Revised ERS-1 and ERS-2 MWR L1B dataset

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Overview

- Schedule
- ERS-1 and ERS-2 main events
- Processing
- Results

- [Extra : comparison of Envisat TB vs Simulated TB (UCL RTM)]

Schedule

- 2014/12/30: Updated TN on recommendations

`PresentationRecommendationERS-1-2TBProducts_CLS-DOS-NT-14-203_2rev0`

- 2015/01/07: Delivery of “v3.0” L1B dataset

- 2015/05/07: Intercal TN

ERS-1 main events

- ERS-1 mission lifetime main events are:
  - 17/07/1991 (launch date)
  - 02/06/1996 (switch off)
  - 31/03/2000 (retired)

- ERS-1 flew on three different orbits:
  - a 3-day period for calibration and **sea ice** observation (from 12/28/1991 to 03/30/1992 and from 12/24/1993 to 04/10/1994),
  - a 168-day period for **geodetic** applications (from 04/10/1994 to 09/28/1994 and from 09/28/1994 to 03/21/1995).
  - a 35-day period for **multi-disciplinary** ocean observations (for the other dates)

(https://directory.eoportal.org/web/eoportal/satellite-missions/e/ers-2)

- No incidents are reported on the radiometer.

ERS-2 main events

- ERS-2 mission lifetime main events are:
  - 21/04/1995 (launch date)
  - 22/06/2003: tape recorder A stopped functioning. ERS-2 coverage limited to North Europe and Canada
    (https://directory.eoportal.org/web/eoportal/satellite-missions/e/ers-2)
  - 06/07/2011 (retired)
- ERS-1 and ERS-2 identical orbits (35 days) having a one-day shift. The tandem phase covers the whole common period:
  - 15/05/1995: 1st cycle of ERS-2
  - 02/06/1996: ERS-1 switch-off

- **A major event occurred on the radiometer**:
  - 26/06/1996 (after pass number 650 in cycle 12): 23.8 GHz channel gain drop probably due to an amplifier break down.

➔ From this date, **a drift on 23.8 GHz** TB is also detected.

Processing

- **Step 1:** ERS-1 and ERS-2 L1B “1st run” REAPER
  - REAPER consolidated dataset
  - Envisat L1B PDS binary format
  - Envisat side-lobe correction
  - **radiometer time tag**
  - **all surfaces**
  - date, lon, lat, TB 23.8 GHz, TB 36.5 GHz
- **Step 2:** Upload on CLS database
  - identical content (step 1): time tag, location …
  - **format conversion**
- **Step 3:** Interpolation on CLS L2 database:
  - linear interpolation on **altimeter time tag**
  - **ocean and sea ice surfaces**
  - altimeter backscattering coefficient is available
- **Step 4:** Correction of gain drop and drift on ERS-2 23.8 GHz channel
  - identical content (step 3) for ERS-1 (both channels) and ERS-2 36.5 GHz channel
  - Correction applied on 23.8 GHz TB (step 3) in CLS L2 database

Processing: ERS-2 TB@23.8

- This correction is extracted from ERS2/MWR drift evaluation and correction, Eymard L. and E. Obligis, CLS-DOS-NT-03-688, 1rev0, 20/02/2003

```
TB23.8corrected_for_the_gain_drop = 0.93 x TB23.8 + 19.18.
```

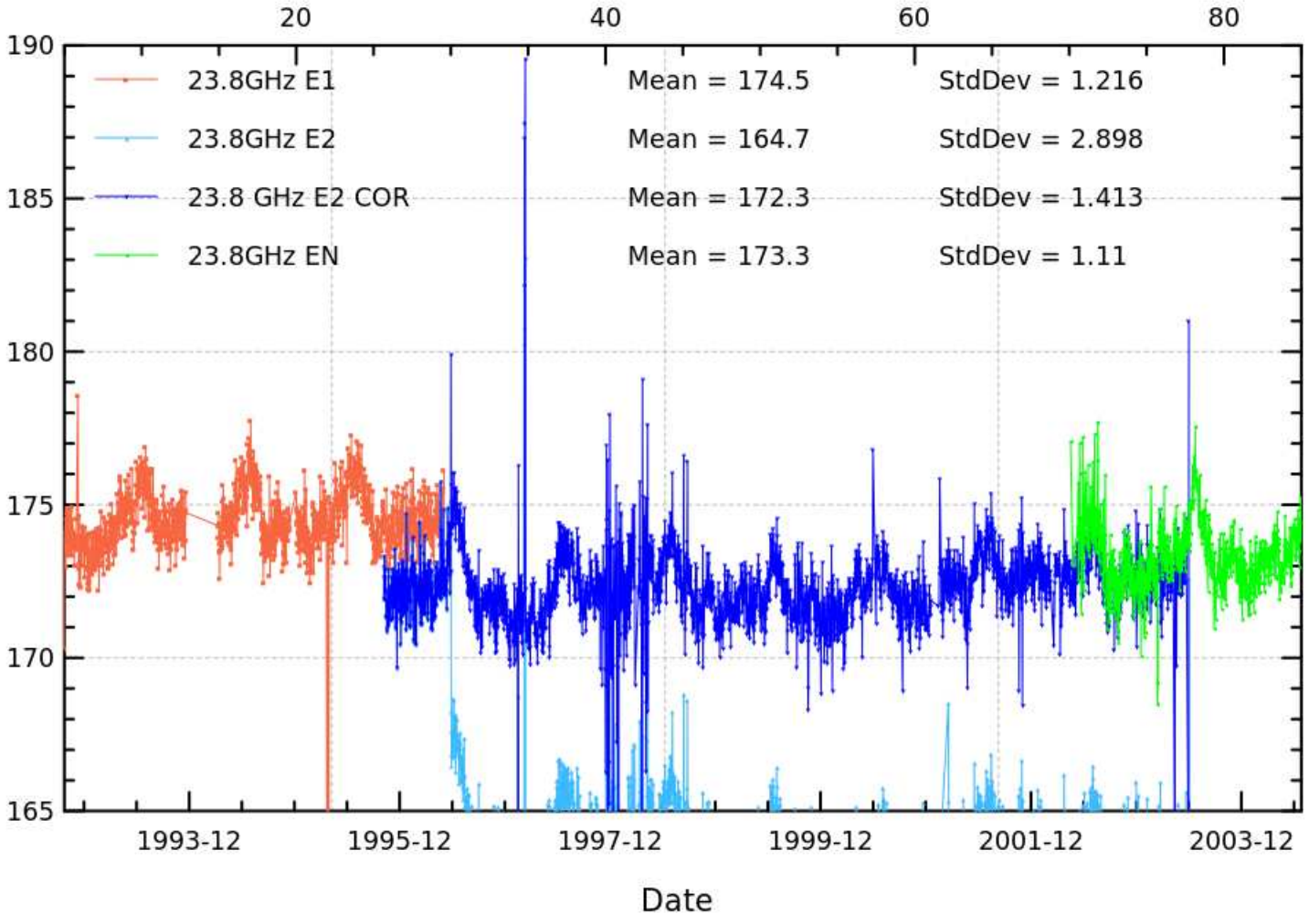
- Since this gain drop in June 1996, a drift appeared on the 23.8 GHz brightness temperatures cold brightness temperatures

```
TB23.8corrected_for_the_gain_drop_and_from_the_TBs_drift =
   TB23.8corrected_for_the_gain_drop + corr(t,TB23.8corrected_for_the_gain_drop)
```

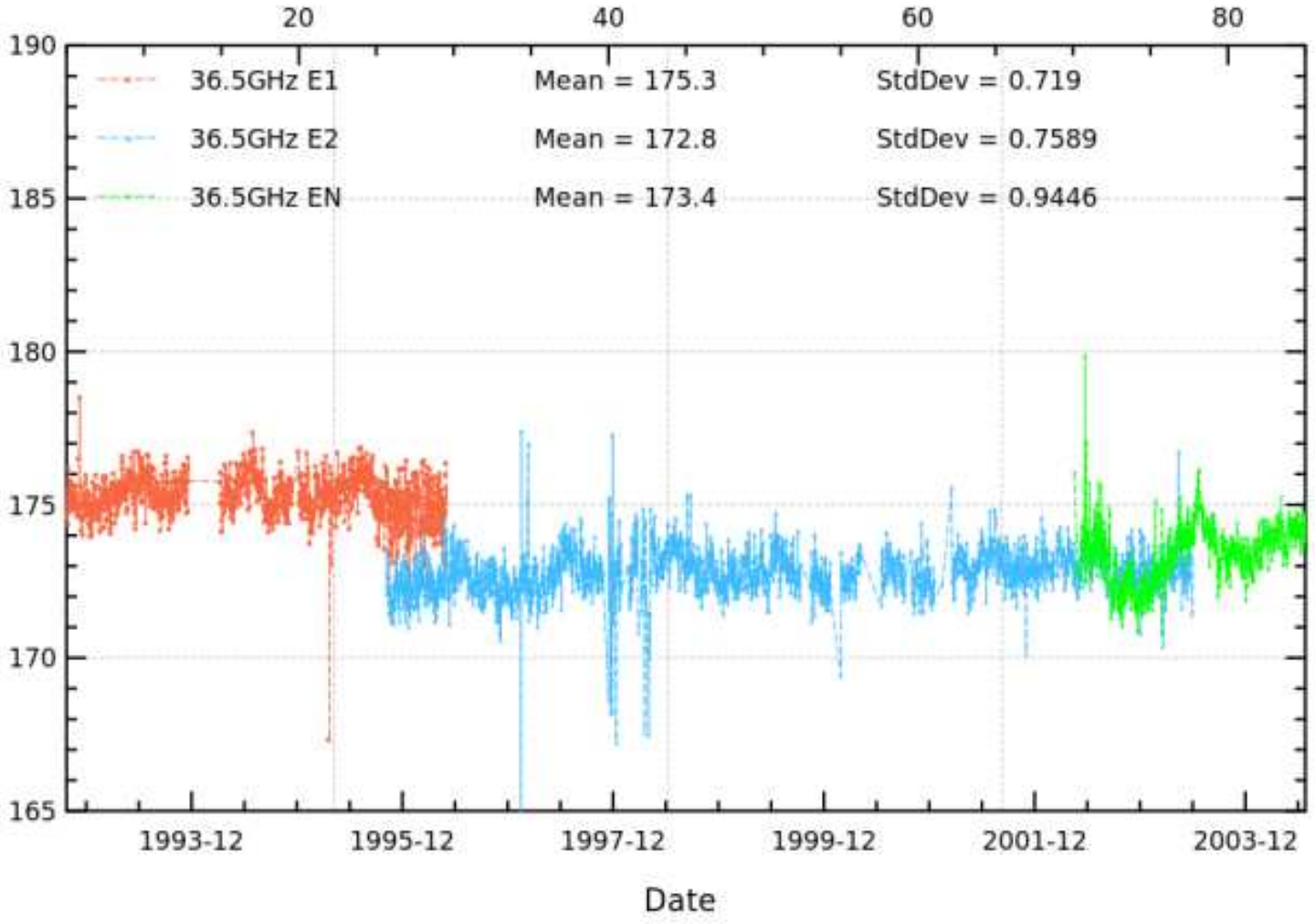
with :

- `corr(t, TB23.8corrected_for_the_gain_drop) = 0 for t ≤ 1.18`
- `corr(t, TB23.8corrected_for_the_gain_drop)= (a1*t+a2)* TB23.8corrected_for_the_gain_drop + (b1*t+b2) for t > 1.18`
- `a1=-0.001521`
- `b1=0.4564`
- `a2=0.001795`
- `b2=-0.5386`
- `t the elapsed time in decimal year since ERS2 launch.`

Results: 23.8 GHz



Results: 36.5 GHz



Recommandations to REAPER

- Same approach should be applied

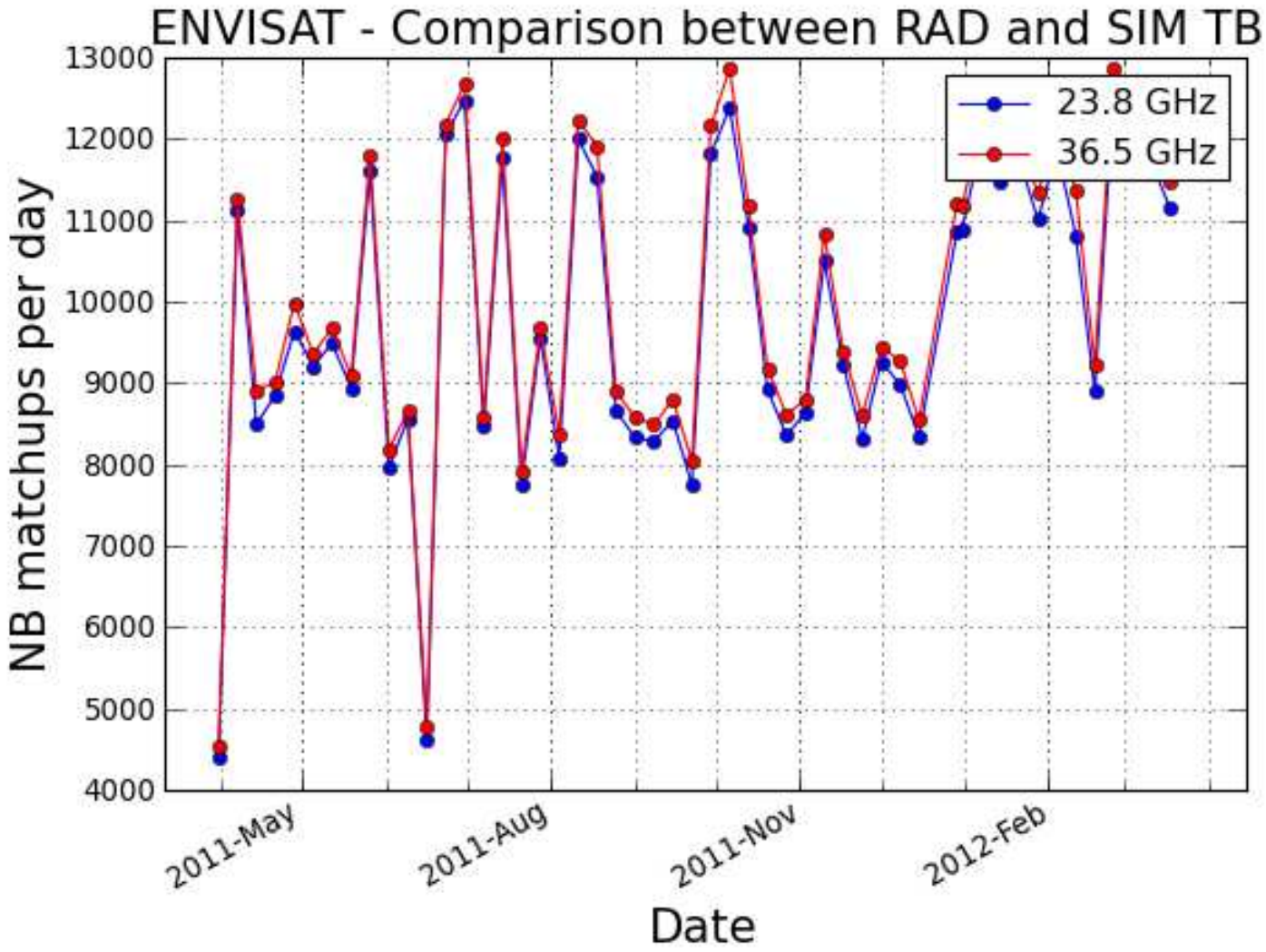
- Robustness of the dataset could be improved (detailed check of the gaps in the reprocessing)

Envisat TB VS UCL_MTR

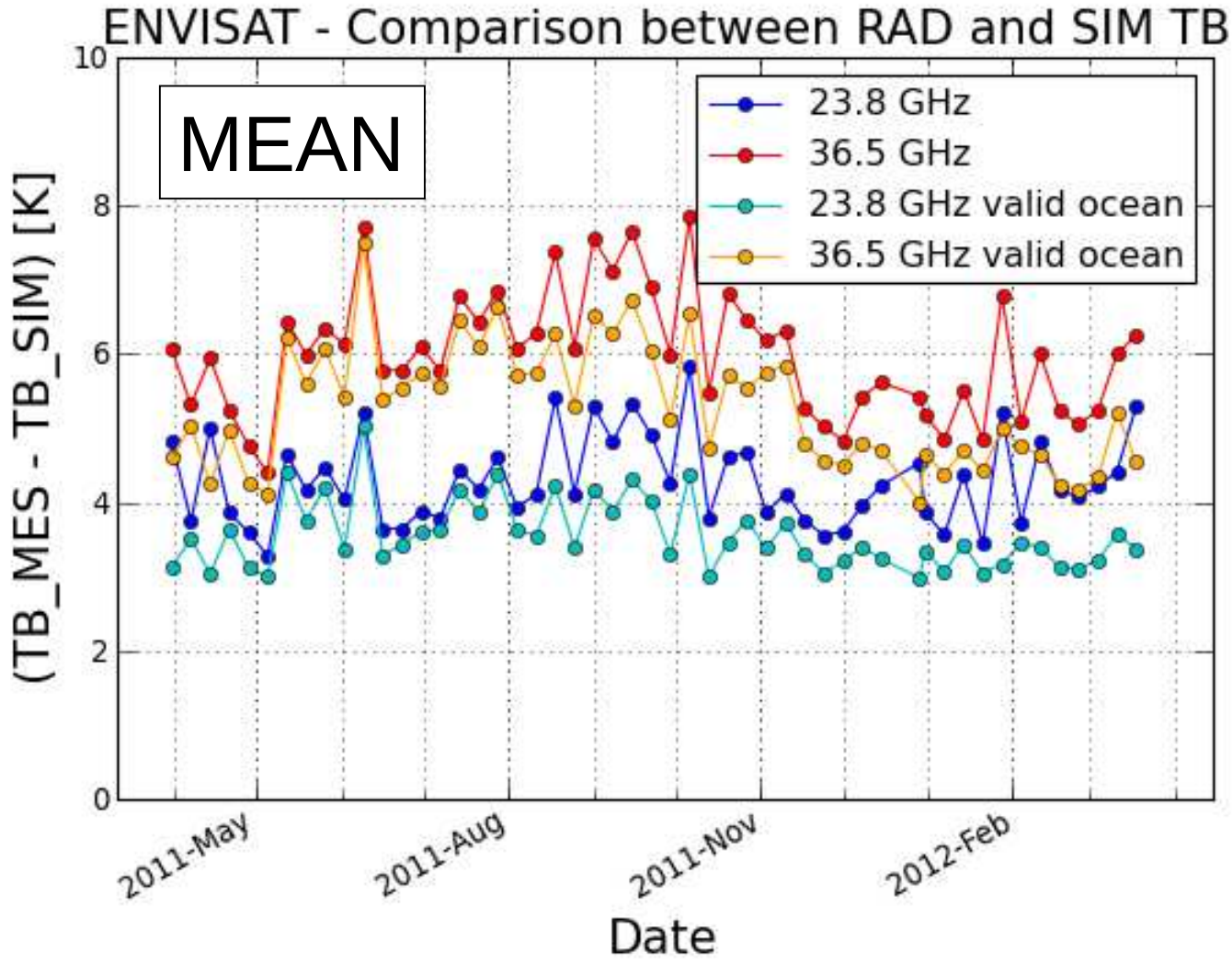
- Simulations performed by UCL RTM
- over 0.25°x0.25° ECMWF analysis, 4 analysis per day
- 1 analysis every 7 days between
  Apr 2011 and Apr 12 (last year of envisat)
- matchup critera :
  ABS(time between analysis and measurements) < 30 min
- All Sky

- figures show the statistics PER DAYS of the difference (RAD - SIM) : # occurrences, mean, std

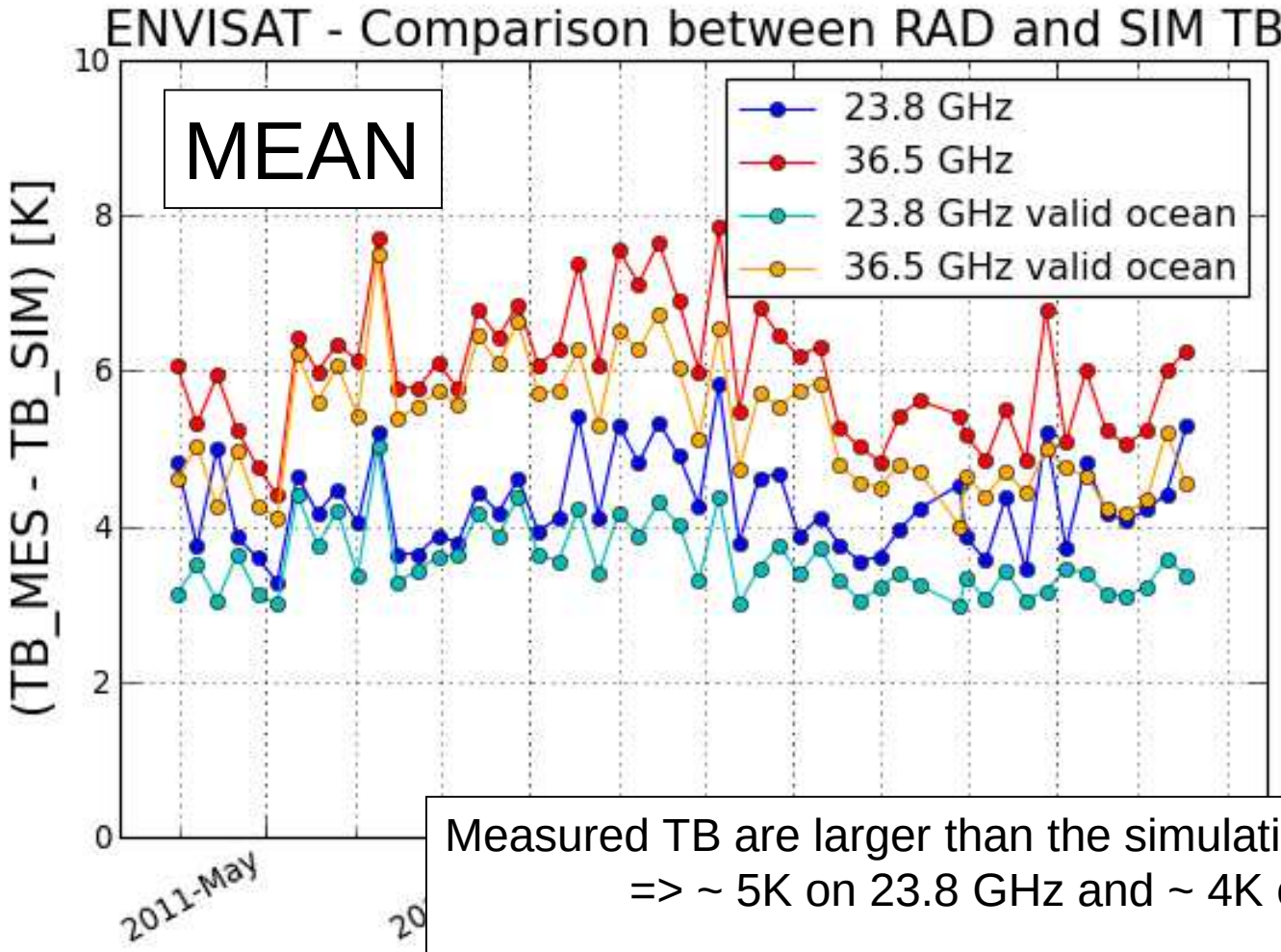
Envisat TB VS UCL_MTR



Envisat TB VS UCL_MTR



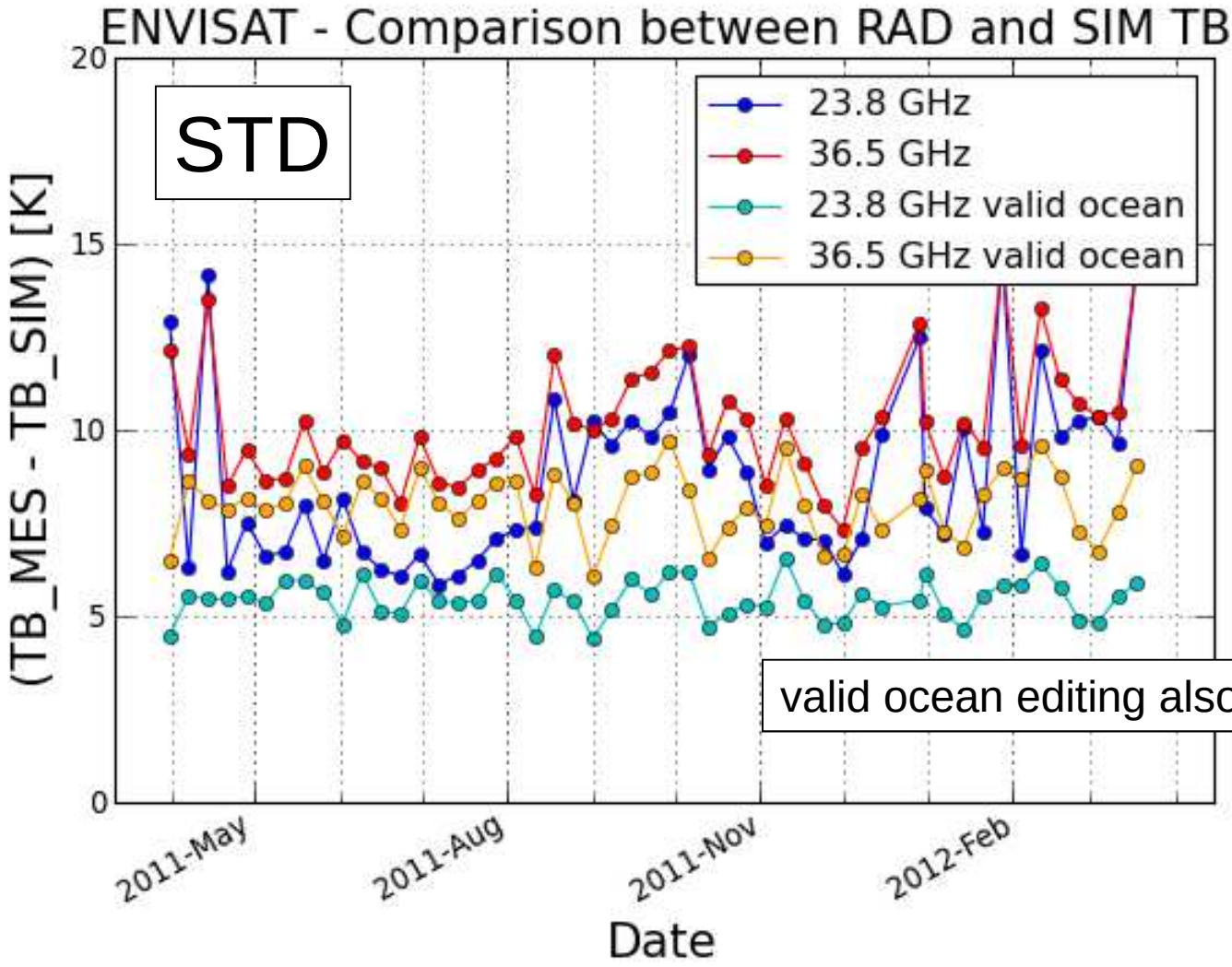
Envisat TB VS UCL_MTR



Measured TB are larger than the simulations
=> ~ 5K on 23.8 GHz and ~ 4K on 36.5GHz

valid ocean mitigate the annual cycle (Ice / Rain)

Envisat TB VS UCL_MTR



valid ocean editing also reduce STD

Danke !