

U.S. Department of Energy (DOE)
Atmospheric Radiation Measurement (ARM) Climate Research Facility

ARM Update & Changes

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ARM Associate Director for Operations

Represented Contributors:

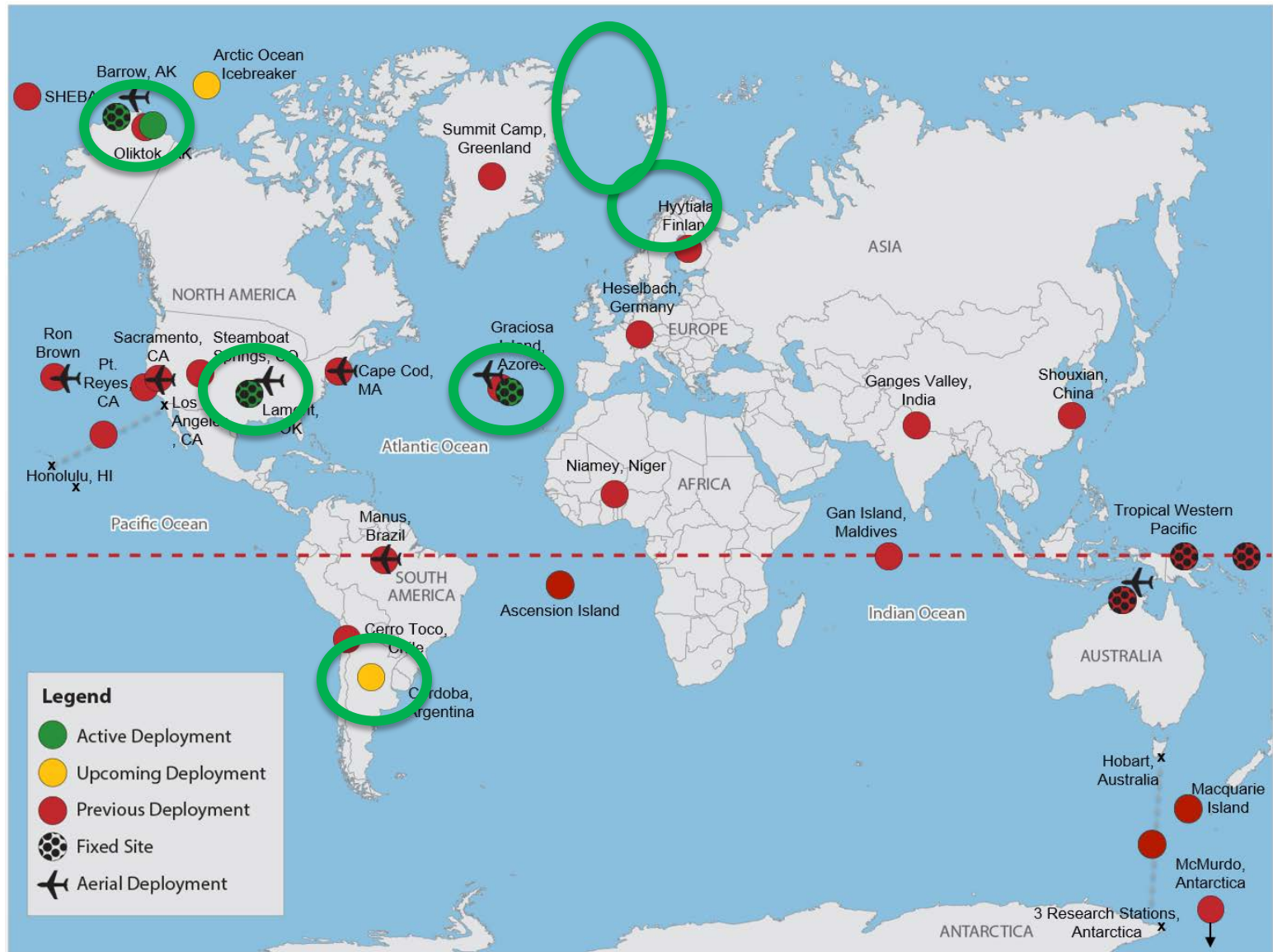
Argonne National Laboratory: Donna Holdridge, Jenni Kyrouac, Doug Sisterson

University of Alaska Fairbanks: Martin Stuefer, Telayna Gordon

University of Wisconsin-Madison: Lori Borg

NOAA National Centers for Environmental Information (NCEI): Howard Diamond

ARM Site & Campaign Locations (1992 - Present)



Working With the ARM User Facility

- Types of Funding Activities:
 - Approved Field Campaign
 - Engineering Development
- Justification Measures
 - ARM Mission
 - Scientific Contribution
 - Users
 - Publication Impact

Download Data From the Archive

The screenshot shows the ARM Data Discovery interface. At the top, there's a search bar and navigation links. Below, the search results are displayed with filters for categories and dates. A table shows data for 'sonde a1' at 'sfp C1' from July 1993 to May 1994. The table includes columns for month and data points.

Collaborate with Instrument Mentors

INSTRUMENT	MENTOR(S)
ACSM AEROSOL CHEMICAL SPECIATION MONITOR	Stephen Springston Brookhaven National Laboratory
	Thomas Watson Brookhaven National Laboratory
	Bill Behrens (Associate) Brookhaven National Laboratory
	Cynthia Salwen (Associate) Brookhaven National Laboratory
	Jonathan Gero University of Wisconsin
AERI ATMOSPHERIC EMITTED RADIANCE INTERFEROMETER	Raymond Garcia (Software) University of Wisconsin
	Denny Hackel (Associate) University of Wisconsin-Madison

Propose a Field Campaign

RESEARCH CAMPAIGNS
 Proposals are accepted from members of the scientific community for conducting field campaigns using the ARM Research Facility.

The annual facility call for campaign proposals is open December 1 to February 1.

The ARM Climate Research Facility provides the scientific community with the operational and logistical resources to conduct field campaigns using the ARM observatories that focus on advancing research in support of the ARM mission.

Priority will be given to proposals that make comprehensive use of ARM facilities, focus on strategic goals of the DOE Office of Biological and Environmental Research (BER), and have the ability to improve regional or global earth system models.

Proposals that coordinate with other BER community capabilities, such as the Atmospheric System Research (ASR) program, Energy Exascale Earth System Model (E3SM) project, and Climate and Earth System Modeling programs, are encouraged.

REMINDER
 Please give ample lead time for your campaign proposal submissions. The timing for submitting a proposal depends on the size and complexity of the proposal.

Refer to the [proposal deadline guidance](#) for estimated time frames needed from reviewing a proposal to implementing in the field (e.g., a small campaign can take up to 10 weeks from submission to implementation).

FEATURED CAMPAIGNS

- CACTI**
 Cloud, Aerosol, and Complex Terrain Interactions (CACTI)
 1 October 2018 to 30 April 2019
- MARCUS**
 Measurements of Aerosols, Radiation, and Clouds over the Southern Ocean (MARCUS)
 1 October 2017 to 1 April 2018
- MICRE**
 Macquarie Island Cloud and Radiation Experiment (MICRE)
 1 March 2016 to 31 March 2018

ARM Radiosonde Operations Upgrades

- May 2017: Expansion of NSA Autosonde deck
 - Improve manual launch operations
 - Support conversion to hydrogen lifting gas
 - Cooperative Agreement w/ National Weather Service
 - Two additional launches per day (1100 & 2300 UTC)
- RS41 Launch Start Dates
 - SGP C1: 13 Nov 2017
 - SGP S01: 14 Jan 2018
 - NSA C1 (Autosonde): 18 Oct 2017
 - NSA S01: 27 Feb 2018
 - ENA S01: 12 Apr 2018 (RIVAL approval yesterday)
 - AMF1: CACTI (Oct 2018)
 - AMF2: MOSAIC (Sep 2019)
- Mass Flow Controllers
 - OLI: 2015/2016
 - SGP: Sep 2017
 - ENA: Coming Soon



SGP Radiosonde GRUAN Specific Criteria & Gaps

- ✓ ARM submitted SGP GRUAN site certification proposal 06 Mar 2017
- ✓ GRUAN review comments received: 11 Apr 2018
- ☐ Responses to reviewer comments: In progress

- ☐ Resolve ARM/GRUAN User Metrics

- ✓ Dedicated surface observations for radiosonde system:
 - Vaisala MAWS systems are operational and integrated at SGP, OLI, ENA, NSA

- ✓ Balloon Fill Regulation:
 - Mass Flow Controllers in use at SGP, OLI, NSA (autosonde), ENA imminent

- ☐ Standard Humidity Chamber (SHC) at SGP: Funding not proposed
 - Needs champion with scientific justification
 - Informal quote received but order dependent upon 10 quantity purchase

- ☐ Burst Heights 10 mbar (ARM typical 15-20 mbar): Funding not proposed
 - Needs champion with scientific justification

- ✓ Participation in GRUAN Activities: RIVAL outcome of ICM-8 (Borg, et al.)



ARM Balloon-Borne Cryogenic Frost-Point Hygrometer (CFH) Measurements - Humidity (1/mo)

- NOAA provides CFH launch hardware (**Howard Diamond**)
- ARM provides mentorship oversight (**Martin Stuefer, Telayna Gordon**)
- ARM provides operational effort support
- GRUAN Lead Center provided launch procedures & software
- Launch package updates:
 - Cryogenic Frostpoint Hygrometer from JH Acquisition LLC
 - (EnSci is in the process of becoming JH Acquisition LLC)
 - InterMet IMet1 RSB
 - Vaisala RS92 radiosonde, ground check with Vaisala GC25 prior to each launch
 - Vaisala RS41 radiosondes added to CFH launch package in support of RIVAL: 12 Apr 2018
 - CFH launches have been coordinated with overpasses of the MetOp polar orbiting meteorological satellites
 - ENSCI purchase price for CFH now ~\$3,000 (one-time use concerns)



ARM Data Plots & Quality Checks

ARM Data Quality Explorer - Field Metrics

Home Plot Browser Data Zoom DS View DQPR Search Legend

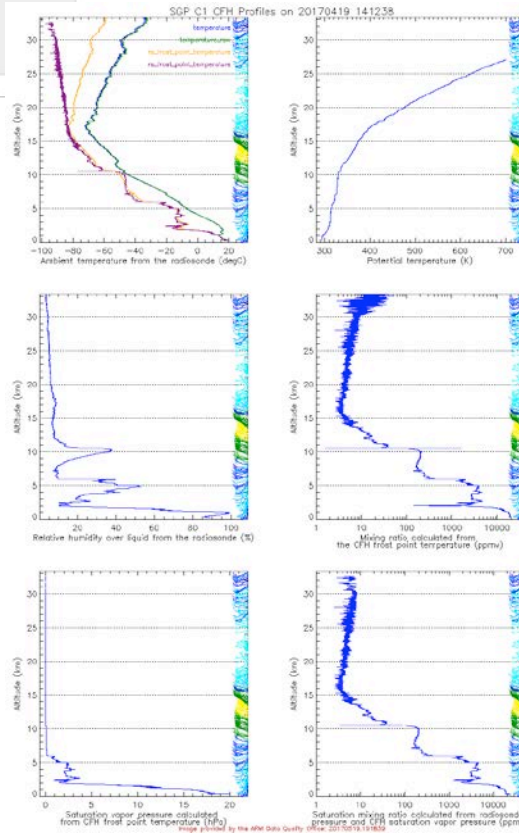
cfh_frost_point_temperature

sgpfc1.b1 : 04.19.2017 - 141238

	075 900	900 800	800 700	700 600	600 500	500 400	400 300	300 200	200 100	100 50	50 0
Good											
Not Available											
Missing											
BB 2											
BB 3											
BB 4											

Field Attributes

Auxiliary variables
 sp_0h_frost_point_temperature
Comment
 This is the direct minor temperature herentiated by the CFH.
Long name
 Frost point temperature measured by the CFH
Missing value
 -999.0
Units
 degC
Valid max
 50.0
Valid min
 -110.0



ARM Data Quality Explorer - Metrics

Home Plot Browser Data Zoom DS View DQPR Search Bottombar Invalid Requests Add Request Modify Requests Legend Times Loaded: 1 of 1

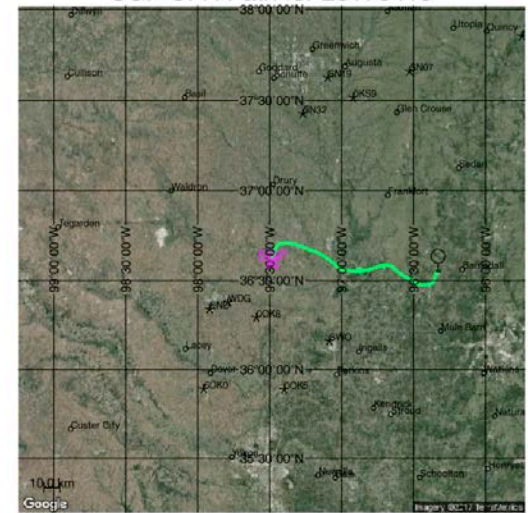
sgpfc1.b1 v1.6 : 04.19.2017 - 141238

Pressure from the radiosonde pressure sensor (hPa)

Assessment Tagging	075 900	900 800	800 700	700 600	600 500	500 400	400 300	300 200	200 100	100 50	50 0
status											
rs_battery_voltage											
rs_frost_point_temperature											
sock_name_number											
detector_signal											
radiosonde_temperature											
cfh_chang_rate											
stat_temp_1											
stat_temp_2											
stat_temp_3											
stat											
temp											
external_temperature											
radiosonde_humidity											
rs_battery_voltage											
rs_frost_point_temperature											
rs_humidity											
radiosonde_mixing_ratio											
radiosonde_vapor_pressure											
temperature											
temperature_hpa											
temp_detector											
temp_sensor											

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SGP CFH Path for 20170419



Legend
 * Airport
 o City
 X Site

SGP Time Series of Altitude (km)

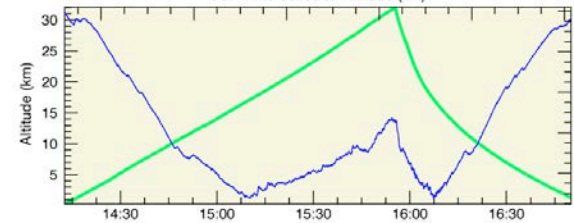
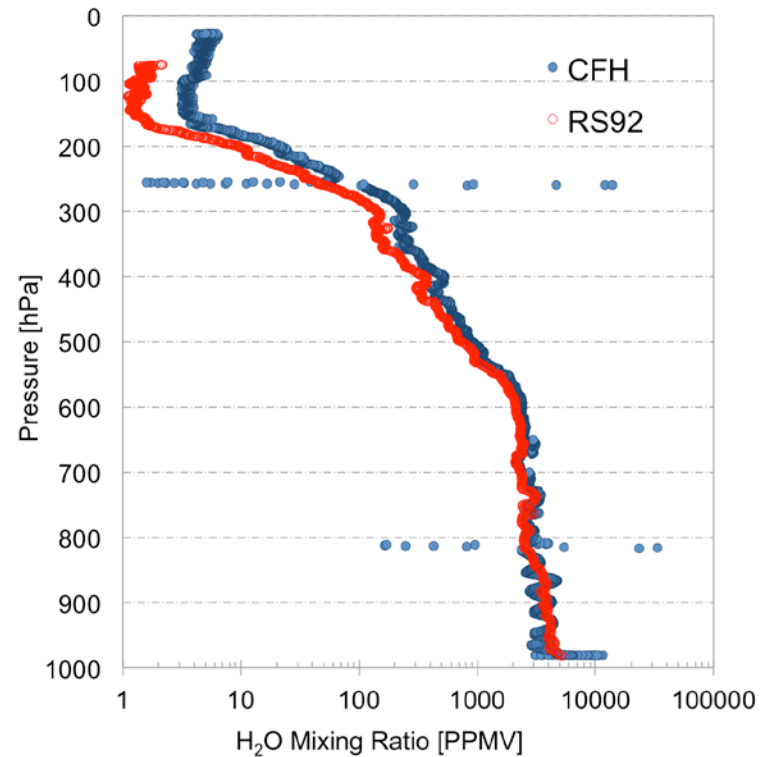
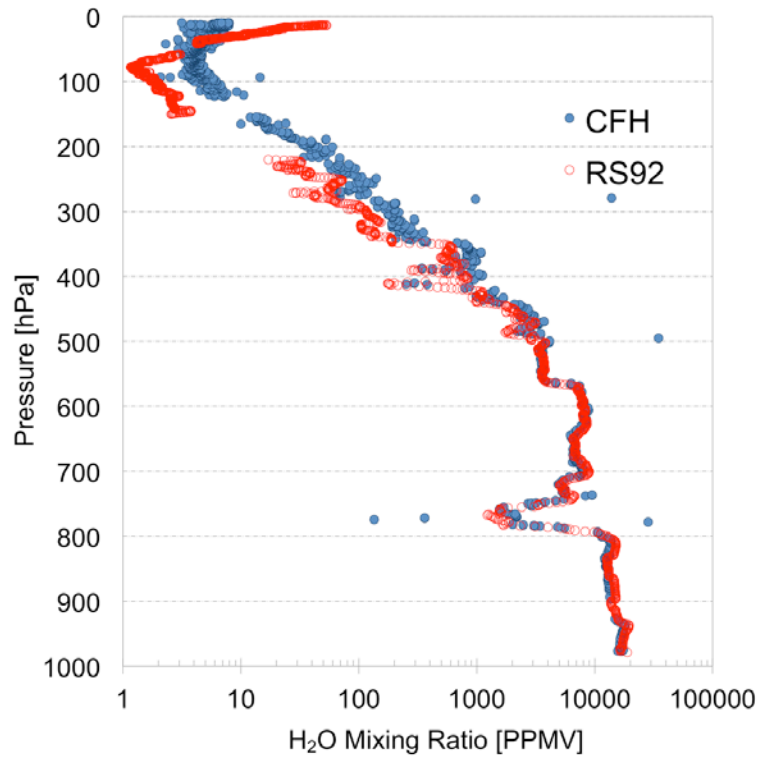


Image provided by the ARM Data Quality Office: 20170419 191914



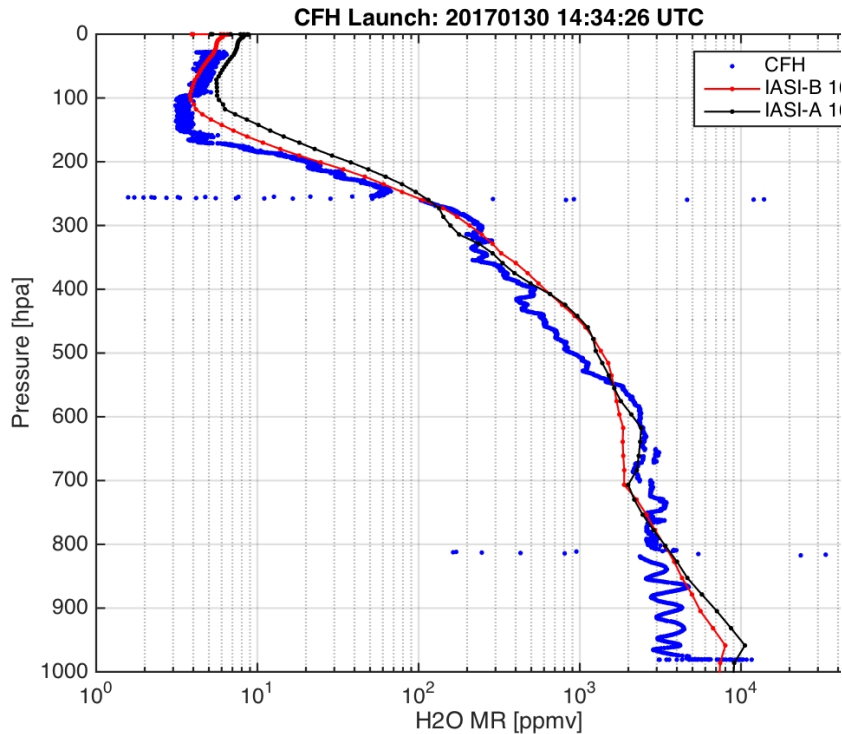
Profiles



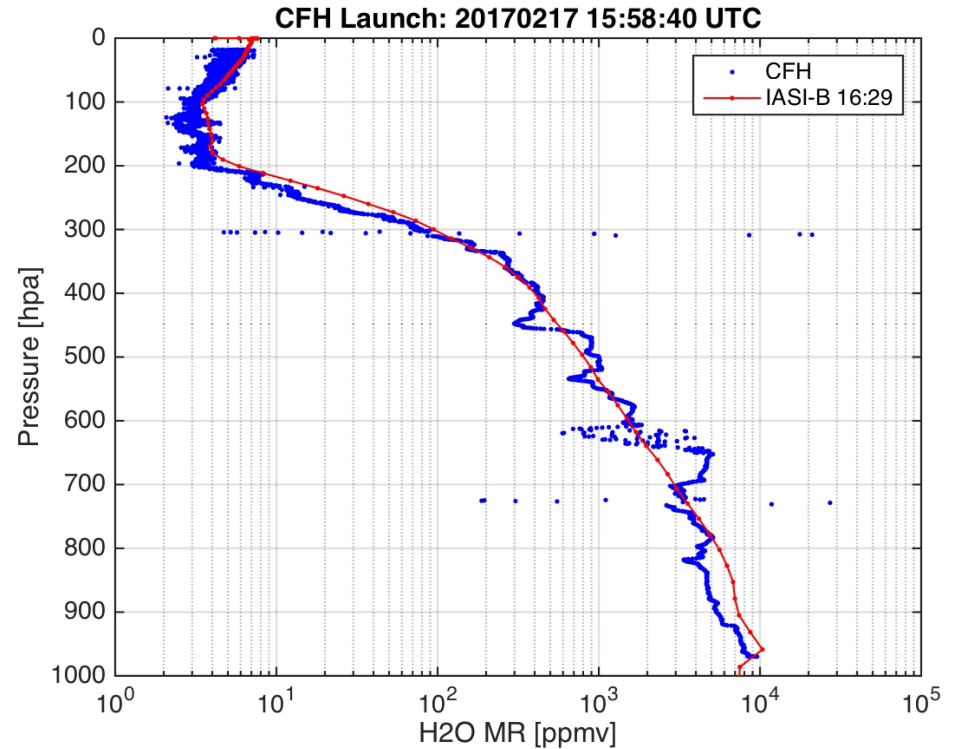
- ✓ Water vapor mixing-ratio profiles from combined instrument measurements reveal a typical dry bias for RS-92 radiosondes.
- ✓ Burst altitudes often exceed 10 hPa
- ✓ Launch times in the late mornings due to METOP overpass coordination



Spaceborne H₂O Profiles



01/30/2017

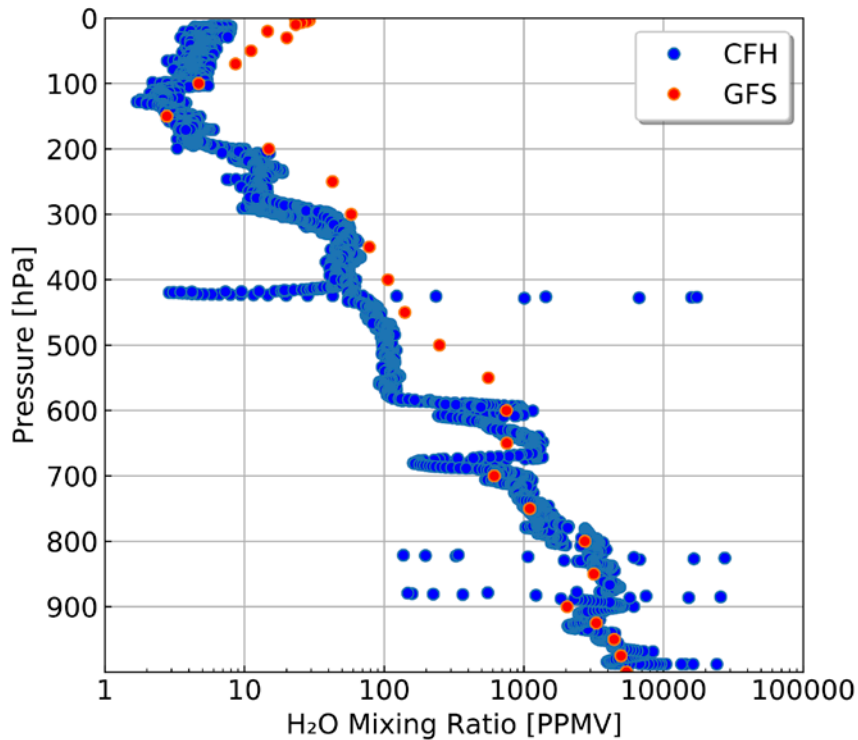


02/17/2017

- IASI derived water vapor mixing ratio compared with CFH observational data
- CFH launches have been partly coordinated with overpasses of MetOp polar orbiting meteorological satellites.
- Analysis provided by Lori Borg.



CFH observations to improve numerical weather models



03/02/2018

⇒ *Example CFH launch from March 2, 2018. The water mixing ratio as derived from the CFH as well as from the Global Forecast System (GFS) model (red dots) is shown. Algorithms to remove the radiosonde dry bias are often too ‘radical’ in operational numerical weather models.*

⇒ *Improvements of the algorithms in progress for NOAA’s High Resolution Rapid Refresh model.*



SGP CFH Tasks

- ✓ ARM Data Ingest
- GRUAN RS launch client issues
 - Martin working with Michael Sommer
- Data processing
- Refine launch procedures for ARM operators
- Refurbish old CFH instruments
- Transition from iMet to RS41 on CFH launch package
- GRUAN certification
 - Upon successful completion of the SGP certification process for radiosondes, ARM intends to prepare a certification request for the SGP CFH



CFH - Additional Acknowledgements

- Michael Sommer - GRUAN Lead Center
- Ruud Dirksen – GRUAN Lead Center

- ARM SGP Operations
 - Chris Martin
 - Matthew Gibson
 - James Martin
 - John Schatz
 - Nicki Hickmon
 - Mike Ritsche
 - Jody Martin
 - George Sawyer



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