



Royal Netherlands
Meteorological Institute
*Ministry of Infrastructure
and Water Management*

E-AMDAR Data Monitoring

Experiences with *Quality
Evaluation* of AMDAR Air
Temperature observations

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E-AMDAR QEvC 1999 – 2019,

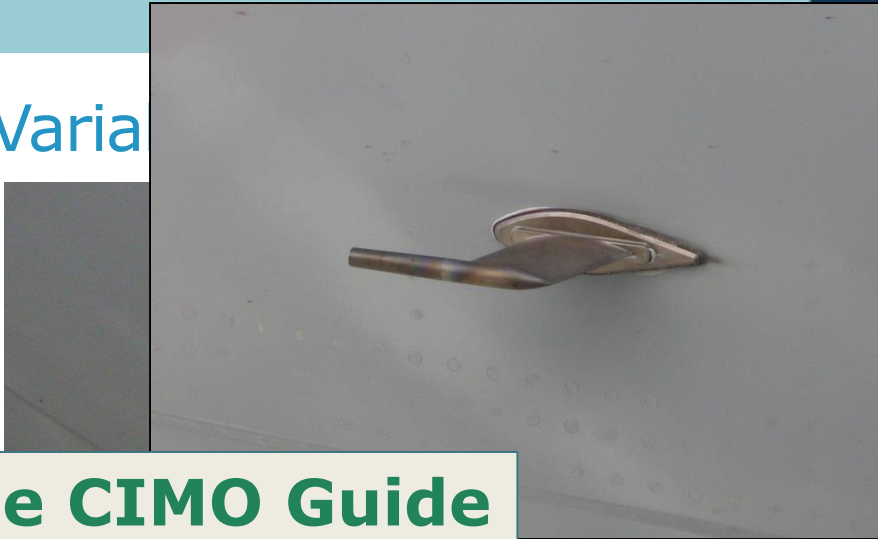
*20 years of experience with
data monitoring and quality evaluation*

- Background & history
- Data quality evaluation practices
- Air Temperature quality evaluation results
- Conclusions

Data quality evaluation practices



Varia



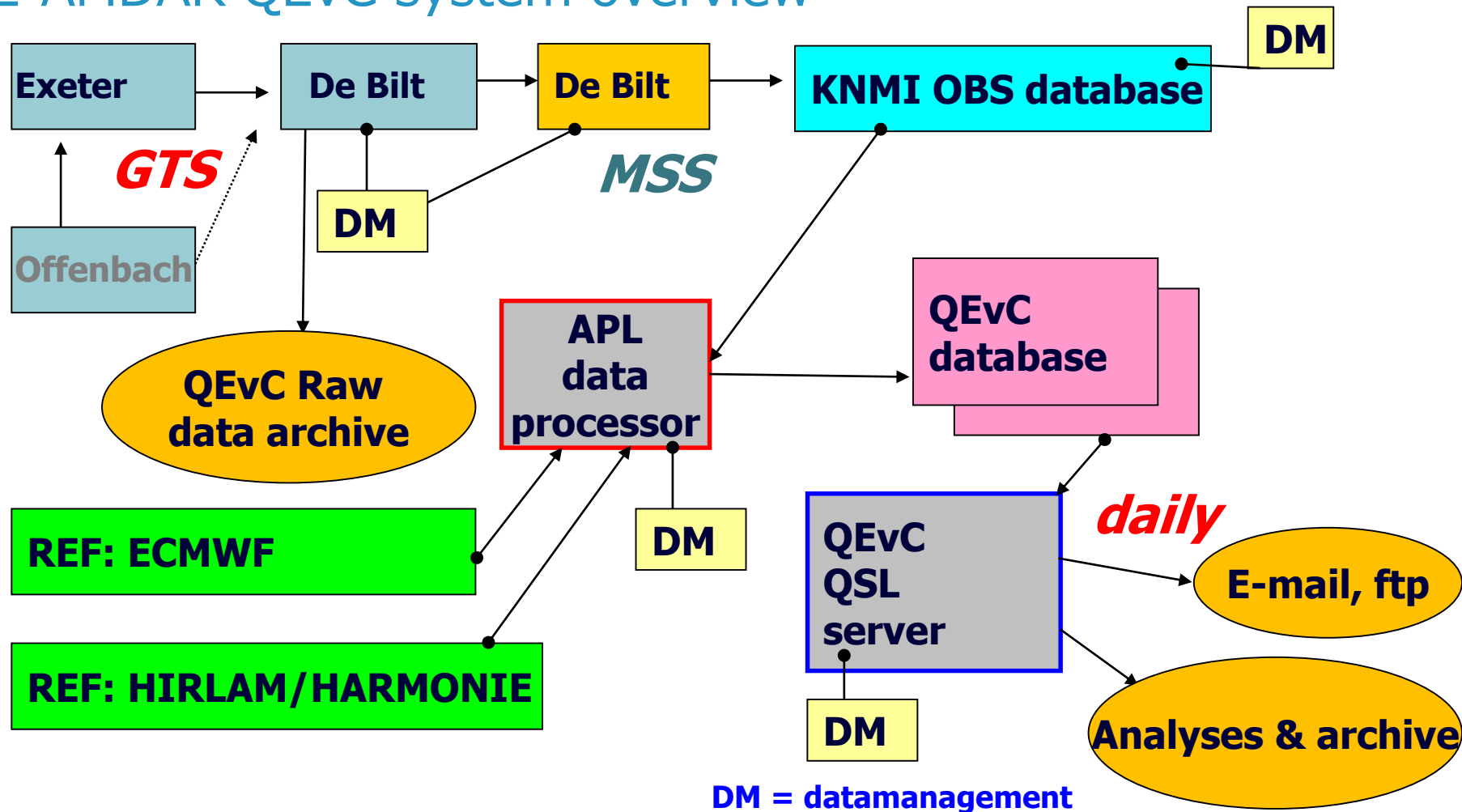
See CIMO Guide



2020-11-11



E-AMDAR QEvC system overview



Observations: Quality Assessment

In short, important items for QEvC are:

1. *Quality* of the **metadata**, like *location* and *time* of observation
2. *Quality* of the reported **variables** (*derived* from measurands, provided by the sensors), like air temperature
3. *Performance*, like **availability** and **timeliness** (*instabilities*)

Data evaluation

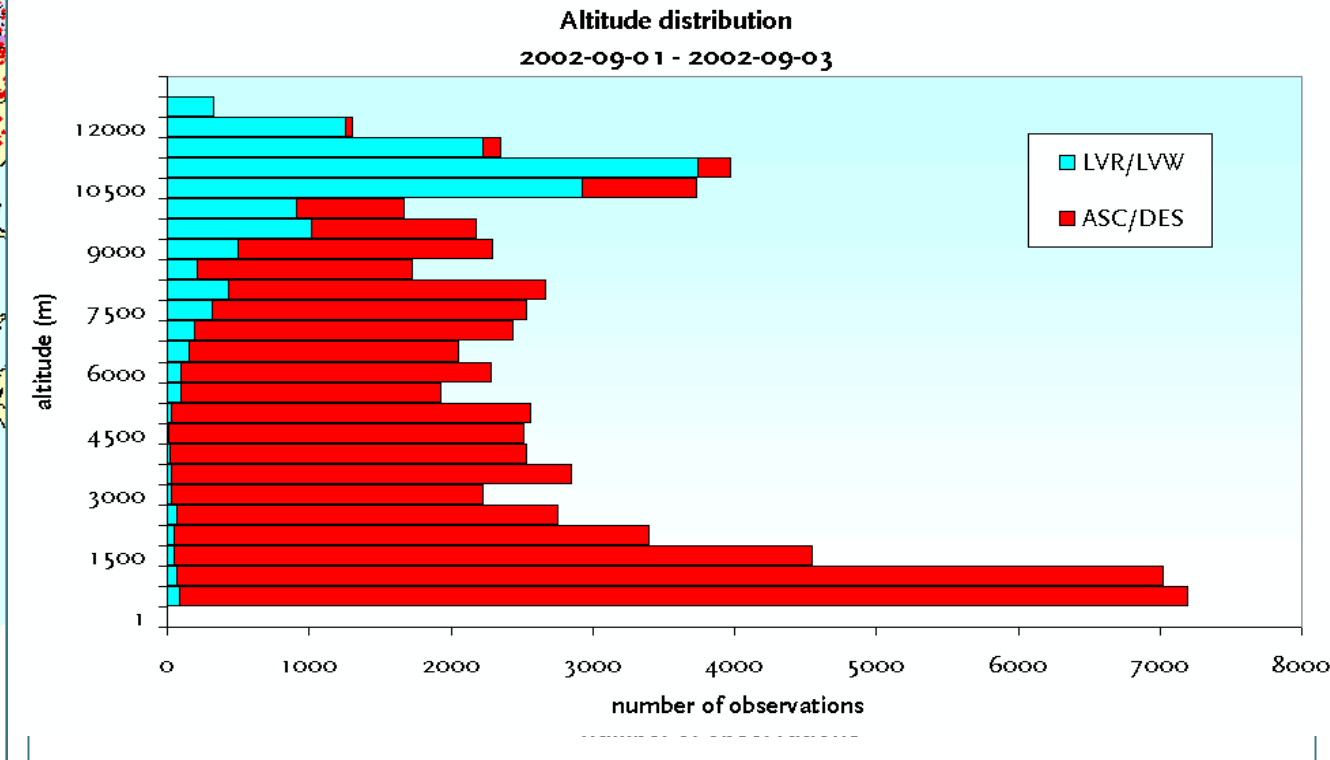
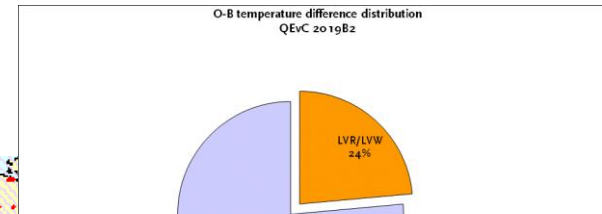
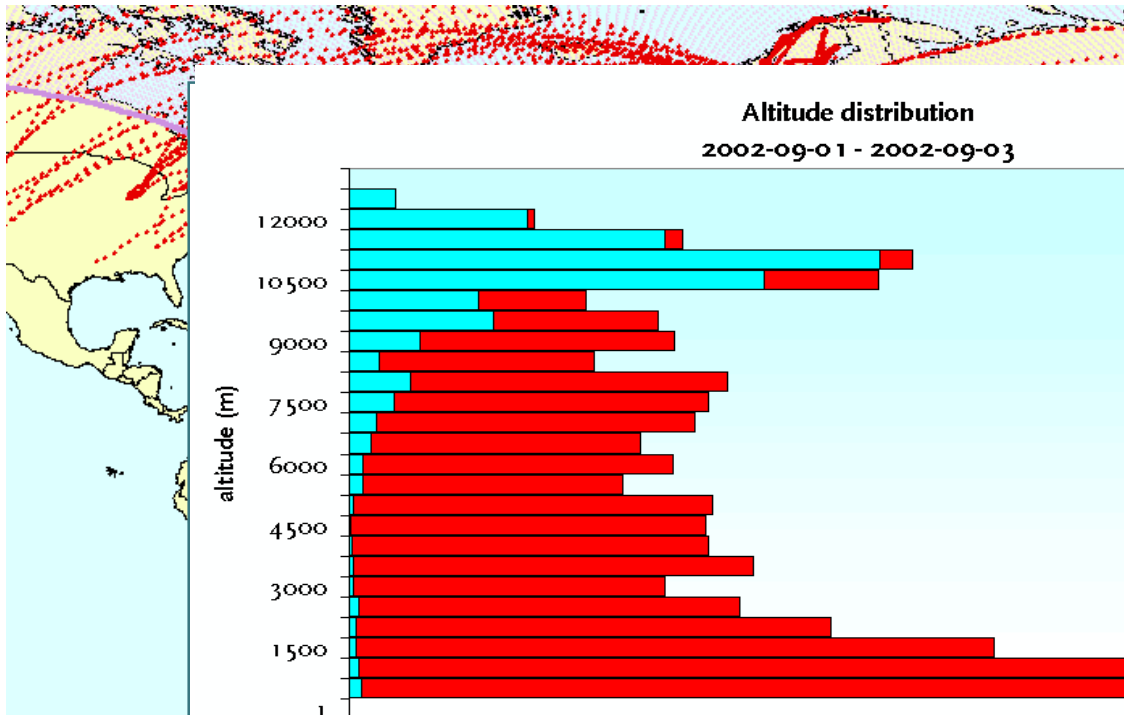
- To evaluate the quality of air temperature observation an appropriate **understanding of the definition of the biases** (differences, not error) w/r any reference is essential.
- NWP data as **reference** give appropriate results although NWP data and observational data have a different nature. NWP data is not a “true reference standard”
- A hard constraint is **sufficient quality of the metadata**

Impact of metadata errors

- Observation time stamp: *incorrect or delayed due to unknown response times; NWP timestamps are derived from specific runs, producing interpolated data values*
- Position (latitude, longitude, vertical): *incorrect LAT/LON and pressure altitude (not altitude); NWP position are derived by interpolation from gridded datasets.*
- Impacts are significant and will give high STD values, so STD requirements make no sense; however reduction in STDs may be caused by improvement of the OBS.
- Aircraft ID (in BUFR: "Aircraft Registration Number"): *impact if aircraft based corrections are applied*



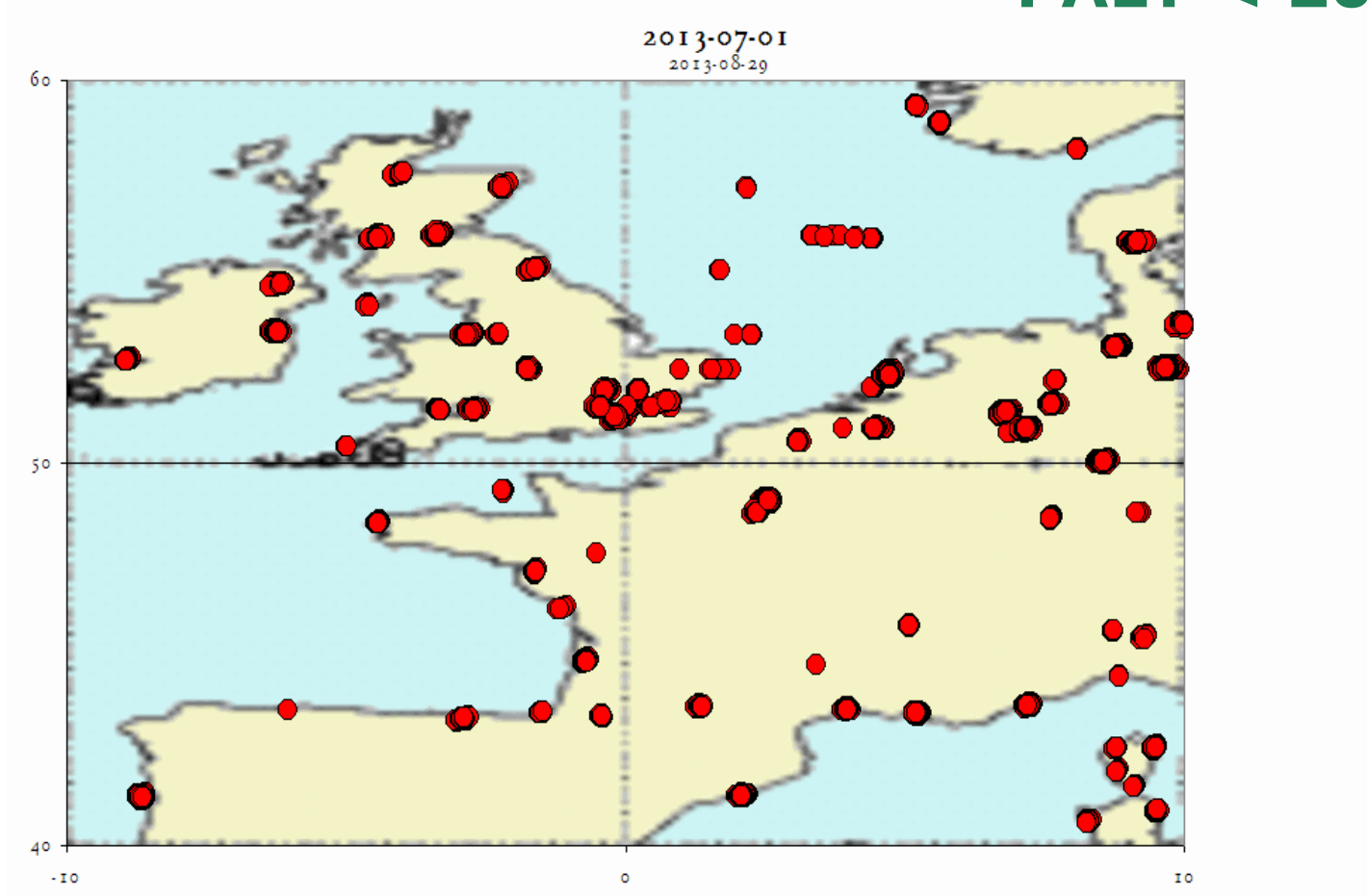
Position





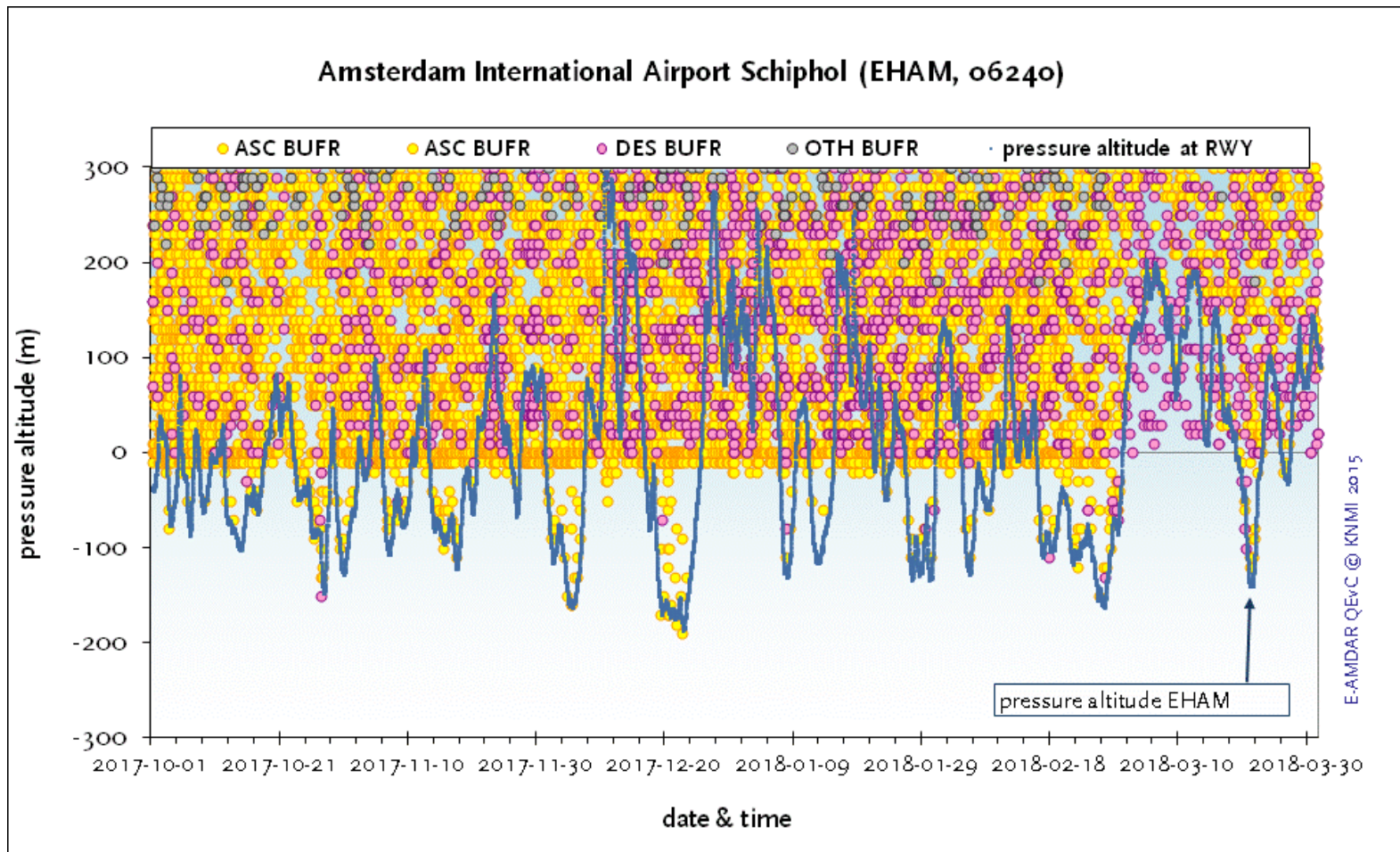
Positional errors

PALT < 200 m



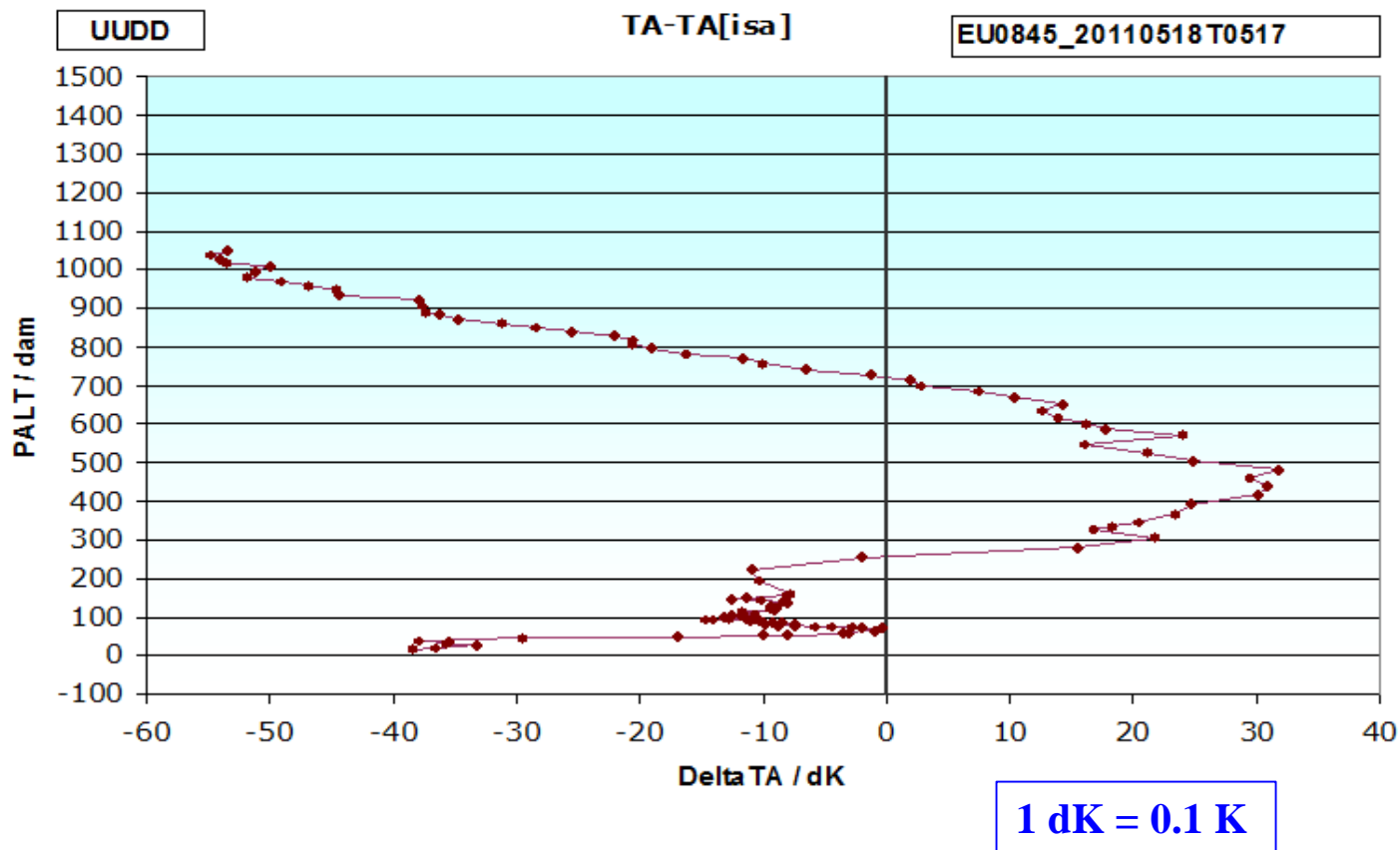


Position





Variables: air temperature

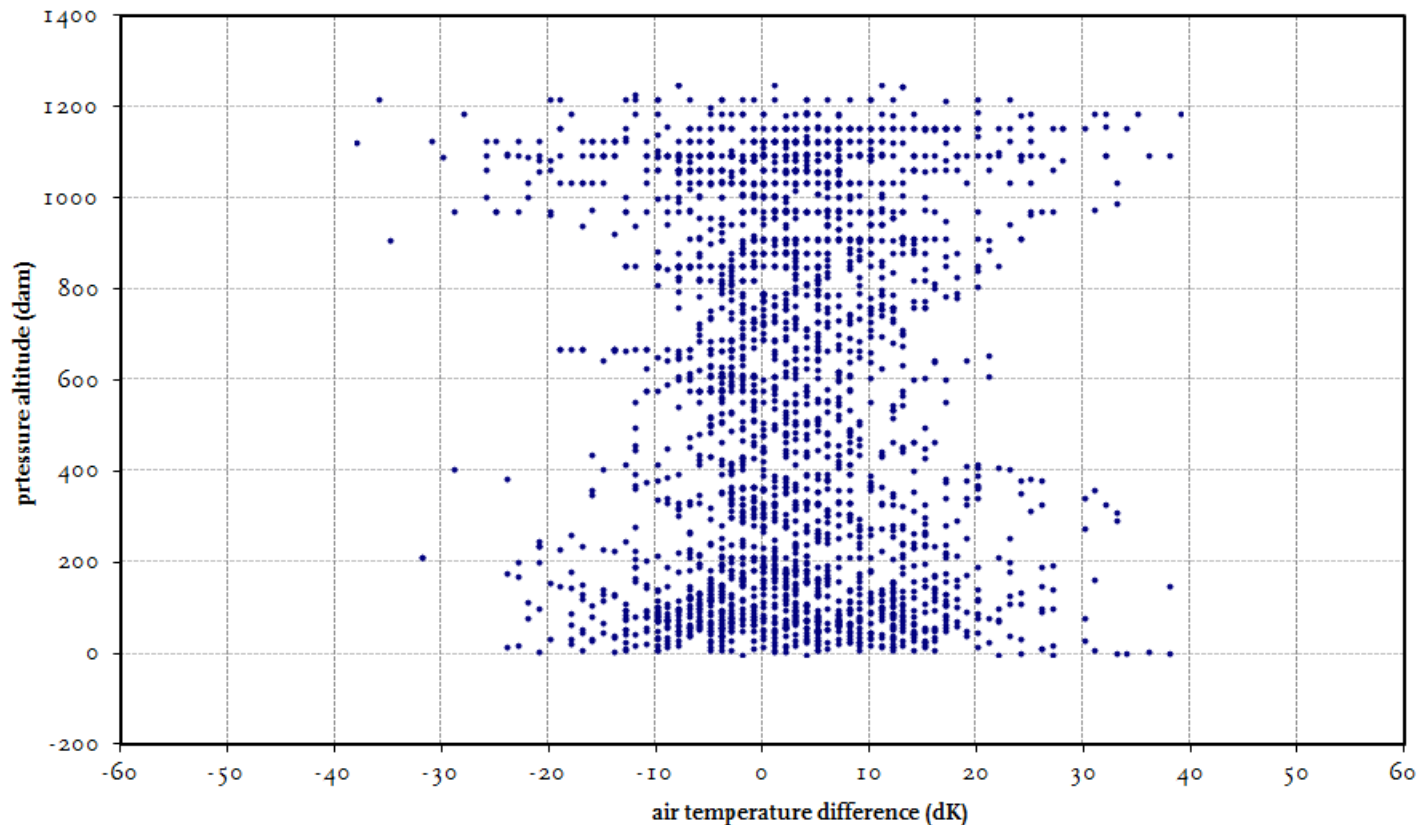




Variables: air temperature

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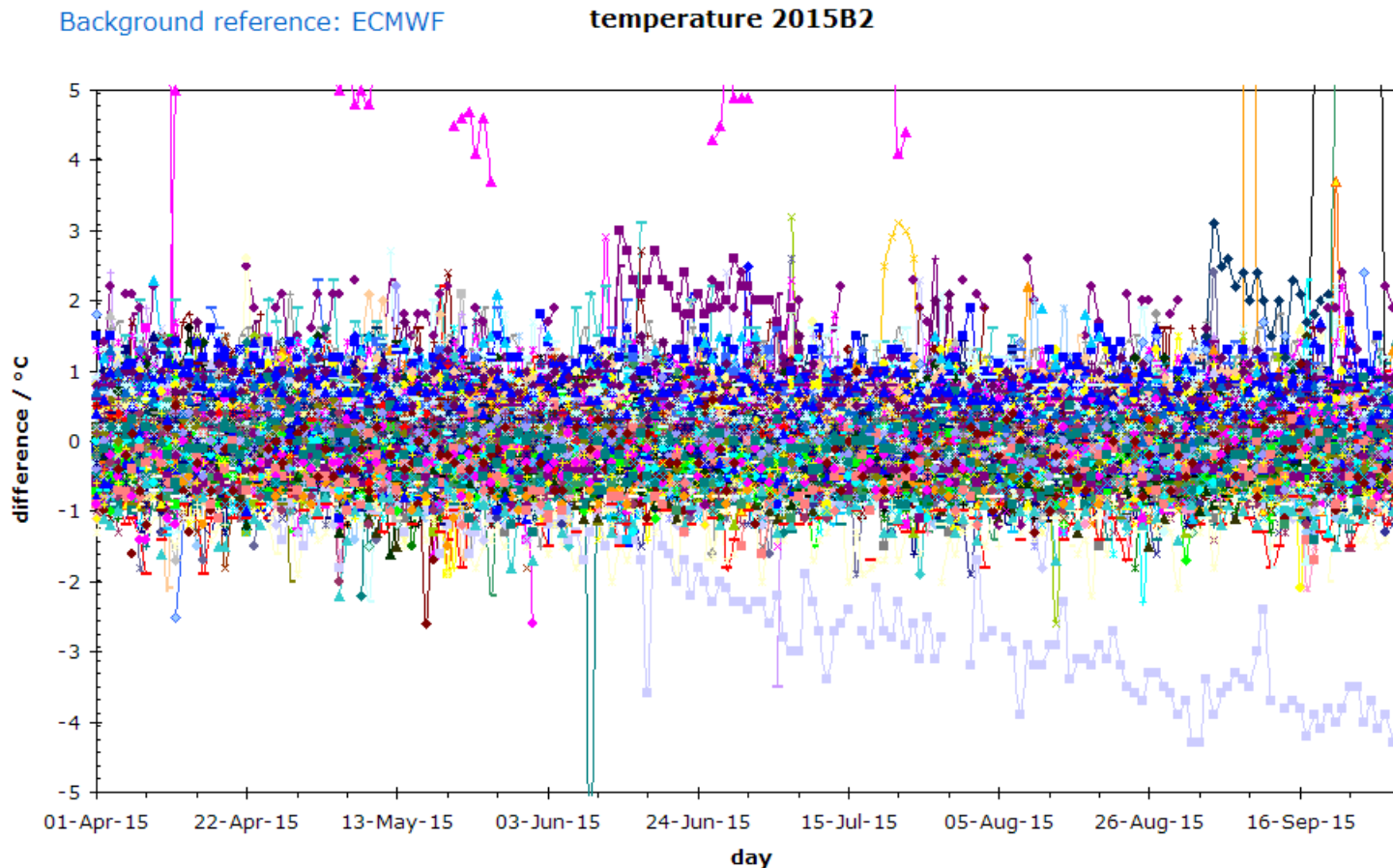
all data for 03:45 to 04:44 and for 05:45 to 06:44 UTC



1 dK = 0.1 K

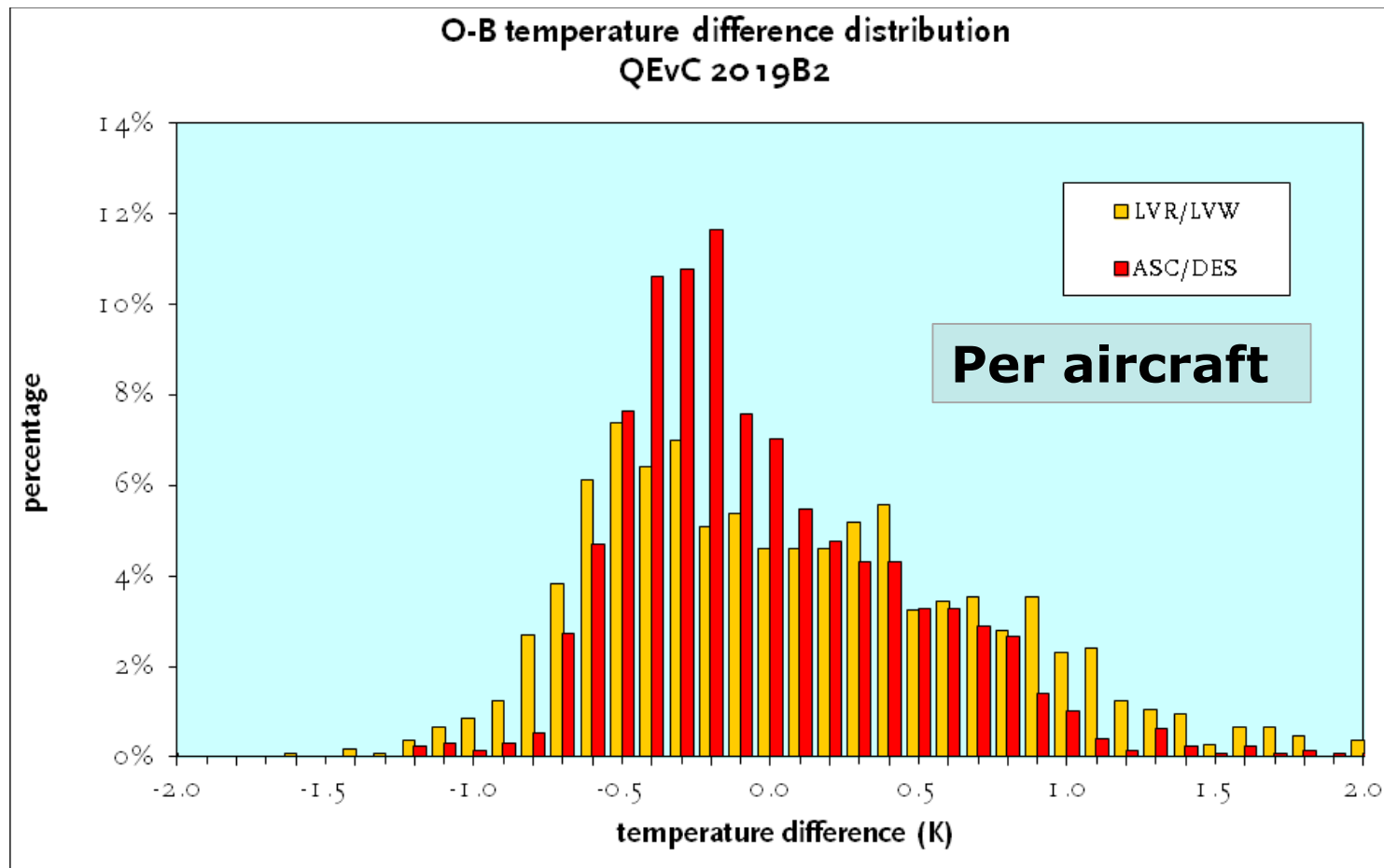


Variables: air temperature



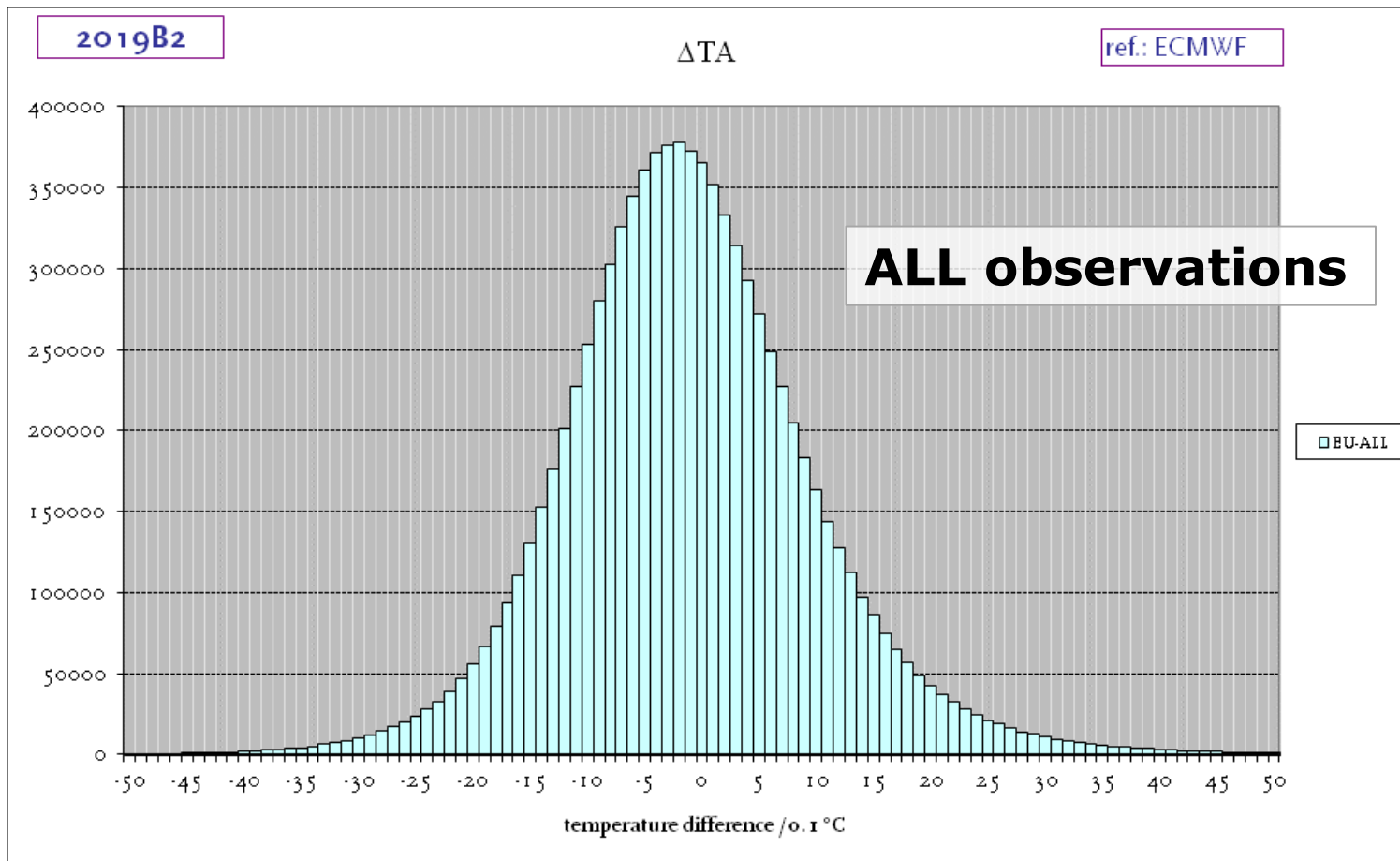


Variables: air temperature



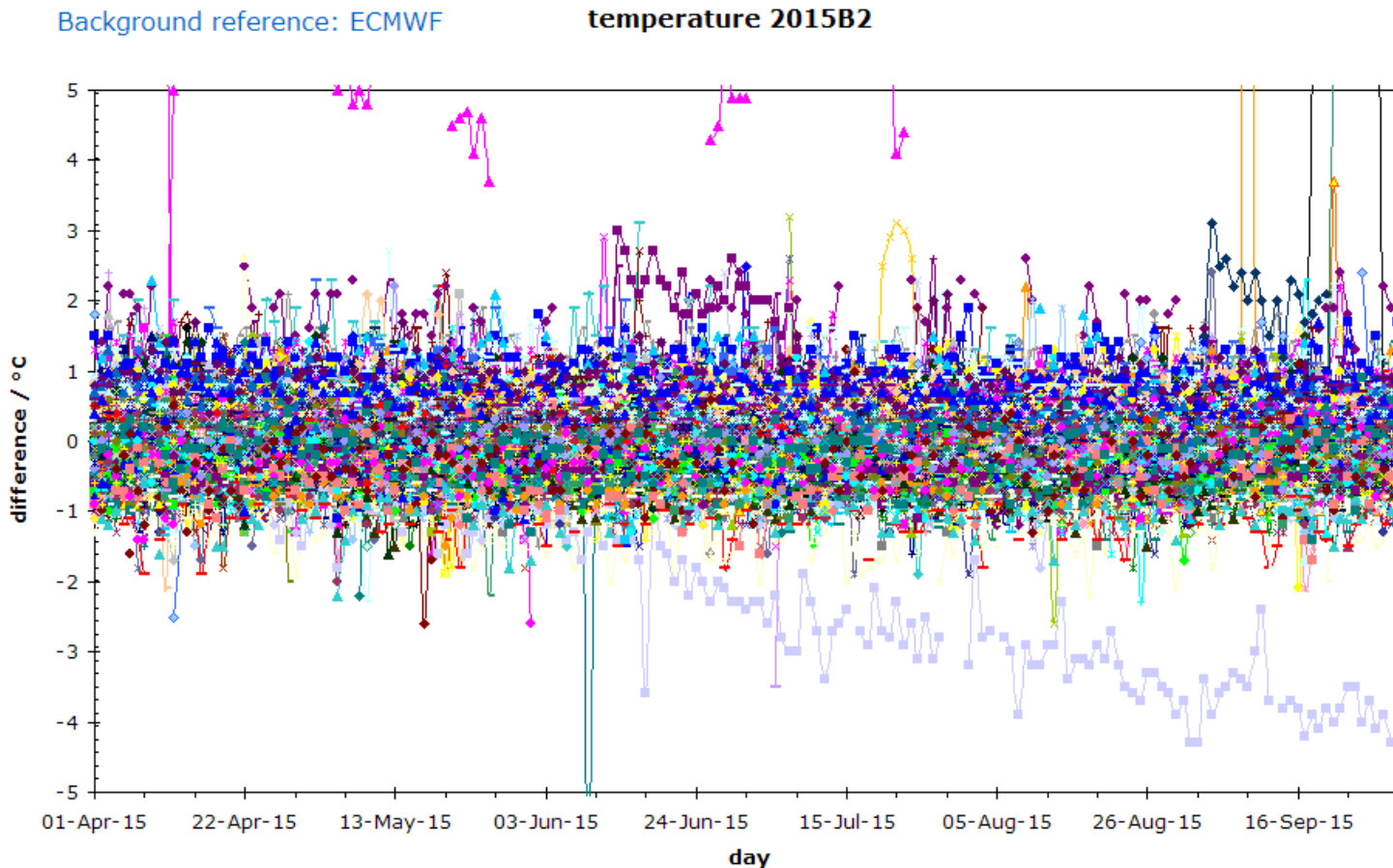


Variables: air temperature



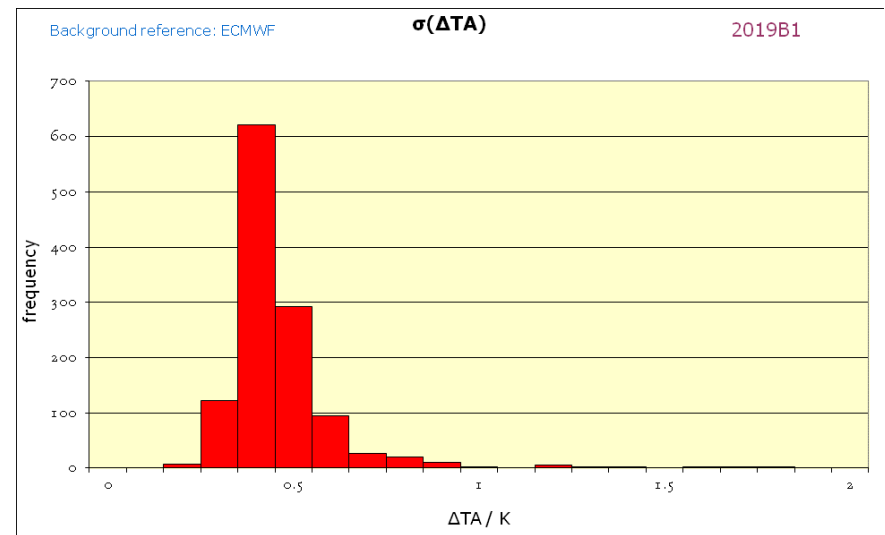
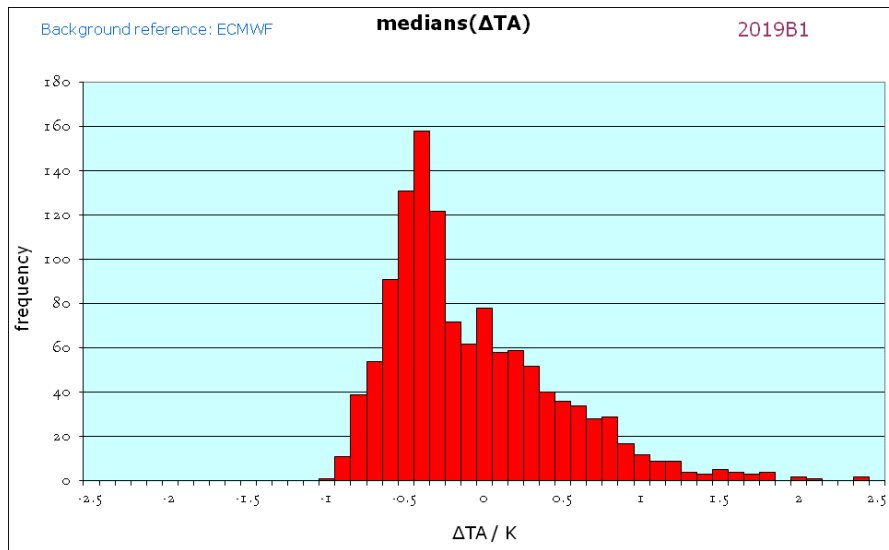


Variables: air temperature





Variables: air temperature Medians and STD

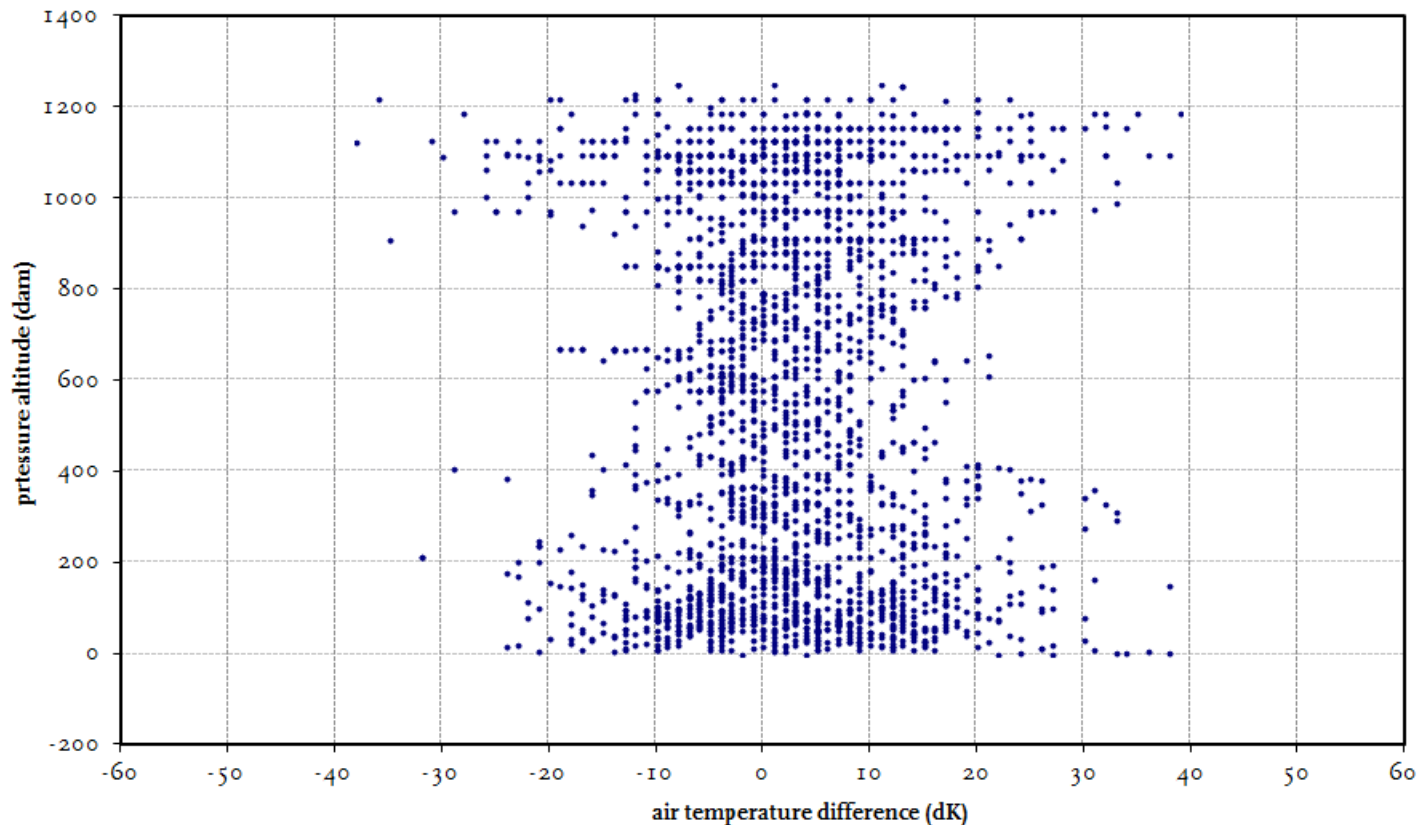




Variables: air temperature

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all data for 03:45 to 04:44 and for 05:45 to 06:44 UTC



1 dK = 0.1 K



Variables: air temperature

IP=6 DES

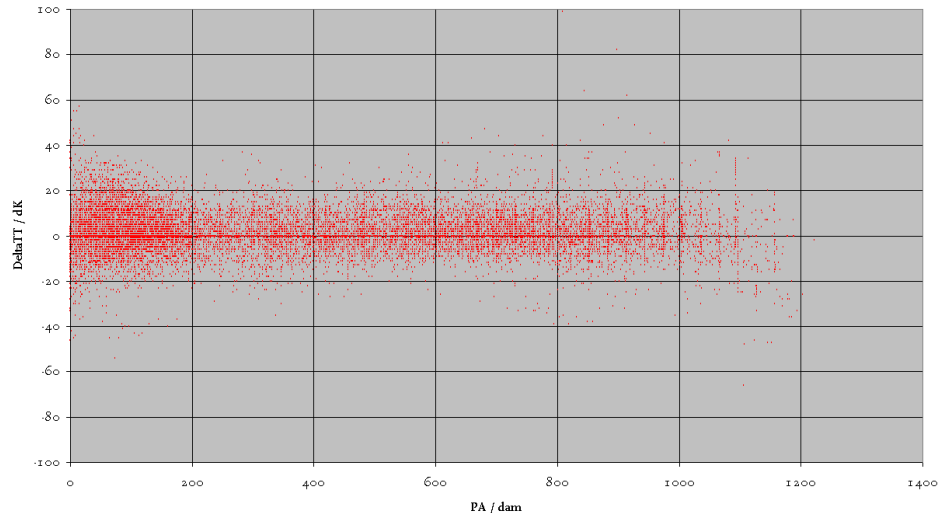
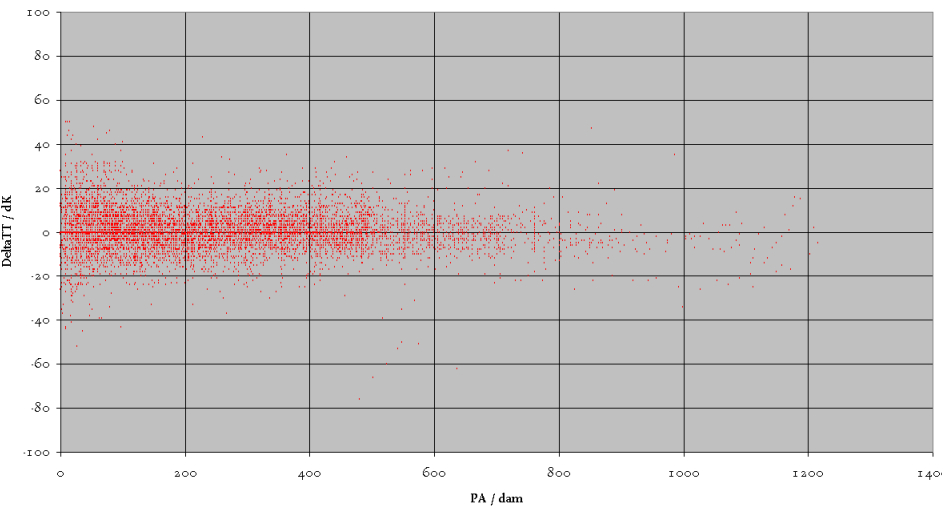
IP=5 ASC

DeltaTT(PA)

2009-08-03

DeltaTT(PA)

2009-08-03



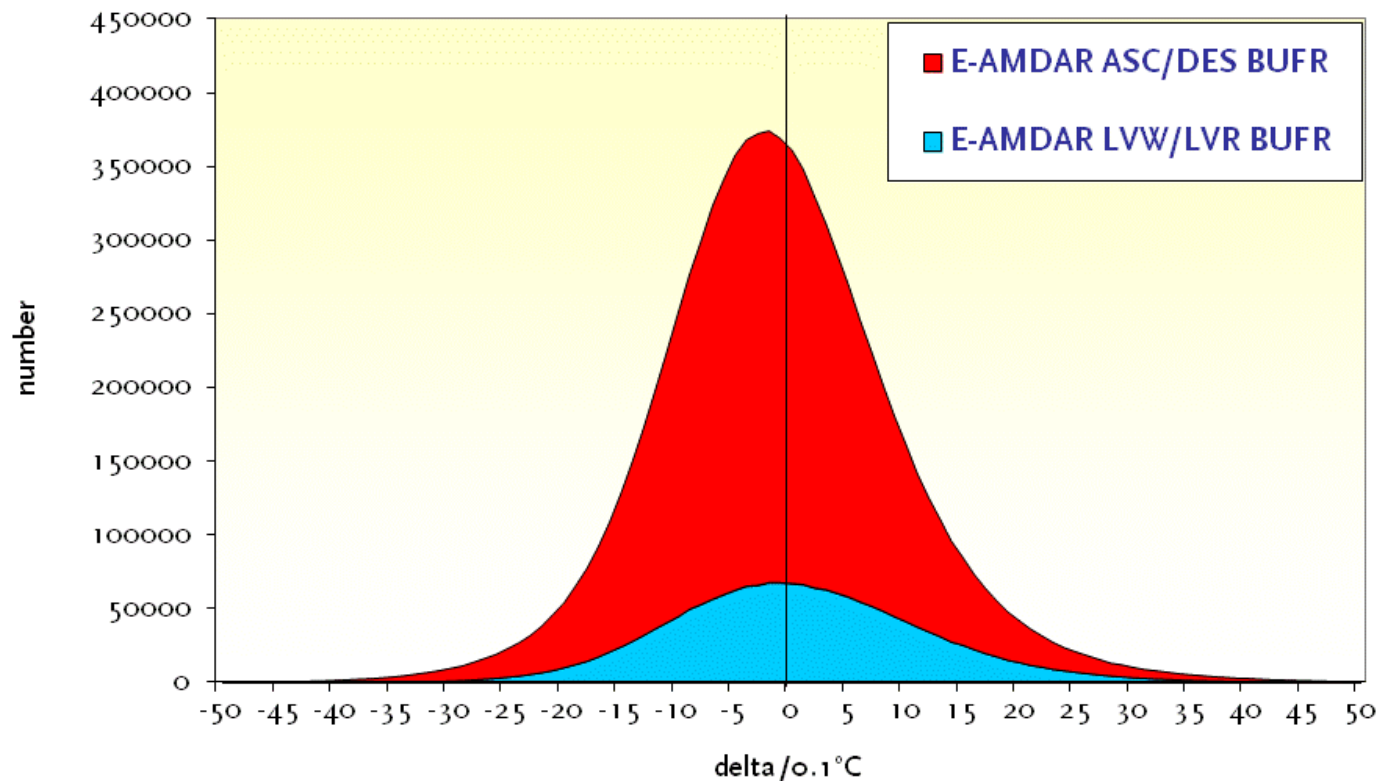
1 dK = 0.1 K



Variables: air temperature (LVW/LVR – ASC/DES)

ref.: ECMWF

E-AMDAR 2019B2
temperature

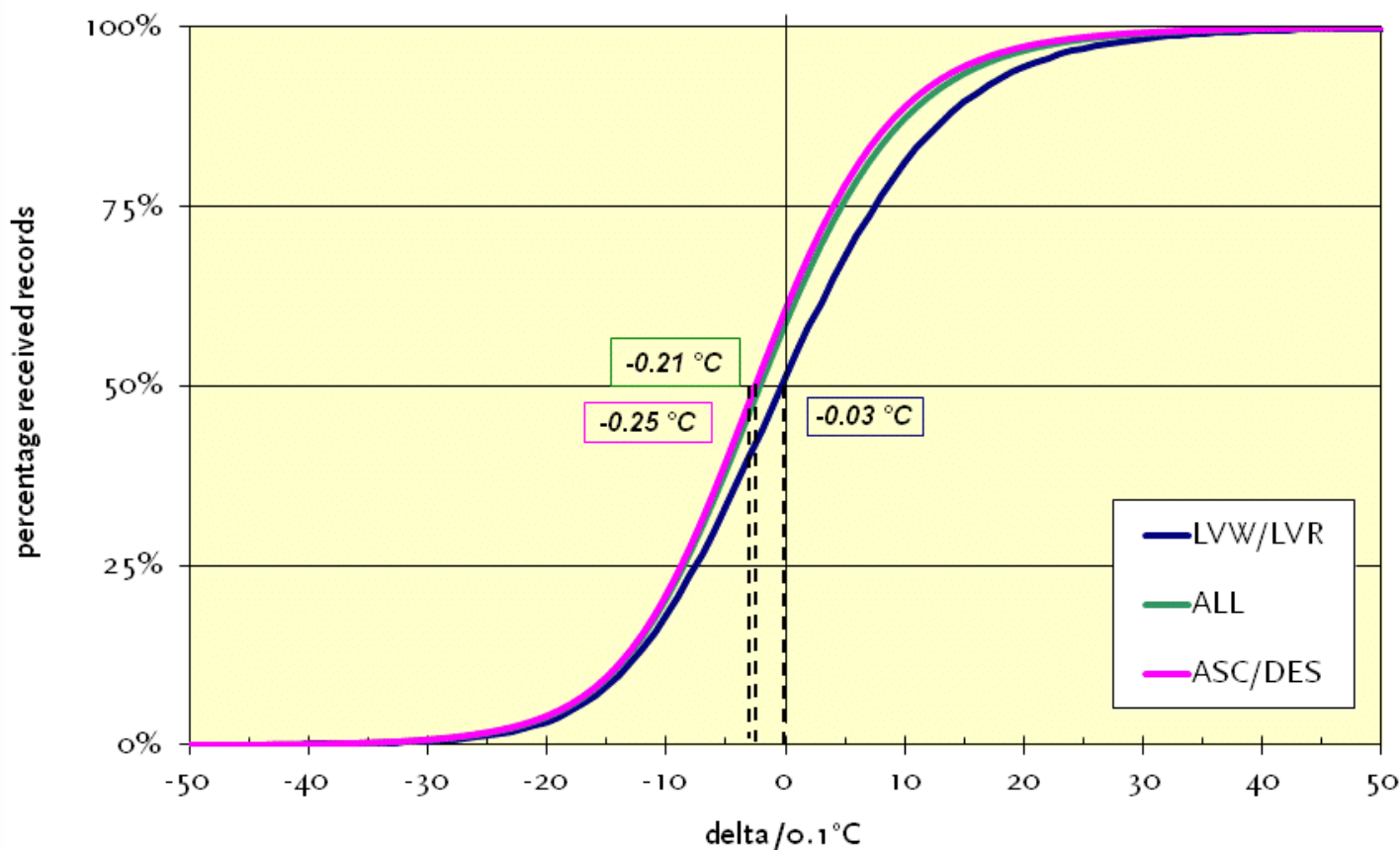




Variables: air temperature (LVW/LVR – ASC/DES)

ref.: ECMWF

E-AMDAR 2019B2
temperature (cumulative) ALL

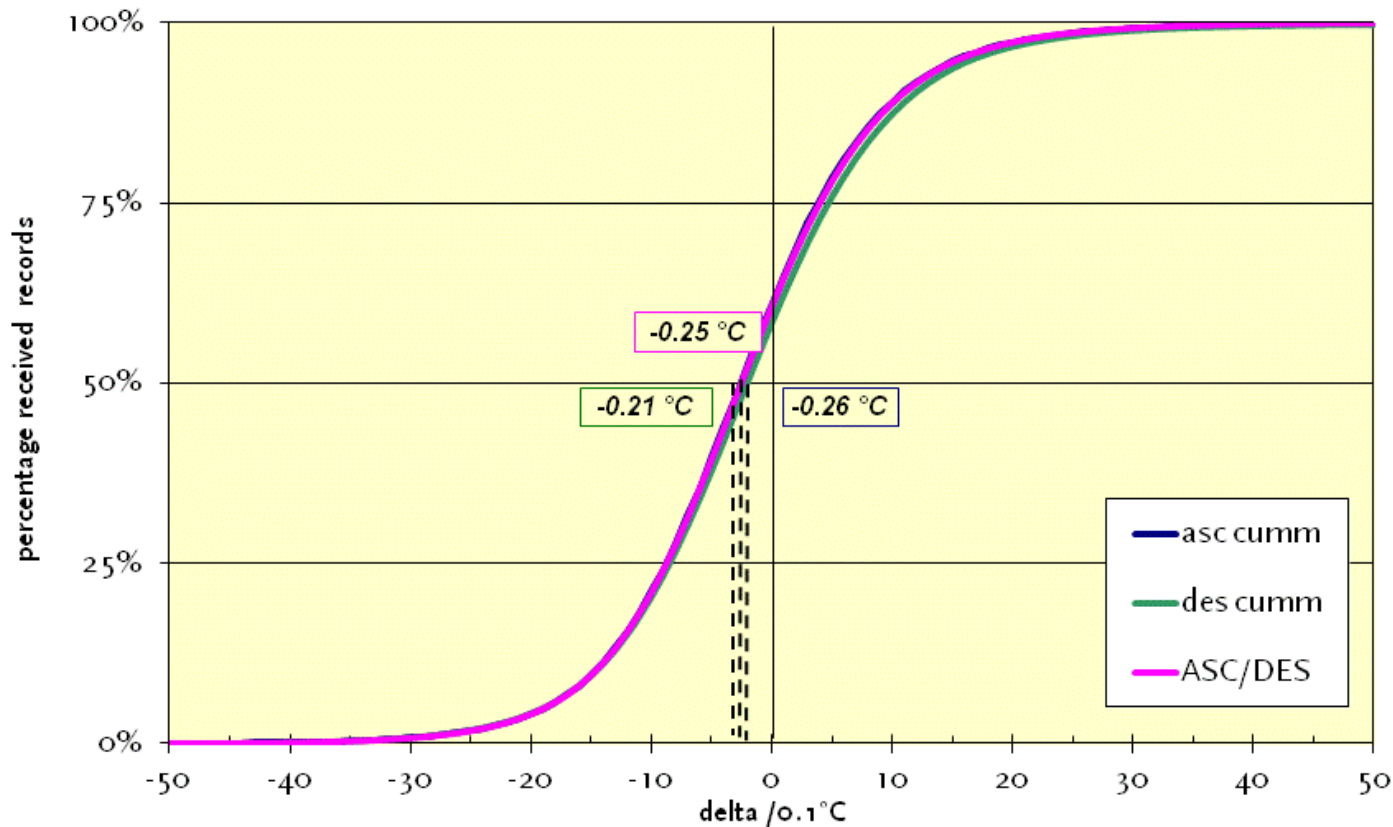




Variables: air temperature (ASC vs DES)

ref.: ECMWF

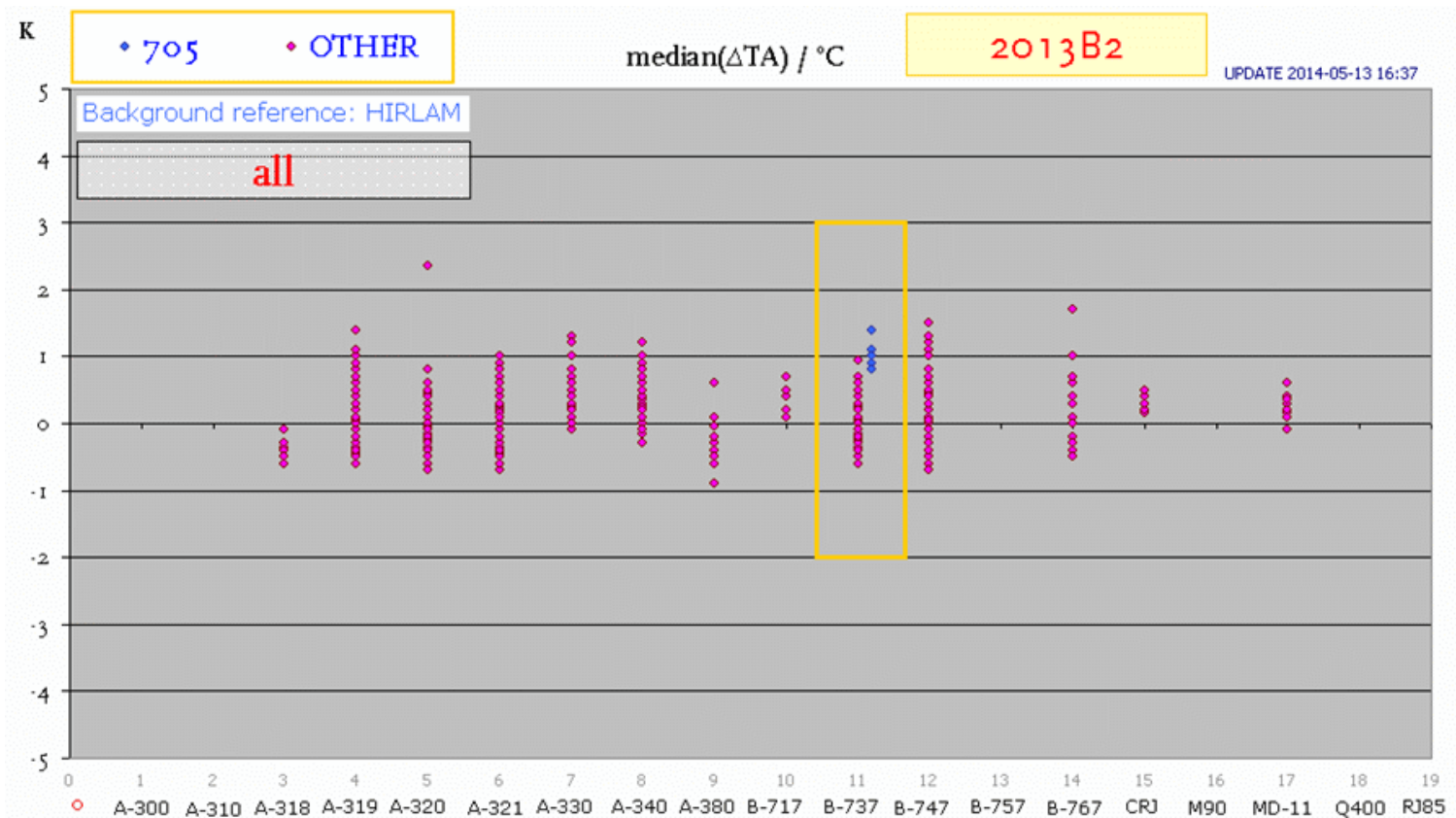
E-AMDAR 2019B2
temperature (cumulative) ALL



Data quality evaluation practices

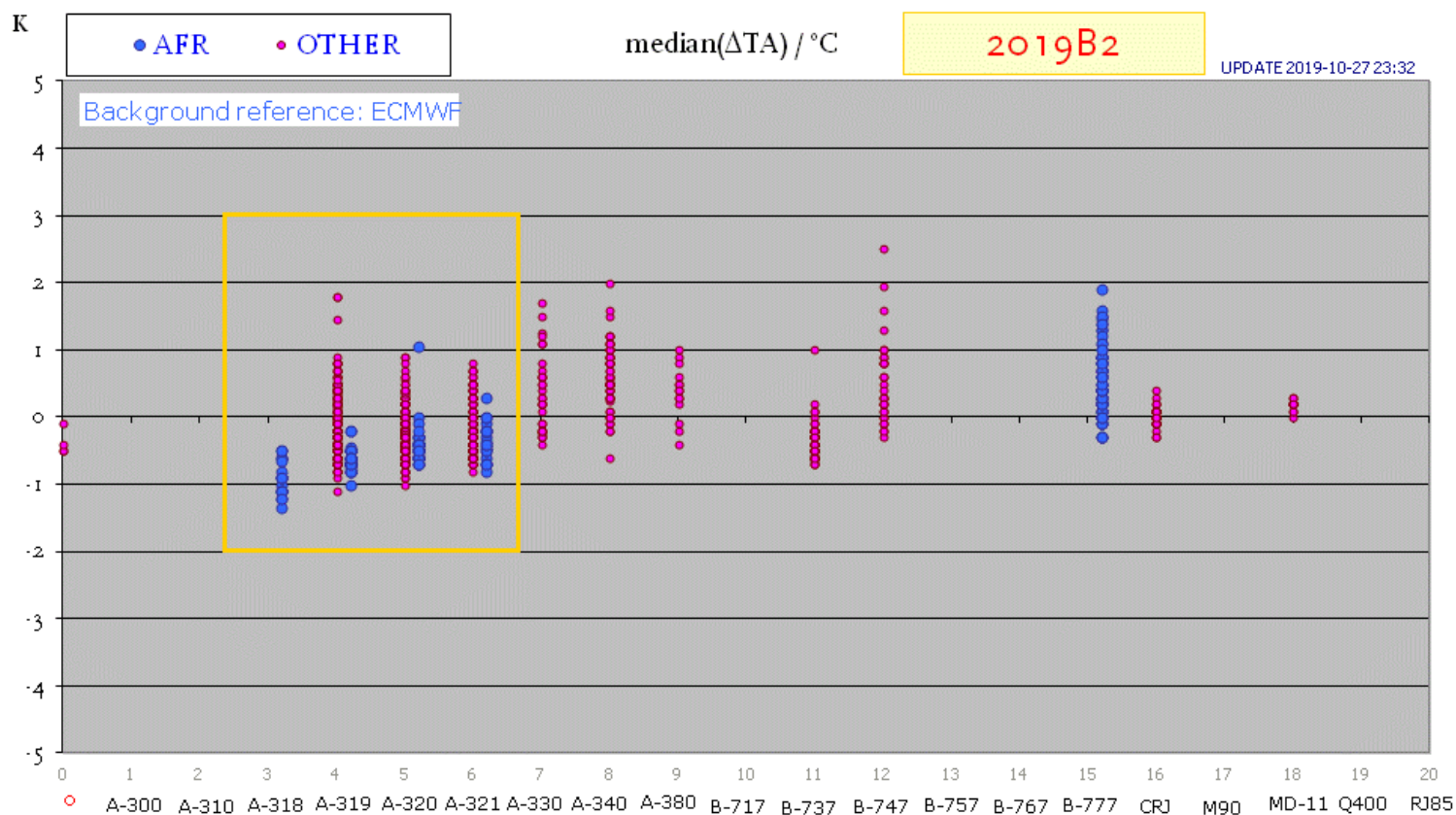


Variables: air temperature *aircraft sub-type*





Variables: air temperature *airliner*





- Quality evaluation of AMDAR using NWP as background reference helps significantly to *improve the observations*
- Data quality analyses and research require a talented approach, but results in *improved NWP*
- On average aircraft demonstrate a negative TA bias w/r NWP, but a significant number has a TA bias > 1.0 K
- On average the TA differences between ASC and DEC are not significant
- TA biases are altitude dependent
- TA data can be corrected, but only individually, not per aircraft type.

