Royal Netherlands
Meteorological Institute
Ministry of Infrastructure
and Water Management

E-AMDAR
Data Monitoring

Experiences with *Quality Evaluation* of AMDAR Observations

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Contents

E-AMDAR QEvC 1999 – 2019,

20 years of experience with

data monitoring and quality evaluation

- Background & history
- Data quality evaluation practices
- Conclusions

Background

Feedback mechanism

Data generator

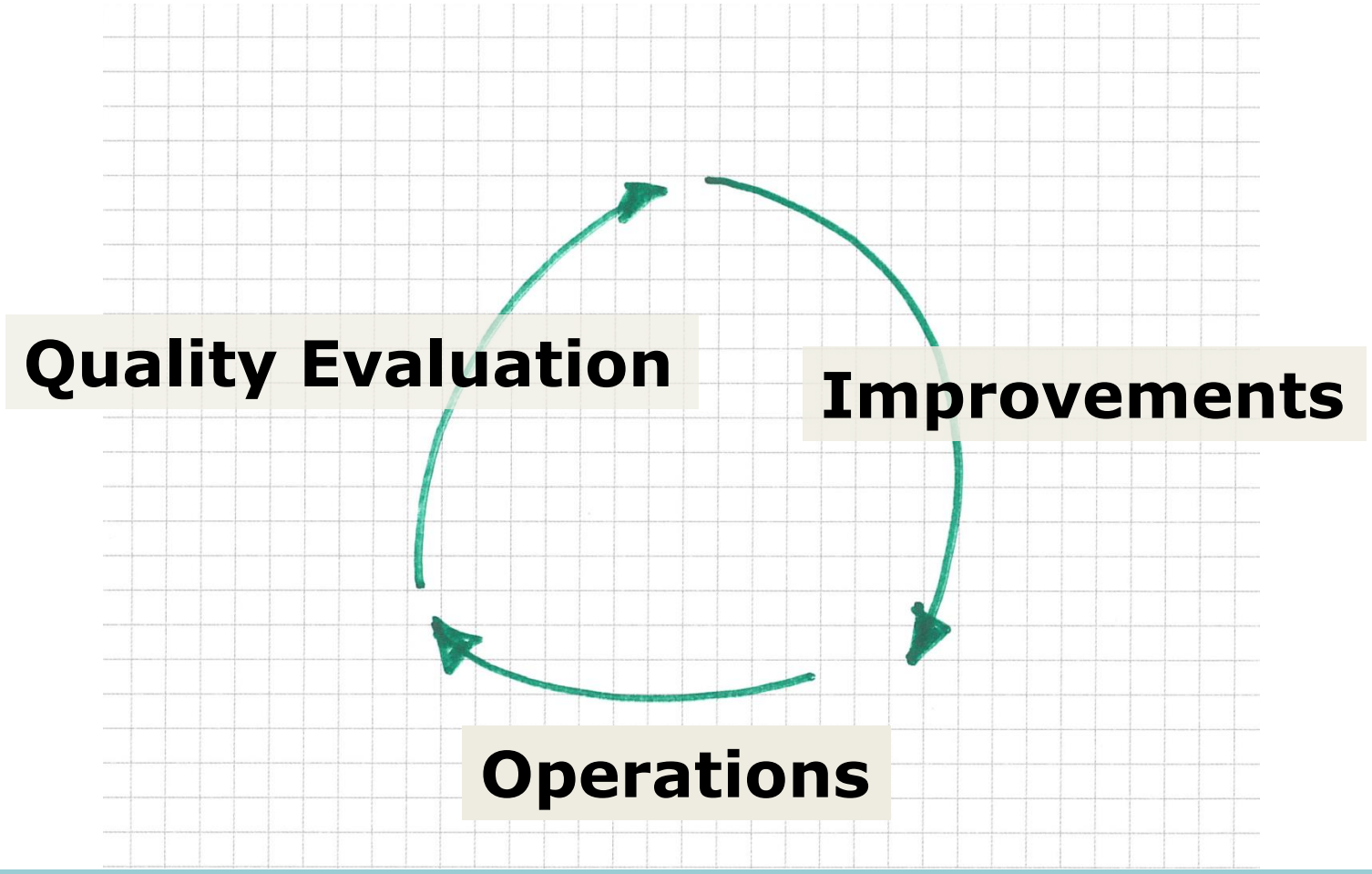
1. Data control and validation *versus* reference
2. Evaluation *versus* requirements
3. Improvements *versus* technology

Data use

1. automatically? → part of control, *automatic pre-validation & control*
2. Manually by the operator
3. R&D project

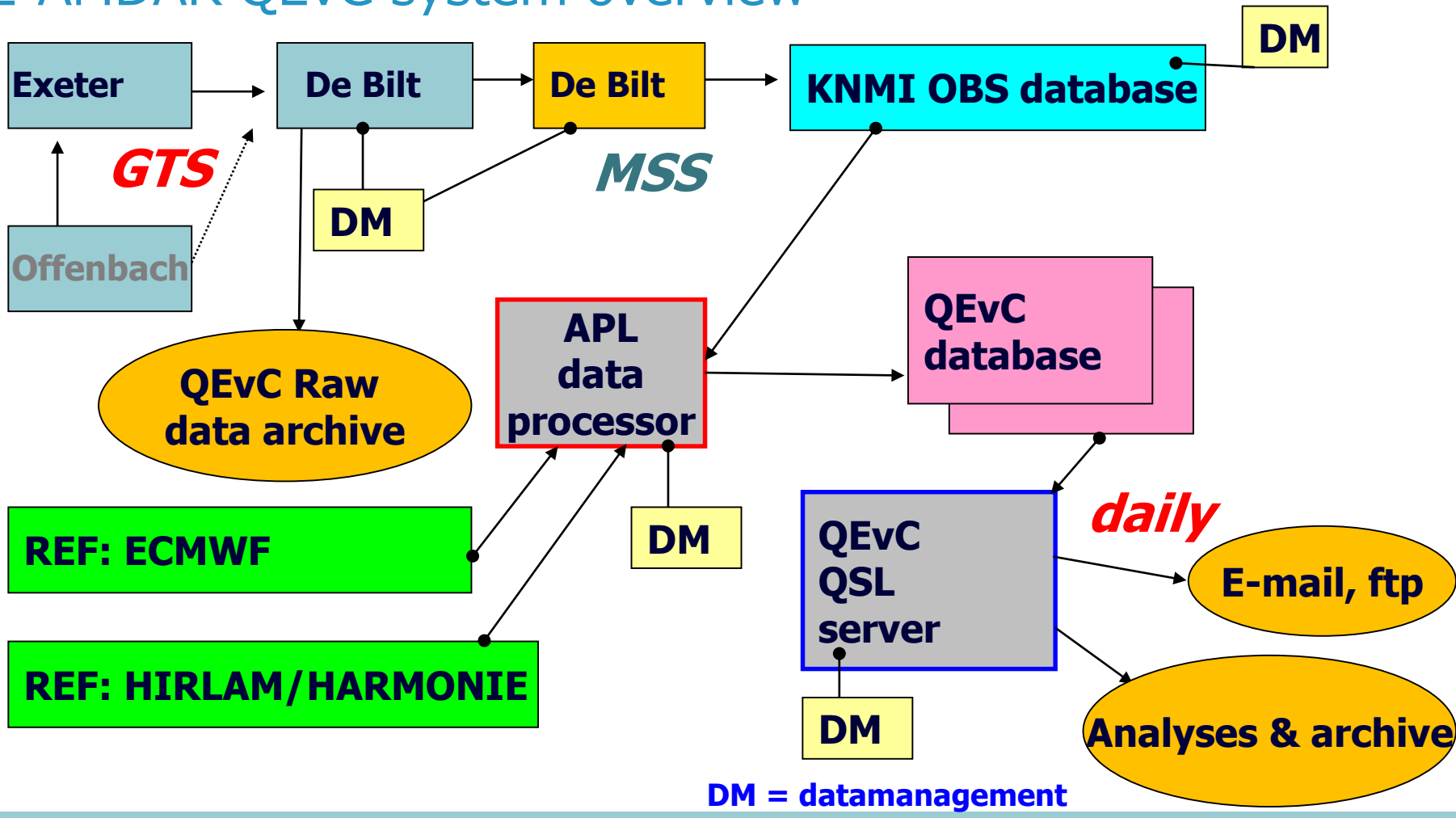
Background

Feedback mechanism



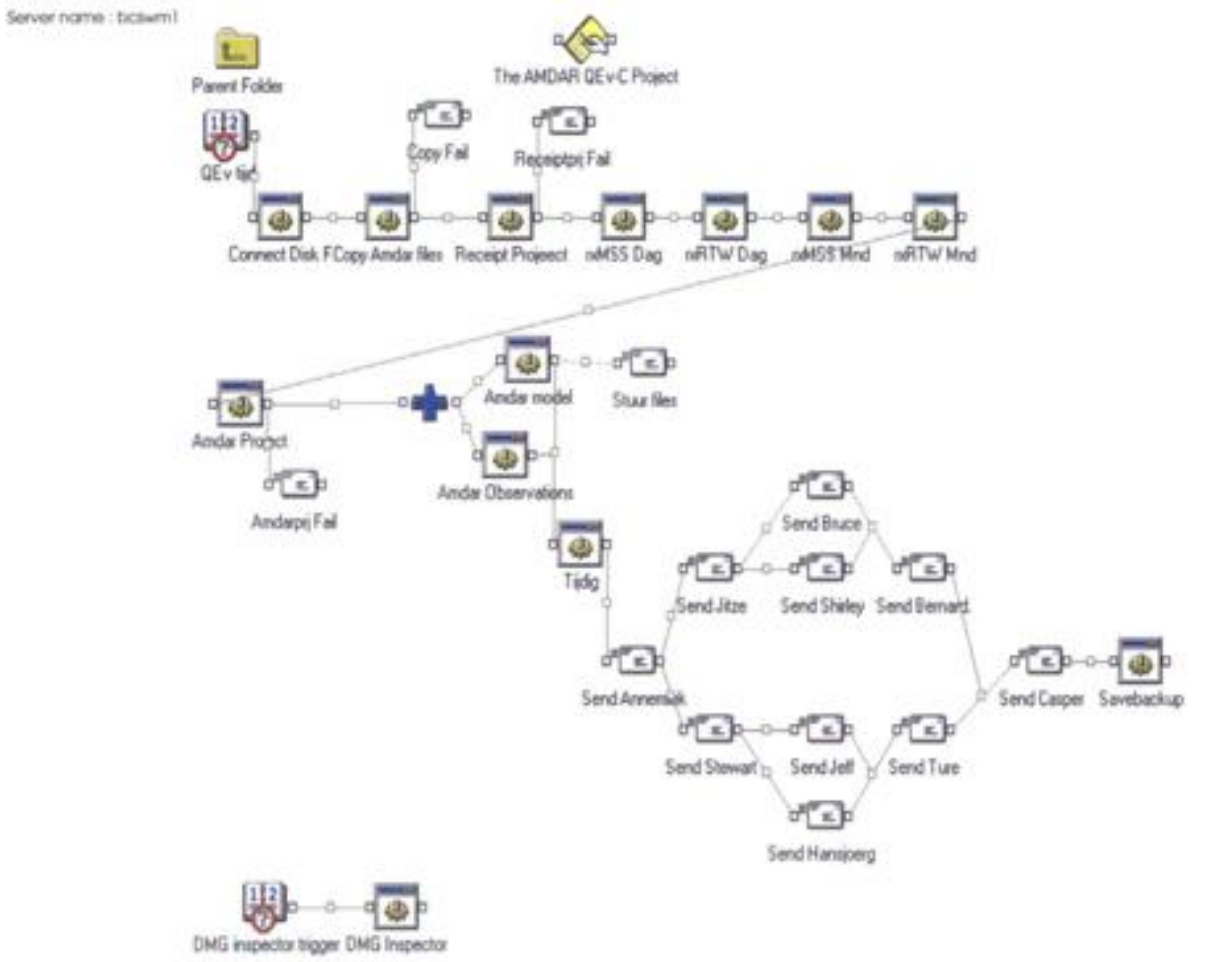
Background

E-AMDAR QEvC system overview



Background

QEvC system overview



Observations: Quality Assessment

Items for feed-back:

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, mixing ratio (humidity), wind vector (speed and direction) [pressure is for location {pressure altitude}]
3. *Performance*, like **availability** and **timeliness** (*instabilities)*

But also:

logistics *e.g.* bugs in reports (also *duplicates TAC+BUFR*)

Quality Evaluation Centre products

- daily, monthly, quarterly, etc., to become *real time*
- case studies, to analyse special issues

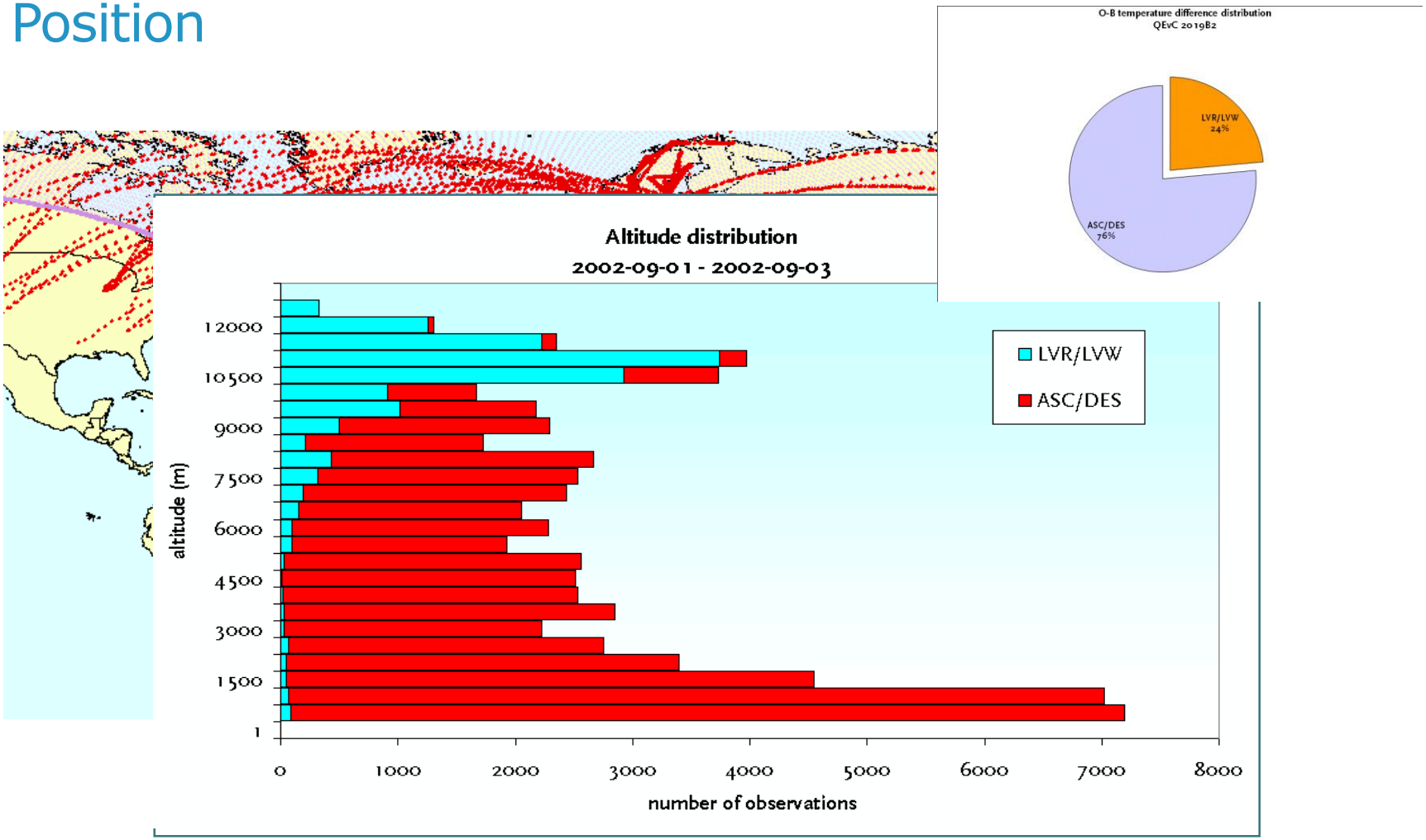
Data quality evaluation practices

Logistics & metadata

- Amounts
- Timeliness of observation (& time of dissemination and reception)
- Position (latitude, longitude, vertical) (*PALT versus altitude*)
- Aircraft ID (in BUFR: "Aircraft Registration Number")
- Phase of Flight (ASC, DEC, LVR, LVW, UNS)

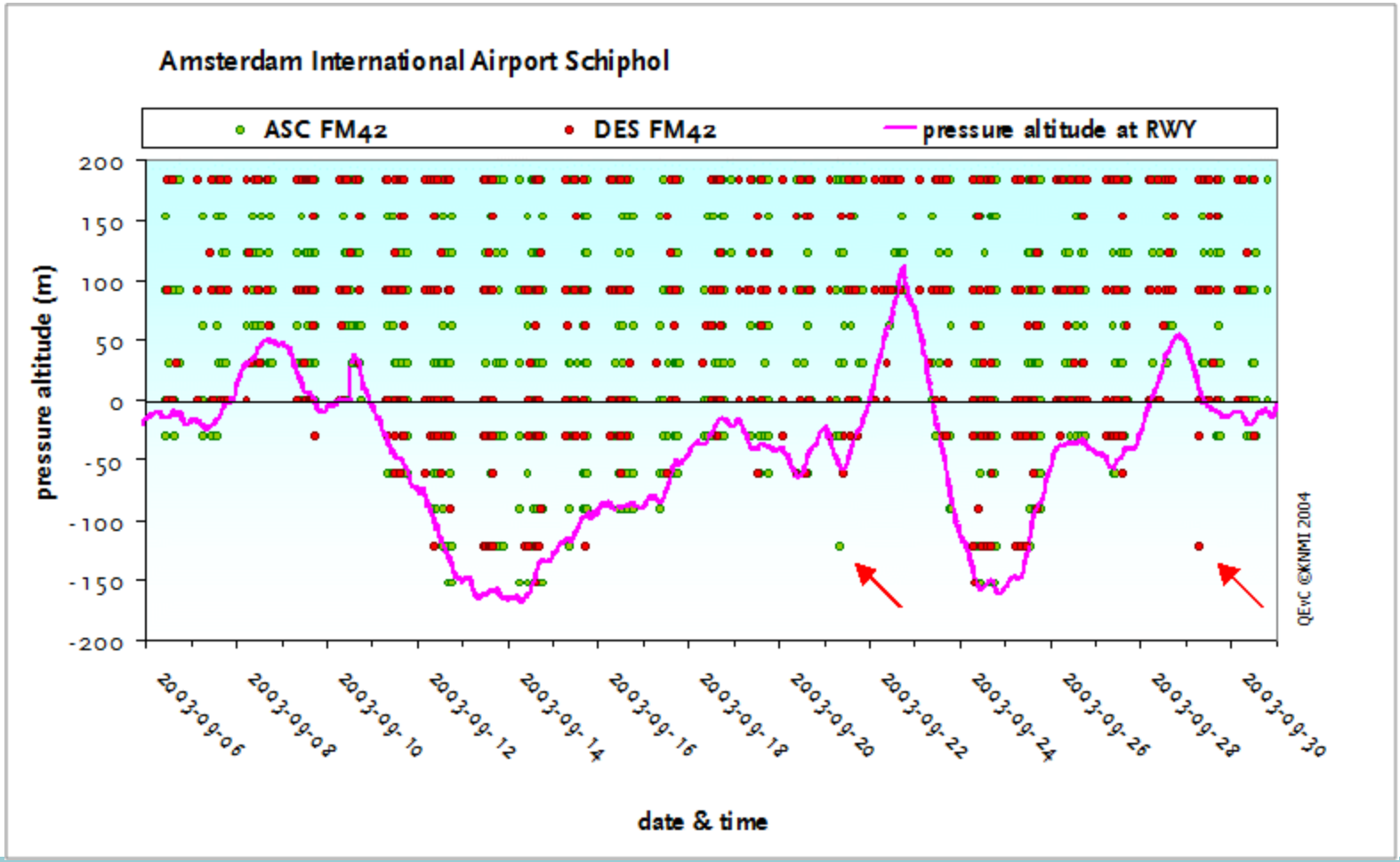
Data quality evaluation practices

Position



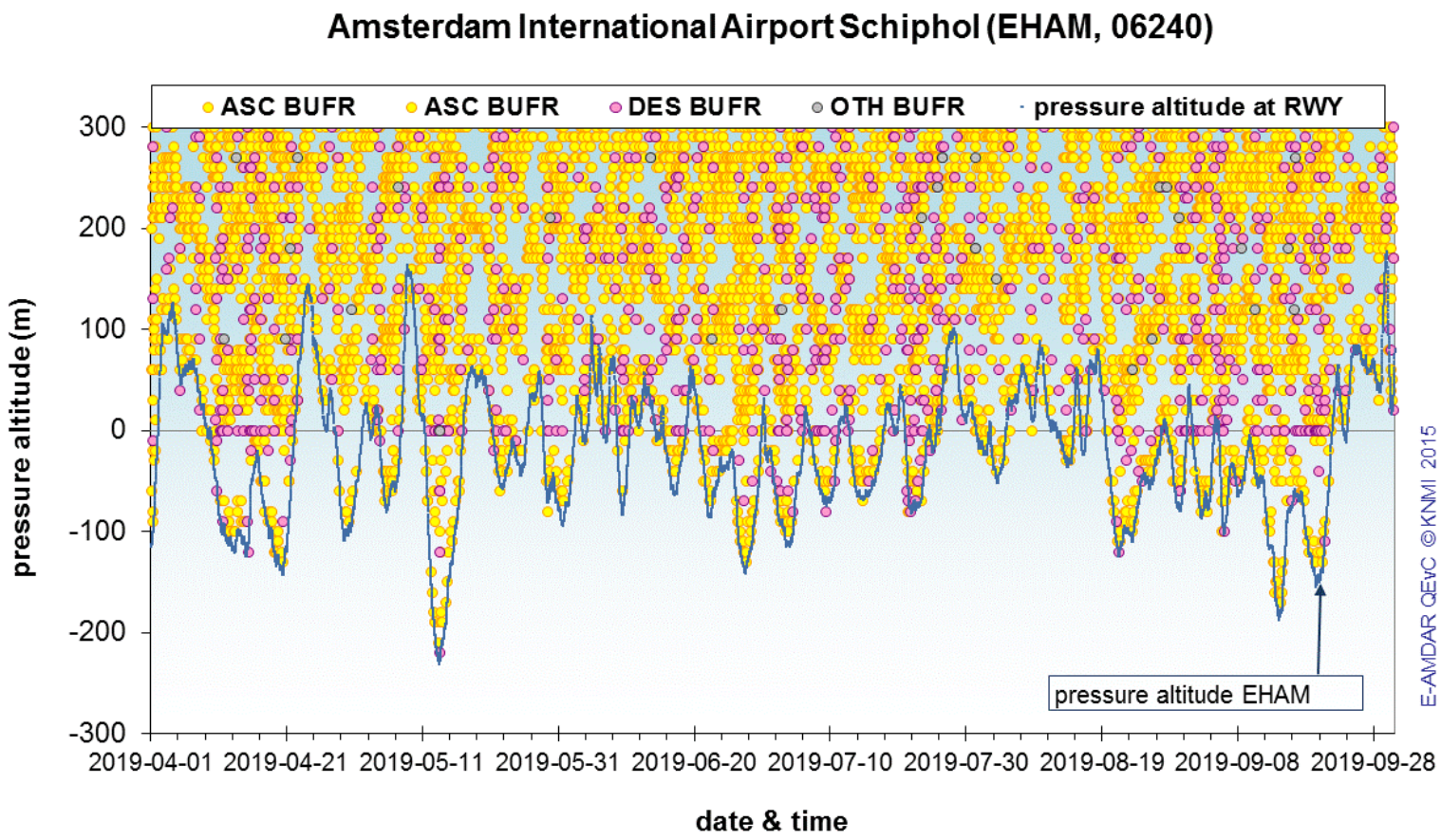
Data quality evaluation practices

Position



Data quality evaluation practices

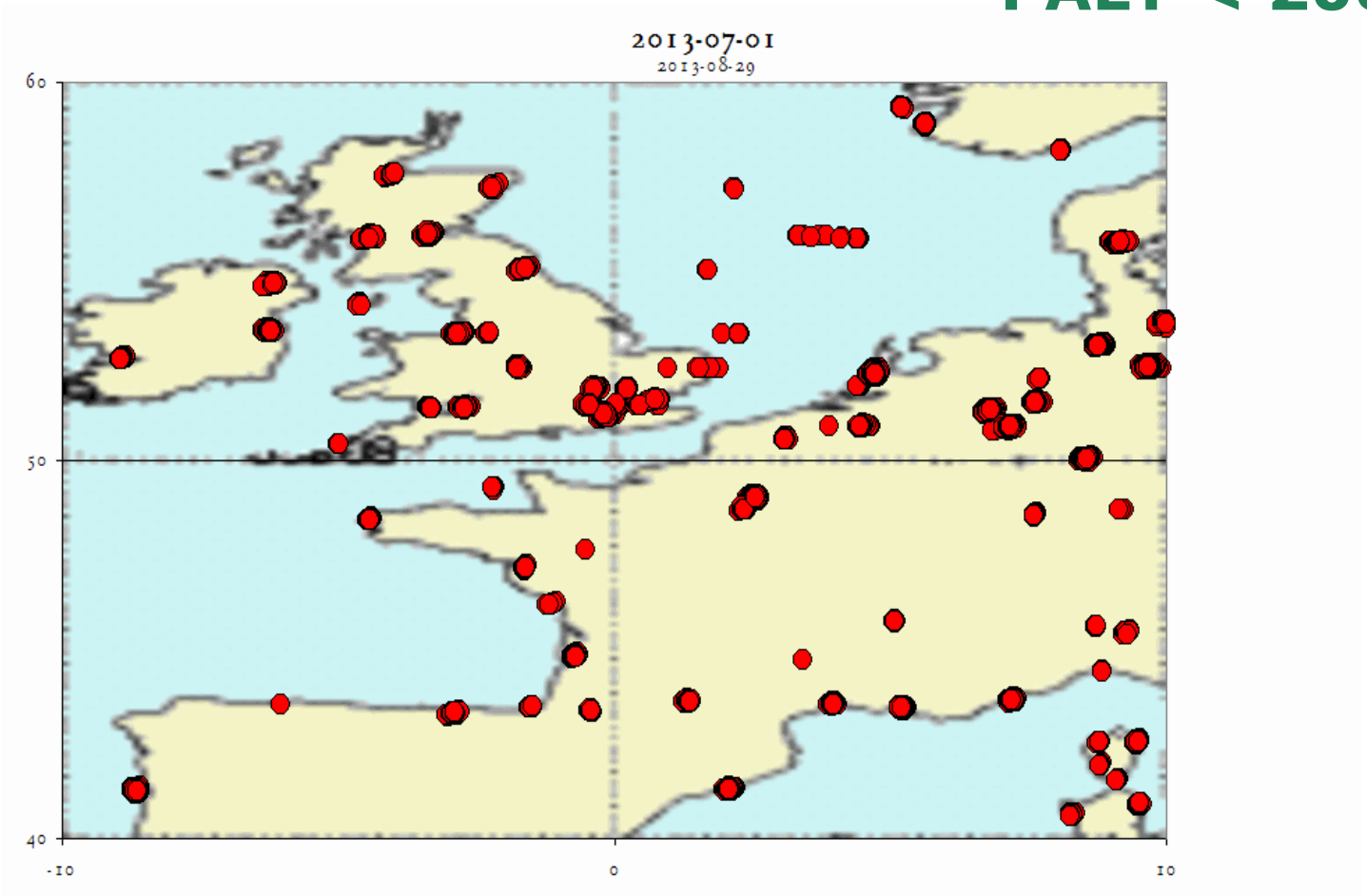
Position



Data quality evaluation practices

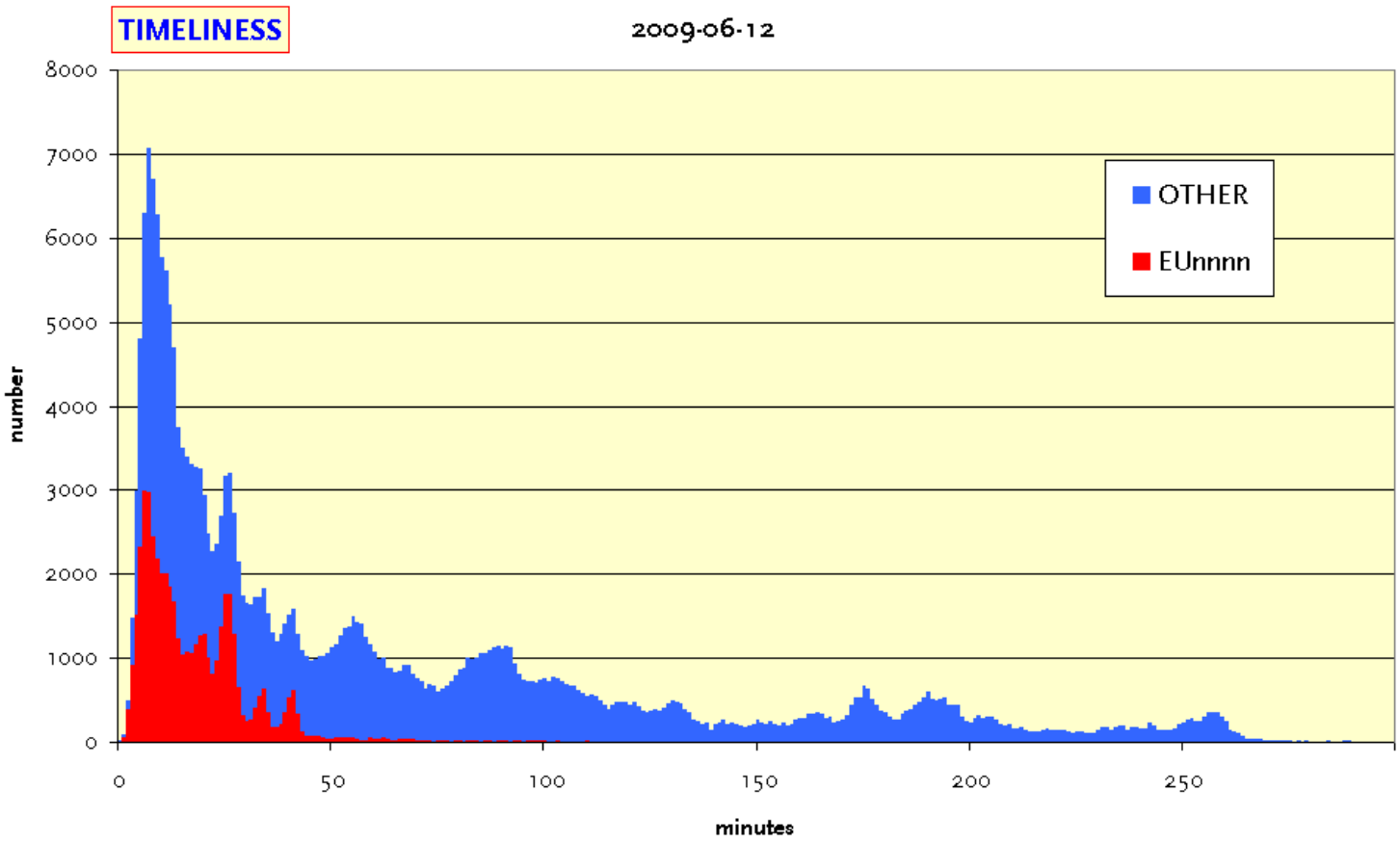
Positional errors

PALT < 200 m



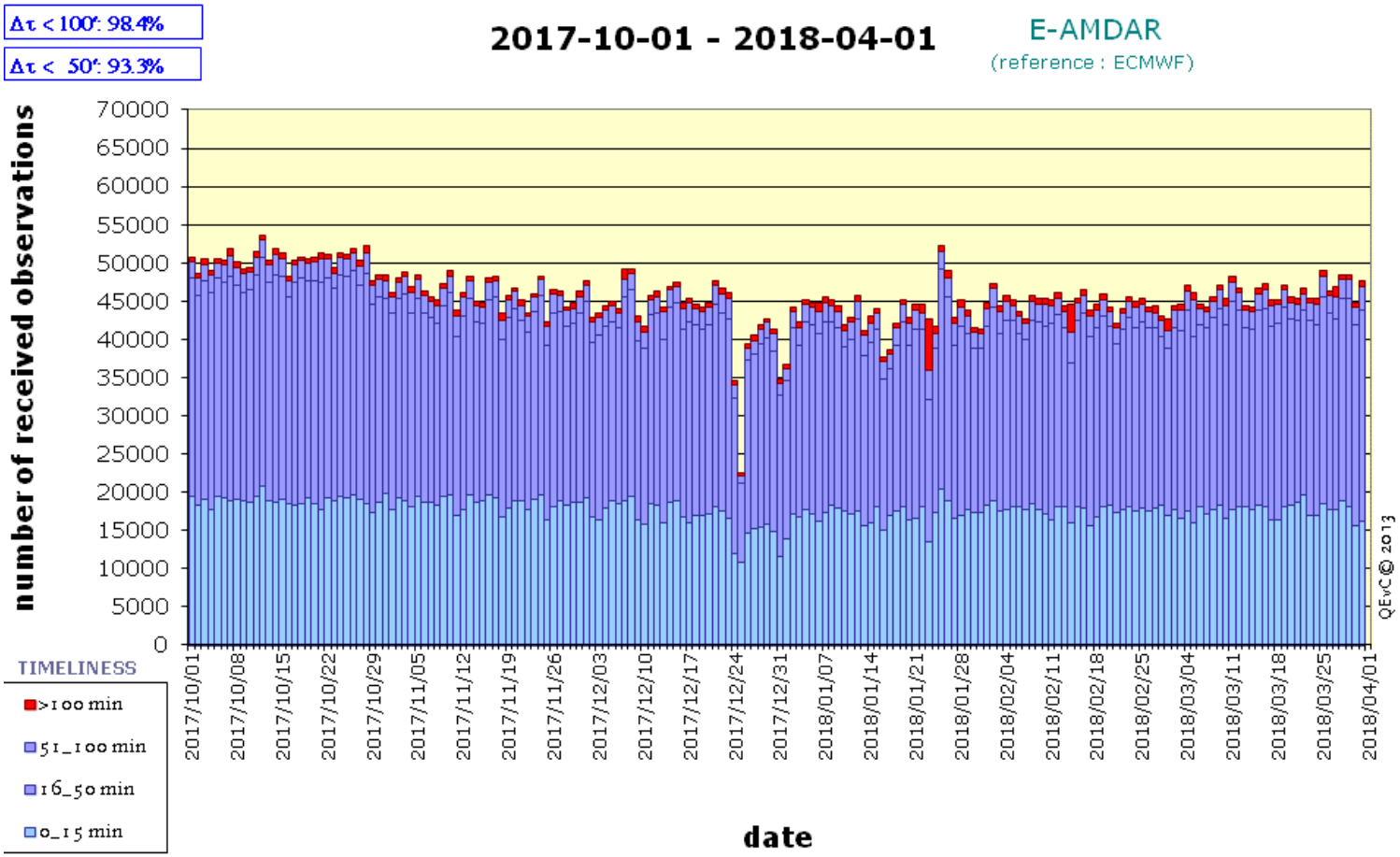
Data quality evaluation practices

Timeliness



Data quality evaluation practices

Timeliness



Data quality evaluation practices

Variables: observational data

- TA: air temperature
- Wind vector: u/v, DD/FF (issue with {FF;DD}={0;0})
- MR: Mixing ratio
- turbulence & icing (for E-AMDAR still <empty>)

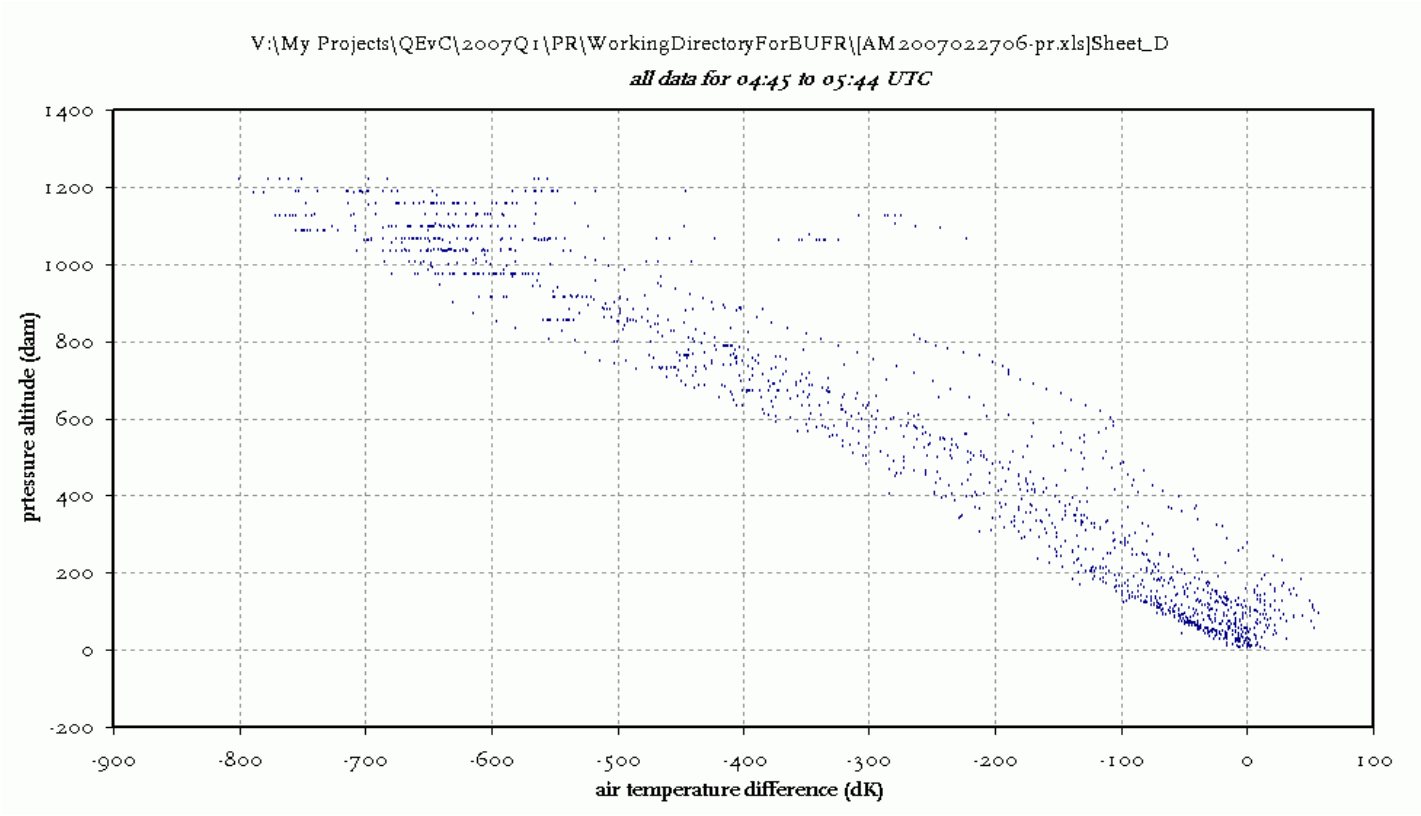
Data quality evaluation practices

Varia

See CIMO Guide

Data quality evaluation practices

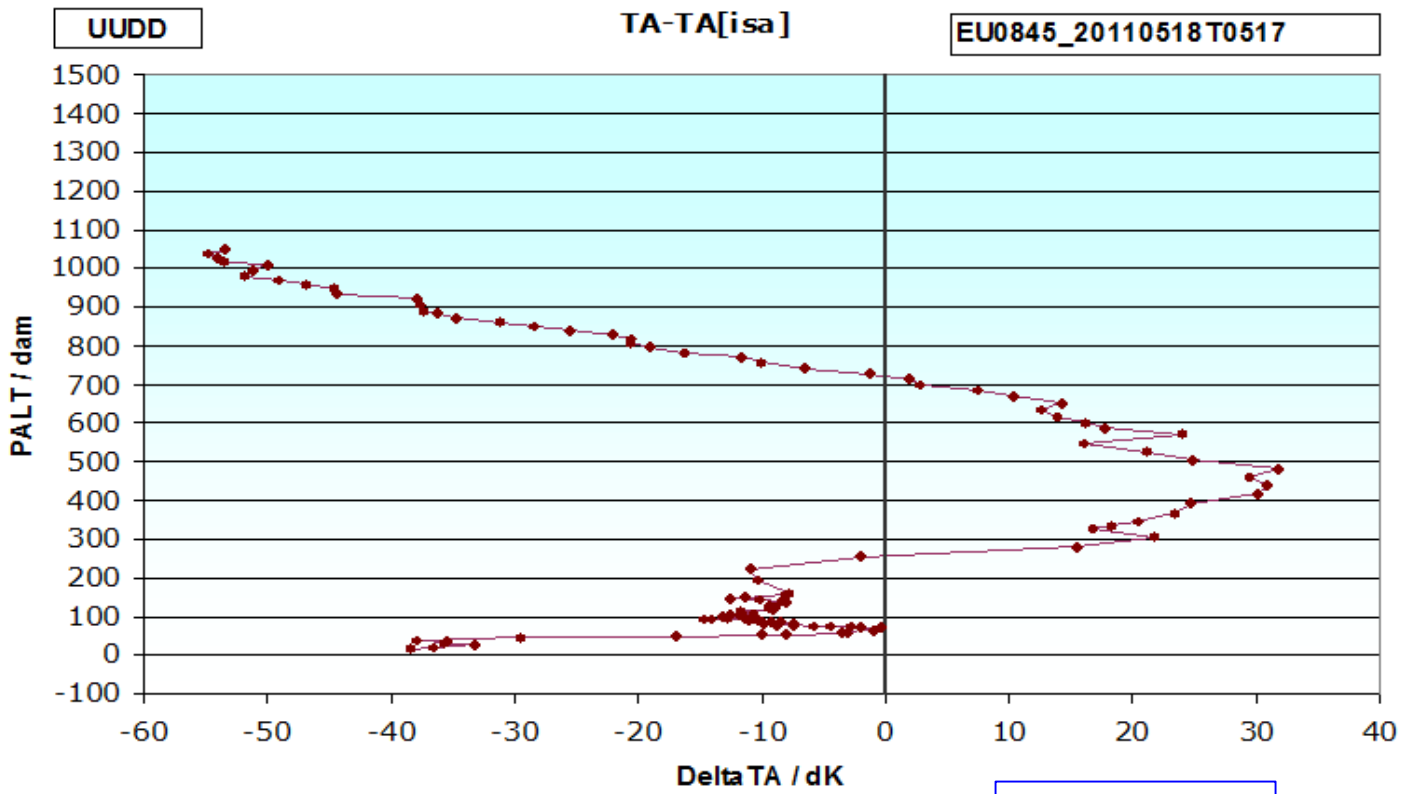
Variables: air temperature



1 dK = 0.1 K

Data quality evaluation practices

Variables: air temperature



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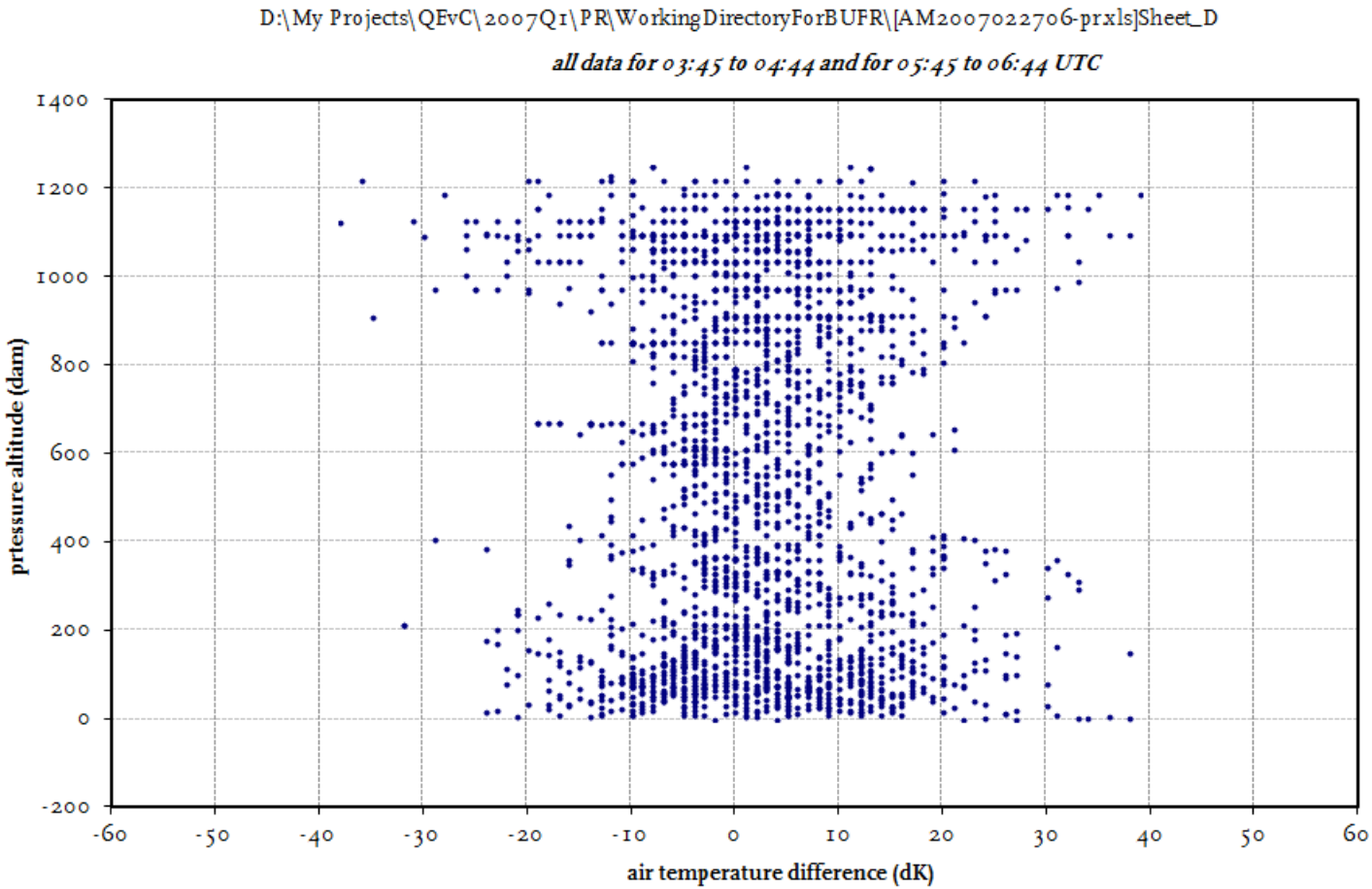

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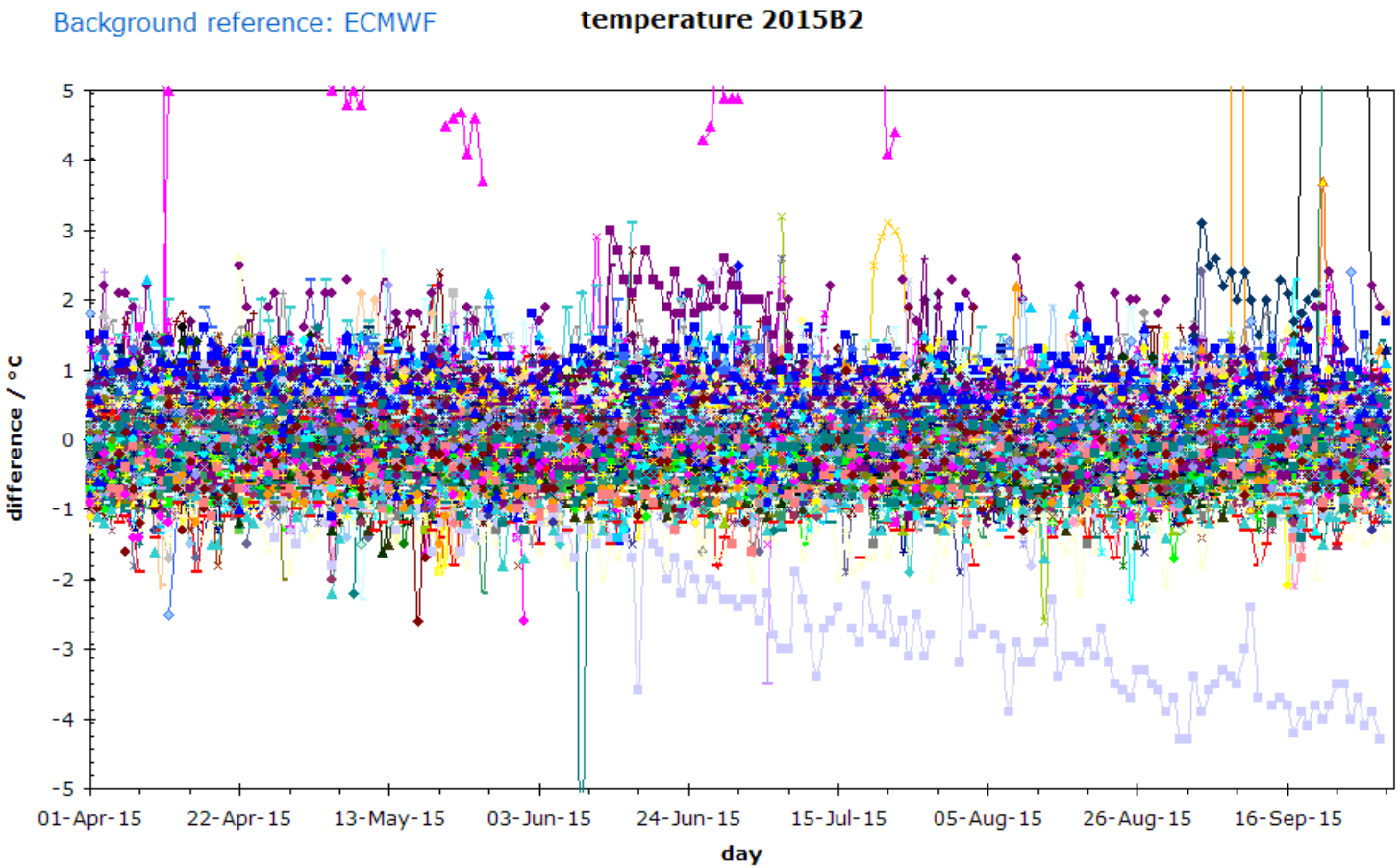
Data quality evaluation practices

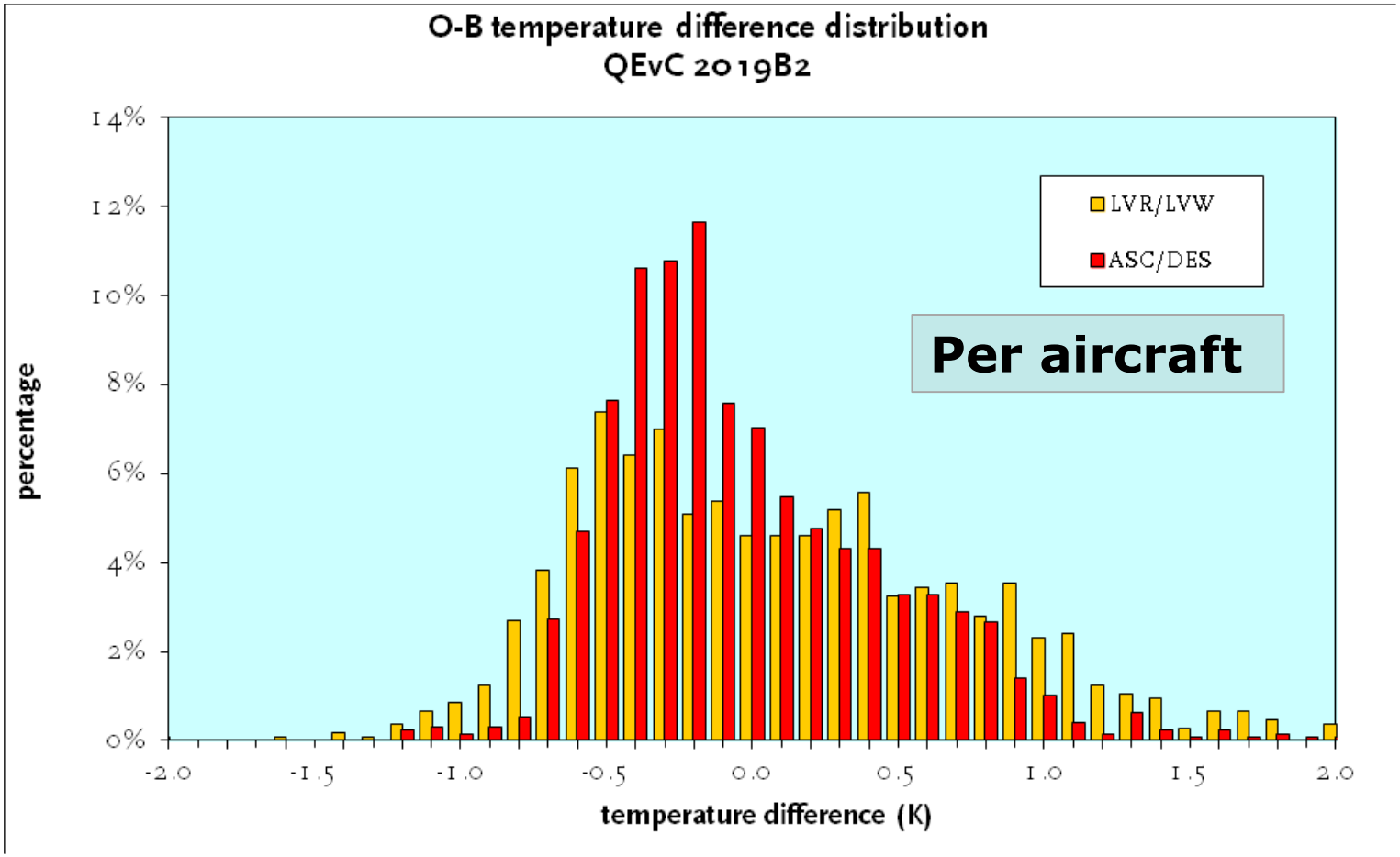
Variables: air temperature

Background reference: ECMWF



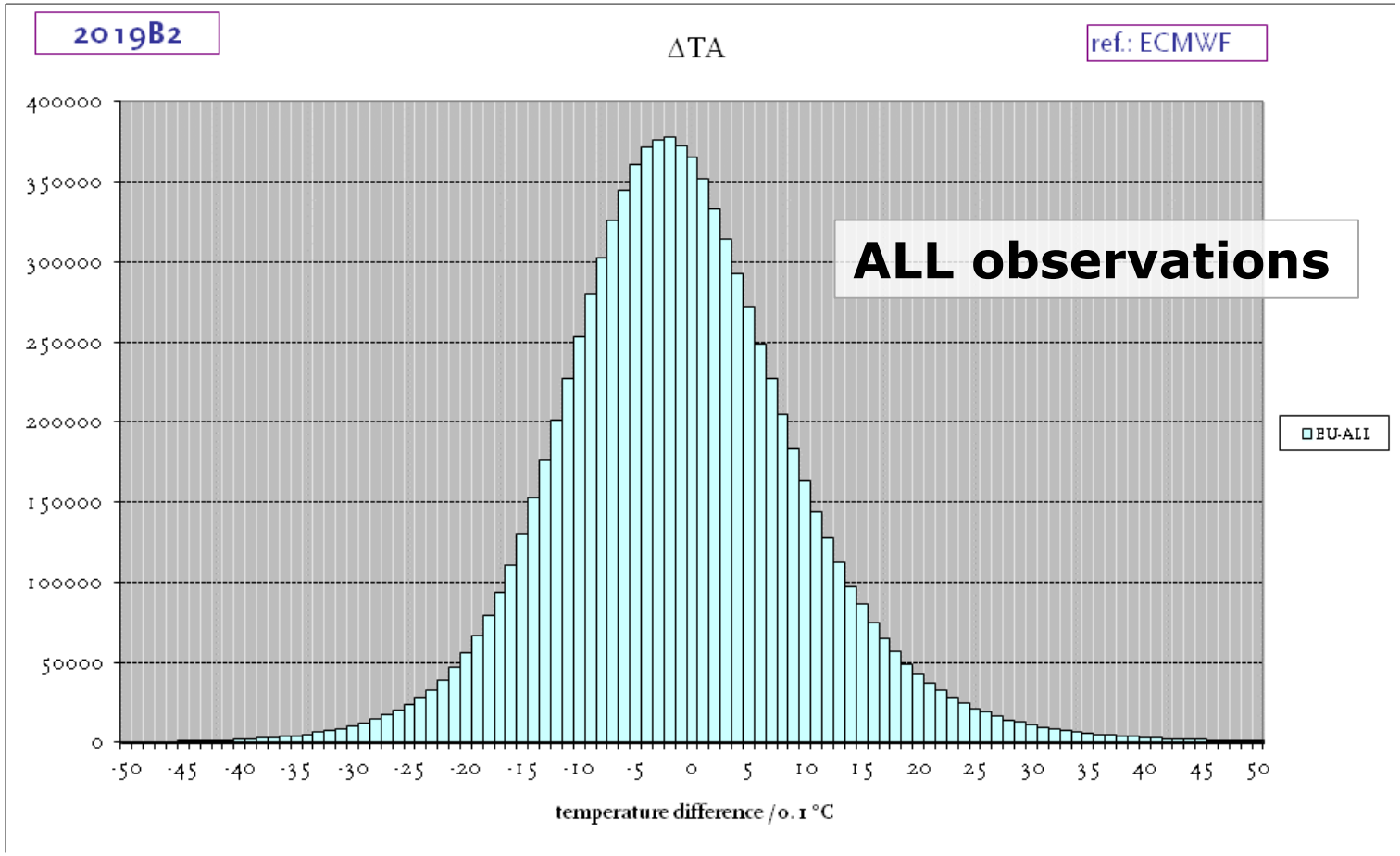
Data quality evaluation practices

Variables: air temperature



Data quality evaluation practices

Variables: air temperature



Data quality evaluation practices

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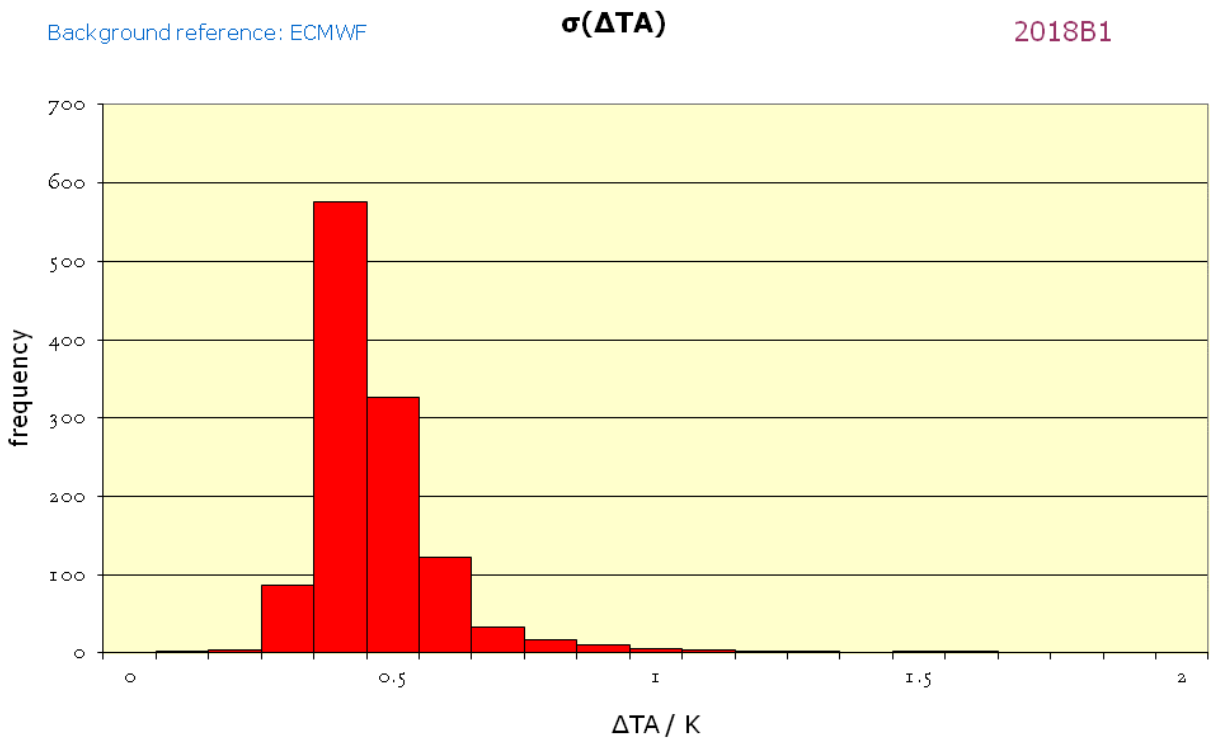
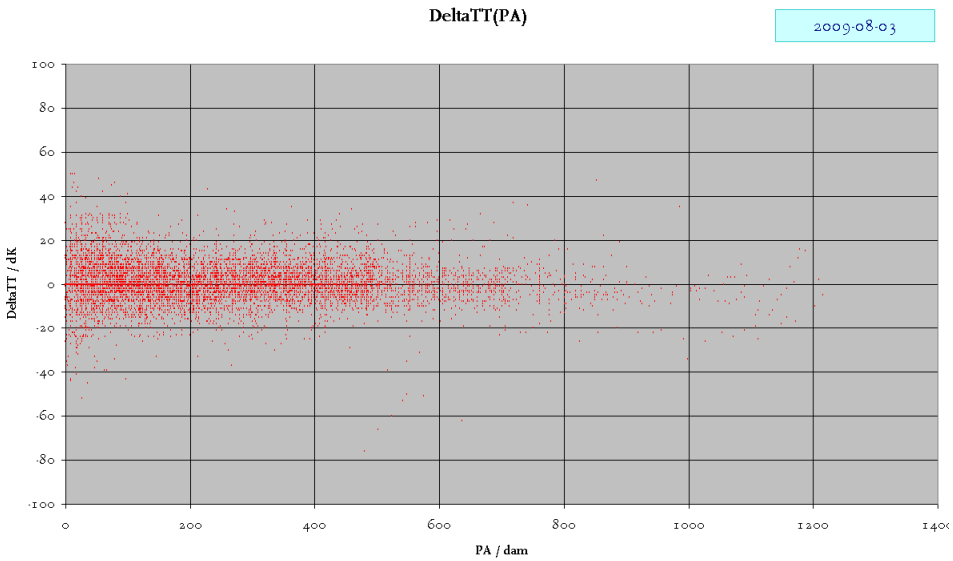


Data quality evaluation practices

Variables: air temperature

IP=6 DES



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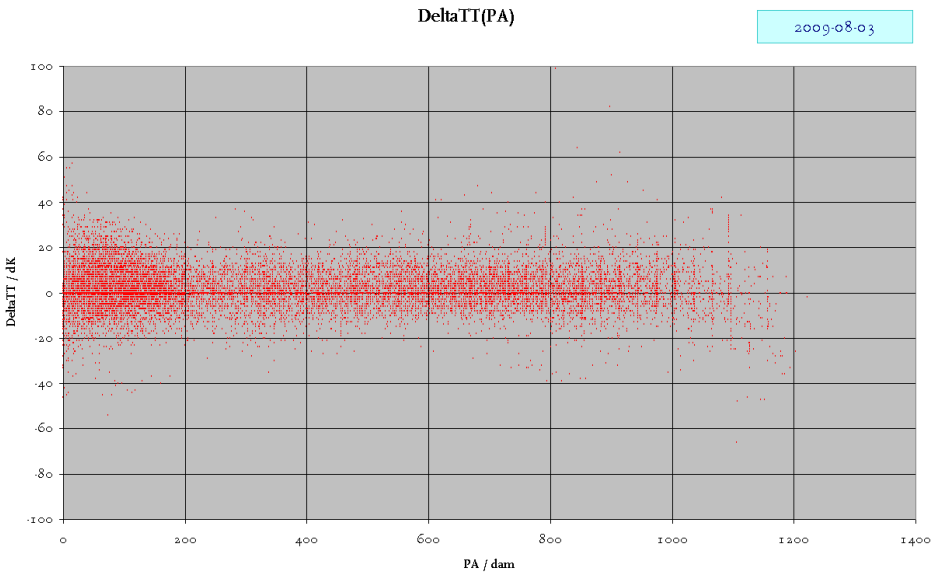
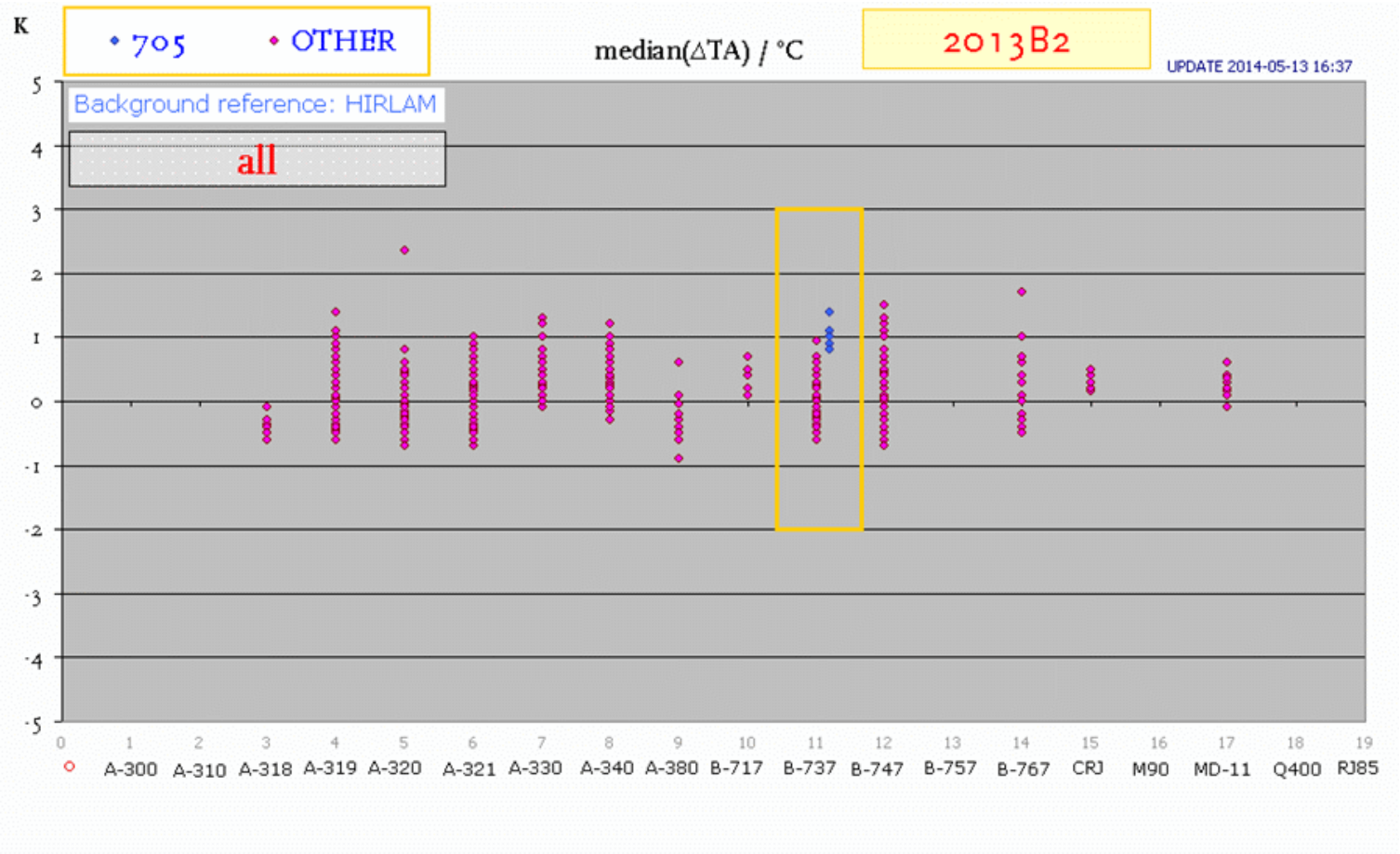


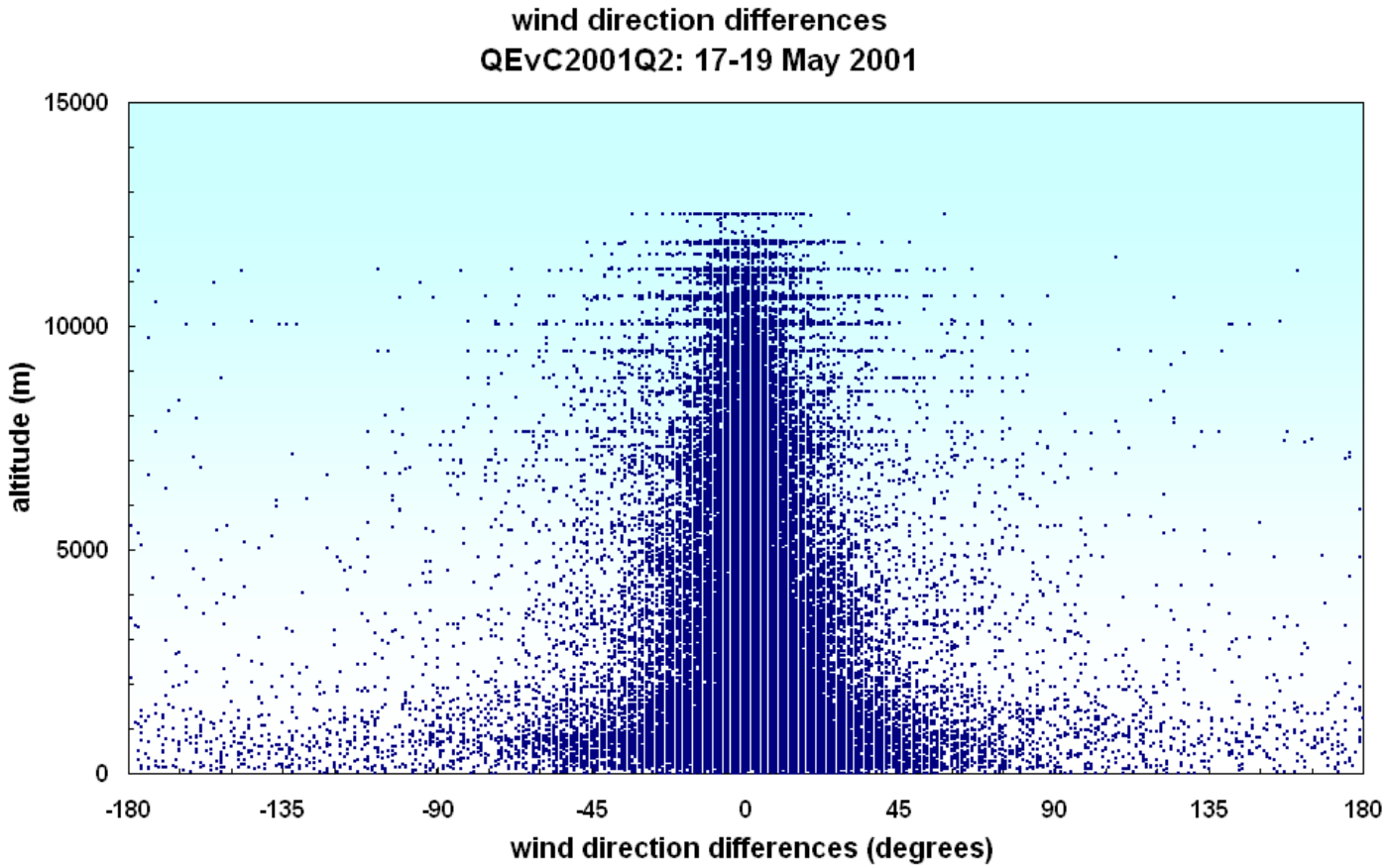
1 dK = 0.1 K

Data quality evaluation practices

Variables: air temperature

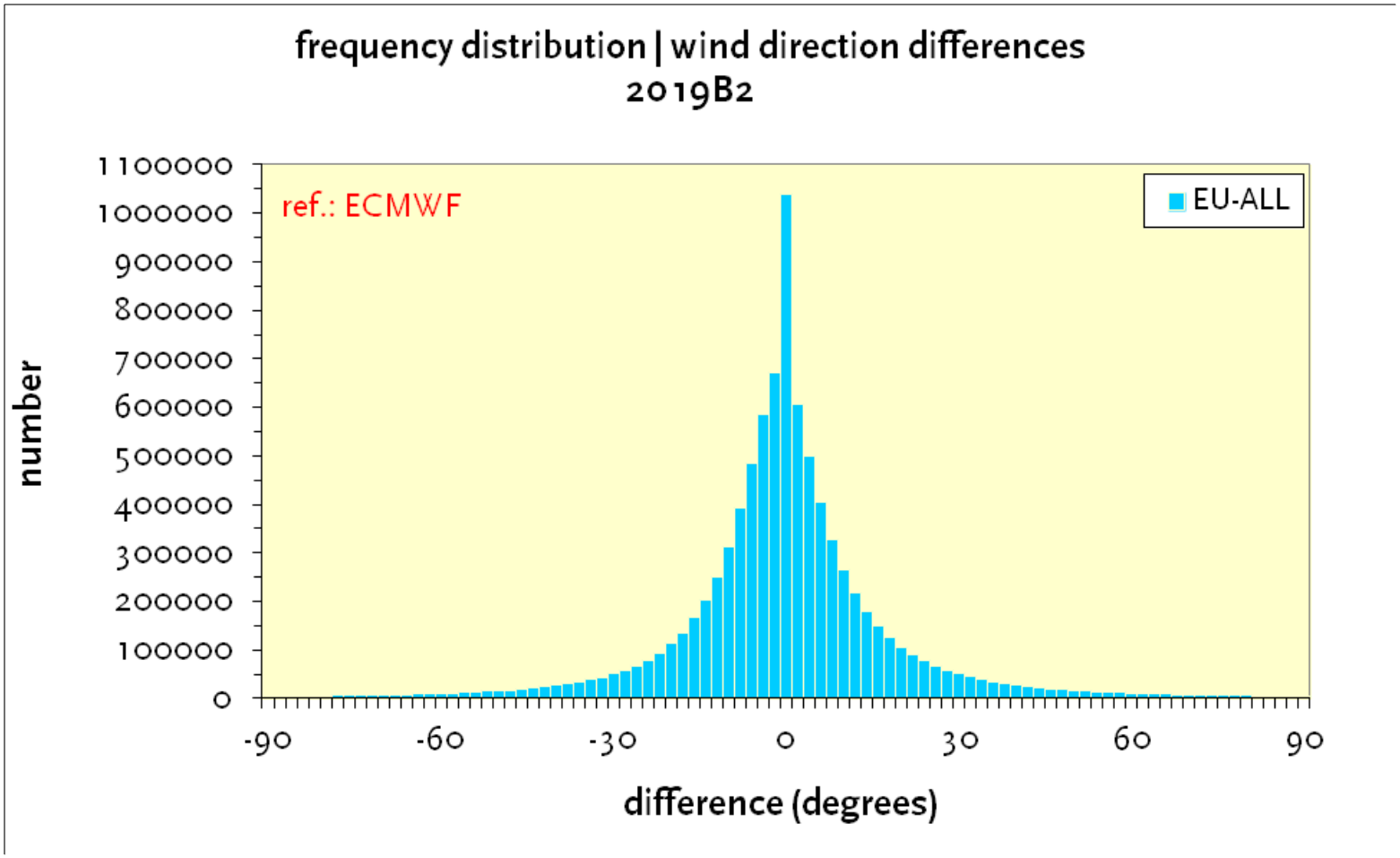


Variables: wind direction



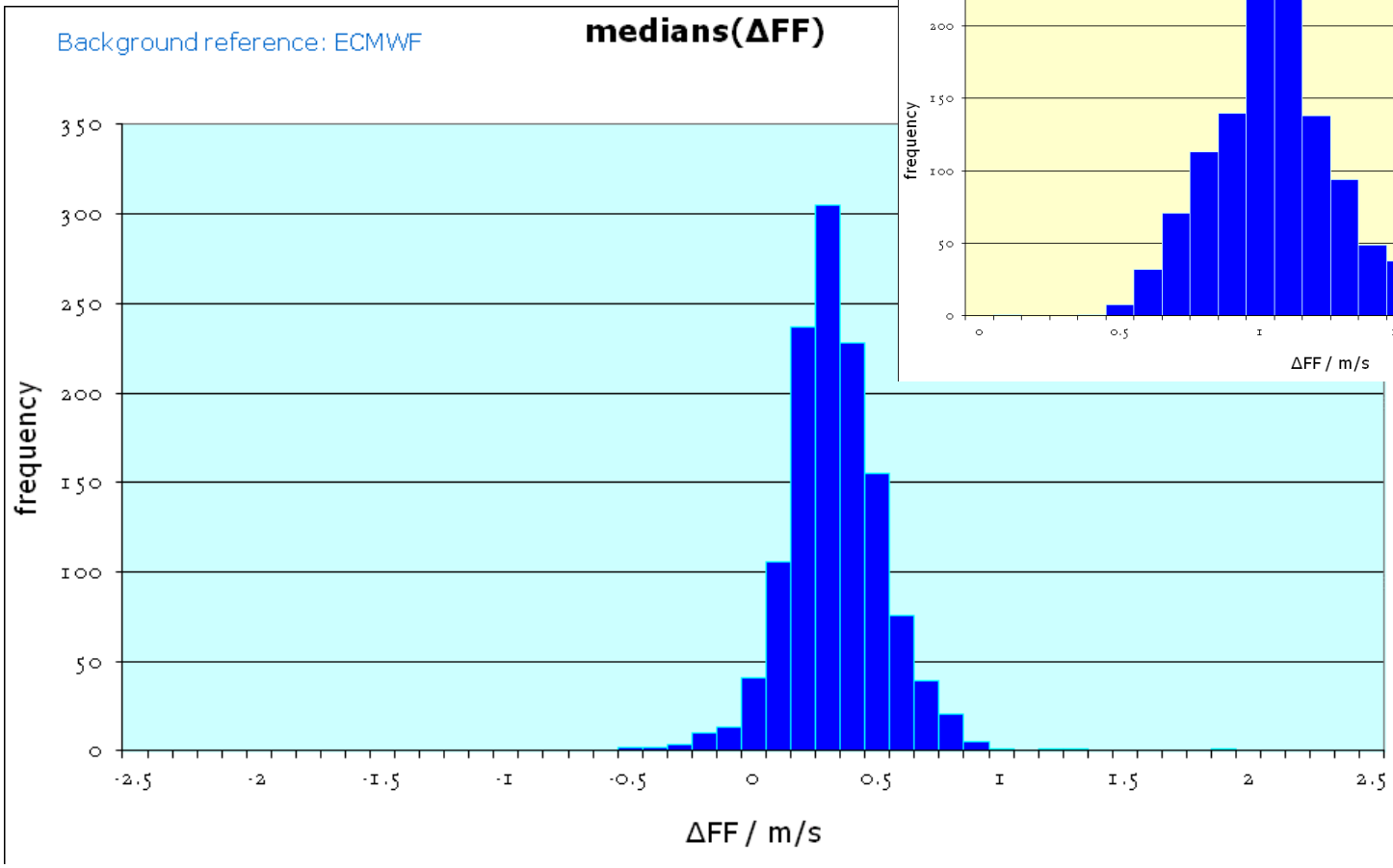
Data quality evaluation practices

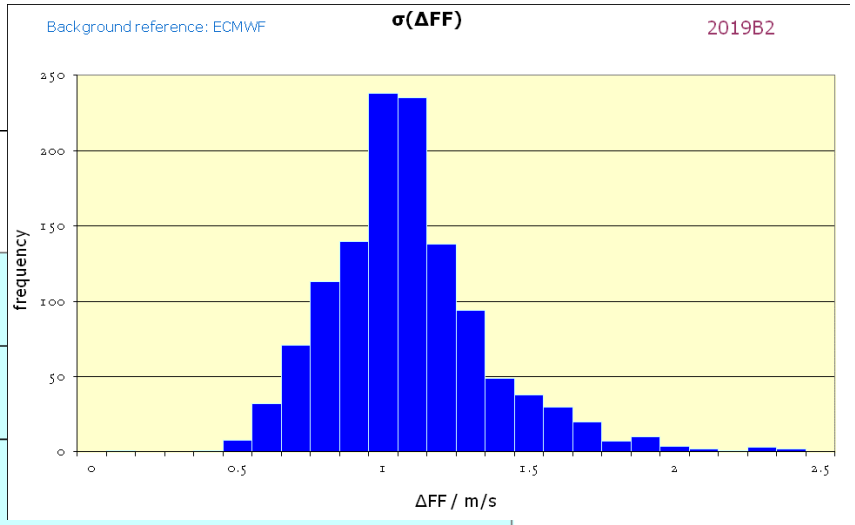
Variables: wind direction



Data quality evaluation practices

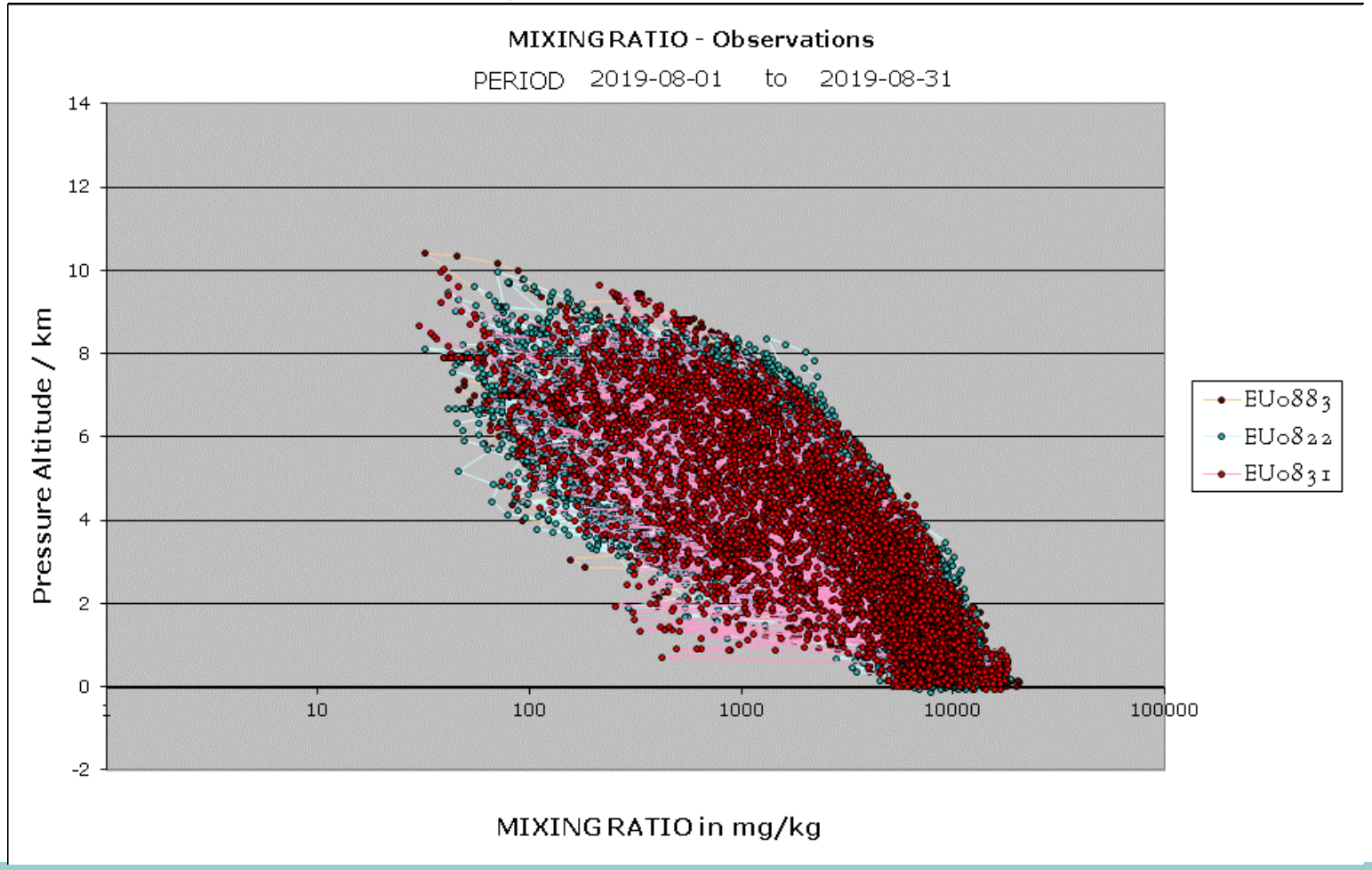
Wind speed





Data quality evaluation practices

Variables: humidity



Data quality evaluation practices

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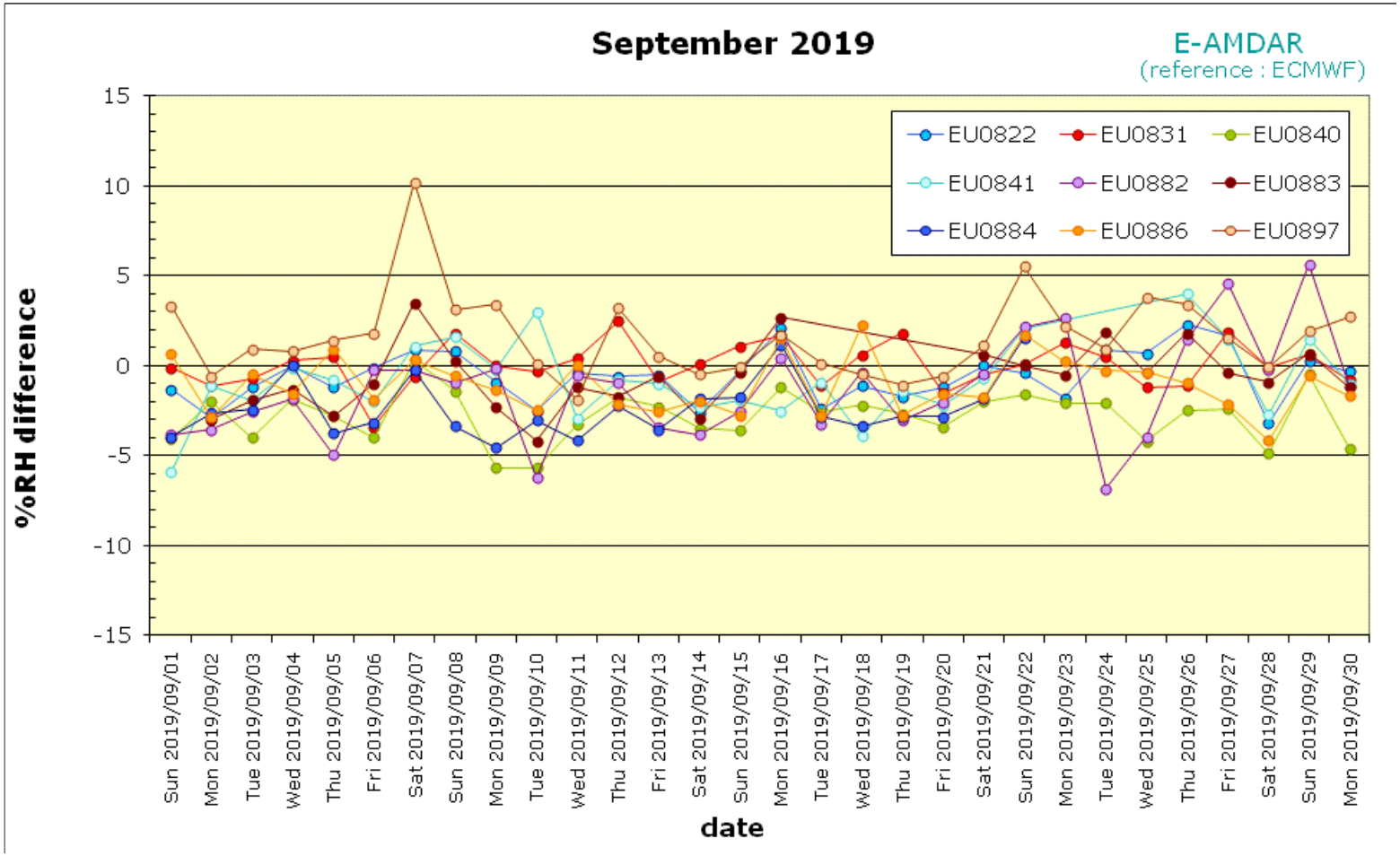
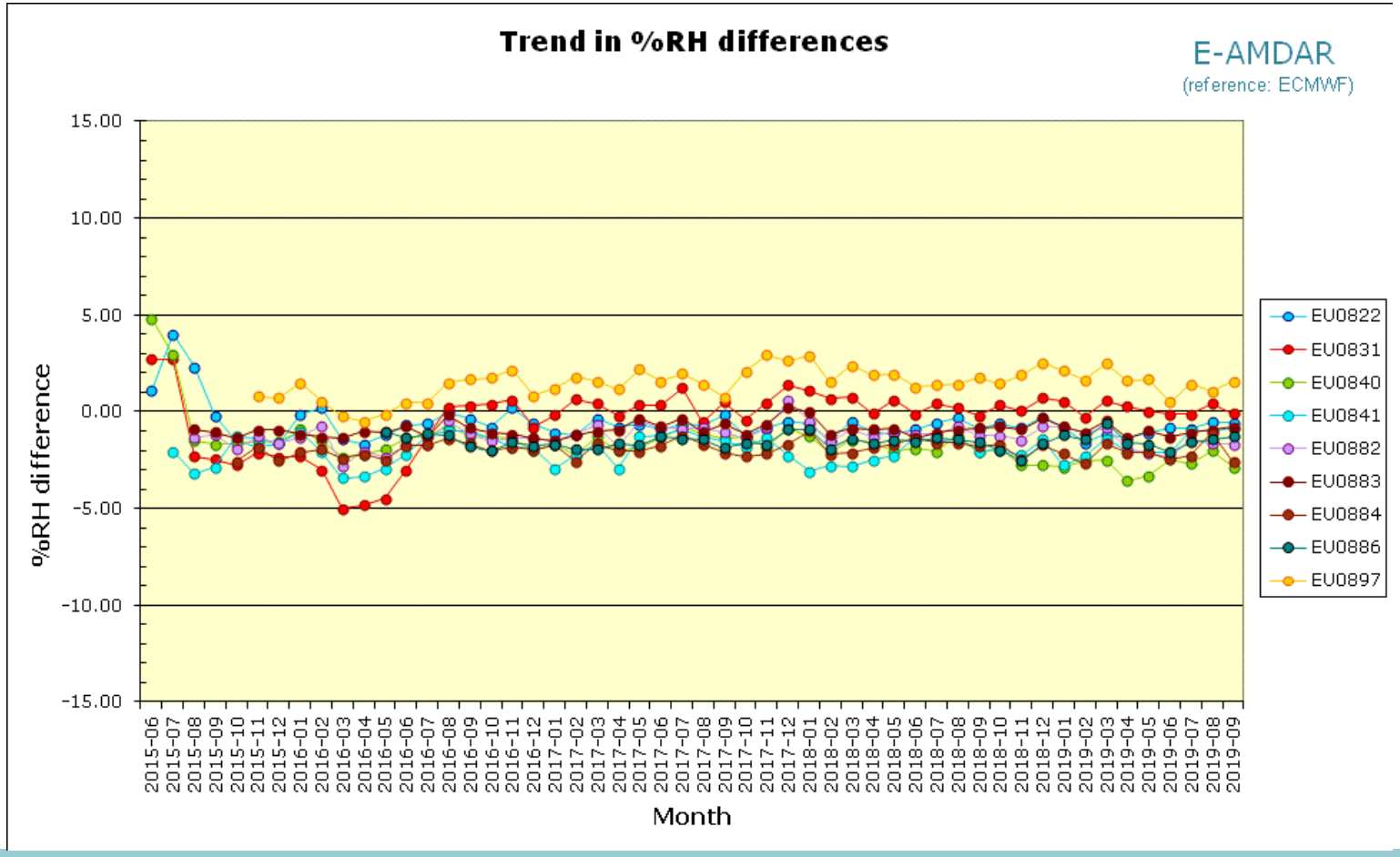


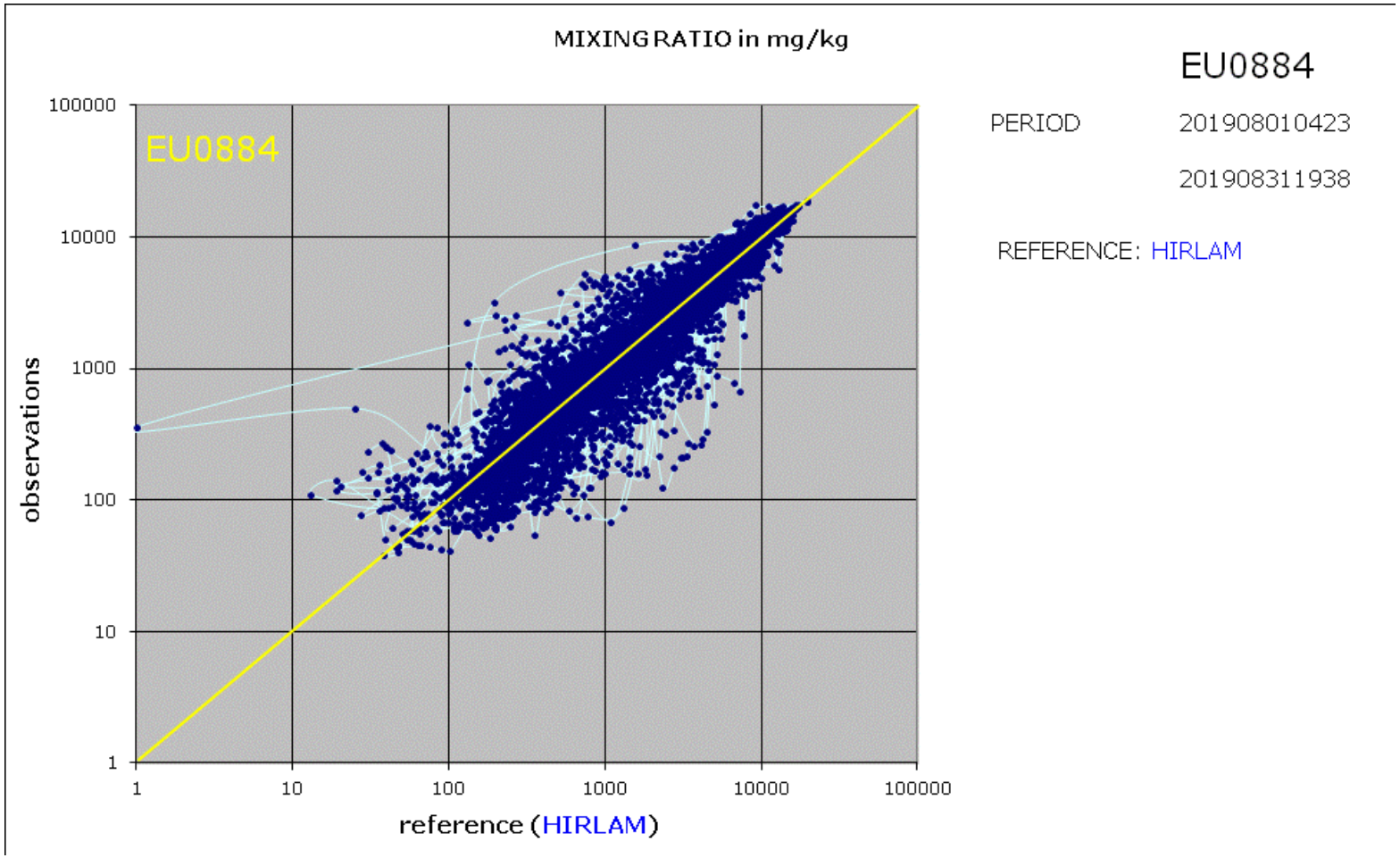
Data quality evaluation practices

Variables: humidity



Data quality evaluation practices

Variables: humidity



Conclusions

- Quality evaluation of AMDAR using NWP as background reference helps significantly to *improve the observations*
- Quality evaluation practices are suitable for *real time* quality control up-to *long term trend* analyses.
- Data quality analyses and research require a talented approach, but results in *improved NWP*
- Together with humidity, turbulence and icing these aircraft based observations provides the major upper-air datasets, to be used for *climate research*