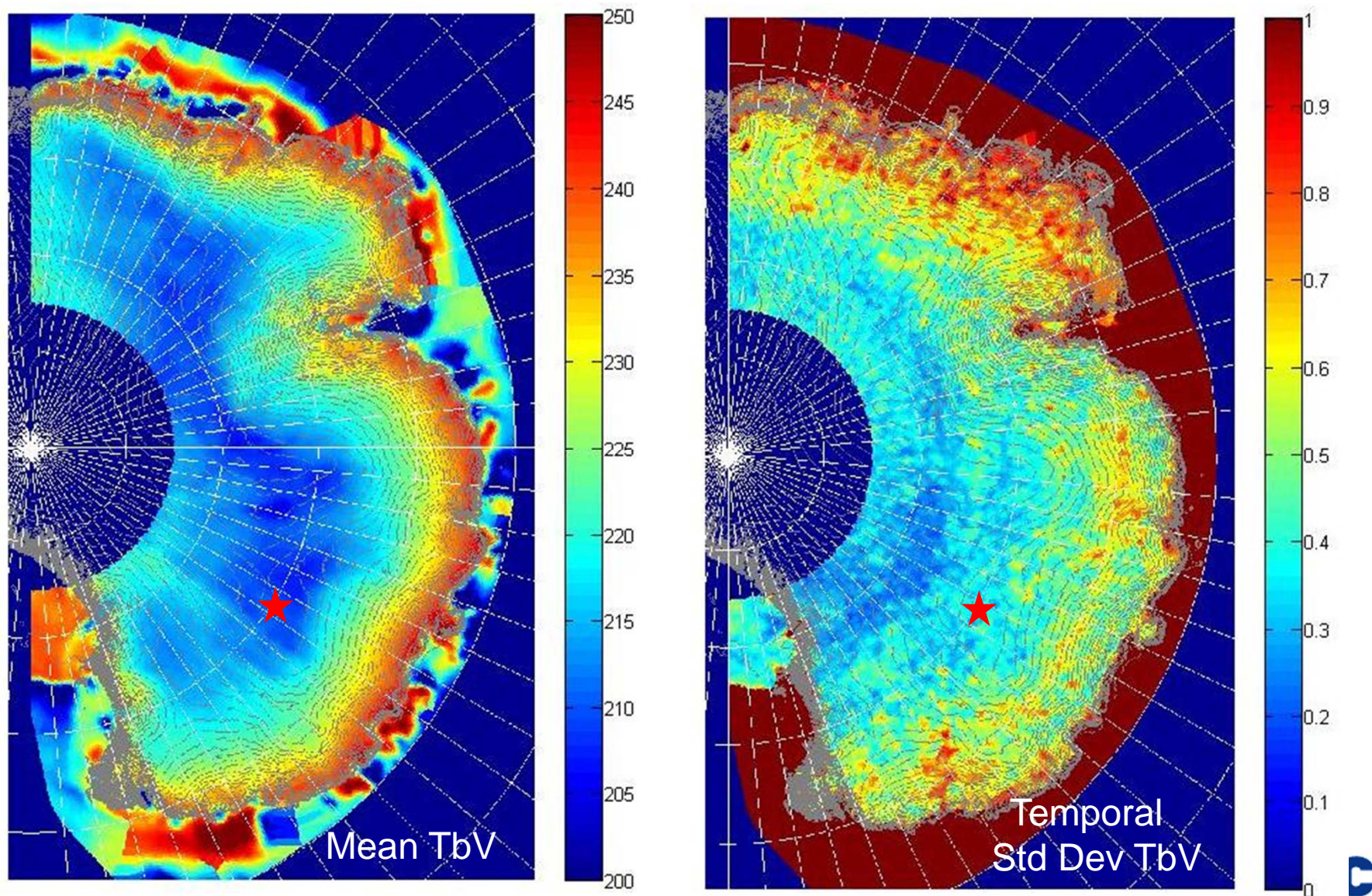
Dome C and the Antarctic Plateau



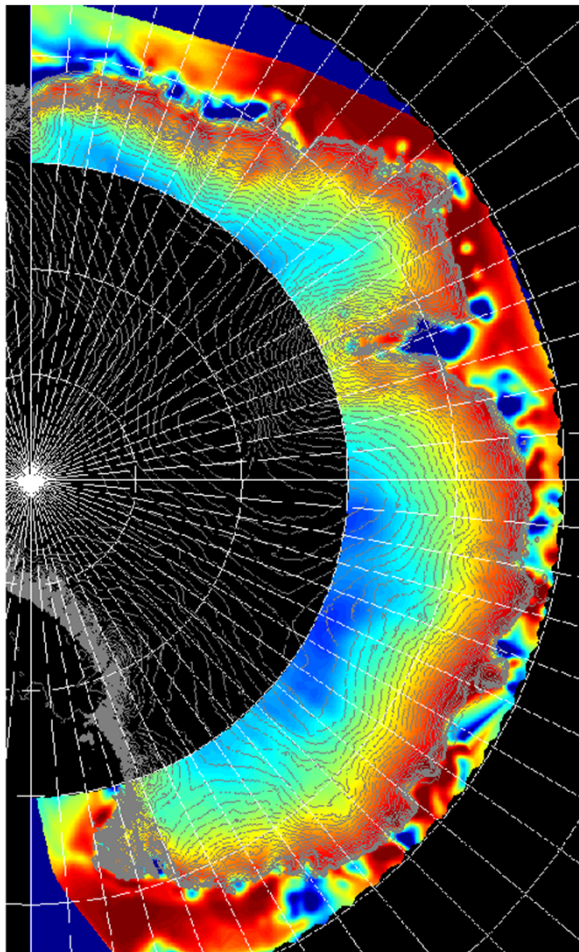
- The site is view on a **sub-daily frequency** by polar-orbiting satellites, at a variety of incidence and azimuth angles.
- **Homogeneity** of snow surface at the **100 km scale**.
- **Small surface roughness** relative to other ice sheets.
- Low snow accumulation rate (around 3.7cm/yr).
- **Clear sky**, and extremely dry and stable atmosphere.
- Well known topography and environmental condition

**Concordia Station (Dome C): 75.125 S, 123.25 E
3270 a.s.l**

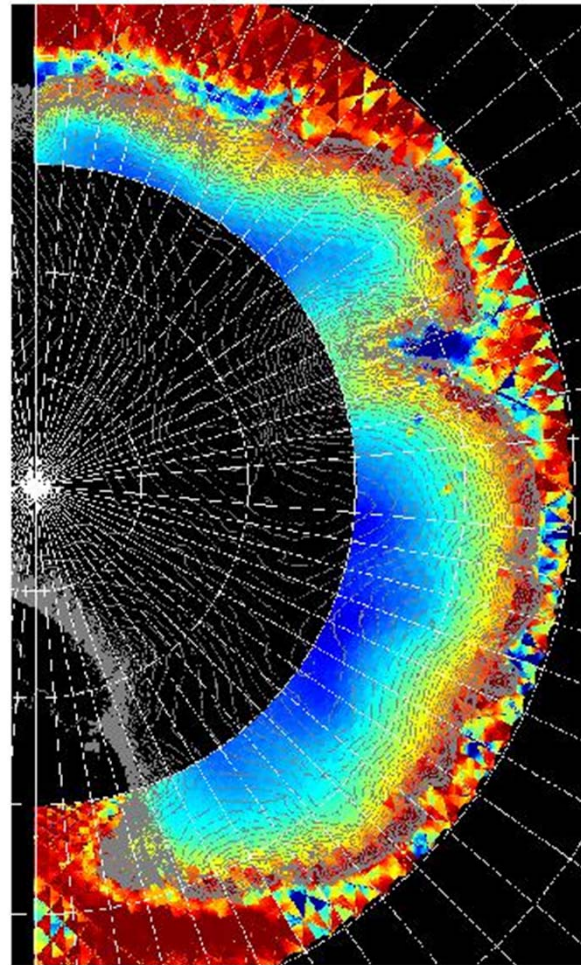
SMOS in EAST Antarctica



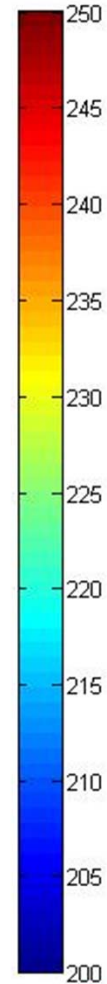
SMOS-Aquarius over EAS



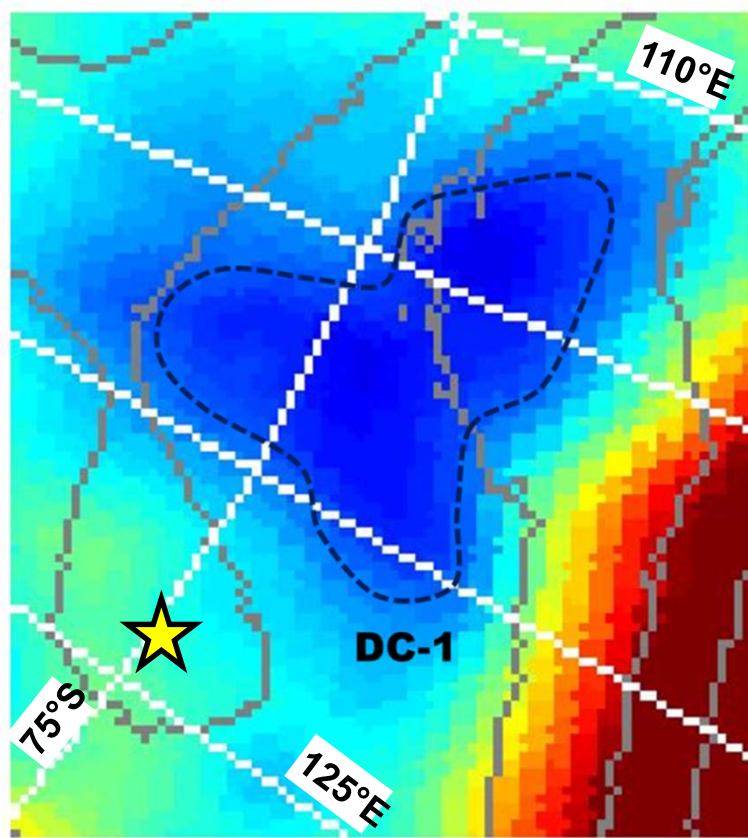
SMOS - Vpol



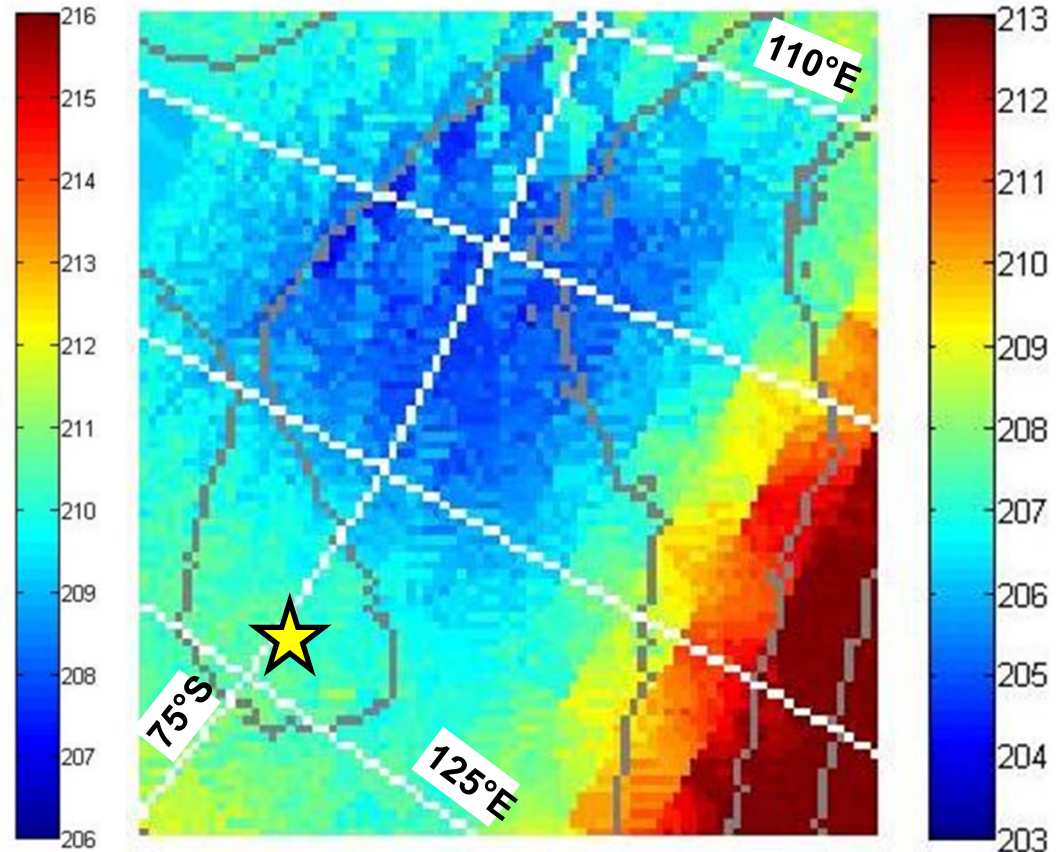
Aquarius - Vpol



SMOS – Aquarius near to Dome C



SMOS - Vpol



Aquarius - Vpol

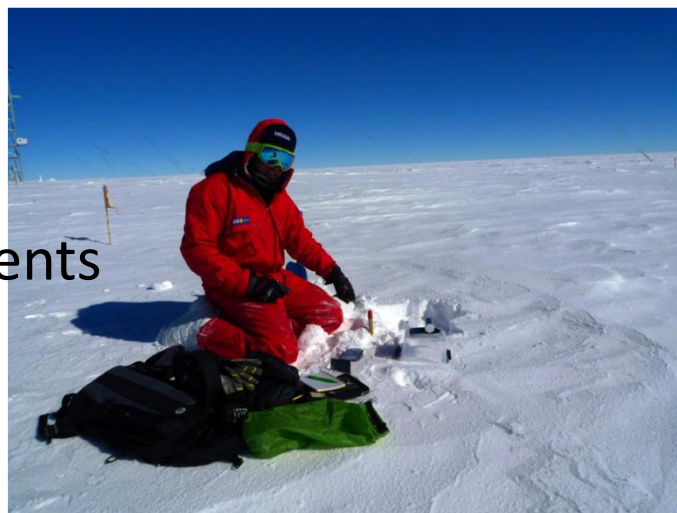
The patterns are similar and the triangle is observed in both sensors

Investigation on temporal stability: the DOMEX campaign 2012



Installation of Radomex

Snow Measurements

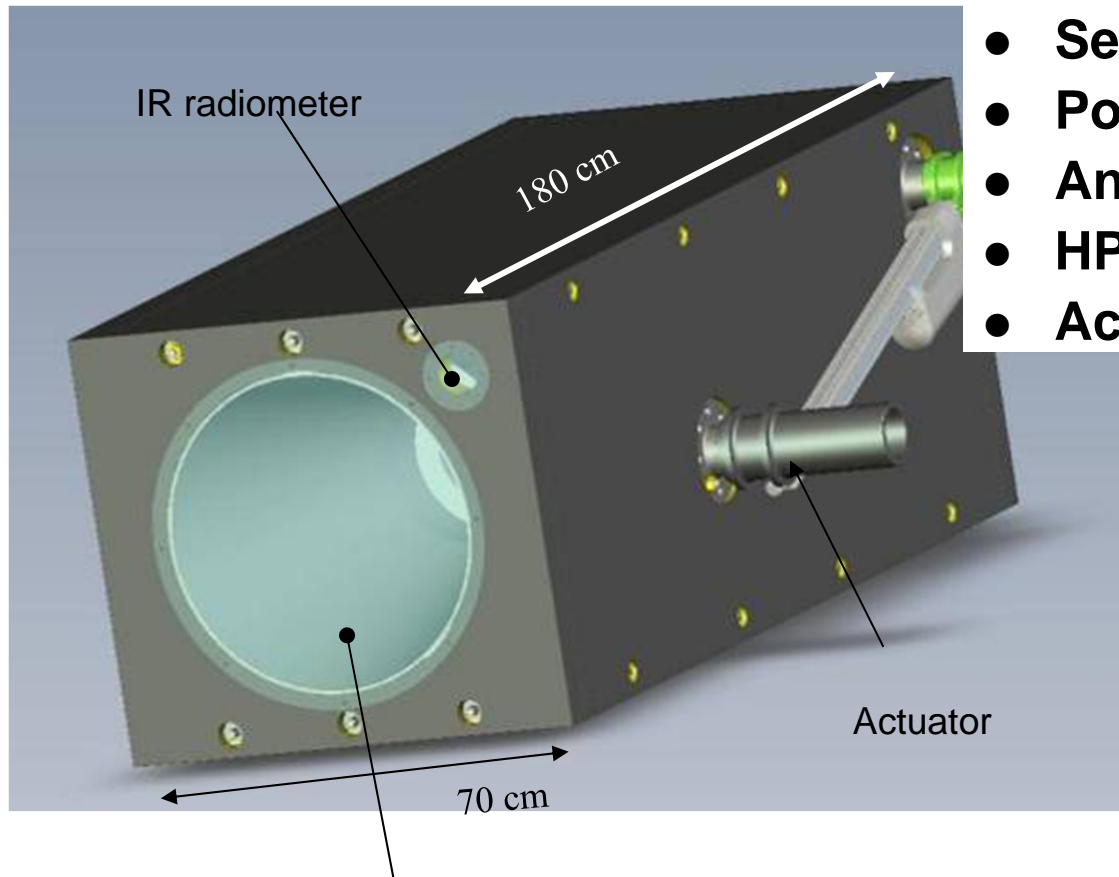


Start: Dec 2012

Stop: Dec 2015

The Instrument

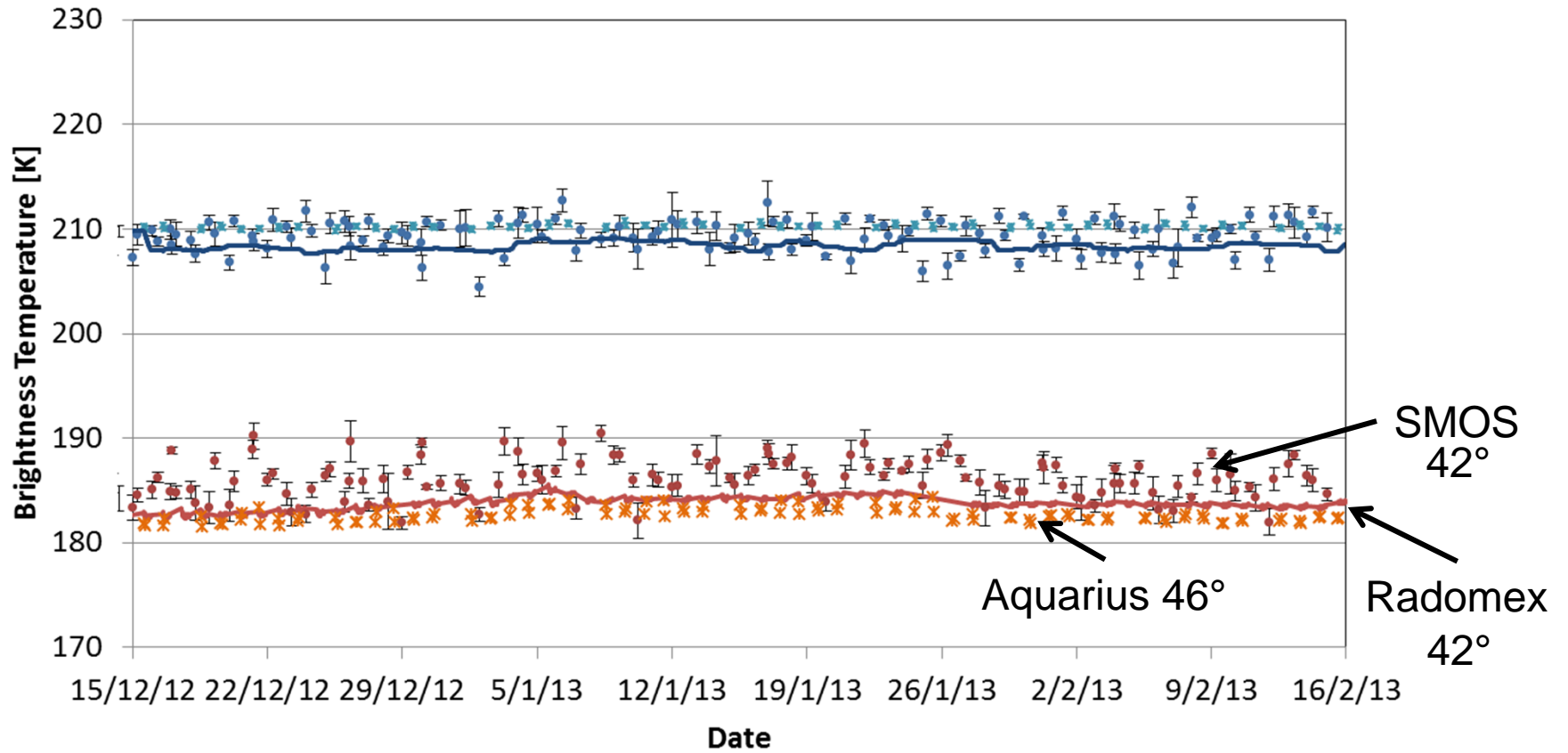
- RaDomeX - Radiometer
- Frequency : 1413 MHz
- Bandwidth: 27 MHz
- Sensitivity = 0.2 K ($T_i = 2$ sec)
- Polarization: H and V
- Antenna: Potter Antenna
- HPBW: 20°
- Active (PID) thermal control



L- Band – Potter Antenna



SMOS and DOMEX-3 data : temporal trend



SMOS = 209.3 K , Stdev = 1.6 K
 Aquarius = 210.1 K , Stdev = 0.2 K
 DOMEX-3 = 208.5 K , Stdev = 0.9 K

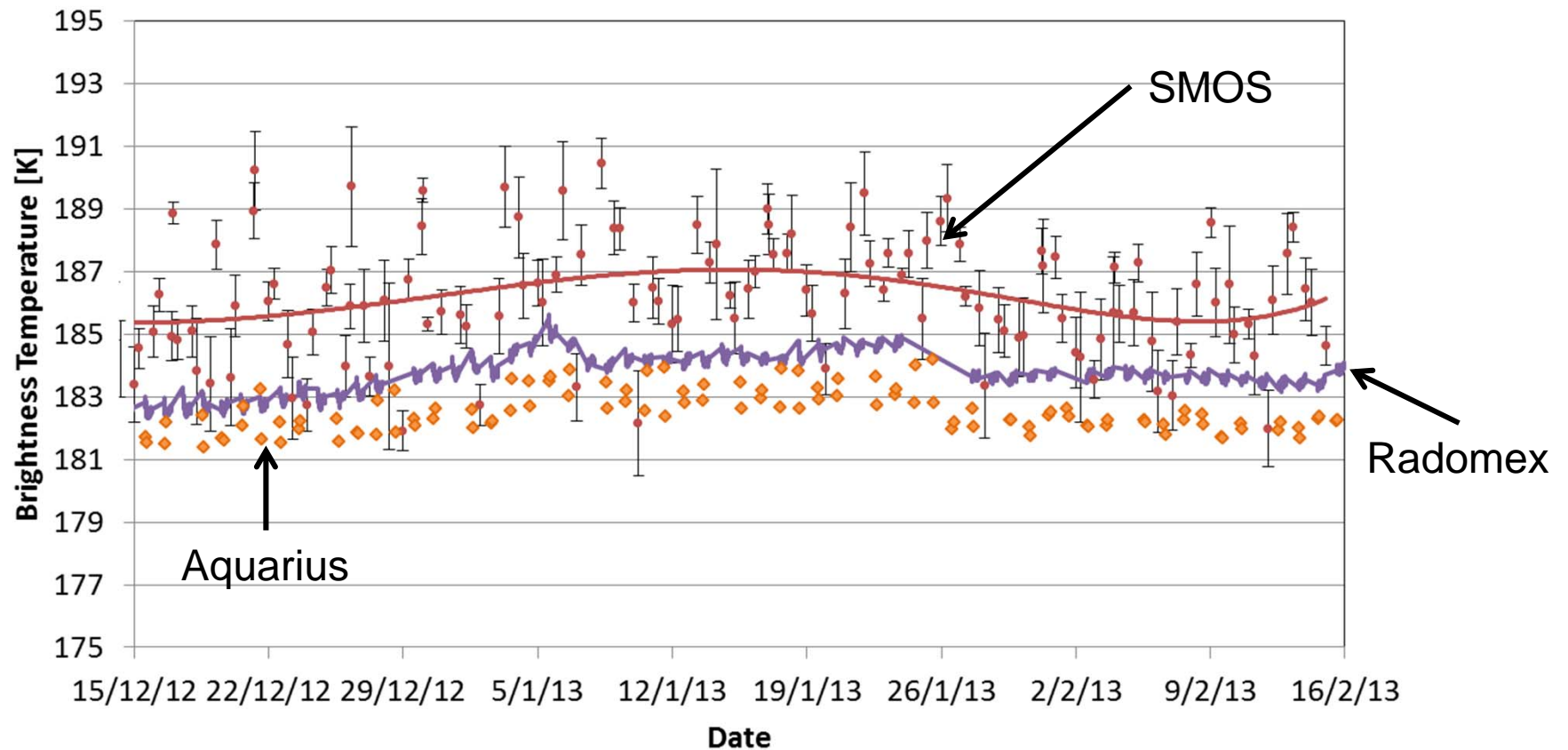
SMOS = 186.1 K , Stdev = 1.8 K
 Aquarius = 182.5 K , Stdev = 0.67 K
 Domex-3 = 183.7 K , Stdev = 0.75 K

V pol

H pol

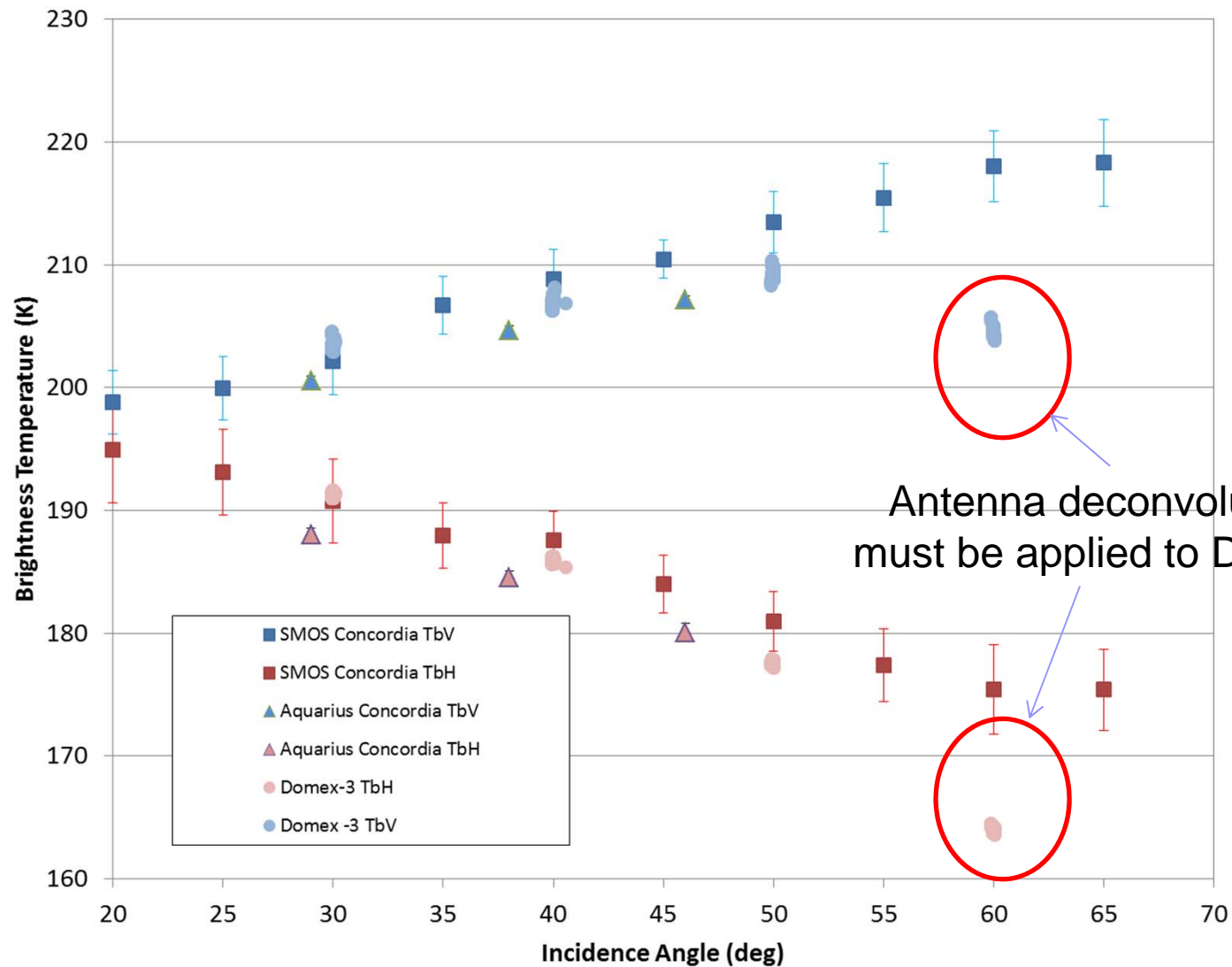


SMOS and DOMEX-3 data : H polarization

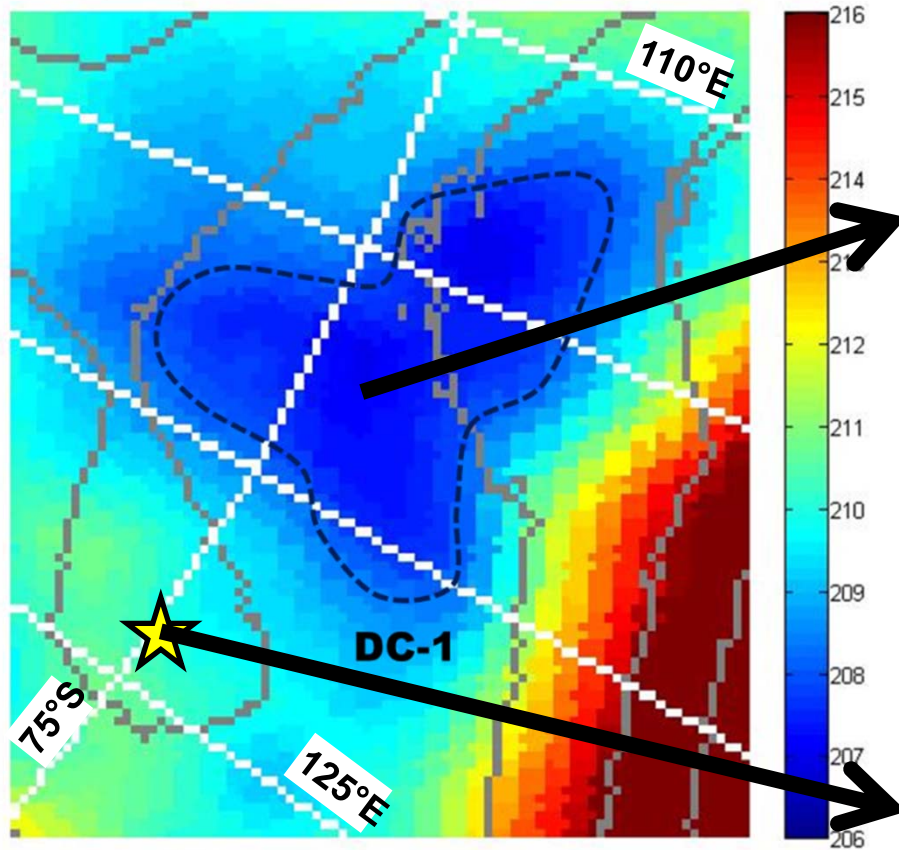


Tbh fluctuations in both SMOS, Aquarius and DOMEX data !

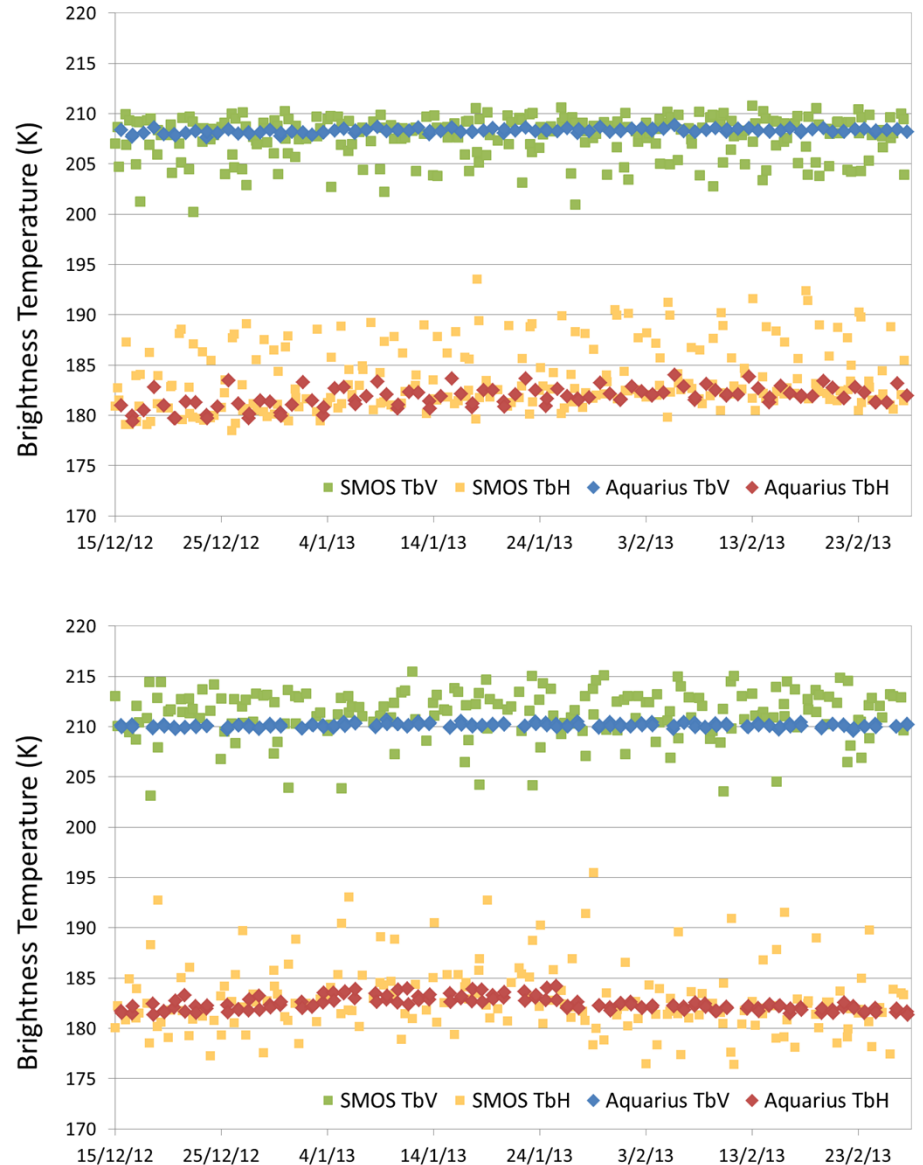
SMOS – Aquarius – DOMEX-3



SMOS - Aquarius over the Dome C area



Observation angle 46 deg



Conclusions

- The analysis of SMOS and Aquarius data demonstrates that East Antarctic plateau exhibits several areas homogenous in space and stable in time
- Two campaigns Domex-1/-2 have been carried out demonstrated the potential of Dome-C as stable external ‘cold calibrator’ for L-band radiometers
- In order to monitoring the long time stability of the site (along the SMOS-Aquarius-SMAP era) and better analyze the fluctuations at H_{pol}, a new experiment called Domex-3 started on Dec. 2012
- Preliminary data analysis from Domex-3 and satellites measurements shows a good agreement