Vaisala RS92 Radiosonde and Vaisala DigiCORA® Sounding System MW31

Reference Upper Air Observations for the Global Climate Observing System: Potential Technologies and Networks, 22 – 24 May 2006

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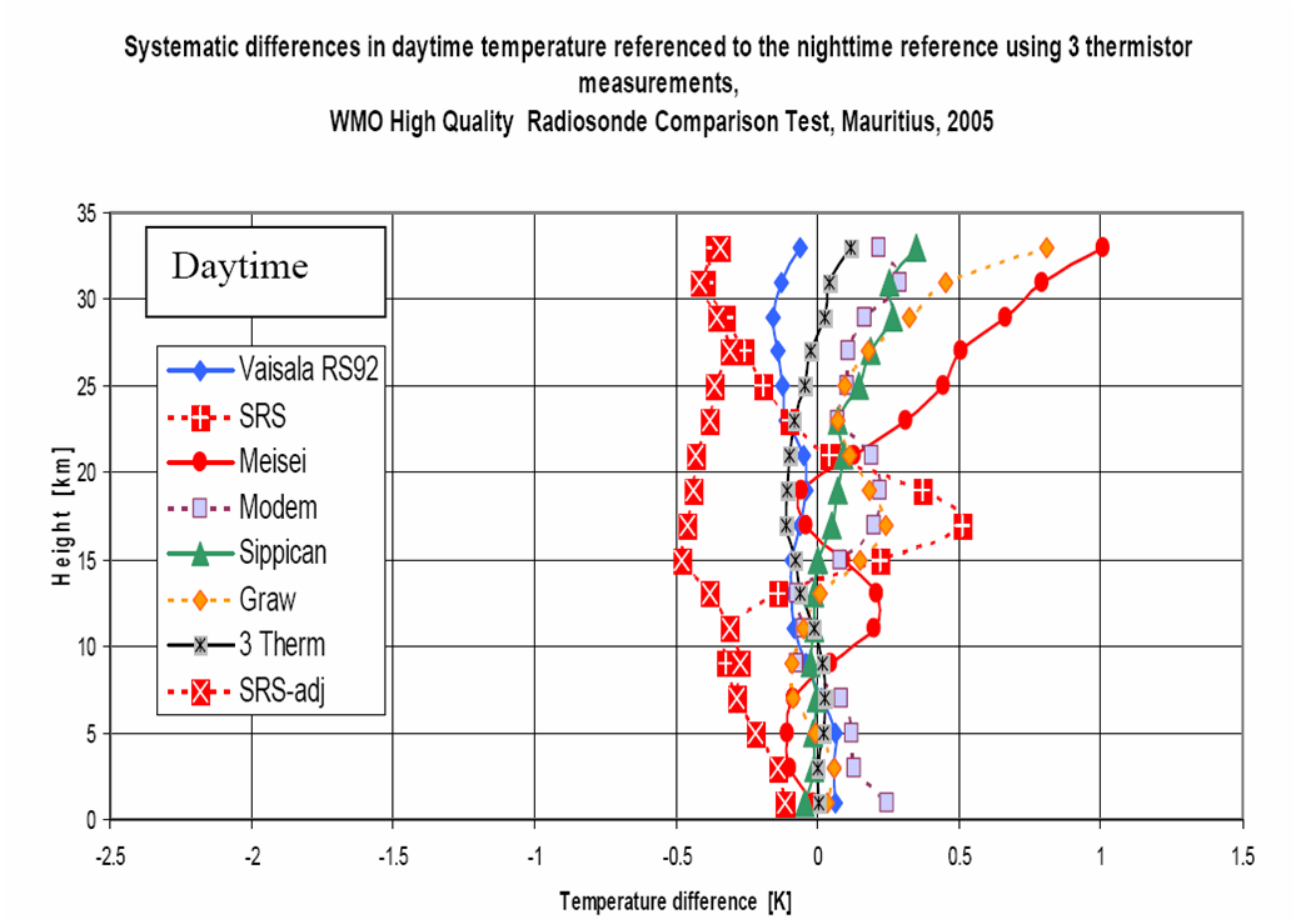
VAISALA

F-THERMOCAP thin wire temperature sensor

- Fast response time
- Small radiation error correction in all conditions
- Glass-ceramic active material enabling excellent long term stability. In each measurement cycle the sensor is referenced to internal long–term stable ceramic reference capacitor
- Measurement is finetuned in ground check preparation phase. GC references are traceable to international standards

GC25 Ground Check set

Temperature measurement performance



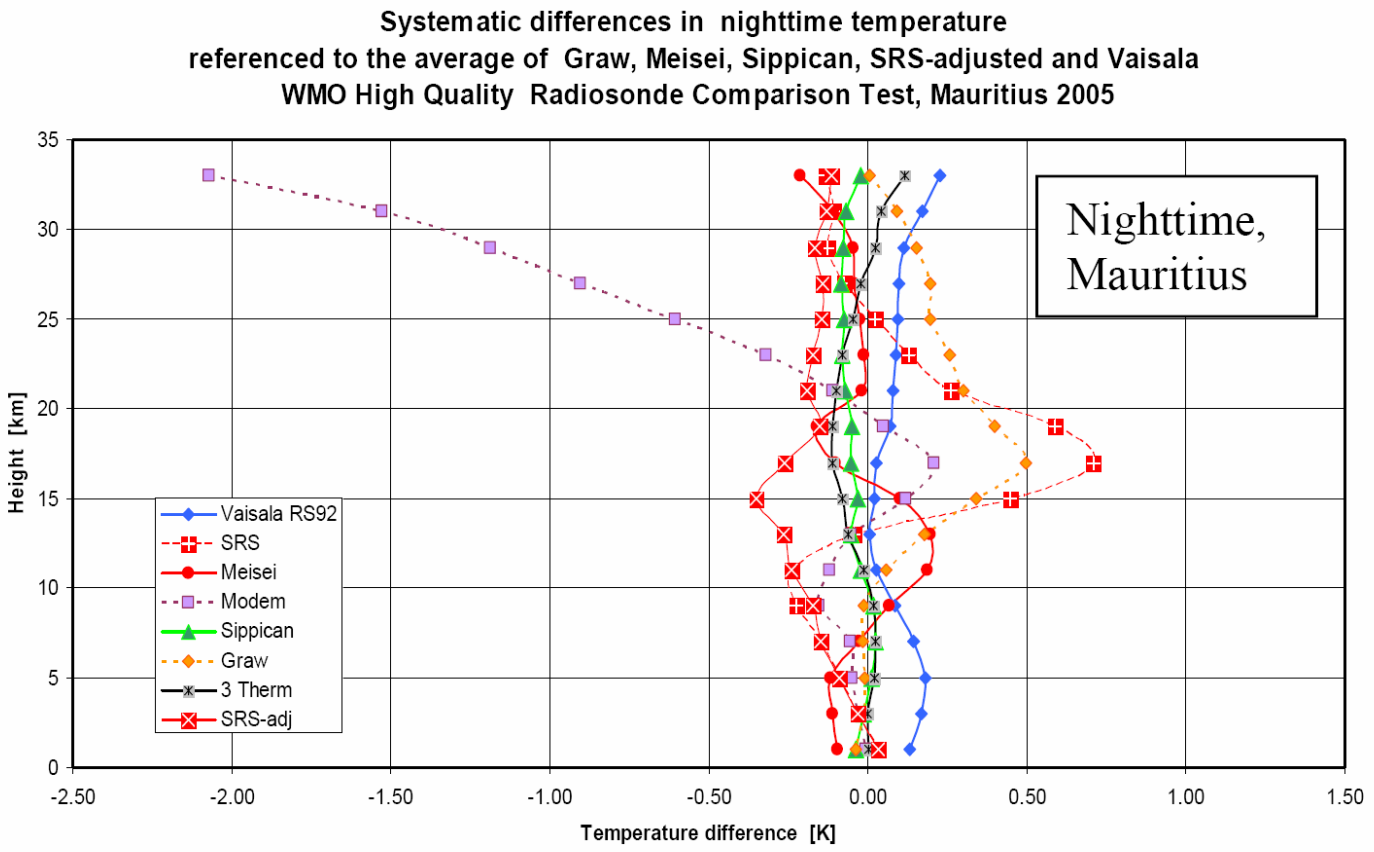


Fig. 9.6 Systematic bias between simultaneous temperatures (K) at night.

Temperature random errors, nighttime

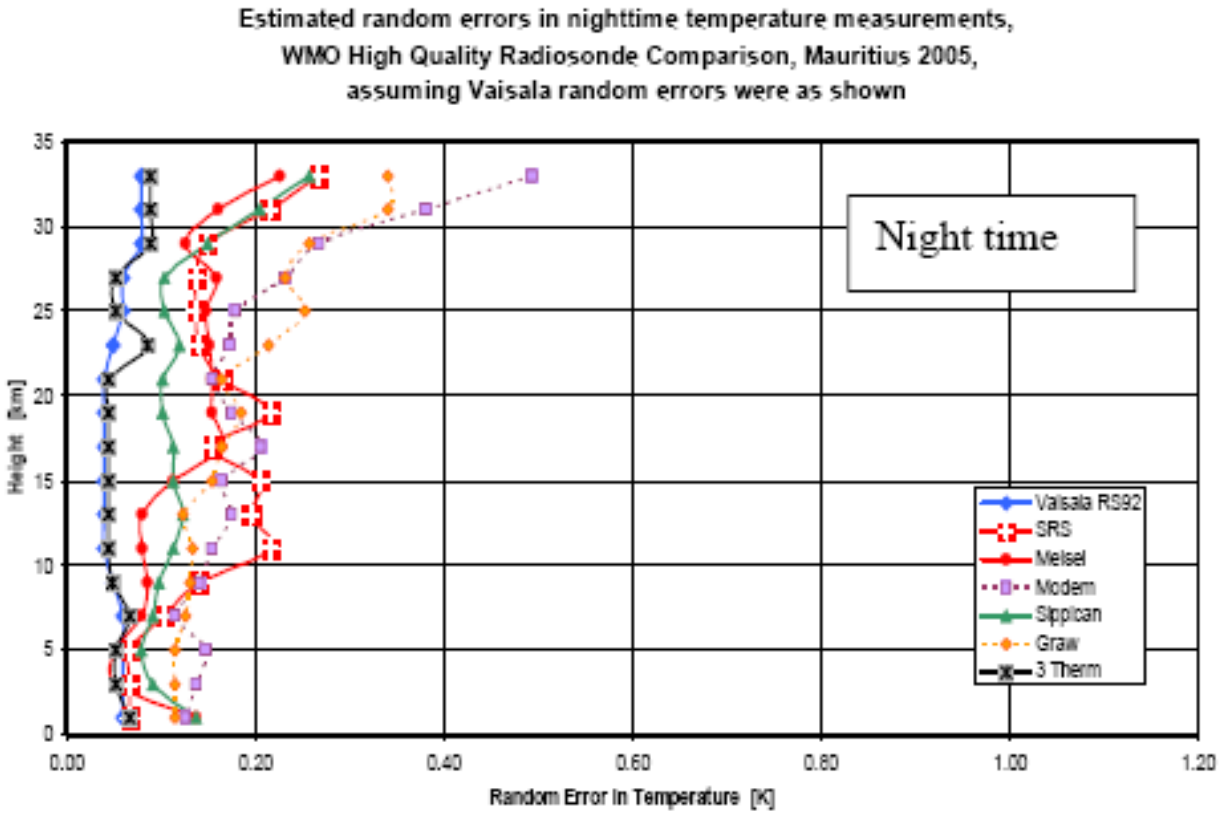


Fig. 9.9 Estimated random errors in temperature sensor measurements at night.

Temperature random errors, daytime

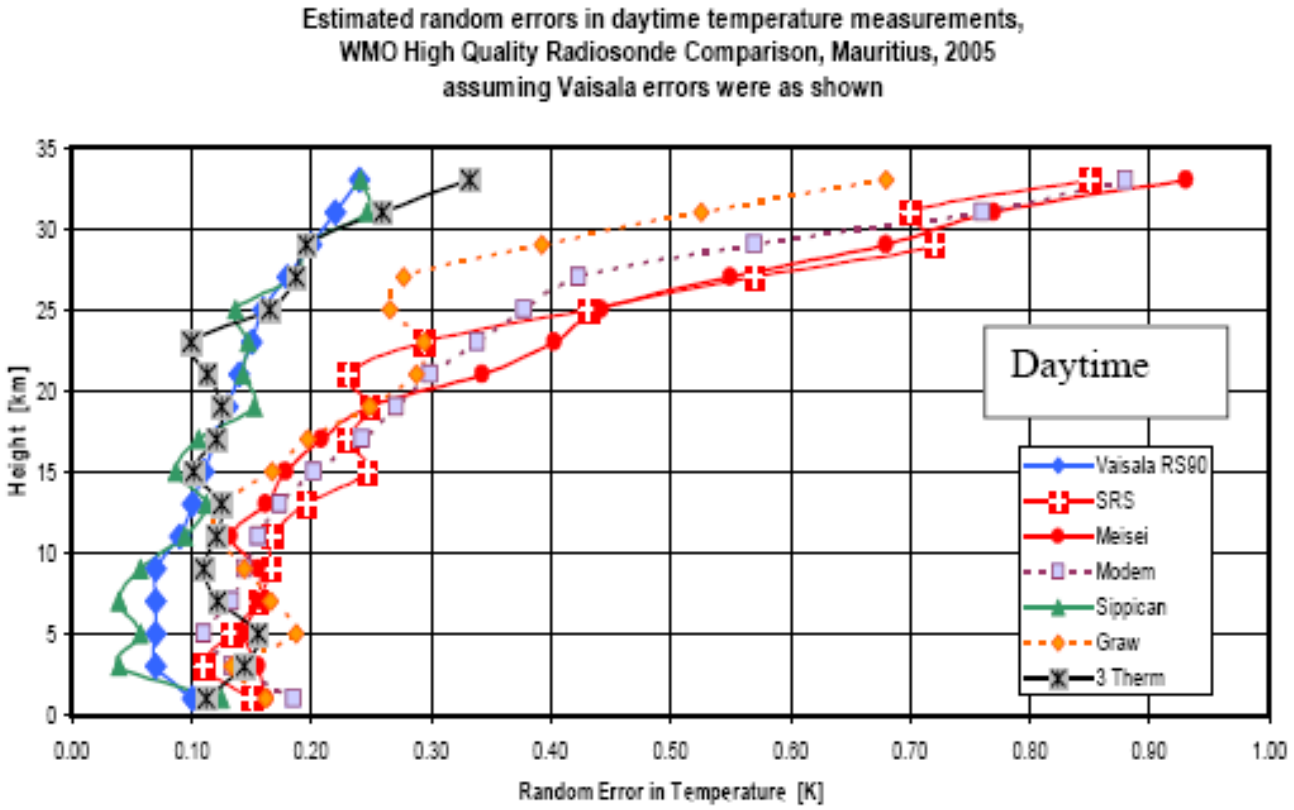
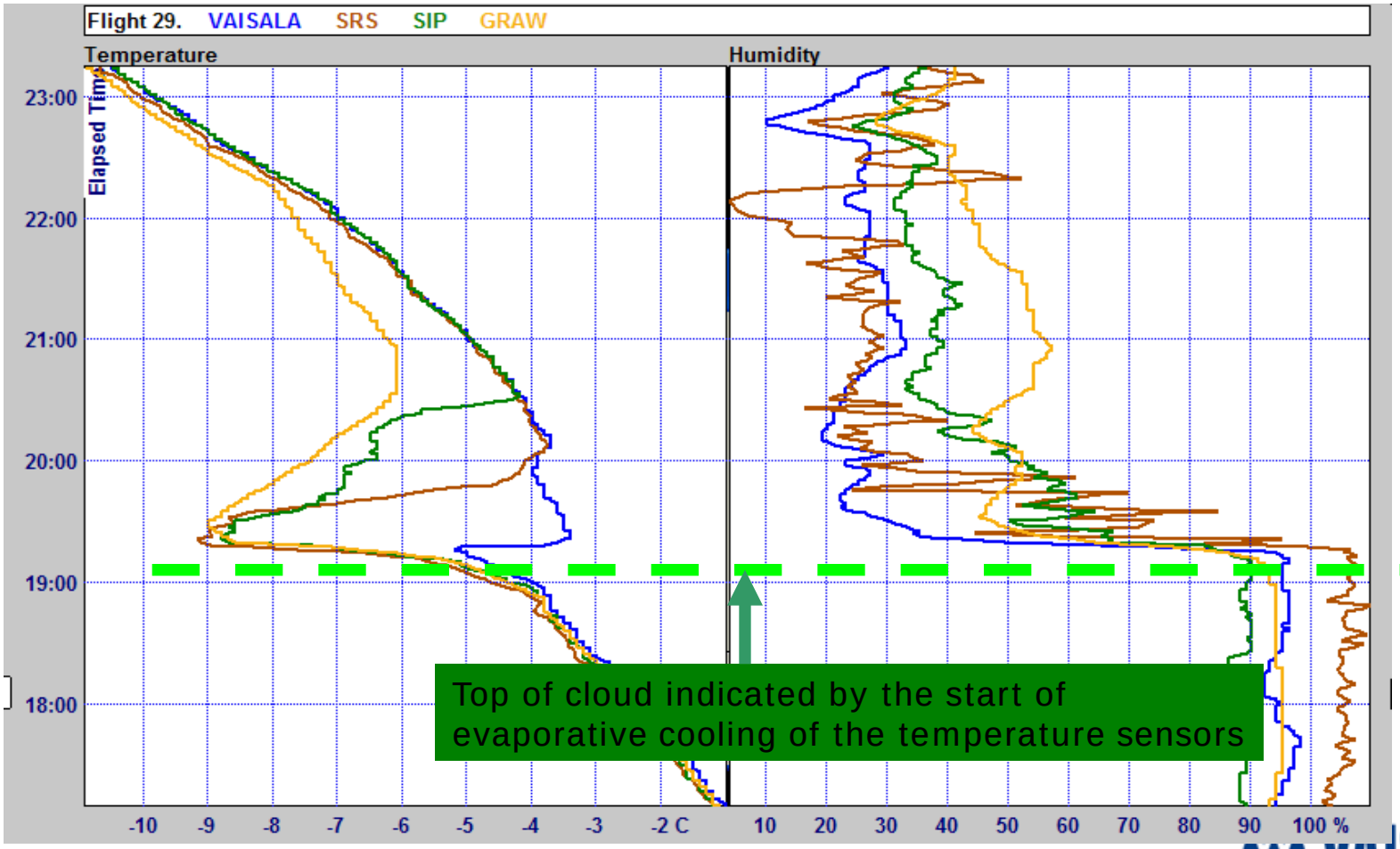


Fig. 9.14 Estimates of random error in daytime temperatures (K).

Temperature measurement performance above cloud top

Figure from presentation “Initial results from WMO High Quality Radiosonde Comparison, Mauritius”



Humidity sensor

- Technology based on long term Vaisala humidity sensor know-how.
- Specially developed for radiosonde application
- Manufacturing in new ISO5, ISO6 class clean room facilities
- Accurate calibration with excellent repeatability
- The humidity sensor comprises two sensors that are alternately heated to prevent ice from forming on them in freezing conditions
- To get optimum performance from the RS92 humidity sensors, the ground check includes a phase for removing possible sensor contamination (reconditioning).

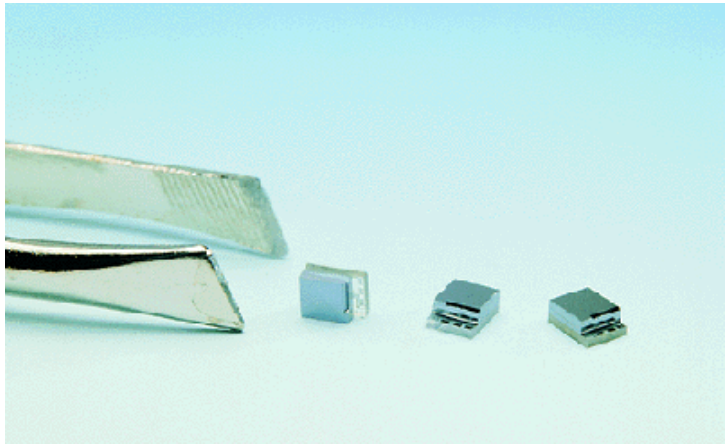
RS92 Radiosonde humidity sensor performance has been tested in intercomparisons / tests with good results

Some reports:

- **WMO Intercomparison of High Quality Radiosonde Systems, Vacoas, Mauritius, 2-25 February 2005** J. Nash, R. Smout, T. Oakley, B. Pathack, S. Kurnosenko
- **Absolute Accuracy of Water Vapor Measurements from Six Operational Radiosonde Types Launched During AWEX-G, and Implications for AIRS Validation** L. Miloshevich, H. Voemel, D. Whiteman, B. Lesht, F. Schmidlin, and F. Russo, 2006. *J. Geophys. Res, 111*.
- **LAUTLOS upper-air humidity comparison – the first results.** U. Leiterer, V. Yuskov, R. Neuber, P. Ruppert, A. Paukkunen, E. Kyrö, D.G. Feist, H. Vömel, A. Kats, T. Brossi, H. Dier, T. Naebert. WMO, TECO-2005, Bucharest, Romania
- **Two time-series interpretations: 1) The effect of the Mt. Pinatubo eruption on arctic lower stratospheric aerosol and 2) the homohenity of the Vaisala radiosonde humidity records** T. Suortti: Thesis for Phil. Lic. in Meteorology, University of Helsinki

Silicon micromachined pressure sensor

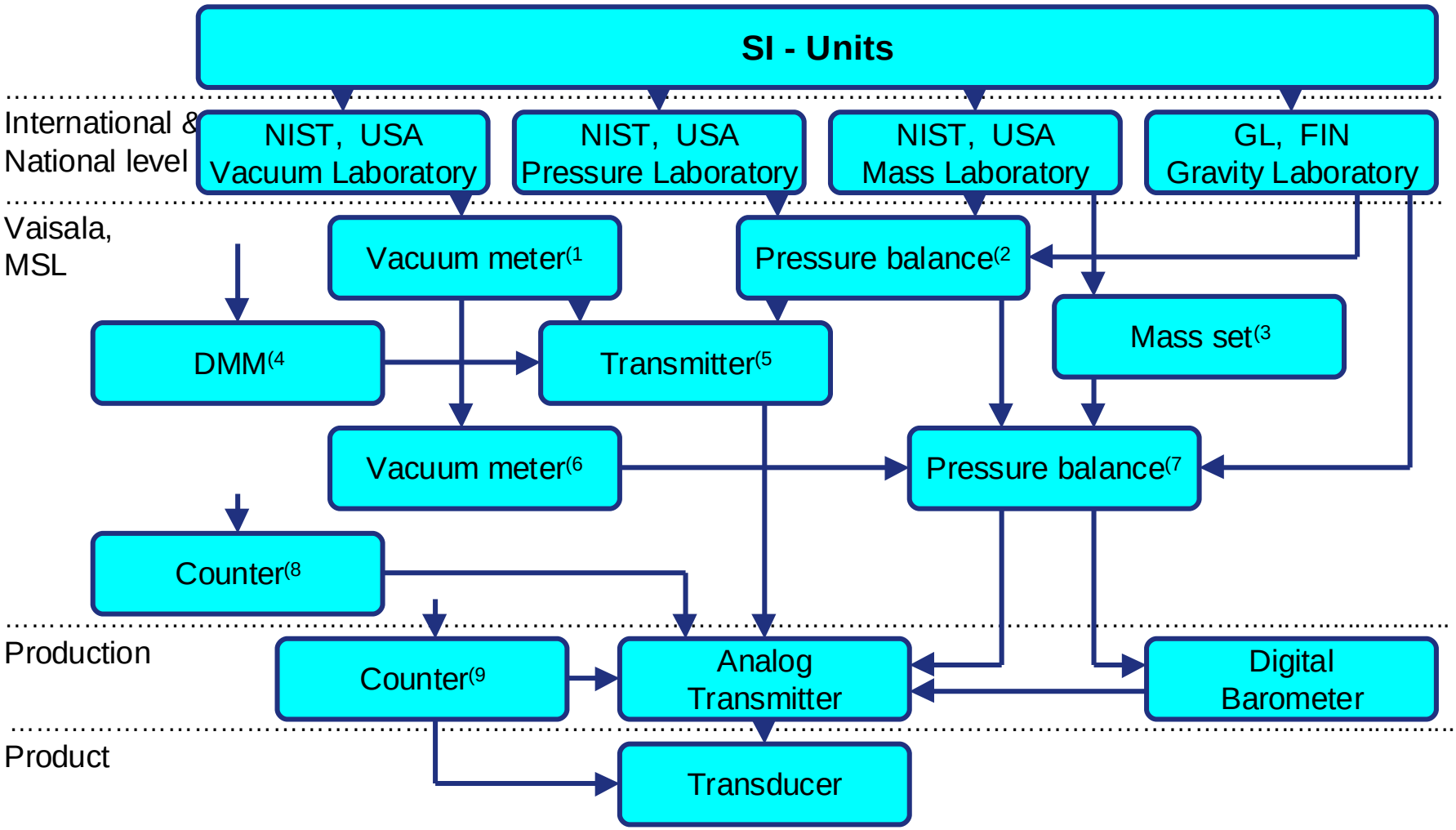
- Excellent long-term stability
- Accurate pressure measurement in conditions of fast ambient temperature changes
- Added protection against shock damage during transportation.



CAL-4 Calibration

- **Accredited Vaisala Measurement Standards Laboratory (MSL)** maintains primary standards for pressure, temperature and humidity at Vaisala Oyj and calibrates the working standards used in radiosonde production.
- All working references for radiosonde calibration with the CAL-4 calibration machine are traceable to international standards

Example: Pressure measurement traceability



GPS wind measurement

- The Vaisala Radiosonde RS92-SGP code correlating GPS receiver has a very fast search engine which ensures that all satellites in view are tracked. Optimized filter is used for sonde/balloon pendelum effect smoothing.

Fully digital data transmission

- Narrowband transmission downlink, comprising error detection and correction fulfills the requirements of the ETSI EN 302 054 European standard for digital radiosondes.

DigiCORA® Sounding System MW31

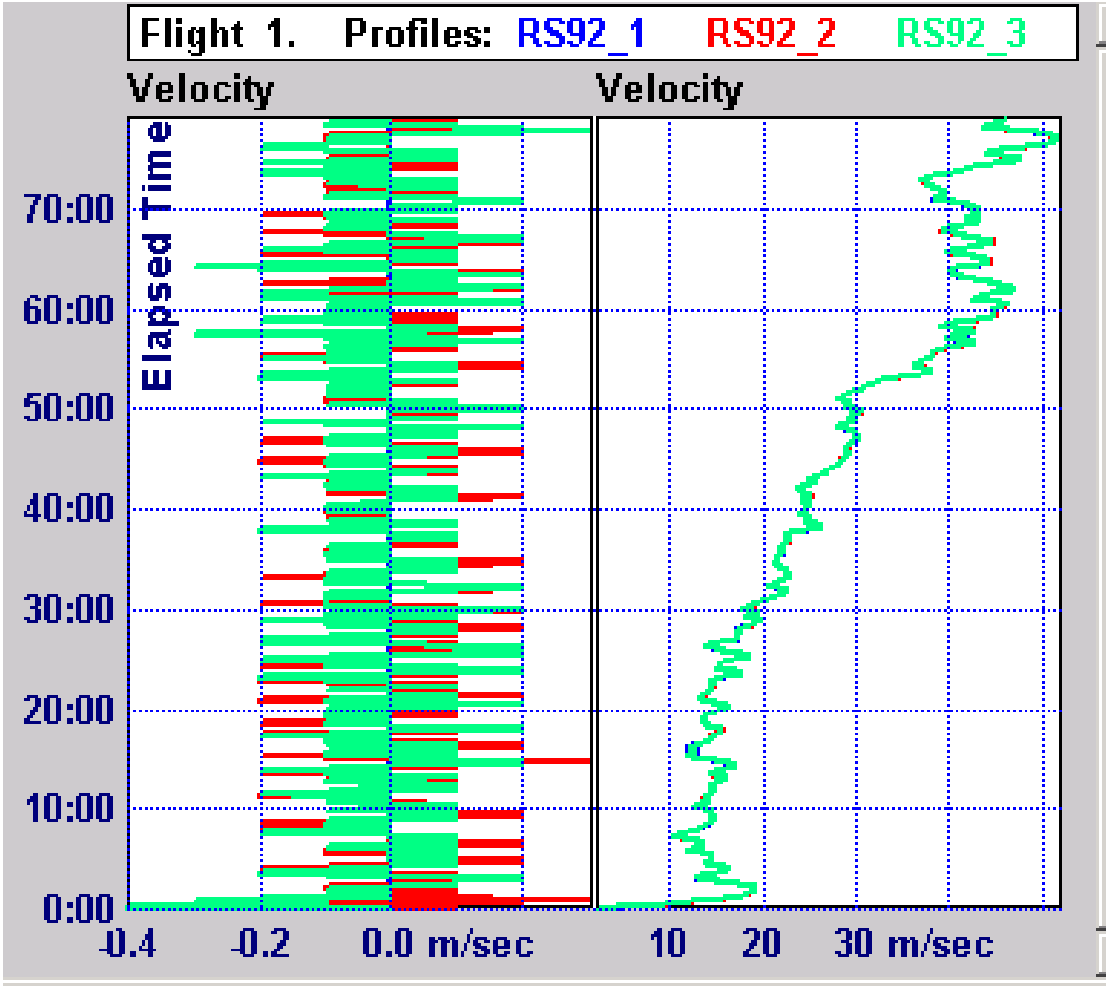
- The Vaisala DigiCORA® Sounding System MW31 consists of a PC connected to the Vaisala Sounding Processing Subsystem SPS311.
- The DigiCORA® sounding software incorporates basic modules for data analysis, archival and relaying of meteorological messages as well as several optional modules
- The SPS311 contains the processor cards for data reception and wind-fi nding, with connections to the required antennas. Th e system configuration is dependent upon the wind-finding method required

Vaisala DigiCORAIII Sounding System MW31

Vaisala DigiCORA Sounding System MW31 and GC25 Ground Check Set

RS92-GPS wind finding performance, velocity

Reproducibility of wind velocity



RS92-GPS geopotential height calculation reproducibility

Typical performance of three RS92 radiosondes measuring the same altitude

Note: The absolute accuracy varies due to satellite constellation and various error sources