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Vaisala RS92 Number One in WMO Intercomparison

Vaisala Radiosonde RS92 received the highest score in WMO's Radiosonde Intercomparison.

Vaisala Radiosonde RS92 was proven to be the world's top radiosonde as it was placed number one in the 8th World Meteorological Organization (WMO) Intercomparison of Radiosonde Systems held last July in Yangjiang, China. The Vaisala RS92-SGP – operated together with the Vaisala DigiCORA® Sounding System MW31 – achieved very good overall results in terms of all measurement parameters.

The Intercomparison, organized every 4-5 years, is a continuous four-week sounding campaign, designed to be an objective venue for assessing the qualities and performance of different radiosonde systems. More instruments than ever before were entered into the 8th Intercomparison, making it the largest measurement campaign in the history of modern radiosondes.

High Level of Temperature Measurements in Demanding Conditions

The Vaisala RS92-SGP got almost perfect scores in all the measurement parameters, meeting and even exceeding international observation network requirements. It performed very well in temperature measurement, being highly consistent and maintaining the level of performance also in demanding conditions, such as those experienced after emerging from clouds. The RS92 thin-wire temperature sensor features very fast response time with small solar radiation error.

The Vaisala RS92 temperature sensor performed consistently under different solar radiation conditions, and showed very good agreement between daytime and nighttime observations. High solar radiation intensity combined with varying cloud conditions and low atmospheric pressure created demanding conditions for achieving accurate upper tropospheric and stratospheric temperature measurements during the day, and even though solar radiation does not effect measurements in nighttime conditions, good sensor properties are required to make the measurement insensitive to long-wave radiation.

Only Model with Protection Against Evaporative Cooling

The RS92 was the only radiosonde in the Intercomparison that incorporates working protection against evaporative cooling. Evaporative cooling can happen when a radiosonde emerges from a cloud into a dryer layer, and water accumulated to the surface of the temperature sensor during the ascent starts to evaporate. The evaporation causes

How we measured up

	Vaisala	LMS	Graw	Modem	Meisei	Intermet
Temperature, Night, Height < 16 km	5	5	4.5	5	5	4.5
Temperature, Night, Height > 16 km	5	5	4.5	5	5	3.25
Temperature, Day, Height < 16 km	5	5	4.5	5	4	4.75
Temperature, Day, Height > 16 km	5	5	4.25	5	4.25	3.25
Protection for Evap. cooling errors	Yes	No	No	No	No	No
Humidity, T > -40 °C, Night	5	5	5	3	4.75	4.5
Humidity, T > -40 °C, Day	5	5	4.75	4.25	5	4.25
Humidity, T < -40 °C, Night	5	4.75	4.5	4.25	4	4.5
Humidity, T < -40 °C, Day	4.5	4.5	4.25	3	3	2.5
Height, P < 100hPa	5	5	5	5	4	5
Height, P > 100hPa	5	5	5	5	5	5
Pressure, P < 100hPa	5	5	4.5	5	4.5	4
Pressure, P > 100hPa	5	5	4.5	4.75	4.25	4.75
Wind, troposphere	5	5	5	5	5	5
Wind, stratosphere	5	5	5	5	5	5
2 years in operation	Yes	Yes	New	Yes	New	Yes

Source: WMO Final Report

Vaisala RS92's performance against globally operating competitors.

the sensor to cool down and show abnormally low temperature values.

To minimize this effect, the temperature sensor in RS92 is protected with a hydrophobic coating, which prevents water from accumulating on the sensor. The positive effect of the protection was clearly visible already during the previous Intercomparison in 2005, and the campaign in China provided further evidence showing that if the temperature sensor is not properly protected, evaporative cooling can cause several degrees of error in temperature measurement in the atmospheric layer for several hundreds of meters above a cloud.

Humidity Measurement Stands Out

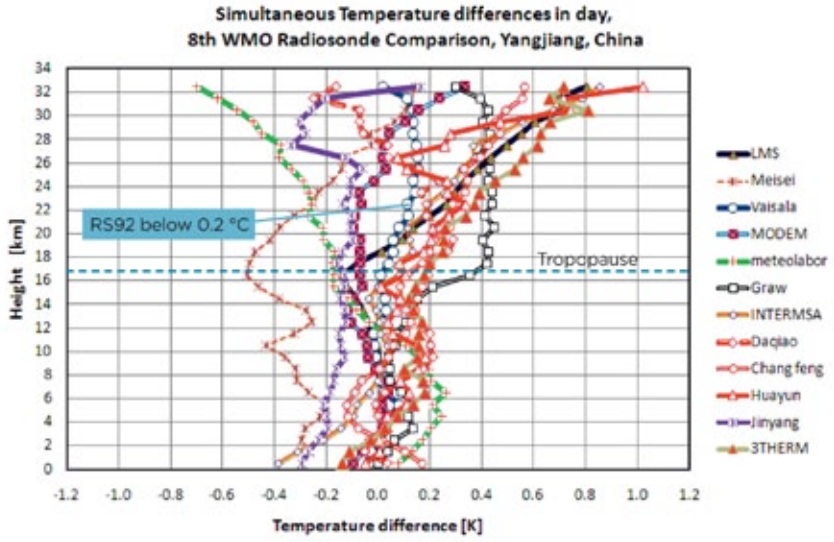
The Vaisala RS92 humidity measurement stood out as being excellent. Compared to a Cryogenic Frostpoint Hygrometer (CFH), which is often used as a reference for upper-air water vapor measurements, the RS92-SGP showed systematic errors of less that 2% RH and random errors of ~5% from the surface to the lower stratosphere. The good result can largely be attributed to the technical solutions in the RS92's sensor, the exposure for free ventilation during soundings, and the algorithms used to produce the humidity values.

The day-night differences in humidity measurements were also compared against integrated water vapor (IWV) data from nearby GPSMET stations. The RS92 showed good reproducibility, as the IWV values derived from the RS92 humidity profiles were highly consistent both during the day and at night when compared to GPS IWV values.

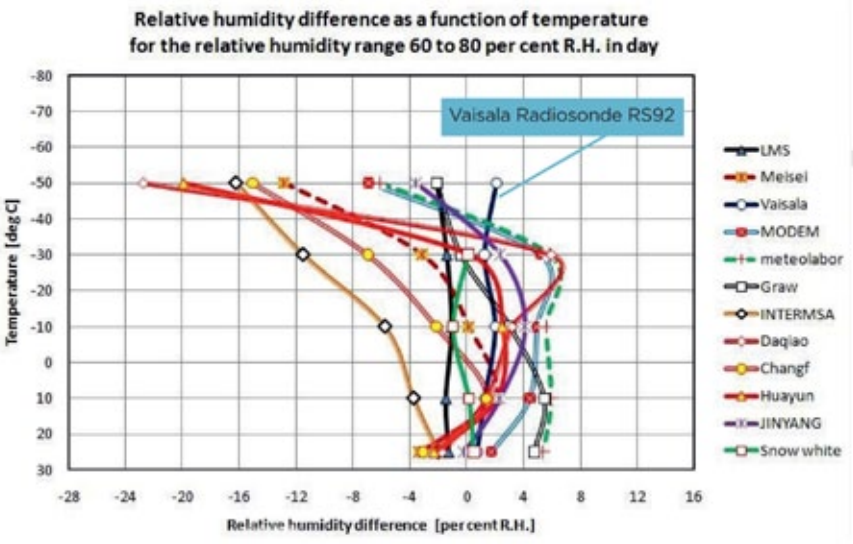
Accurate Data for Wide Range of Applications

In addition to the highly accurate humidity and temperature measurements, also geopotential height, pressure, and wind measurements were at a very high level and showed highly consistent performance throughout the Intercomparison. All three are based on the observations from the onboard GPS receiver.

The Intercomparison results show that Vaisala's sounding system is the best-performing combination for upper-air in-situ observations, and provides the most accurate data for a wide range of meteorological applications, such as numerical weather prediction models, climatology, and synoptic meteorology.



Systematic bias between simultaneous temperatures (K) of tested radiosonde models in daytime conditions, with reference adjusted above 16 km to take into account estimate of day-night differences in geopotential height analysis. A considerable variation between the models can be detected from 14 km up, ranging from 0.7°C to 1.0°C from the reference line at 32 km. The RS92 measurement result is good, within 0.2°C from group reference. Source: WMO Final Report.



Example of relative humidity differences. Systematic bias (%) of relative humidity sensors for the 60-80% RH band (daytime sounding). Source: WMO Final Report.

Further information

WMO's final report on the results of the Intercomparison is available online at www.wmo.int/pages/prog/www/IMOP/publications/IOM-107_Yangjiang.pdf

For more information on the Vaisala RS92, go to www.vaisala.com/RS92