



# IASI LEVEL 2 WATER VAPOR AND TEMPERATURE PROFILE COMPARISONS WITH IN SITU MEASUREMENTS

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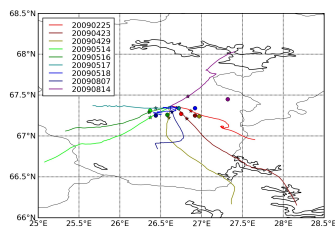


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## Introduction

Confidence in satellite observations is based on independent validation measurements. Sodankylä in northern Finland (67.4° N, 26.6° E) is among the sites that have actively participated in satellite data validation campaigns during the recent years. A large data set of ground based measurements suitable for satellite data validation was collected during the Atmospheric Sounding Campaign of the EUMETSAT Polar System (EPS) in Sodankylä, Finland in summer 2007. Recently another atmospheric sounding campaign took place in Sodankylä motivated by the need to obtain accurate water vapor profiles over land surface including the snow-cover period. During both campaigns we used cryogenic chilled mirror hygrometers (CFH) that are capable of accurate measurements of water vapor in the upper troposphere. In addition, we made comparison flights with RS92 radiosondes in order to investigate the differences in radiosonde humidity relative to the CFH in the upper troposphere.

## Sounding trajectories over northern Finland

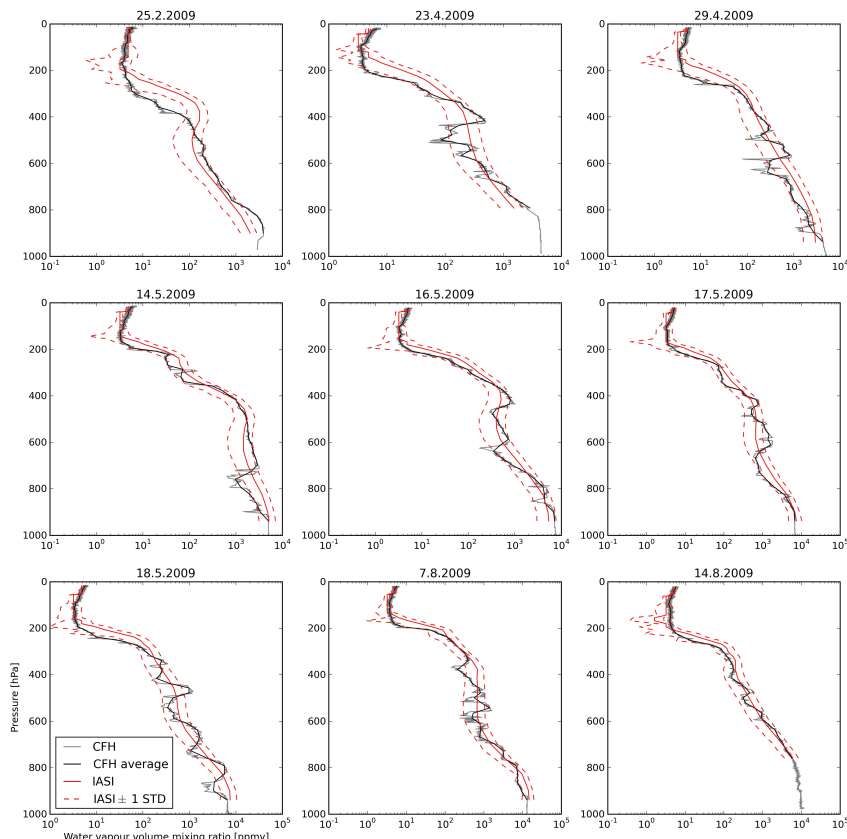


	date	time (UT)	min pressure	max altitude	IASI ovp time (UT)	distance IASI-SND
	14.08.09	09:24:32	11.23	30.83	09:54:44	21.1
	07.08.09	09:11:07	11.90	30.59	10:39:33	9.4
	18.05.09	11:25:06	14.29	28.94	10:15:59	9.6
	17.05.09	08:35:59	16.58	28.86	08:56:42	5.2
	16.05.09	17:12:02	15.90	29.85	17:33:04	10.3
	14.05.09	08:03:10	13.68	29.06	08:18:37	8.9
	29.04.09	18:04:59	11.74	29.69	18:25:54	16.2
	23.04.09	10:30:46	10.04	30.44	10:33:16	6.0
	25.02.09	10:11:57	5.31	34.25	10:12:56	7.0

The purpose of the atmospheric sounding campaign in Sodankylä in 2009 was to obtain accurate measurements of ozone and water vapor in the upper troposphere and lowermost stratosphere. Our observations were made by research grade balloon borne instruments that combined a cryogenic frost point hygrometer CFH and an ECC type of ozonesonde. Pressure, temperature, relative humidity and GPS location were measured by RS92-SGP sondes in the same payload. The sonde launches were timed to Metop-A overpasses, thus they can be used to validate satellite products.

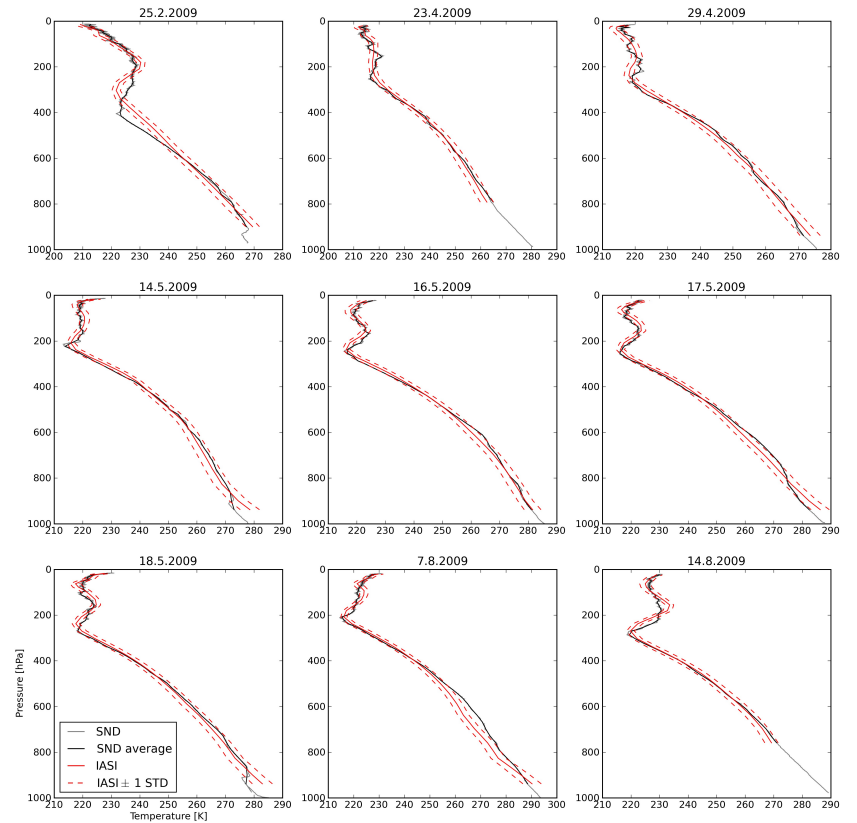
Here IASI level 2 water vapor sounding products are compared with the collocated measurements by research grade hygrometers. The IASI products were processed at the EUMETSAT Central Facilities in Darmstadt and were obtained from the UMARF archive. The table above provides the launch time of the sondes, overpass time for the nearest IASI pixel together with the distance between the sonde at 400 hPa and the nearest IASI pixel centre. The figure above shows the flight paths of the sondes (solid lines), 400 hPa locations (stars) and nearest IASI pixel centres (circles). In most cases we aimed in selecting cloud-free conditions in the middle and upper troposphere to perform our sonde launches.

## IASI water vapor soundings over northern Finland



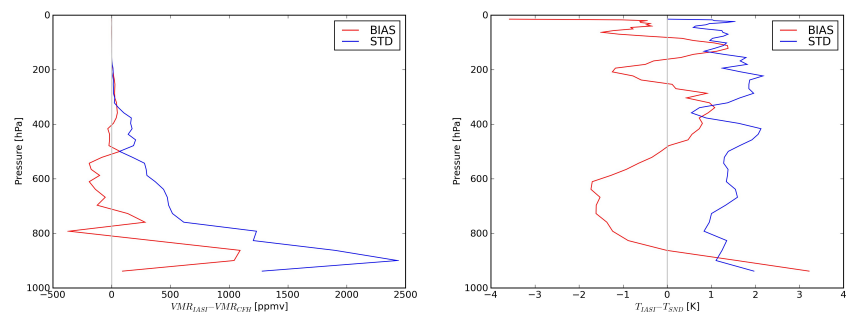
CFH soundings (grey) and IASI L2 water vapor profiles (red) from year 2009. IASI data is the closest measurement relative to the sonde location at 400 hPa. The dashed red lines indicate one standard deviation of the IASI retrieval. CFH soundings were averaged to the IASI layers and all comparisons were made between the CFH average (black solid line) and the corresponding IASI value.

## IASI temperature profiles over northern Finland



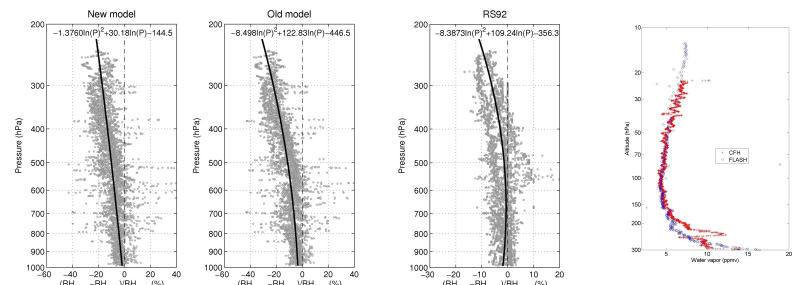
Temperature soundings (grey) and IASI L2 temperature profiles (red) corresponding to the water vapor soundings in figure 2. IASI data is the closest measurement relative to the sonde location at 400 hPa. The dashed red lines indicate one standard deviation of the IASI retrieval. Temperature soundings were averaged to the IASI layers (black solid line).

## Summary of water vapor and temperature profile comparisons



Summary of all comparisons from year 2009. Left: average water vapor differences (IASI-CFH) in ppmv (red) and one standard deviation of the differences (blue). Right: average temperature differences (IASI-SND) in K (red) with one standard deviation (blue) per IASI pressure level.

## RS92 and CFH



Left: Relative difference between RS92 and the CFH humidity profiles during 7 daytime flights in Sodankylä. The new model is using aluminized coating of the sensor attachment, which reduces the radiation dry bias. Right: CFH/Flash comparison flight on Jan 23, 2009.