World Meteorological Organization · Commission for Instruments and Methods of Observations

Solid Precipitation Intercomparison Experiment
WMO/CIMO-SPICE
Report on the Field Reference System for precipitation amount

Introduction

- Twenty sites around the world are participating in the Solid Precipitation Intercomparison Experiment (SPICE), organized by WMO/CIMO.
- The goal of SPICE is to improve our understanding the complexity of measuring solid precipitation with its large uncertainties, often influenced significantly of local climate conditions and small differences in measurement.

- On of the key challenges of such a multisite effort is the ability to define and operate field references that are consistent among the participating sites and are traceable to previous results, especially, as no standard for the measurements of solid precipitation exists.
- The report on the SPICE field working reference system for precipitation amount will define and characterize the field working reference systems for SPICE based on the work, data, and experiences collected until now within the SPICE collaboration.

Field Reference Systems

Standardization of the reference gauge configurations – to the extent possible – is a critical aspect of a successful comparison.

R0
- Provides the best estimate of "ground true"
- One or more precipitation gauges surrounded by a uniform growth of bushes
- Manual (Tretyakov gauge and shield) OR automated

R1
- Double Fence Intercomparison Reference (DFIR)
- Manual Tretyakov gauge and shield
- From 1st WMO Intercomparison of Solid Precipitation (1989-1993)

R2
- Double Fence Automated Reference (DFAR)
- DFIR-fence
- Automated precipitation gauge and single Alter shield
- Precipitation detector/disdrometer

R3
- Pair of identical automated gauges
- 1st unshielded
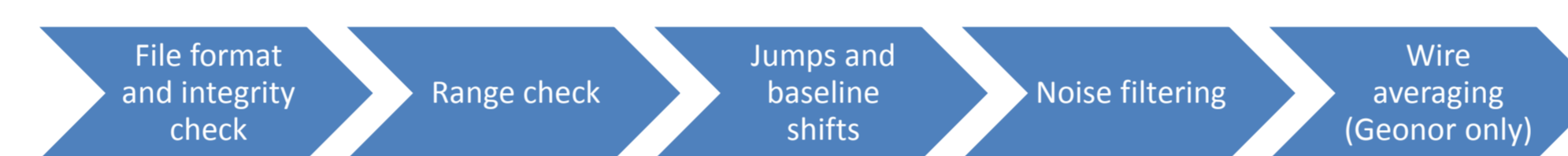- 2nd shielded with single Alter shield

Two gauges with wide operational use are part of the field reference systems for SPICE; both heated:
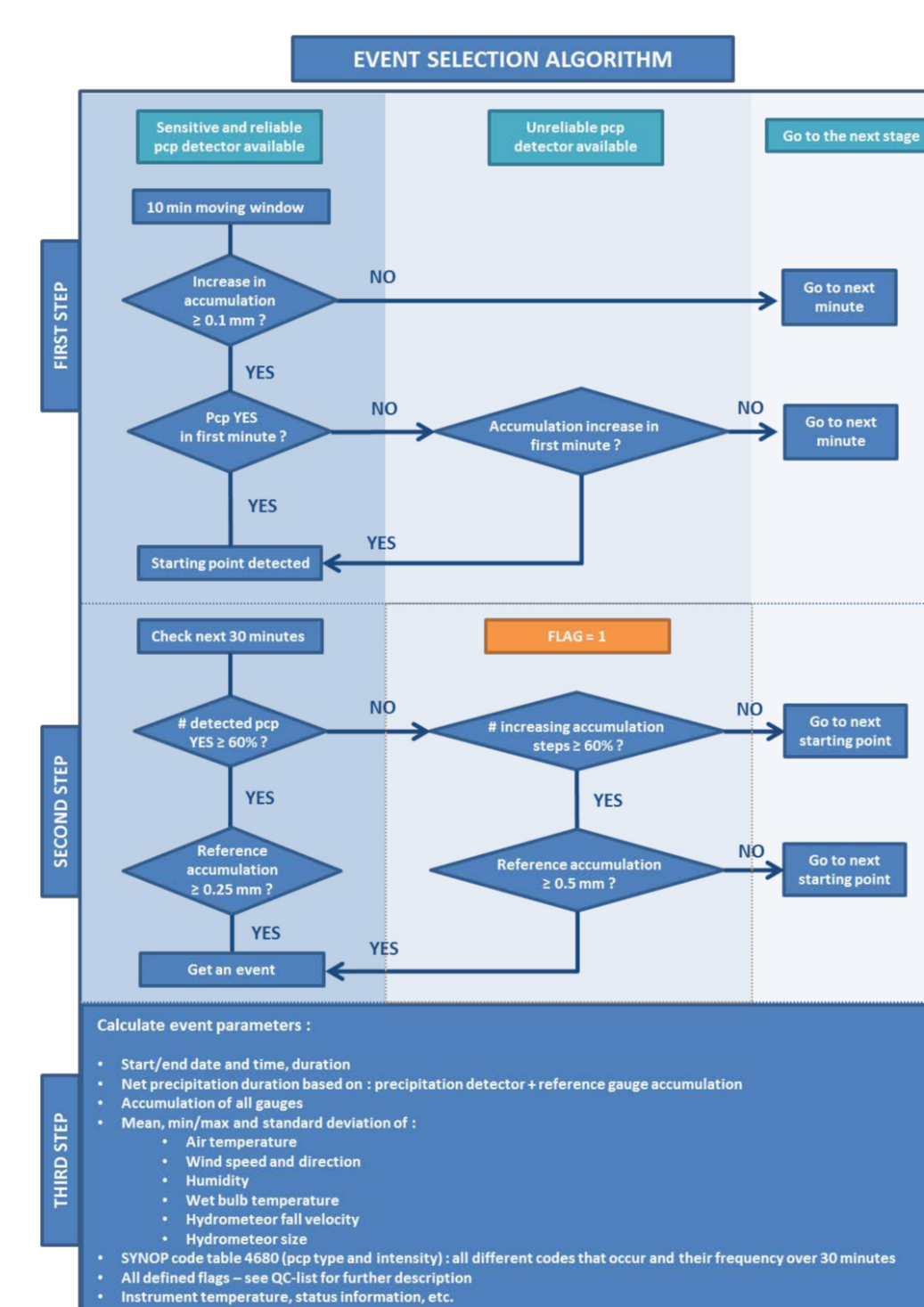- GEONOR T-200B3 gauge (with 3 transducers)
- OTT Pluvio² gauge

Data Processing

Equally important, as the standardization of the reference gauge configurations, is the standardization of the data quality control and processing procedures applied to site reference datasets. These datasets will be aggregated for the intercomparison analysis, and so must all be derived in the same way.

Quality Control

File format and integrity check → Range check → Jumps and baseline shifts → Noise filtering → Wire averaging (Geonor only)

Event Selection

EVENT SELECTION ALGORITHM

The event selection algorithm using quality-controlled data (1 min) from two instruments:
- A precipitation detector : (yes/no output).
- A precipitation gauge

Column 1 : uses data from both the precipitation detector and reference gauge.

Column 2 : describes the method when data from a precipitation detector is not available

Column 3 : indicates continuation of process.

The event file lists all 30 min periods with significant registered precipitation and aggregated, quality controlled measurements.

Uncertainty

The random uncertainty in the gauge measurements itself needs to be quantified to evaluate any results of the intercomparison.

Conditions under which shielding does not affect the measurements were identified using the available data, allowing to compare different shielded gauges of the same type, which is necessary to achieve robust statistics.

Example:
Analyzing rain data for five identical Geonor gauges with different wind shields:
- short DFIR,
- small DFIR,
- double-Alter shields (2x)
- single-Alter shield

Comparison of the individual gauge accumulations with the average accumulation:
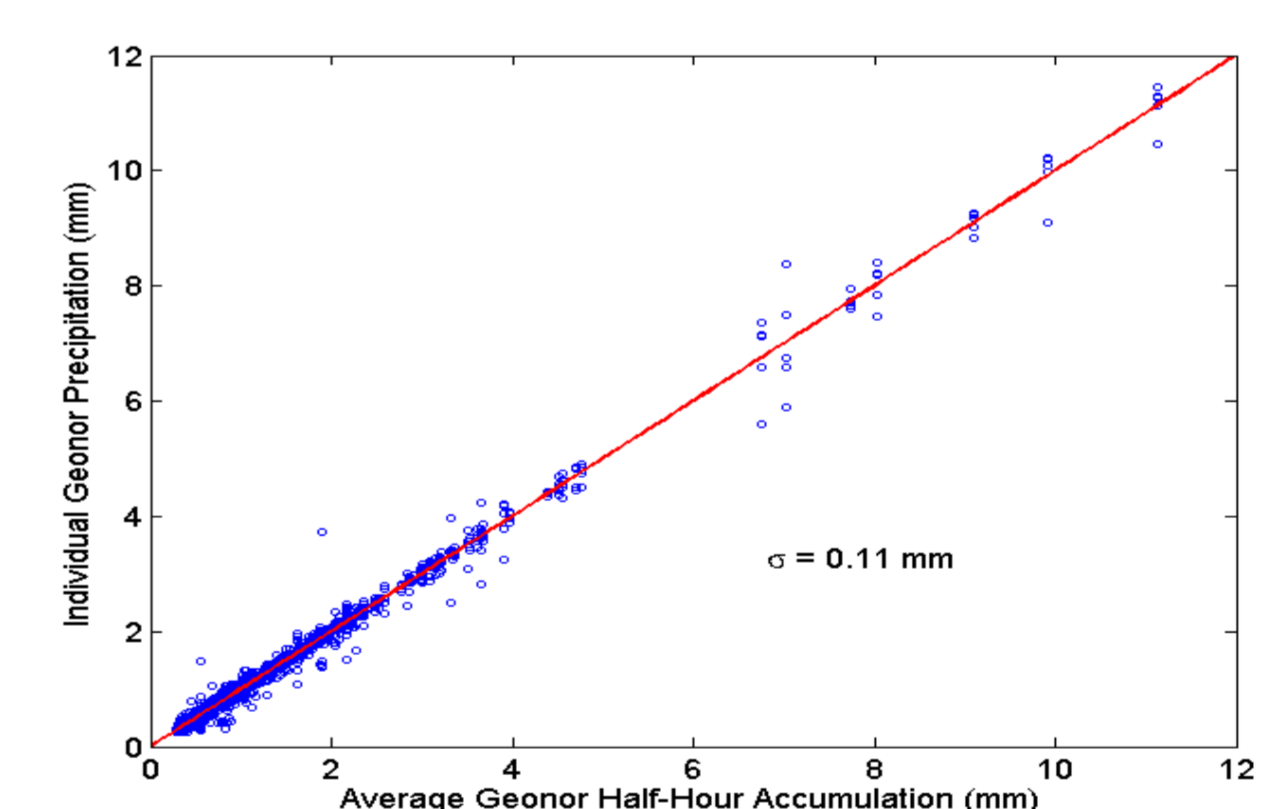
The average scatter index (standard deviation of the gauge accumulation) for these gauges was calculated to 0.13 mm or 13.8% for 30-min precipitation periods.

Relations/Transfer functions between references

R0-R1	R1-R2	R2-R3
• Analysis of historical data set from Valdai hydrological research station, Russia • New data from bush gauge with automatic gauges at Caribou Creek, Canada • Relate back to the last WMO Solid precipitation intercomparison with focus on manual observations	• Analysis of historical data from Bratt's Lake, Canada and Jokionen, Finland • Collect and anlyze new data at Care, Canada • Identify and quantify possible offsets due to the differences between manual and automatic observations	• The nature of the difference between shielded and unshielded gauge can be used to determine the appropriate transfer function to a DFIR for each site. • Concept developed with data from Marshal, USA • To be extended to all other sites

The report on the SPICE working field reference system will define and characterize the methodology used to derive the reference data for the proposed reference(s), and relate the results to previous experiments.
The SPICE-Team will engage the stakeholder community in an active discussion in order to increase clarity and understanding of the final results.

Contact the SPICE-team:

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