Primary author: **Landl, Barbara** (Federal Office of Meteorology and Climatology MeteoSwiss, Aerological Station), barbara.landl@meteoswiss.ch

Co-authors: Yves-Alain Roulet (Federal Office of Meteorology and Climatology MeteoSwiss, Aerological Station), Bertrand Calpini (Federal Office of Meteorology and Climatology MeteoSwiss, Aerological Station).

Abstract ID: 4O3

SwissMetNet: operational quality control on raw data of the new automatic meteorological ground-based network of Switzerland

The Federal Office of Meteorology and Climatology, MeteoSwiss, is responsible for the maintenance of the national meteorological and climatological network of Switzerland. The project SwissMetNet (SMN) was initiated with the goal to automate, renew and unify the prevailing ground-based networks. This leads to a state-of-the-art unified and secured network of 132 automatic weather stations (AWS), measuring and transmitting all relevant meteorological parameters and housekeeping values to a central data base.
Operational quality control on raw data (meteorological parameters and housekeeping values) is done at two levels. The first level is a real-time control (plausibility tests online) and delivers instantaneous alarms. The second level performs a quality control that is operationally run on a daily basis (using measured raw data from the previous three months).
The second level control allows detecting drifting time series due to instrumental problems, which can not be seen by the first level control. Thanks to this control the time to detect instrumental problems can be reduced and furthermore this results in an improvement of the measurement accuracy, data quality and guarantees a high data availability.
This presentation focuses on the development and operational implementation of the second quality control on raw data.

Schweizerische Eidgenossenschaft
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Département fédéral de l'intérieur DFI
Office fédéral de météorologie et de climatologie MétéoSuisse

SwissMetNet: the new automatic meteorological ground-based network of Switzerland

Operational quality control

B. Landl, Y.-A. Roulet, and B. Calpini
MeteoSwiss

7th ECSN Data Management Workshop, Copenhagen, Denmark
4 - 6 November, 2009

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Outline

Introduction

Automatic quality control

- Operational real-time failure detection
- Slow instrument degradation detection
- Intermittent failure detection

Outlook

Outline

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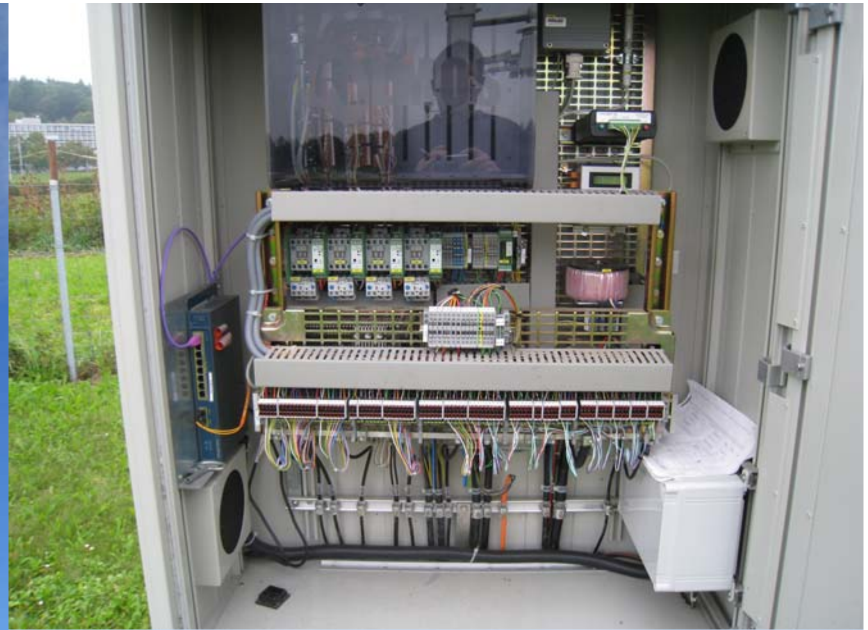
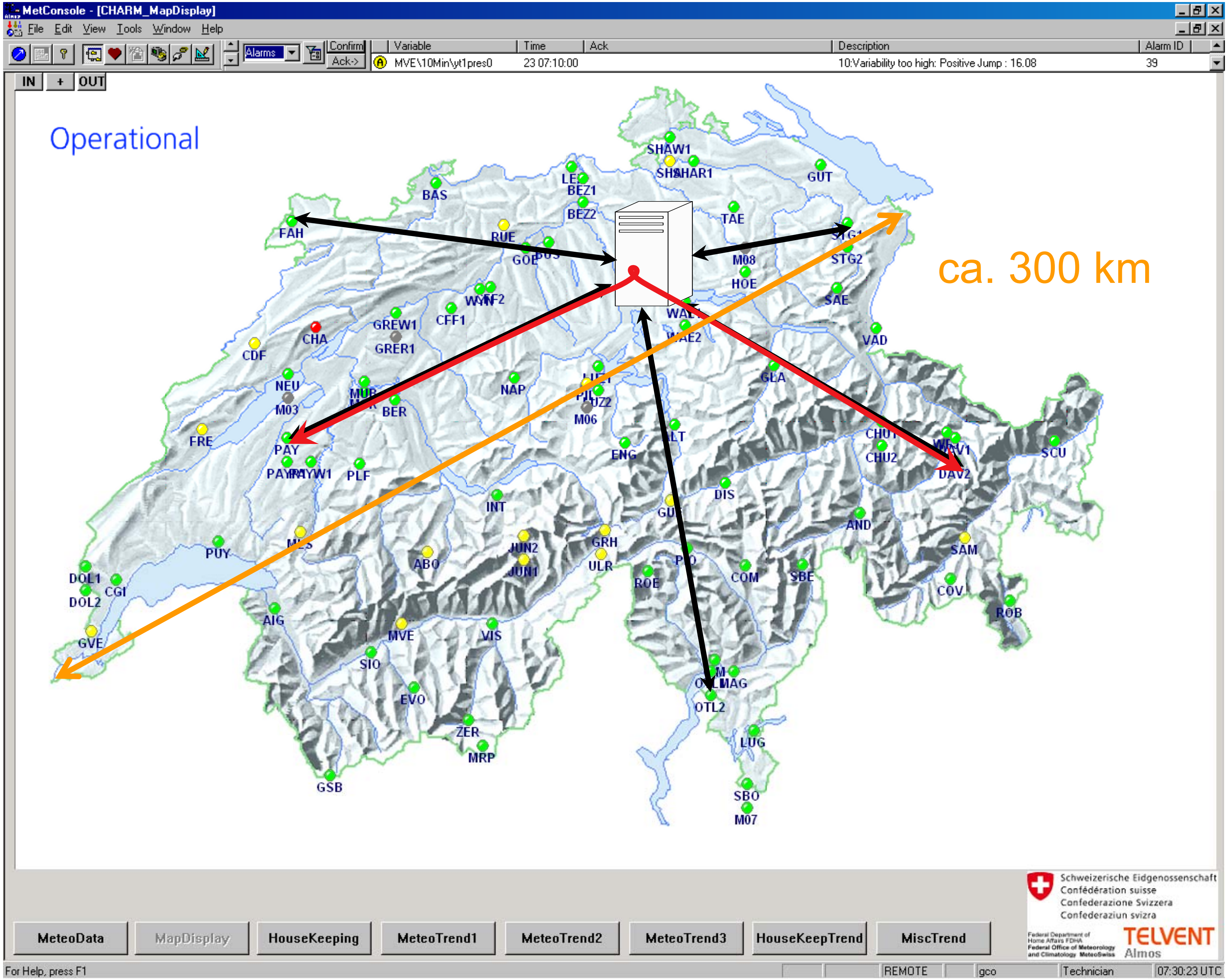
SwissMetNet

Renewal of ground-based networks in Switzerland

Goal: automated
unified
secured
} state-of-the-art network

of **132** automatic weather stations transmitting all relevant meteorological parameters and housekeeping values to a central data base

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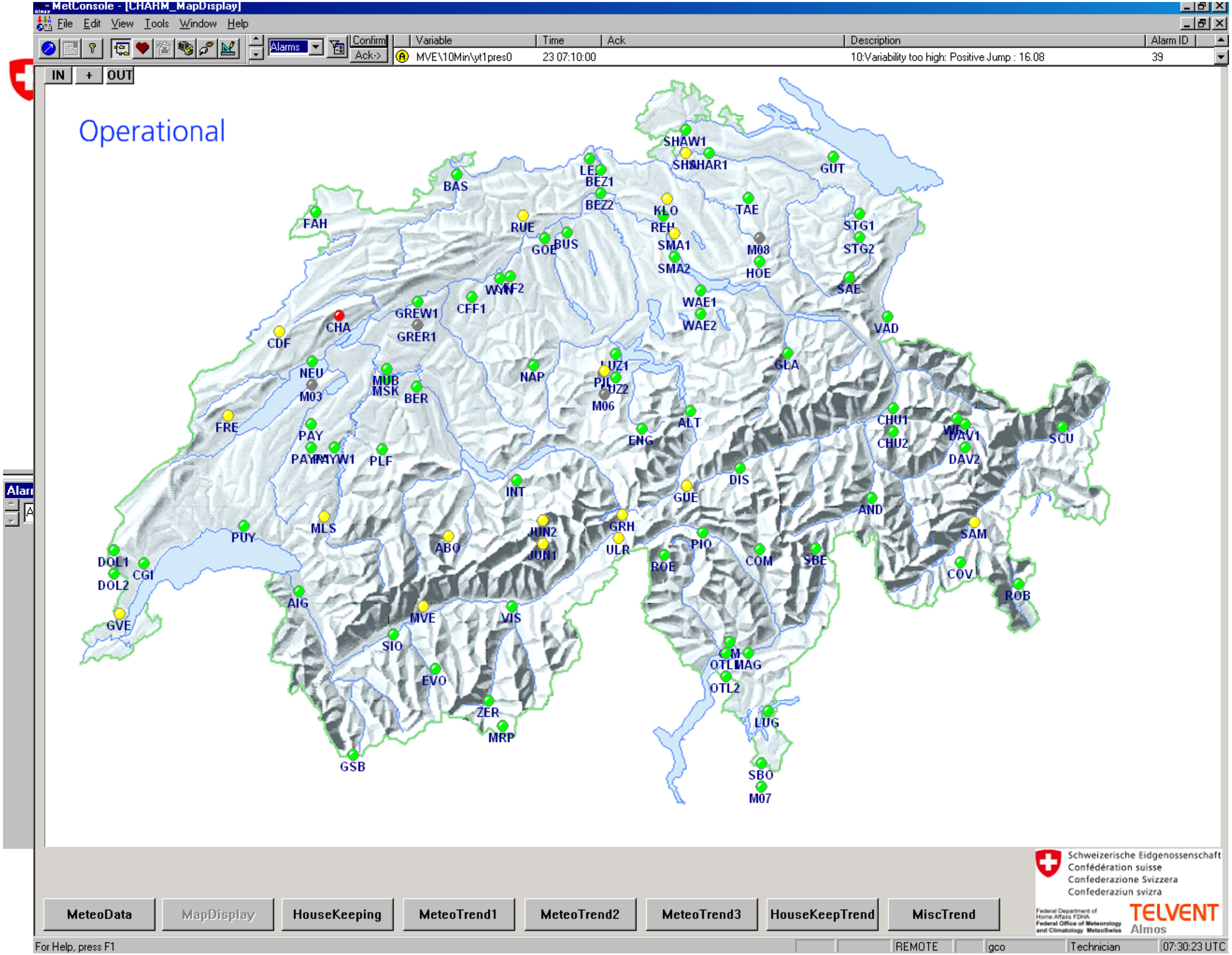
What are the purposes of a Quality Control (QC)?

Detecting instrument failures at its origin
→ avoiding gaps
→ guaranteeing correct measurements
→ availability for clients

Improving know-how on measurement techniques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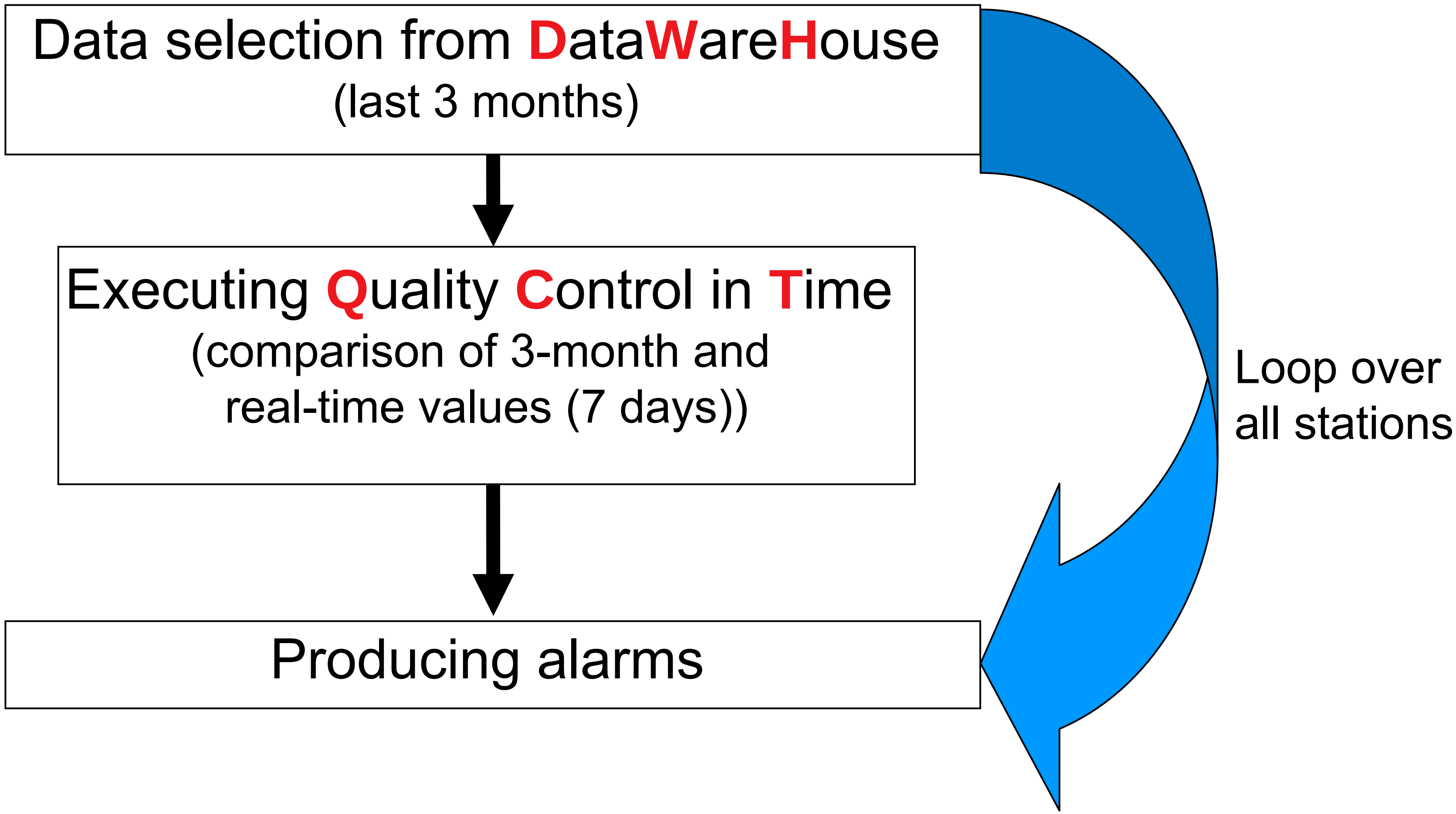
Development of Quality Control in Time - QCT

(1) Determining parameters which are sensitive to instrumental problems and therefore serve as indicators

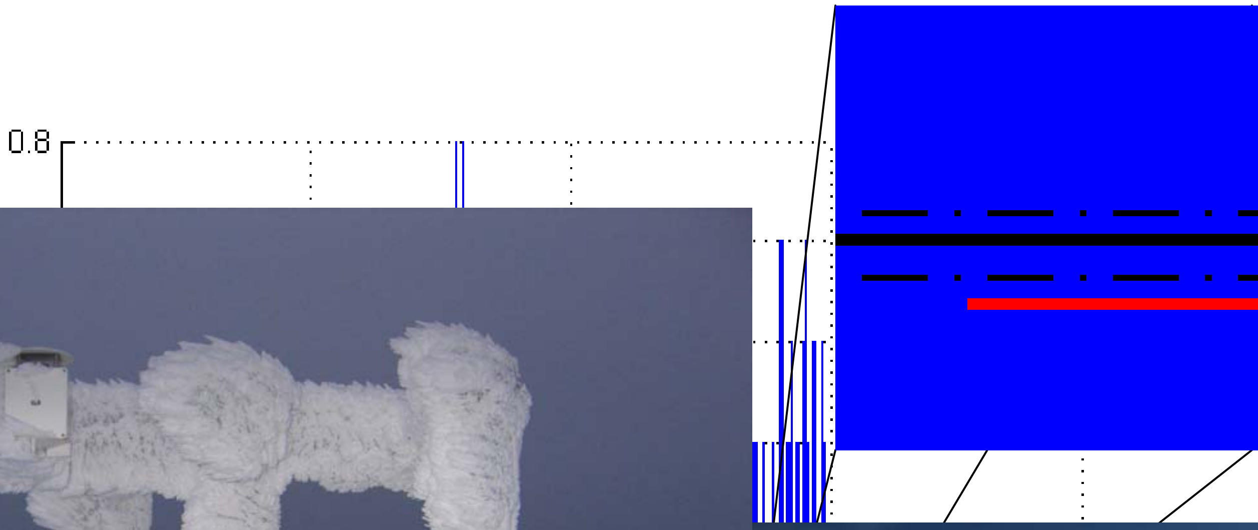
(2) Finding appropriate criteria to detect failures in instrumental behavior

(3) Using these tests in operational mode and giving precise alarms if test-limits are exceeded

QCT – how is it currently applied?

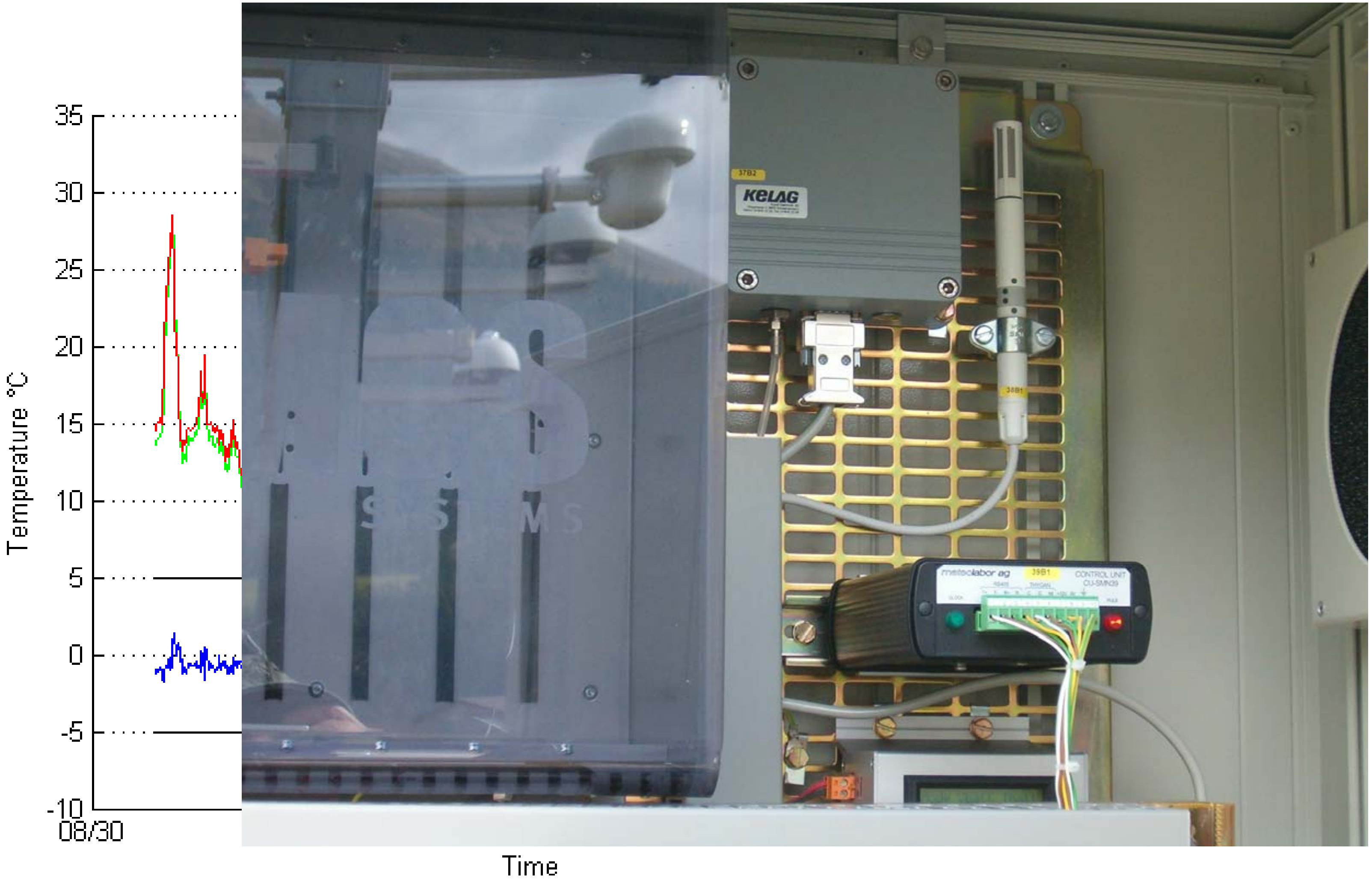


1^{st} Example: battery current



2nd Example

Temperature difference between data-acquistion



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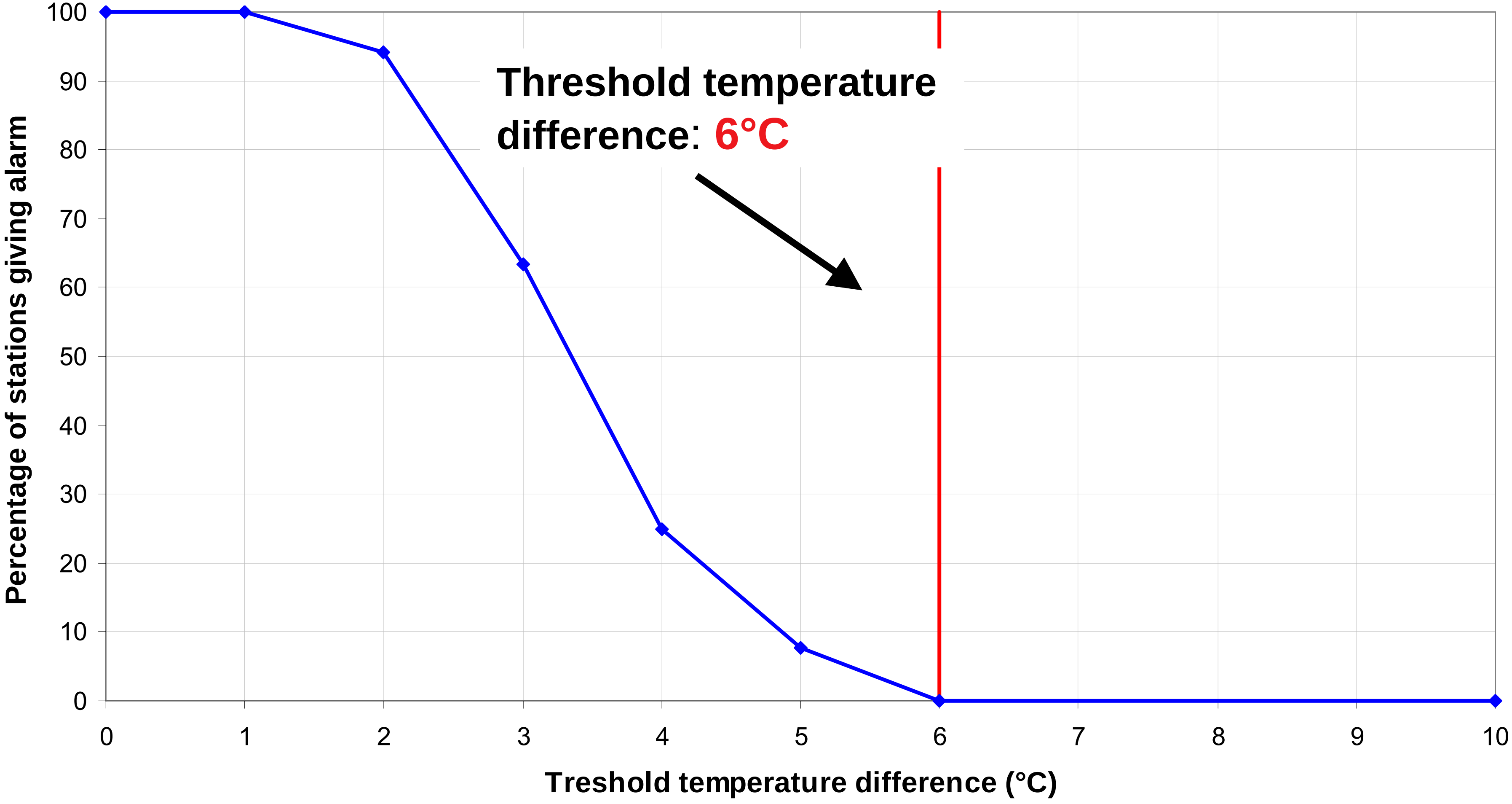
Sensitivity of defined limits

Date of sensitivity test: 17.09.2009



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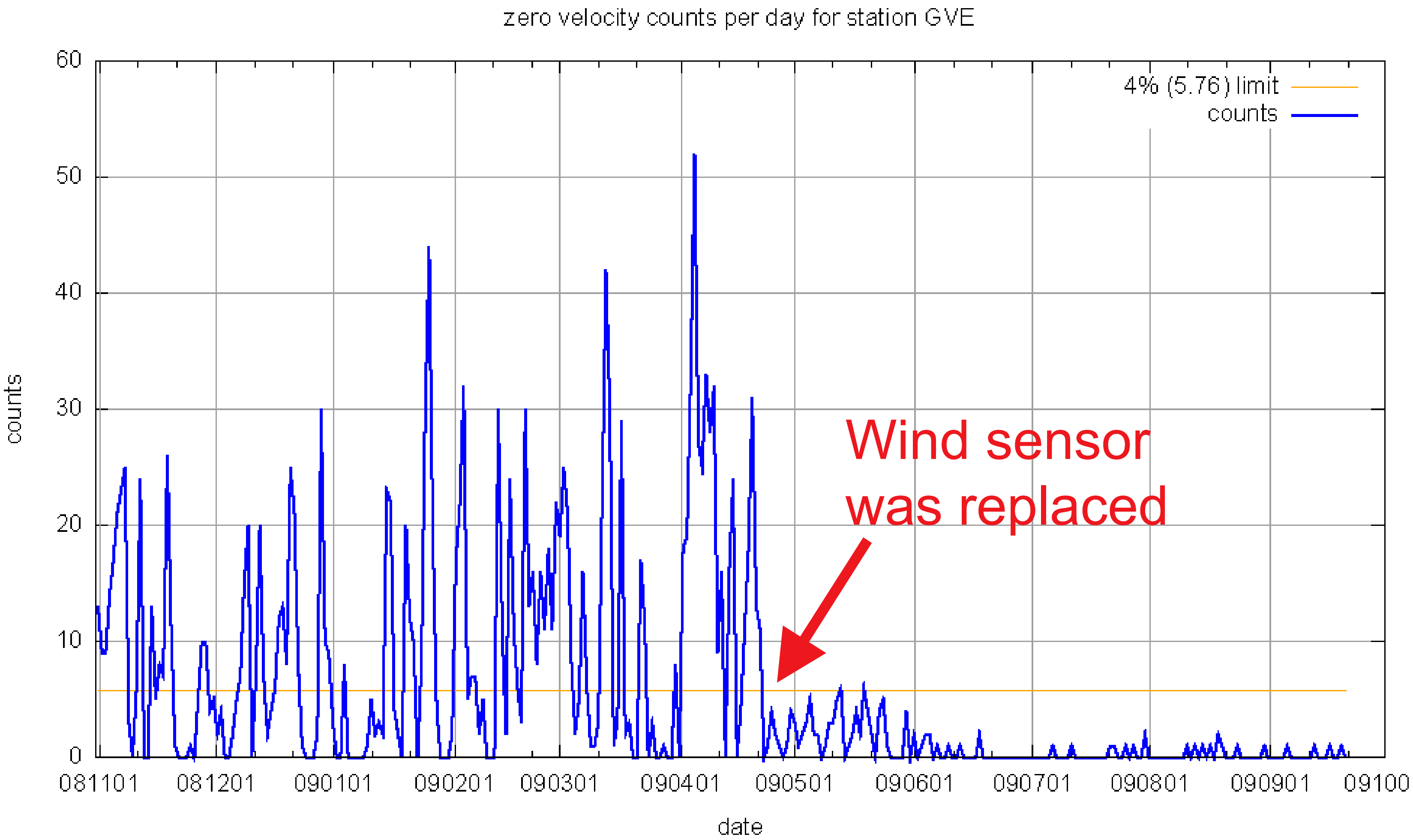
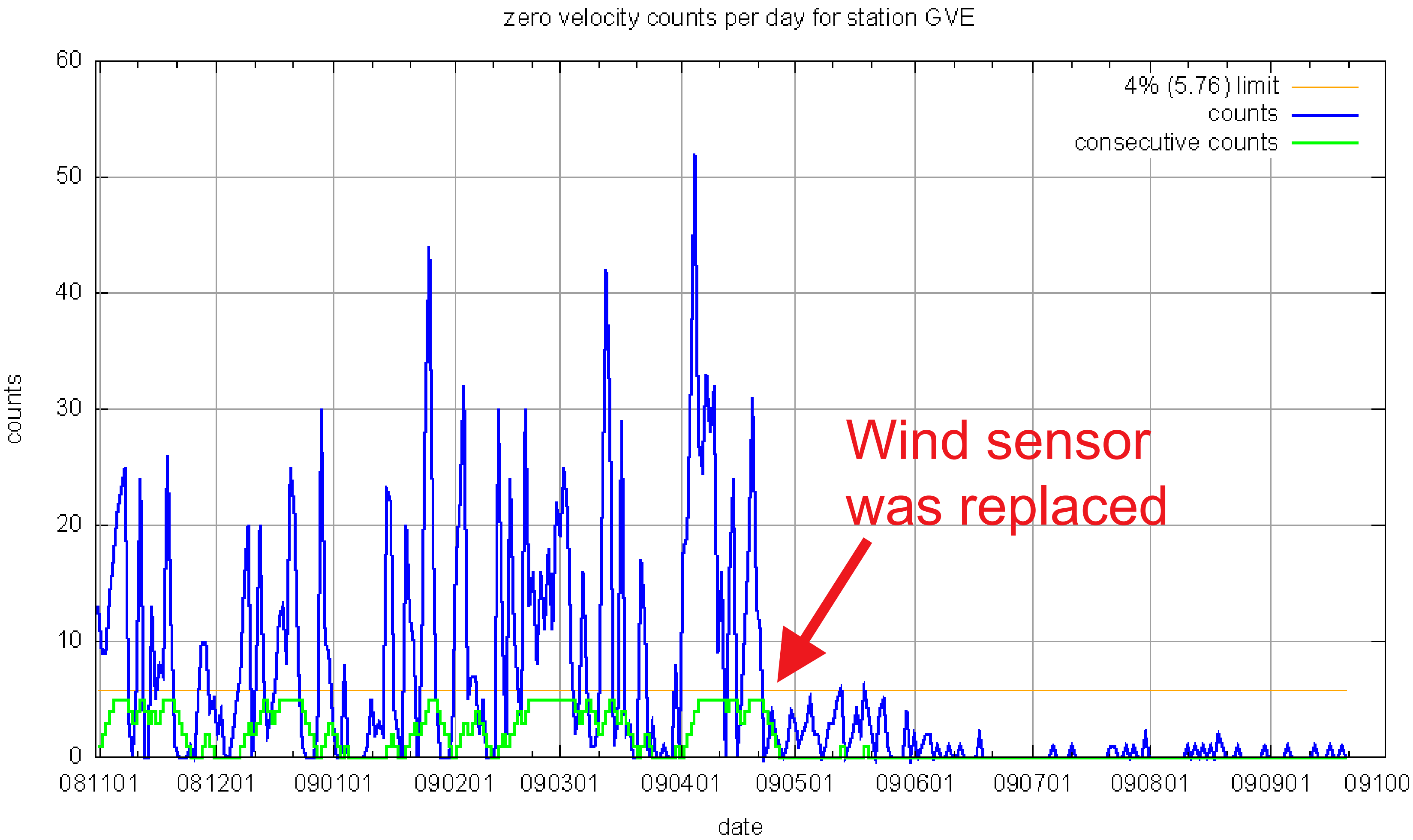
Intermittent failure detection

Detecting too high number of consecutive zero wind speed measurements



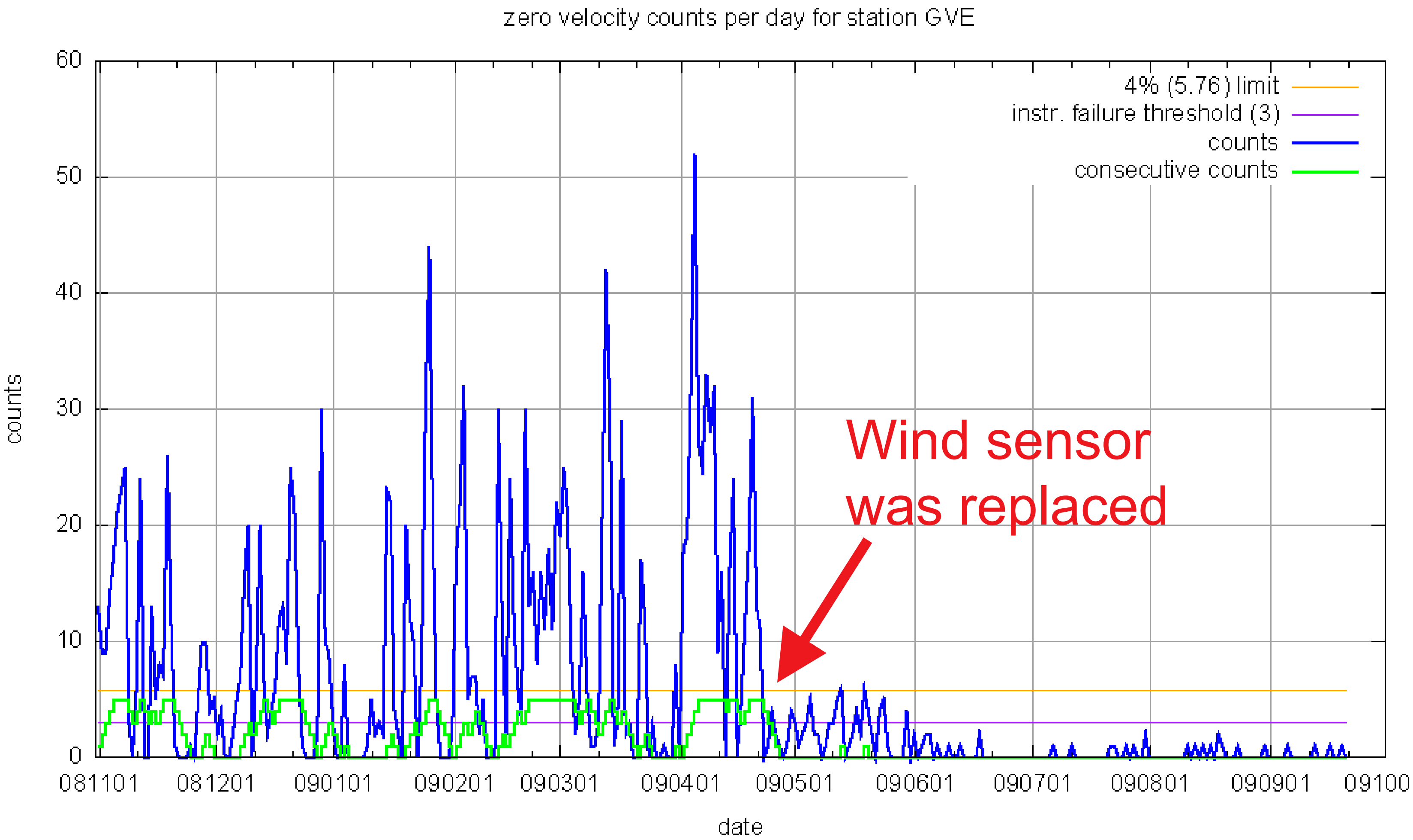
Intermittent failure detection

Detecting too high number of consecutive zero wind speed measurements



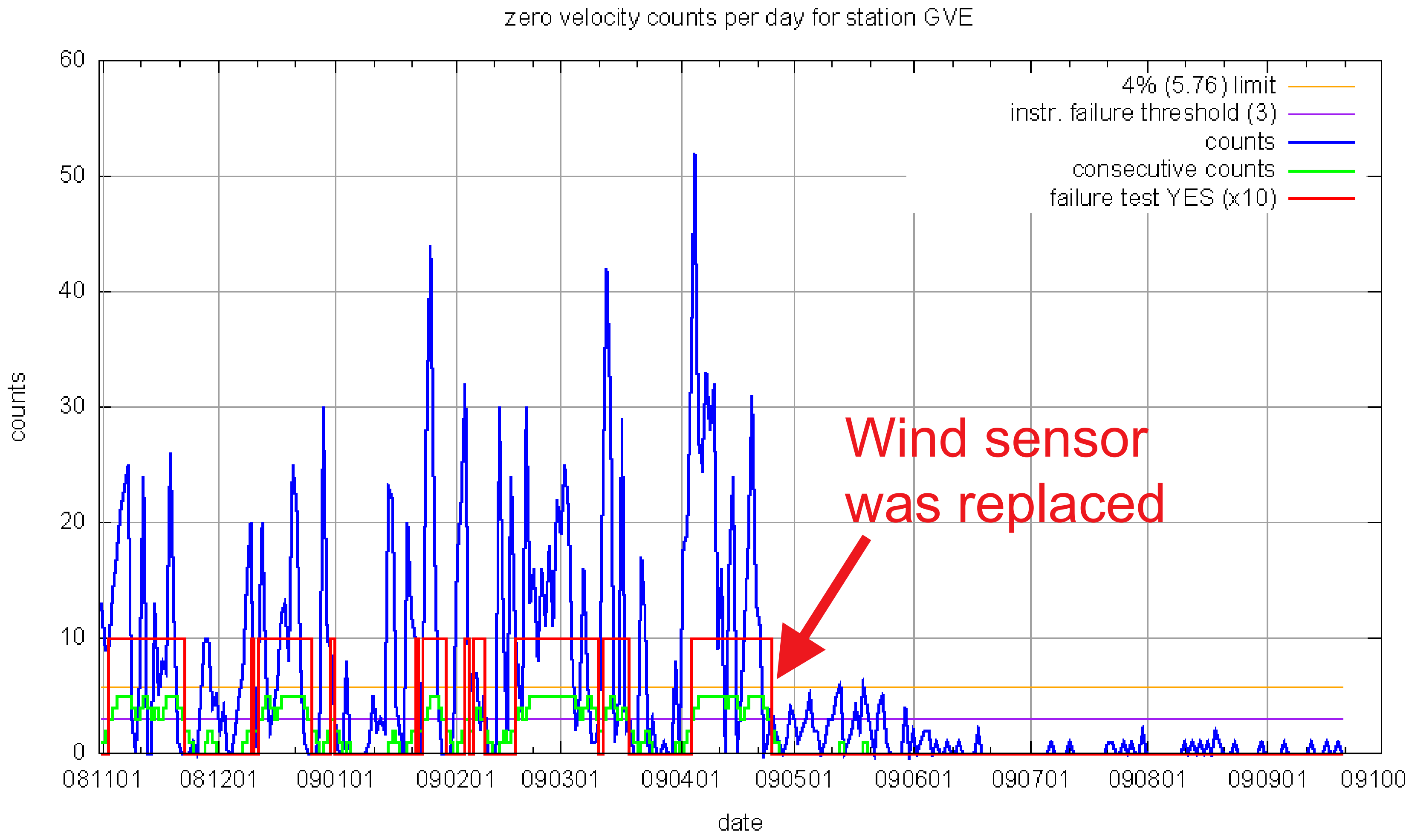
Intermittent failure detection

Detecting too high number of consecutive zero wind speed measurements



Intermittent failure detection

Detecting too high number of consecutive zero wind speed measurements



Intermittent fail

Detecting too high numb
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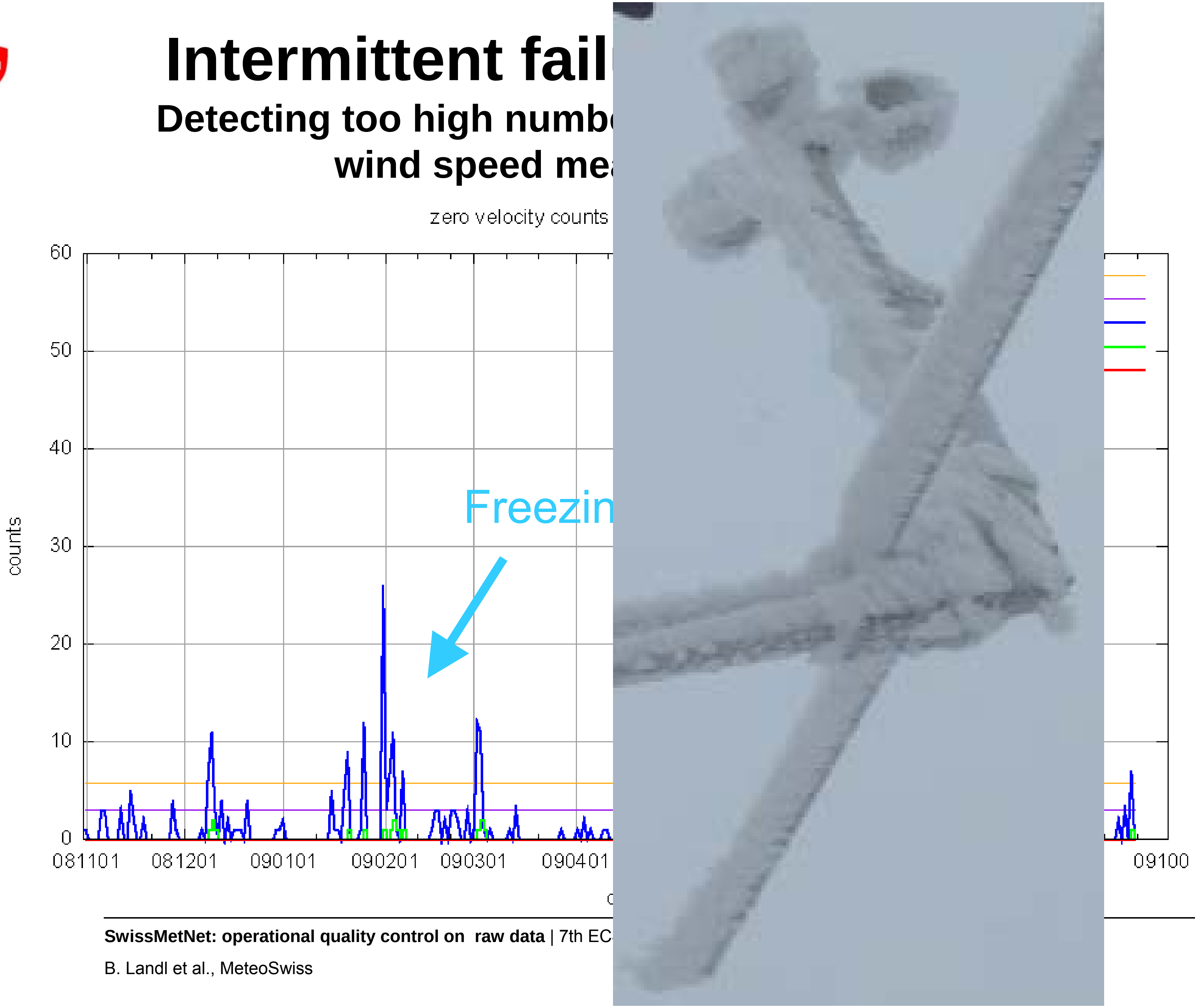

Output daily run

20090902	SMN	ALT	yt1pres0	CheckHouseTemp	min. difference between barometer and cabin temperature is -5.30°C (-5°C allowed)
20090902	SMN	BAS	yt1pres0	CheckHouseTemp	max. difference between barometer and cabin temperature is 5.20°C (+5°C allowed)
20090902	SMN	CHU	ypow01s0	CheckPow1	mean 12V power for last 7 days differs by 5.01% from mean value of past 3 months (3% tolerance)
20090902	SMN	CHU	ypow02s0	CheckPow2	mean 1st 24V power for last 7 days differs by 3.74% from mean value of past 3 months (3% tolerance)
20090902	SMN	CHU	ypow03s0	CheckPow3	mean 2nd 24V power for last 7 days differs by -6.57% from mean value of past 3 months (3% tolerance)
20090902	SMN	DOL	ypow02s0	CheckPow2	mean 1st 24V power STD for last 7 days is 0.70A (tolerance: 0.5A)
20090902	SMN	DOL	ypow03s0	CheckPow3	mean 2nd 24V power STD for last 7 days is 0.70A (tolerance: 0.5A)
20090902	SMN	DOL	yt1pres0	CheckHouseTemp	max. difference between barometer and cabin temperature is 5.10°C (+5°C allowed)
20090902	SMN	JUN	yt1gres0	CheckCM21Temp	percentage of values with a difference between air and CM21 temperature larger than 5°C (for T2m < 5°C)
20090903	SMN	ALT	yt1pres0	CheckHouseTemp	min. difference between barometer and cabin temperature is -5.30□C (-5□C allowed)
20090903	SMN	BAS	yt1pres0	CheckHouseTemp	max. difference between barometer and cabin temperature is 5.20□C (+5□C allowed)
20090903	SMN	CHU	ypow01s0	CheckPow1	mean 12V power for last 7 days differs by 3.39% from mean value of past 3 months (3% tolerance)
20090903	SMN	CHU	ypow03s0	CheckPow3	mean 2nd 24V power for last 7 days differs by -4.17% from mean value of past 3 months (3% tolerance)
20090903	SMN	DOL	ypow02s0	CheckPow2	mean 1st 24V power STD for last 7 days is 0.69A (tolerance: 0.5A)
20090903	SMN	DOL	ypow03s0	CheckPow3	mean 2nd 24V power STD for last 7 days is 0.69A (tolerance: 0.5A)
20090903	SMN	DOL	yt1pres0	CheckHouseTemp	max. difference between barometer and cabin temperature is 5.10□C (+5□C allowed)
20090903	SMN	VAD	yt1pres0	CheckHouseTemp	max. difference between barometer and cabin temperature is 5.60□C (+5□C allowed)
20090904	SMN	ALT	yt1pres0	CheckHouseTemp	min. difference between barometer and cabin temperature is -5.30□C (-5□C allowed)
20090904	SMN	BAS	yt1pres0	CheckHouseTemp	max. difference between barometer and cabin temperature is 5.20□C (+5□C allowed)
20090904	SMN	CDF	ypow02s0	CheckPow2	mean 1st 24V power STD for last 7 days is 0.66A (tolerance: 0.5A)
20090904	SMN	CHU	ypow03s0	CheckPow3	mean 2nd 24V power for last 7 days differs by -3.02% from mean value of past 3 months (3% tolerance)
20090904	SMN	COM	ypow00s0	CheckPow0	mean 220V power for last 7 days differs by -0.00% from mean value of past 3 months (3% tolerance)
20090904	SMN	COM	ypow00s0	CheckPow0	mean 220V power STD for last 7 days differs by -0.00% from mean value of past 3 months (3% tolerance)
20090904	SMN	DOL	ypow02s0	CheckPow2	mean 1st 24V power STD for last 7 days is 0.63A (tolerance: 0.5A)
20090904	SMN	DOL	ypow03s0	CheckPow3	mean 2nd 24V power STD for last 7 days is 0.63A (tolerance: 0.5A)
20090904	SMN	DOL	yt1pres0	CheckHouseTemp	max. difference between barometer and cabin temperature is 5.10□C (+5□C allowed)
20090904	SMN	JUN	ypow02s0	CheckPow2	mean 1st 24V power STD for last 7 days is 0.54A (tolerance: 0.5A)
20090904	SMN	JUN	yt1gres0	CheckCM21Temp	percentage of values with a difference between air and CM21 temperature larger than 5□C (for T2m < 5□C)
20090904	SMN	VAD	yt1pres0	CheckHouseTemp	max. difference between barometer and cabin temperature is 5.60□C (+5□C allowed)

Sensors tested:

Barometer, Windsensor, Thermo-Hygrometer, Pyranometer, Battery

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Further development and outlook

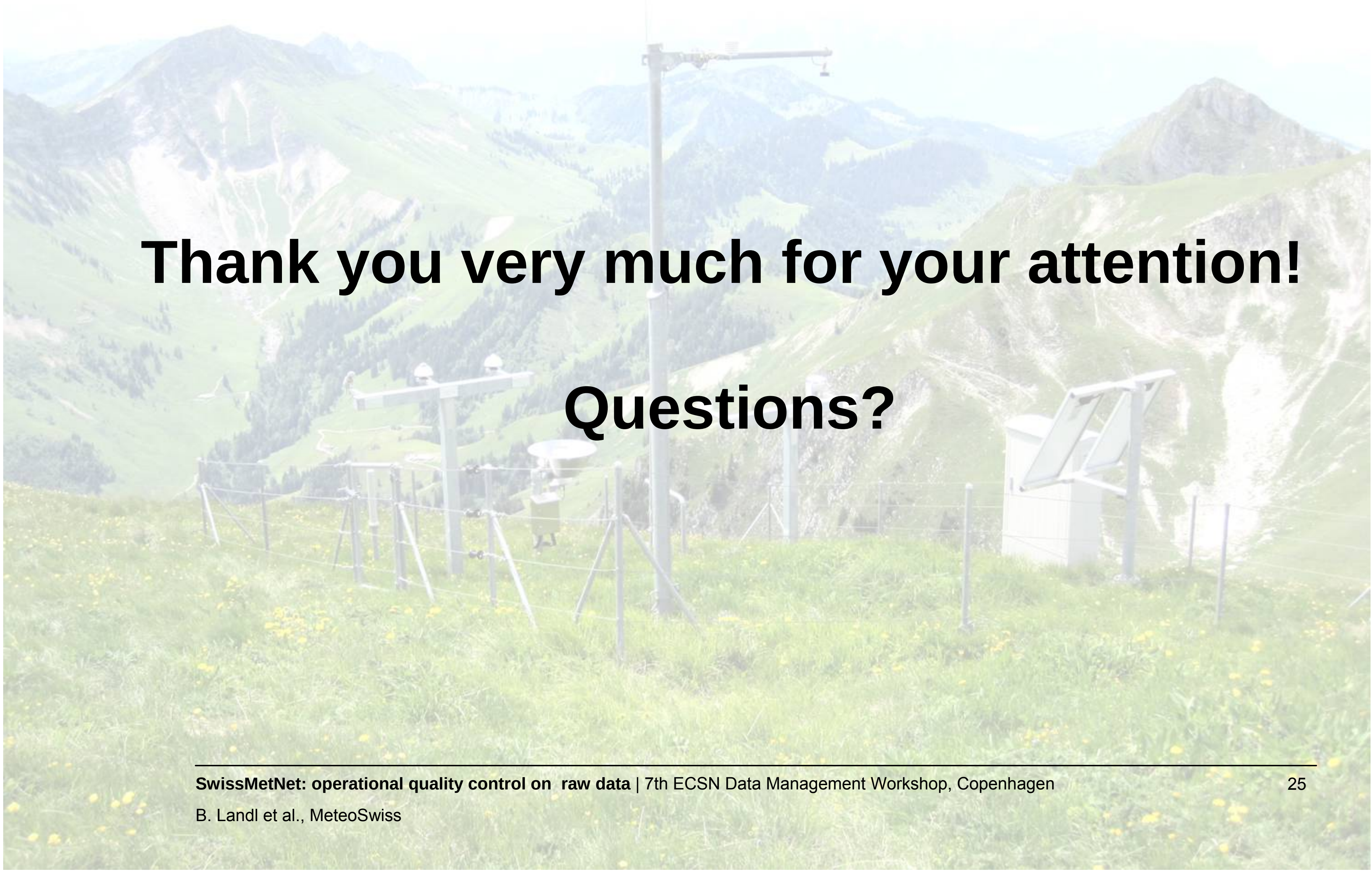
AIM: All sensors are tested!

Definition of new criteria; applying sensitivity tests

Analysis concerning duration of testing period (seasonal, monthly,….)

Development of further tests
(e.g. multiparameter correlation models -
using historic data sets and lists of interventions)

Long-term goal: Quality Control in Time and Space (QCTS)
→ Comparison with stations closby
→ Comparison with stations at similar altitudes



Thank you very much for your attention!

Questions?