Quality control & assessment for radiosonde data products

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Outline and motivation

- Current status in GRUAN
- Some ideas
- Start of discussion

**Motivation**

Meaningful response from LC to sites is demanded.

User of GRUAN data want to have best radiosonde data with controlled quality.
Current status in GRUAN

- RS92-GDP.2 → some rules are defined by LC → incl. assessment
- RS-11G-GDP.1 → other rules are defined by PC → NO assessment
- Until now → NO GRUAN-wide scheme and NO general rules for controlling & assessment are defined yet

The Lead Centre should not dictate such rules!
- Some ideas are available, but more are necessary
- Discussion is really needed with interested persons from community
- A formal definition of rules is required (published as TN or part of TD)
Using ground checks, e.g. within SHC and shelter to assess

- **Humidity**
  - Analyse check period
  - Relative humidity [%]
  - $\Delta U = (0.92 \pm 0.015)\%$
  - $U_{ref} = (100.00 \pm 0.248)\%$
  - $U = (100.92 \pm 0.013)\%$

- **Temperature**
  - **Temperature**
  - $\Delta T = (0.12 \pm 0.003)\, ^\circ C$
  - $T_{ref} = (24.94 \pm 0.003)\, ^\circ C$
  - $T = (25.06 \pm 0.001)\, ^\circ C$

- **Pressure**
  - **Pressure**
  - $\Delta p = (0.05 \pm 0.004)\, hPa$
  - $p_{ref} = (1016.48 \pm 0.001)\, hPa$
  - $p = (1016.53 \pm 0.004)\, hPa$

- **Differences in SHC check period**
  - Relative humidity [%]
  - $\Delta U = (3.78 \pm 0.077)\%$
  - $U_{ref} = (65.89 \pm 0.051)\%$
  - $U = (69.67 \pm 0.065)\%$

- **Differences in SHELTER check period**
  - Relative humidity [%]
  - $\Delta U = (3.78 \pm 0.077)\%$
  - $U_{ref} = (65.89 \pm 0.051)\%$
  - $U = (69.67 \pm 0.065)\%$

**Site:** NYA
**System:** NYA-RS-01
**Setup:** OZONE2
**Date:** 2019-04-17
**Time:** 12:00:00
**B-No:** 1
**Sonde:** RS41-SGP
**SN:** P0540833
**Step:** 29
**AnalyzeSHC**

**Site:** NYA
**System:** NYA-RS-01
**Setup:** ROUTINE2
**Date:** 2019-04-07
**Time:** 12:00:00
**B-No:** 1
**Sonde:** RS41-SGP
**SN:** P1040308
**Step:** 30
**AnalyzeShelter**
What are the thresholds to say “good”, “acceptable” and “unacceptable”?

How should we proceed? (processing, dissemination)
Using results from QC to assess

- How do data gaps influence the "quality" of a sounding?
- Should data files be distributed with data gaps?
- How do noise of data but also outliers influence the "quality" of a sounding?
Using uncertainties to assess

- How do larger uncertainty of data influence the "quality" of a sounding?
- What are the thresholds to say “good”, “acceptable” or “unacceptable”?
- Should different “assessments” be provided for different altitude ranges?
Using detected or assumed contamination to assess

- How does contamination influence the "quality" of a sounding?
  - Real detected contamination using measurement data
  - Assumed contamination from meta-data description

- Too large humidity level in stratosphere
- Water vapor mixing ratio (mass & volume)
- Cloud detection using relative humidity

- Wet clouds determined
- Info: 7 clouds which are together 2.729 km thick
## Quality assessment – a concept

<table>
<thead>
<tr>
<th></th>
<th>Pressure / Alt.</th>
<th>Wind</th>
<th>Temperature</th>
<th>Humidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground check</td>
<td>Large GC correction</td>
<td>OK</td>
<td>OK</td>
<td>OK</td>
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<td></td>
<td>OK</td>
<td>OK</td>
<td>OK</td>
<td></td>
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<tr>
<td></td>
<td>Large difference between U1 &amp; U2</td>
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<tr>
<td>Troposphere</td>
<td>OK</td>
<td>GPS failure for 2 kilometers</td>
<td>Contamination detected (2 – 4 km)</td>
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<td></td>
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<td>OK</td>
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<tr>
<td></td>
<td>Large uncertainties in TP region</td>
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<tr>
<td>Stratosphere</td>
<td>OK</td>
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<tr>
<td></td>
<td>Large uncertainties above 27 km</td>
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<td>Large uncertainties above 33.5 km</td>
<td>More than 100 % relative uncertainty</td>
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<td>Assessment summary</td>
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<td>?</td>
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<tr>
<td>GRUAN stamp?</td>
<td>?</td>
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</tbody>
</table>
Discussion

- These ideas are a first input for discussion.
- Do you have more/other ideas?
- The Lead Centre needs participations from community.

Wanted! → Group of persons to
- think about general scheme and details → discuss and decide
- write down and publish as official GRUAN document