Comparison of Selected In-Situ and Remote Sensing Technologies for Atmospheric Humidity Measurement

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Radiosonde Humidity Measurement RS92 vs. RS41

	Radiosonde	RS92-SGPD	RS41-SG	RH
RH twin- sensor	Sensor type	Thin-film capacitor, heated twin sensor	Thin-film capacitor, integrated T sensor, heating functionality	KII SENSOR
	Uncertainty in sounding	5 %RH	4 %RH	
	Response time (63 %)	< 20 s (T=-40 °C)	< 10 s (T=-40 °C)	
	Ground check	Corrected against 0%RH humidity generated by desiccants	Corrected with RS41 in-built Physical Zero Humidity Check	

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NASA Jet Propulsion Laboratory Table Mountain Facility in California, USA

34.40°N, 117.70 °W 2285 m above mean sea level





Sounding campaign:

- 2014-05-29 2014-10-30
- 19 dual launches RS41-RS92

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Night-time soundings

Instruments in the Table Mountain Campaign

Raman Lidar

- Nd:YAG 355 nm, 650mJ/pulse
- Detection range 1–20 km
- Calibration to RS92 3–6 km
- MR uncertainty 5–15 % (1-13 km)
- **GPS**, NOAA Forecast Systems Lab Seth Gutman, Kirk Holub
 - IPW uncertainty 1.5 mm + 1%
- MWR, Naval Research Lab Gerald Nedoluha
 - IPW uncertainty 3%





Examples of Relative Humidity Profiles



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Relative Humidity – Summary of 17 Flights



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A Water Vapor Volume Mixing Ratio Profile



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Water Vapor Volume Mixing Ratio - Means of 17 Flights



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Integrated Precipitable Water Column



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Integrated Precipitable Water Column



Arctic Research Center of Finnish Meteorological Institute in Sodankylä



67.368 °N, 26.633 °E 179 m above mean sea level 6 launches: CFH - RS41 - RS92 2014-02-07 - 2014-11-19



Cryogenic Frostpoint Hygrometer (CFH)

Measured Parameters	Ambient Frost Point		
Derived Parameters	Relative Humidity, Mixing Ration		
Technique	Temperature-controlled chilled mirror		
Uncertainty Measurement	< 4% in tropical lower troposphere < 10% in middle stratosphere < 9% in tropopause		
Altitude Range	0 - 25 km (all climates)		
Weight	< 400 g (without coolant)		
Instrument Dimensions	7.6 cm x 7.6 cm x 13.3 cm		
Dimensions (in Flight Box)	~12" W x 12" D x 12" H (~39cm x 39cm	n x 39cm)	

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Examples of Relative Humidity Profiles



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Examples of Relative Humidity Profiles



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Relative Humidity – Summary of 6 Flights



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Example of Water Vapour Mixing Ratio Profile



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Water Vapor Volume Mixing Ratio - Means of 6 Flights



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Water Vapor Volume Mixing Ratio - Means of 6 Flights





Water Vapor Volume Mixing Ratio - Means of 6 Flights



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Thank you

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