# NOAA Products Validation System (NPROVS): NWS Alaska Region RS41 Radiosonde Transition Impact Study (2013-2022)

**Tony Reale (NESDIS / STAR)**

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**GRUAN ICM-14**
**Nov 28 to Dec 3, 2022**
**LaReunion**

# Outline

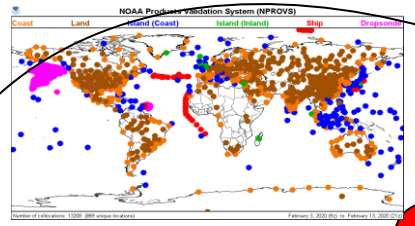
Review of NPROVS

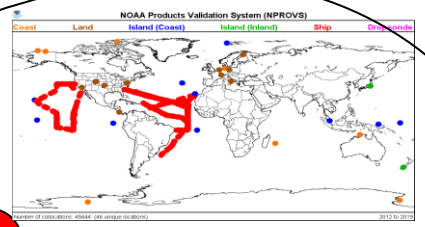
Uncertainty Integration into Satellite Sounding Product Cal/Val

NWS RS41 (vender) Transition Impact (Alaska Region)

Summary

# NOAA Products Validation System (NPROVS)




**INPUTS**

Conventional Radiosonde
GFS 6-hr
CFSR

## Geophysical Profiles

**NUCAPS**
NOAA20
S-NPP
MetOp-A,B
NOAA

**MIRS**
S-NPP
NOAA20
NOAA-18,19
MetOp-A,B,C
NOAA

**AIRS v.6**
Aqua-EOS
NASA

**IASI-L2**
MetOp-A, B, C
EUMETSAT

**ATOVS**
NOAA-19
MetOp-B
NOAA

**GNSS GRAS**
MetOp-A,B,C
EUMETSAT

**GNSS COSMIC-C2**
UCAR
NESDIS
KOMPSAT
Korea

**NWP**
6-hour Global (2)
*1-hr HRRR*
NOAA
ECMWF

Special Radiosonde:
JPSS
DOE / ARM
GRUAN

T4

**NUCAPS Test**
NOAA-20, *21*
MetOp- ??
ASSIST

**Collocation Processing**

NPROVS-C

Visualization Tools
ODS
PDISP
NARCS

NPROVS-S

**OUTPUT :**
**Collocated Raob / Satellite / NWP Dataset**

Conventional
NPROVS Collocation Archive

Special
NPROVS-S Collocation Archive

Algorithm Development

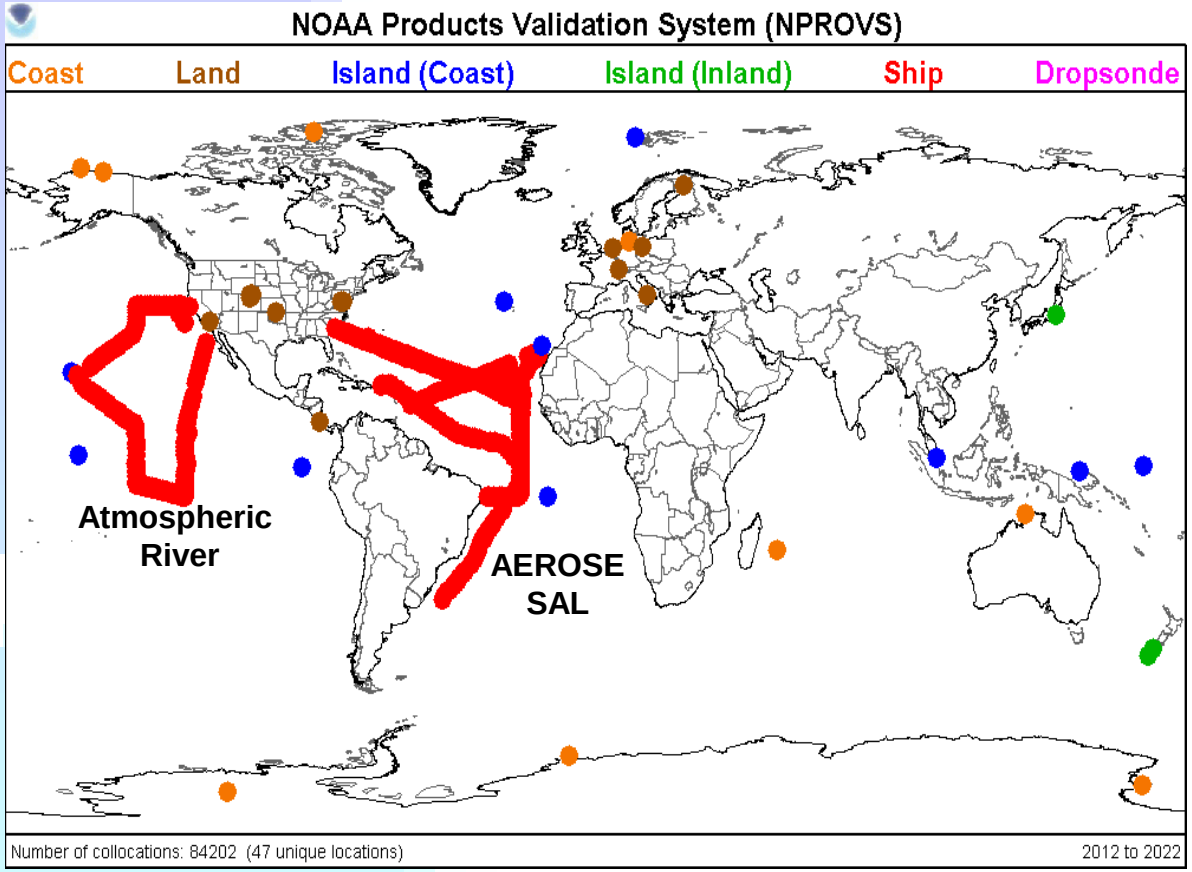
SDR
VALAR
(Sensor)

Sensor Monitoring

FTP

# R e p r o c e s s i n g
## (NPROVS-Special)

- Routine integration of “tardy” observations … @ 60-days
- Entire Dataset … as deemed necessary
  - **Replace vender with RS41 GDP … *RIVAL duals***
  - New satellites, products … GRAS Post-processed
  - CFH integration




GRUAN, JPSS Dedicated Raob (Lori Borg), Research Experiments

# NPROVS Special Radiosonde Sources

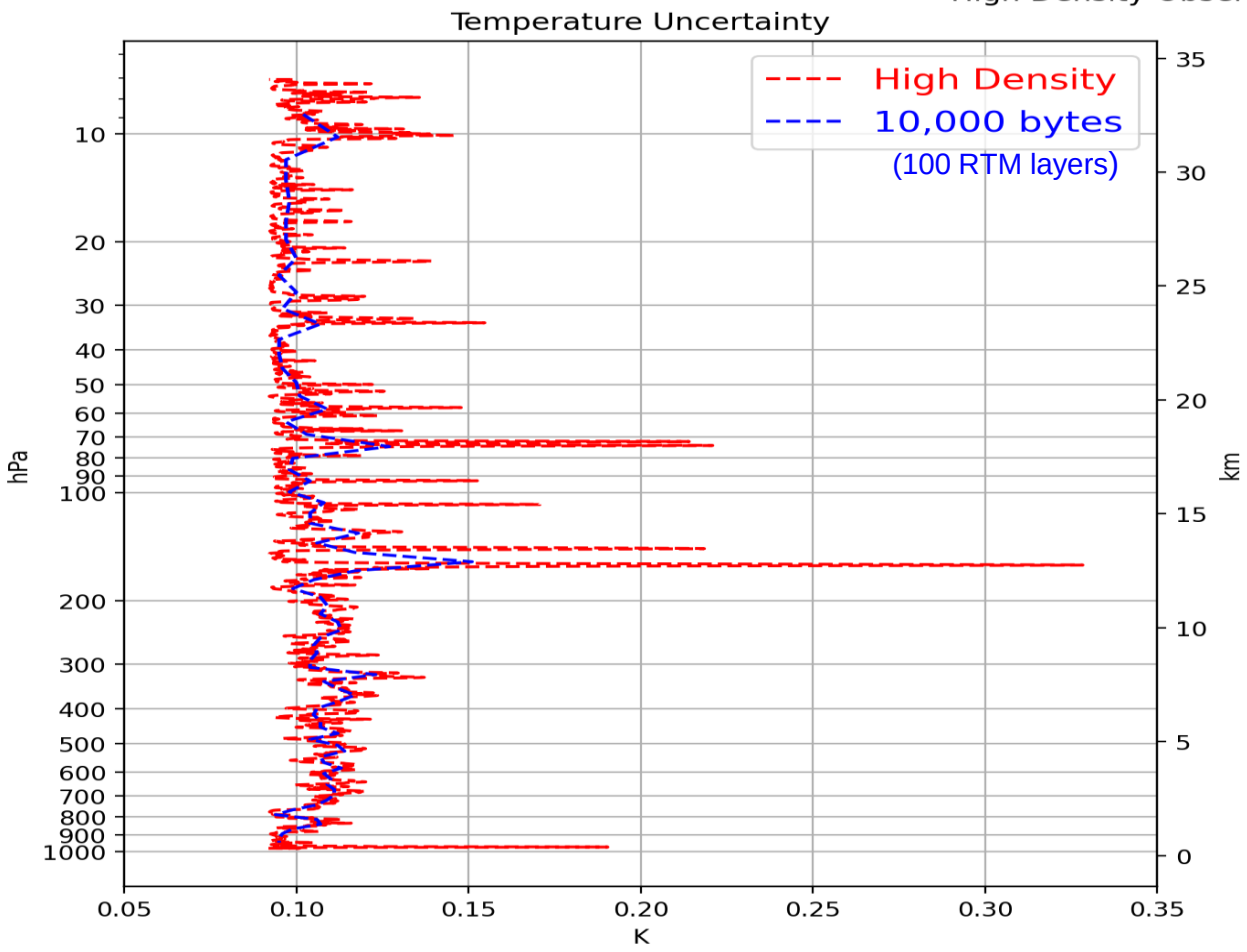
## GRUAN

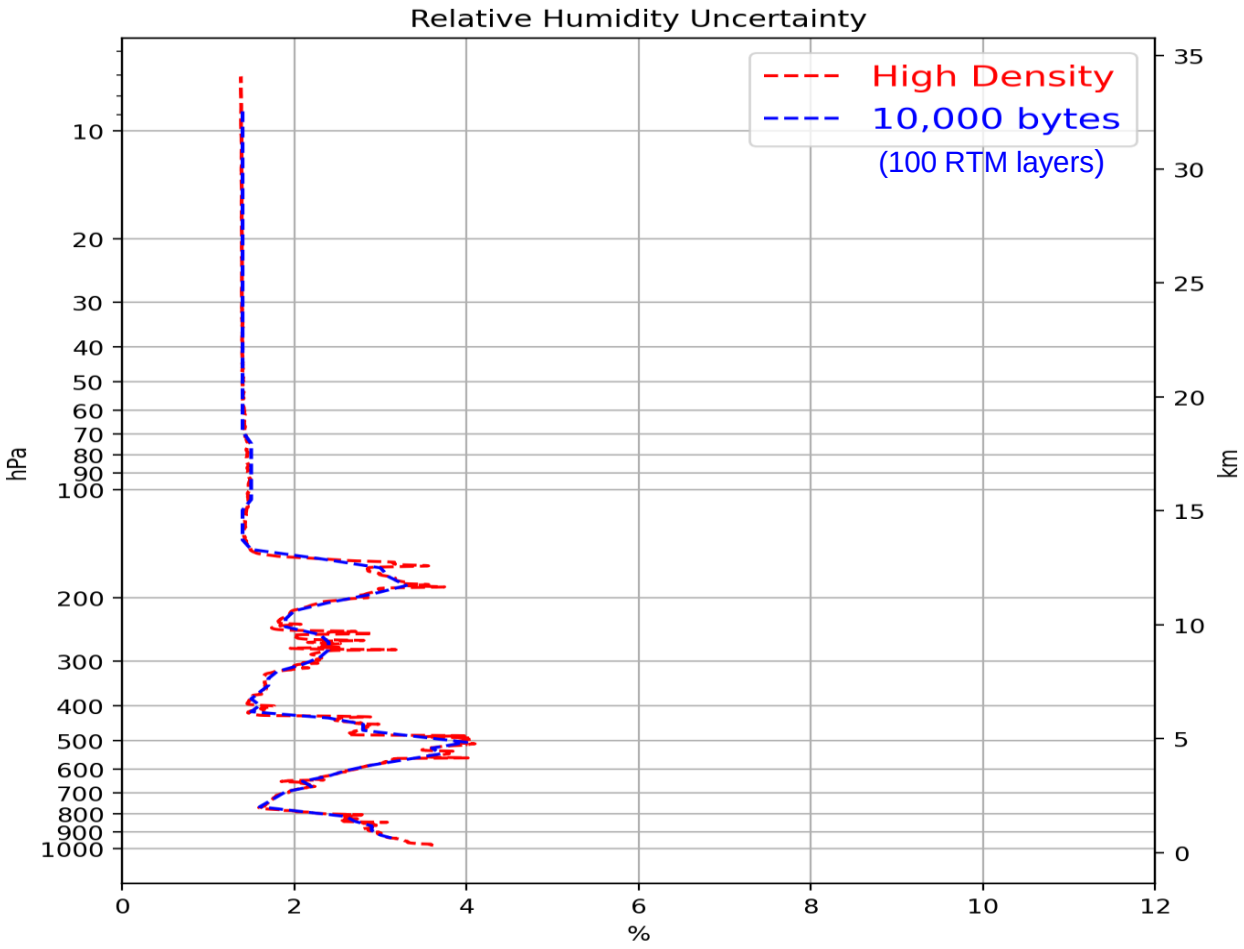
- Global Climate Observing System (GCOS) Reference Upper-Air Network File Transfer Protocol (FTP) Servers at the Lead Centre in Lindenberg, Germany
- Current Stations:
  - Barrow, Alaska, USA (BAR)
  - Beltsville, MD, USA (BEL)
  - Boulder, CO, USA (BOU)
  - Cabauw, Netherlands (CAB)
  - Darwin, Australia (DAR)
  - Graciosa, Portugal (GRA)
  - Neumayer, Antarctica (DE) (GVN)
  - Hong Kong, China (HKO)
  - Lauder, New Zealand (LAU)
  - Lindenberg, Germany (LIN)
  - Ny-Ålesund, Svalbard, Norway (DE, FR) (NYA)
  - Payerne, Switzerland (PAY)
  - Potenza, Italy (POT)
  - La Réunion, France (REU)
  - Ross Island, Antarctica (NZ, US) (ROS)
  - Lamont, OK, USA (SGP)
  - Singapore, Singapore (SNG)
  - Sodanklyä, Finland (SOD)
  - Syowa, Antarctica (JP) (SYO)
  - Tatento, Japan (TAT)
  - Tenerife, Spain (TEN)

## Non-GRUAN

- **U.S. Department of Energy Atmospheric Radiation Measurement (ARM)**
  - Eastern North Atlantic, Azores, Portugal (ENA)
  - North Slope of Alaska, USA (NSA)
  - Southern Great Plains, USA (SGP)
- Saharan Dust Aerosols and Ocean Science Expeditions (AEROSE)
- Colorado State University at Fort Collins, Colorado (CIRA)
- NOAA Earth System Research Laboratory El Niño Rapid Response Field Campaigns from Kiritimati (Christmas) Island (ENRR)
- **Howard University Beltsville Facility in Beltsville, Maryland (HUBV)**
- **National Institute of Water and Atmospheric Research at Lauder, New Zealand (NIWA)**
- **National Weather Service at Sterling, Virginia**
- Pacific Missile Range Facility, Barking Sands, Hawaii (PMRF)

Reference Dedicated 74646, Instrument 272-Vaisala RS92/GDP
10,000 Bytes vs. High Density
Date of Report: 06/28/2019
10,000 Bytes Observation Time: 08:13 Z
High Density Observation Time: 08:00 Z




**RS92 GDP**



**RIVAL Dual Launch**

Reference Dedicated 74646, Instrument 276-Vaisala RS41/GDP
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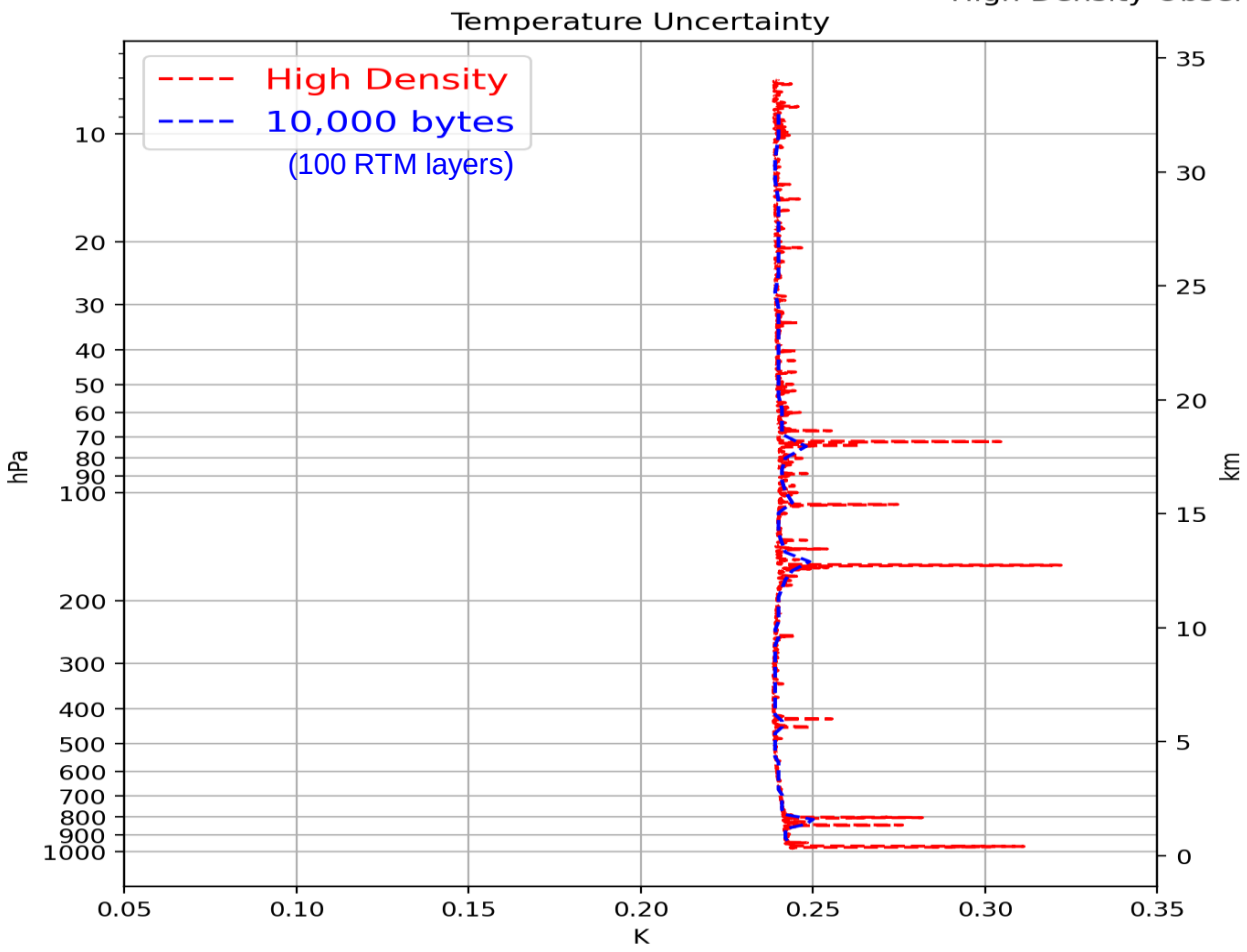
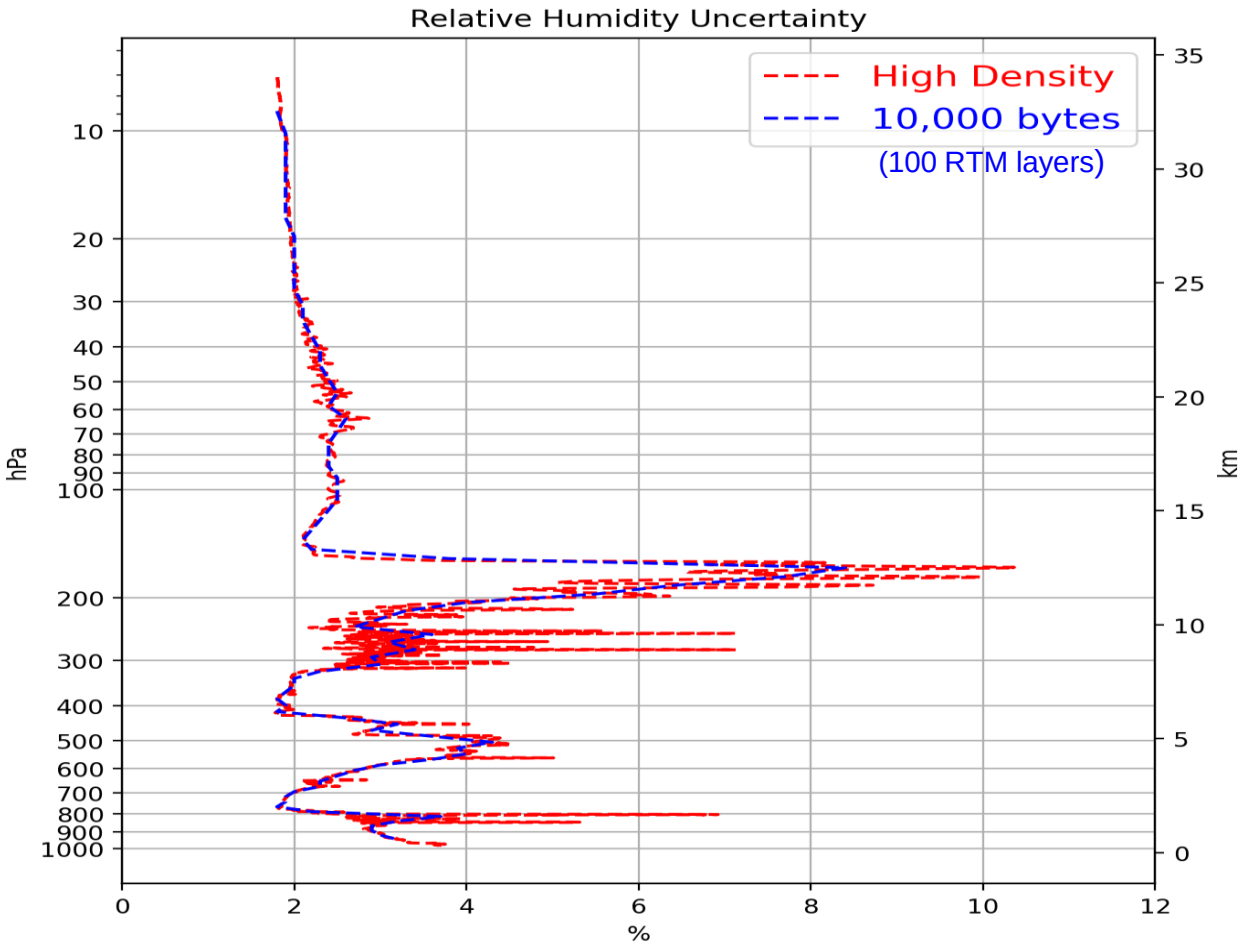



**RS41 GDP**

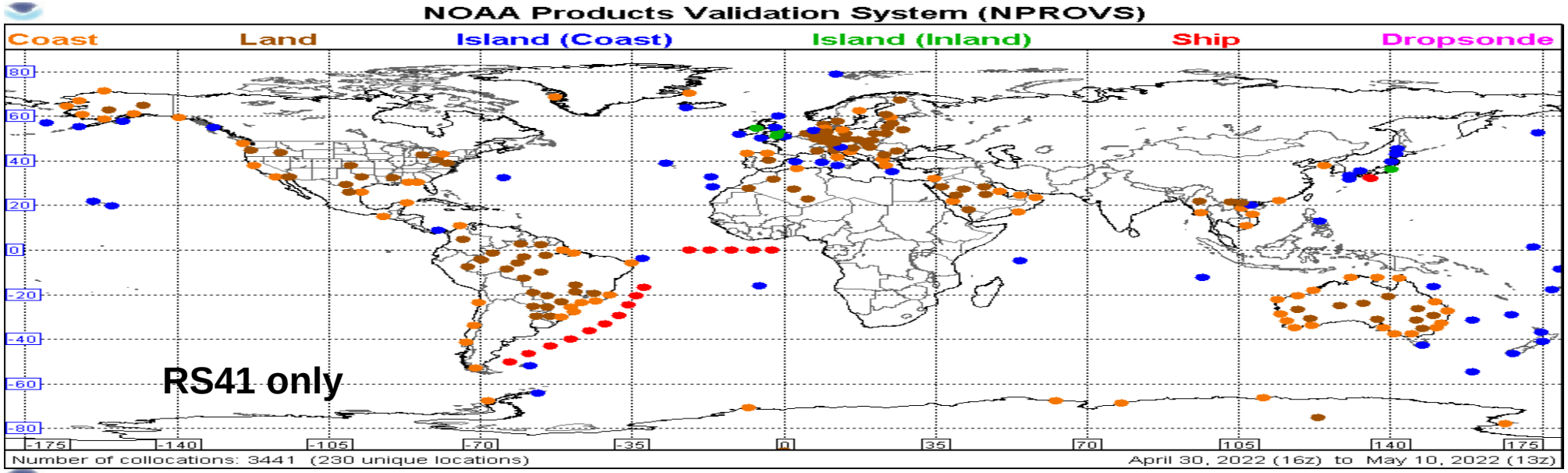


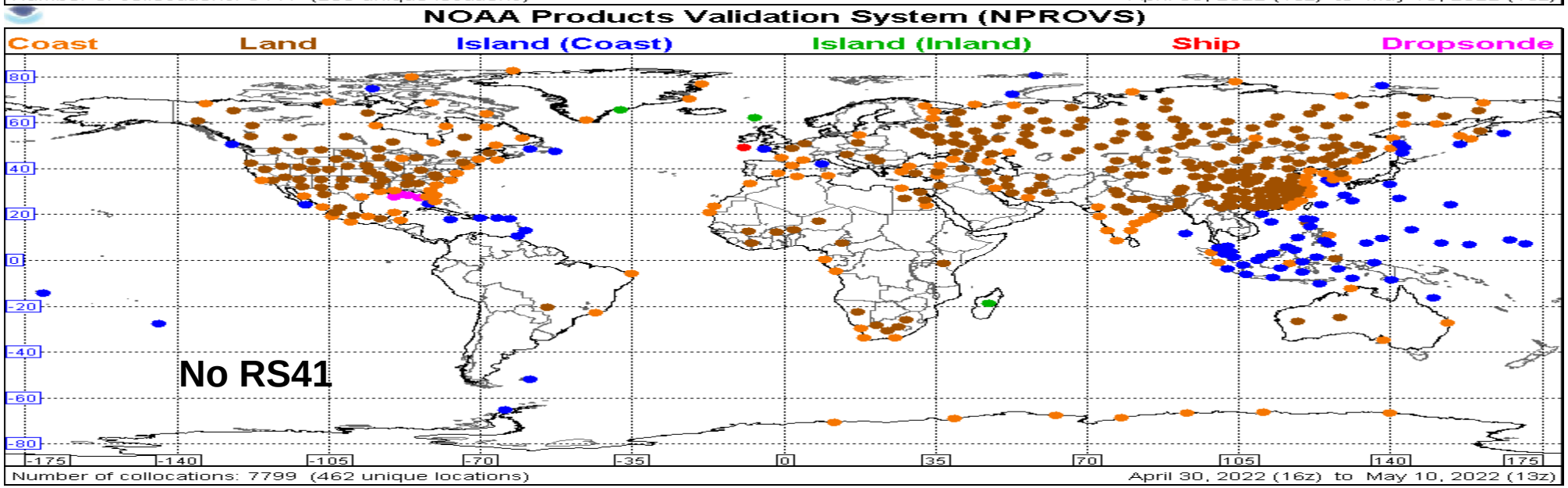
**RIVAL Daul Launch**

***Question:***

***How to address these differences when deriving satellite product uncertainty based on GRUAN Uncertainty … for RS41 vs RS92***

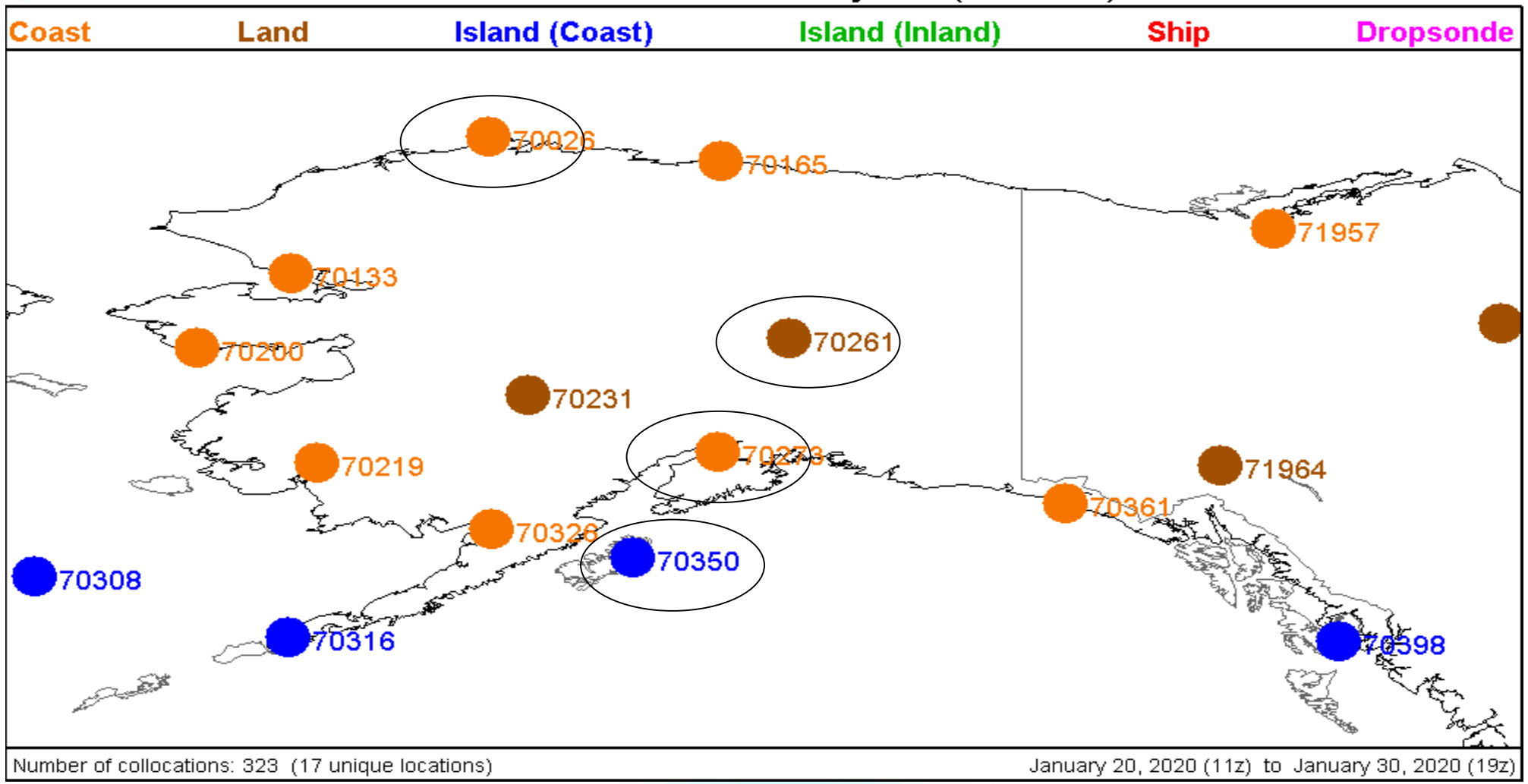
***… see Extra***



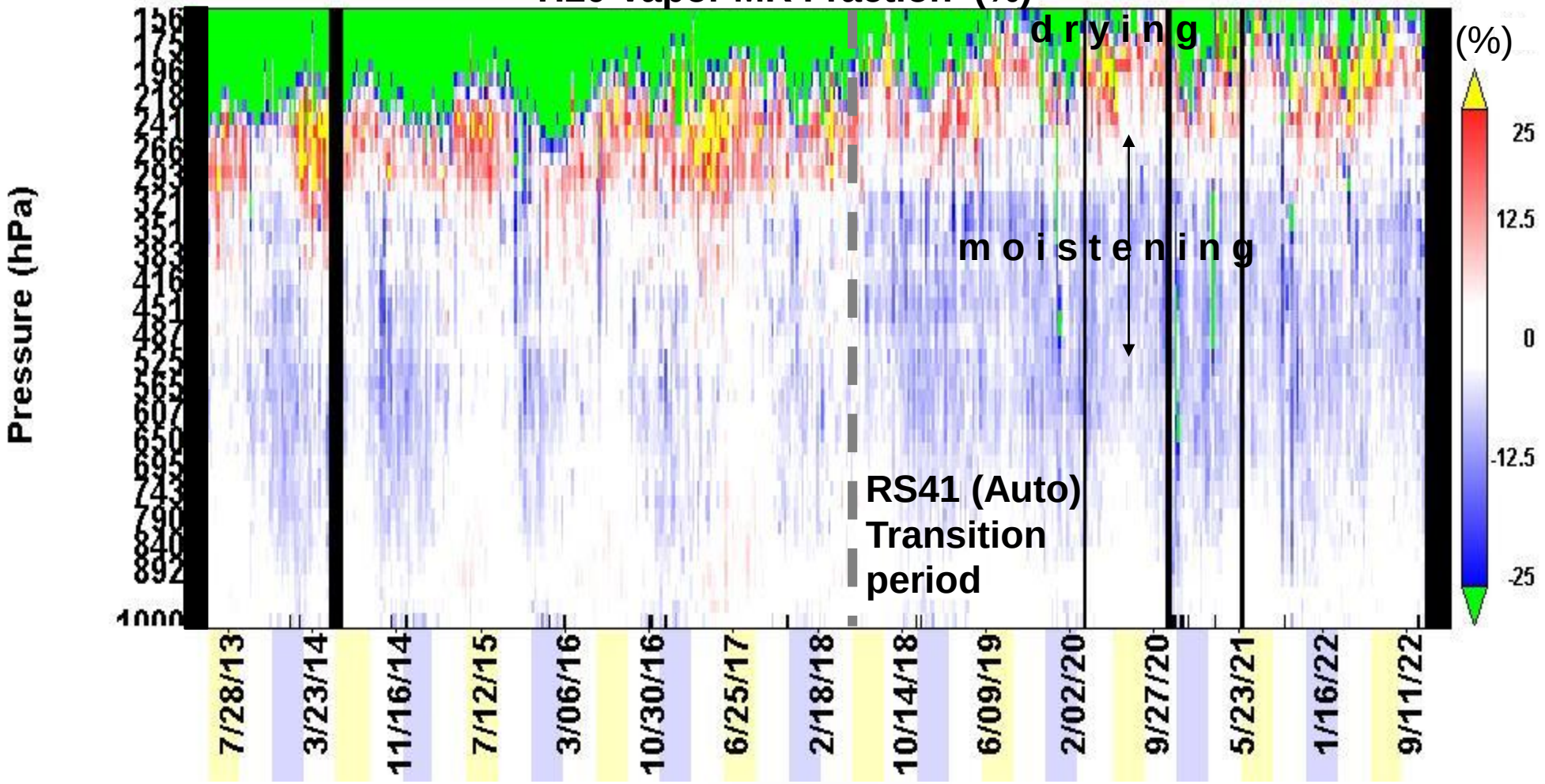

**April/May 2022**

## NOAA Products Validation System (NPROVS)



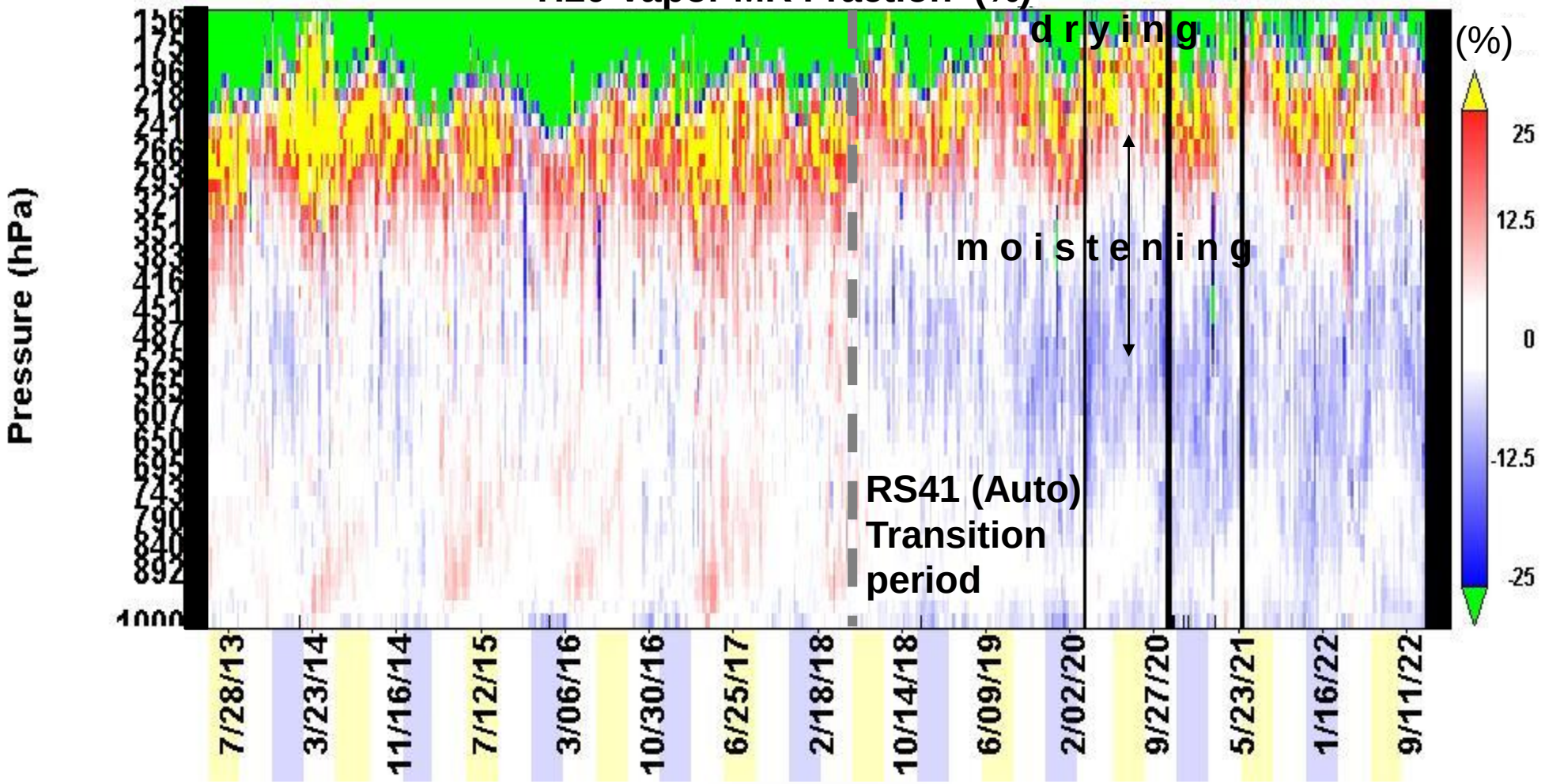

# Alaska Region

## ECMWF Analysis – Radiosonde
## H20 Vapor MR Fraction (%)




**Alaska Composite … H20 Vapor Fraction (Delta/Raob) Time Series (weekly mean; *200*)**

## GFS 6-hr Forecast – Radiosonde
## H20 Vapor MR Fraction (%)

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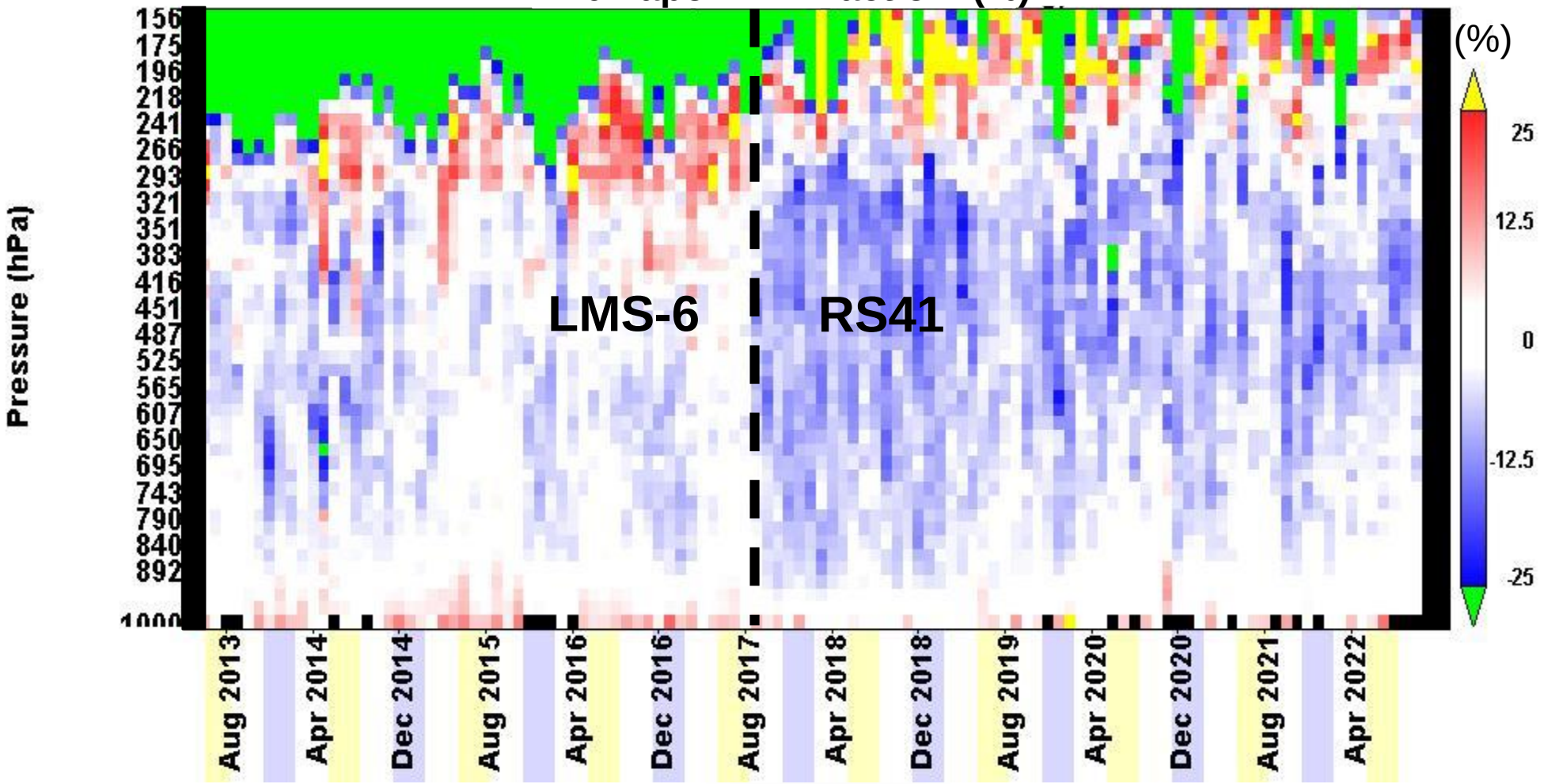


**Kodiak (70350) 10/12/17**
**(monthly mean; 50)**

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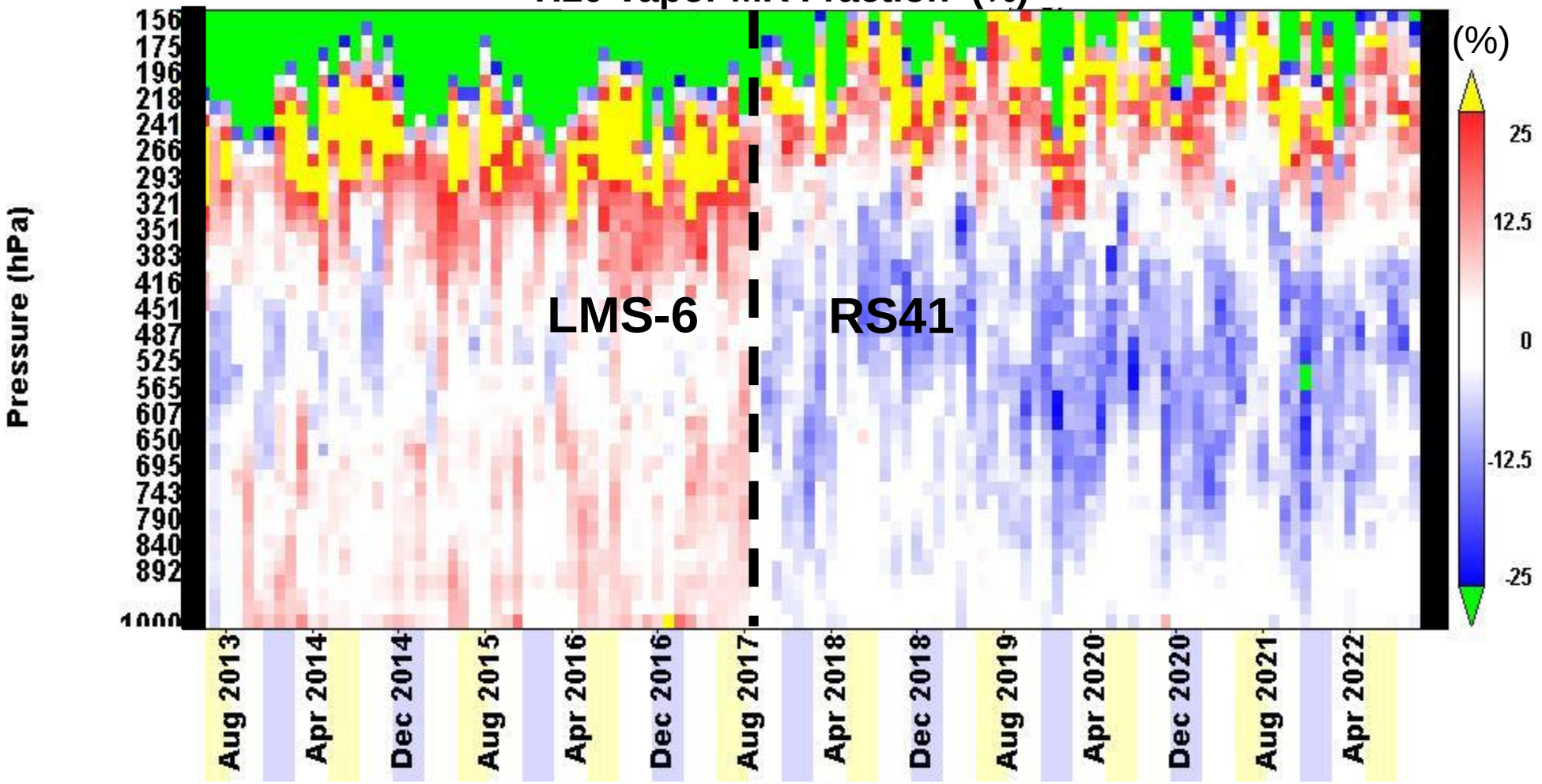
## H20 Vapor MR Fraction (%)

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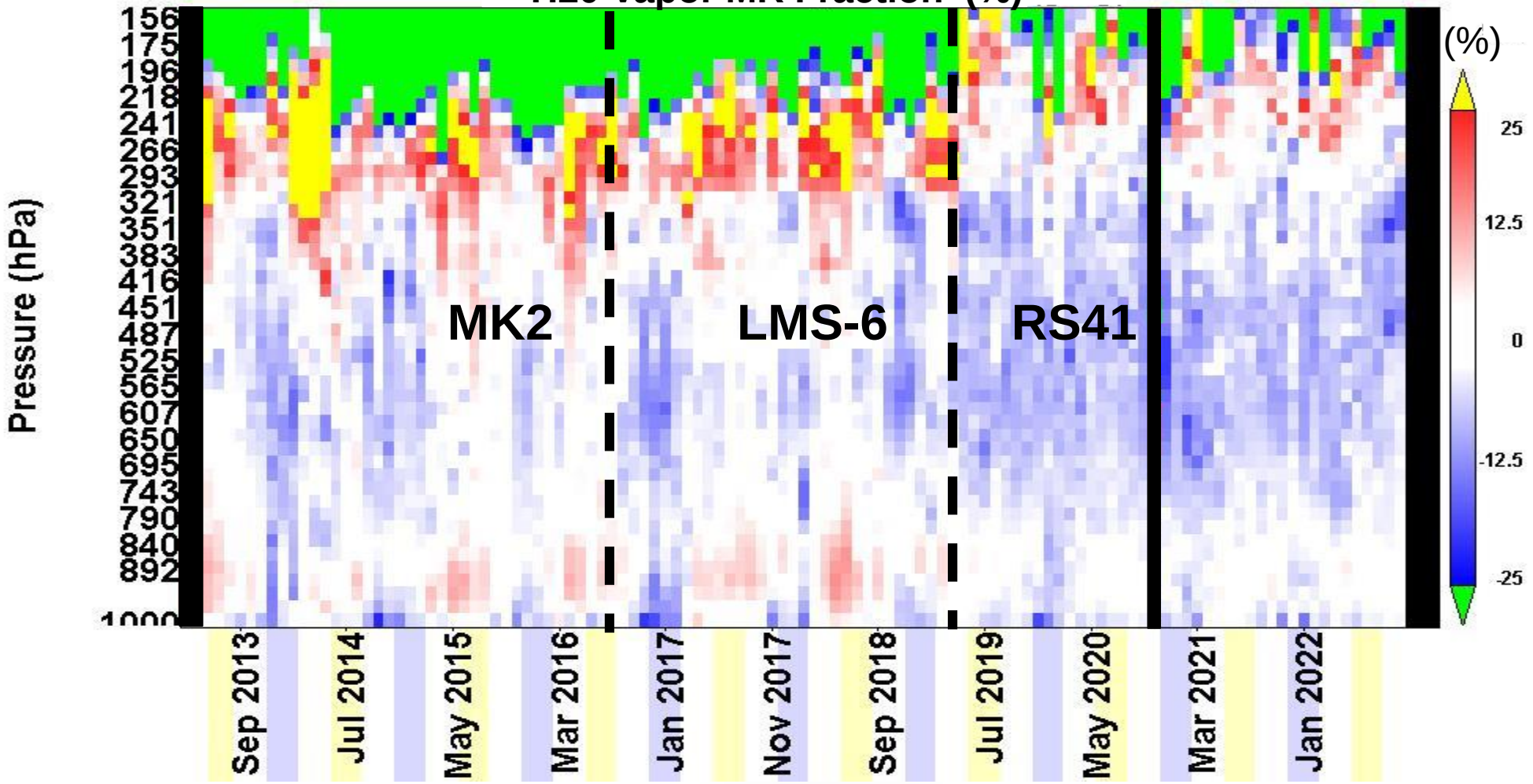
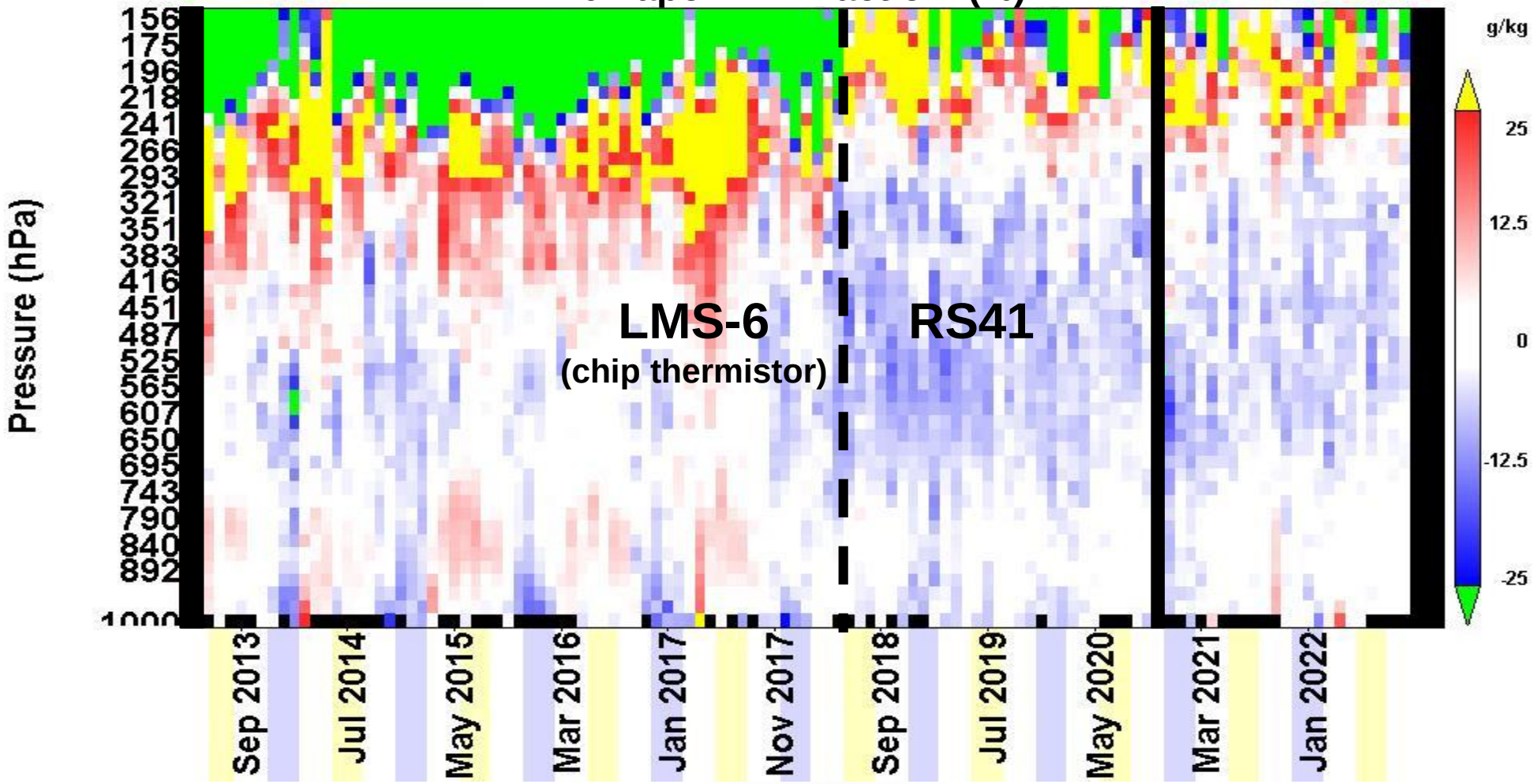


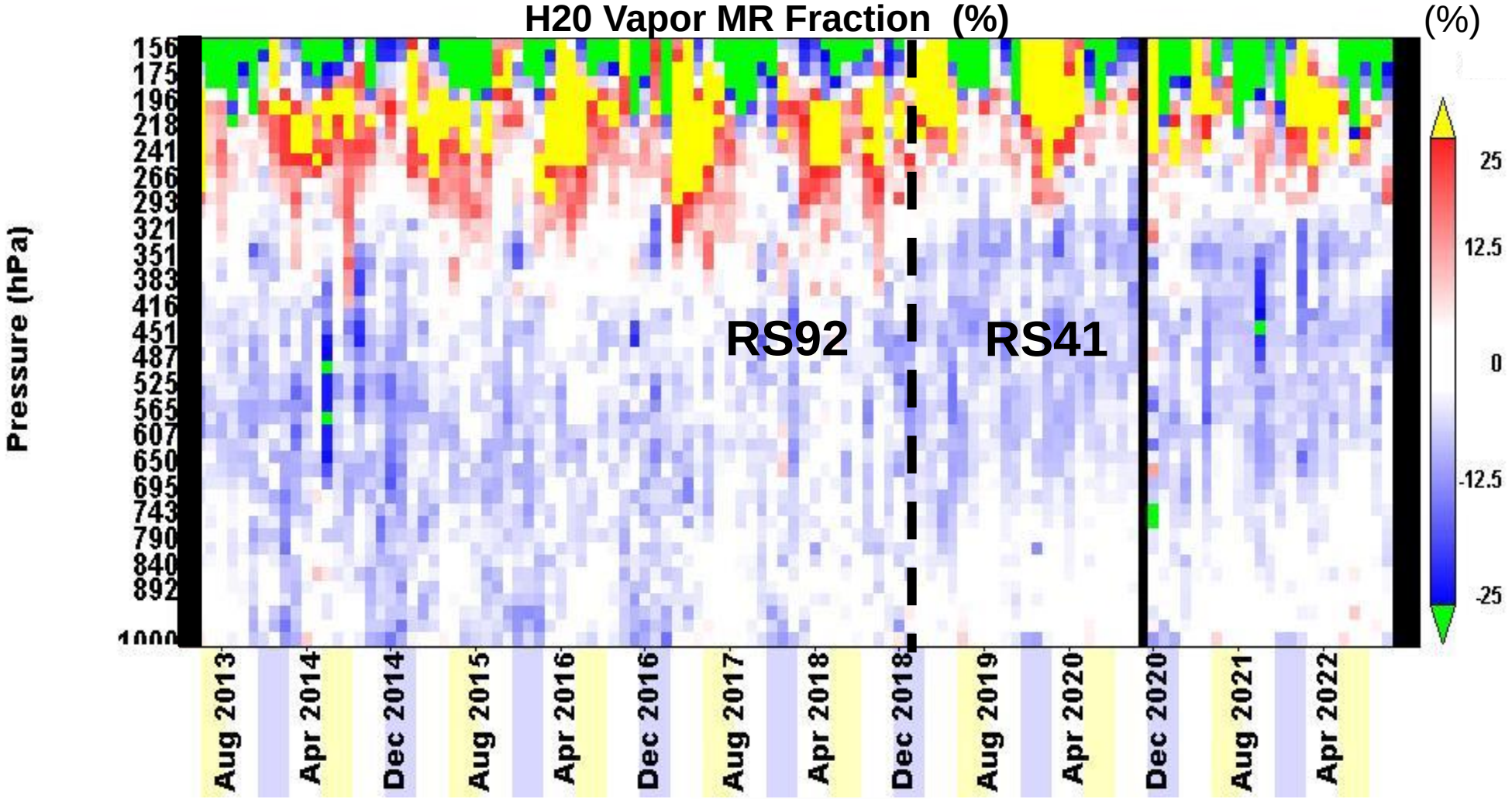

**Anchorage (70273) 5/5/19**
**(monthly mean; 50)**

## ECMWF Analysis – Radiosonde
## H20 Vapor MR Fraction (%)

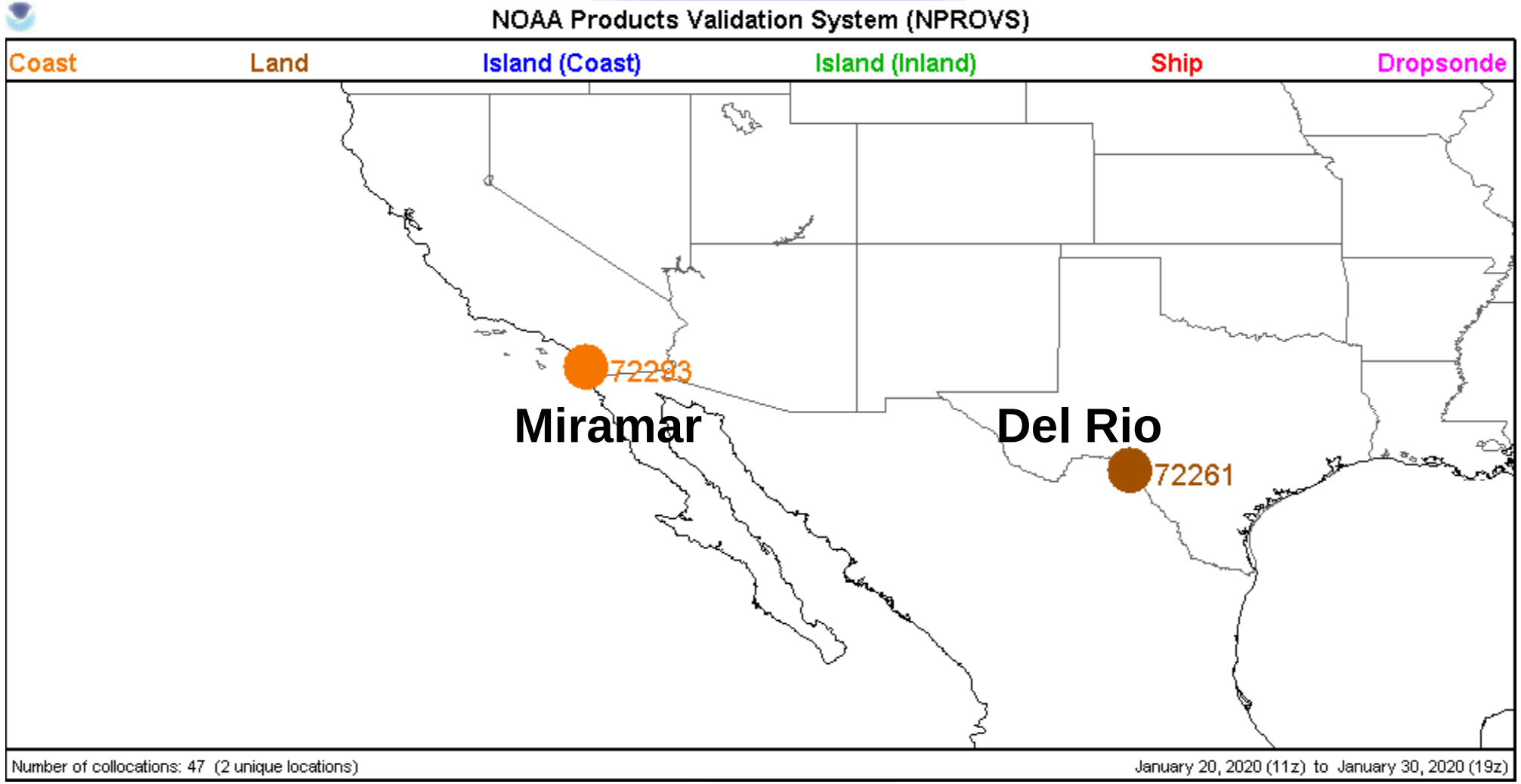



**Fairbanks (70261) 4/20/18**
**(monthly mean; 60)**

## ECMWF Analysis – Radiosonde
## H20 Vapor MR Fraction (%)

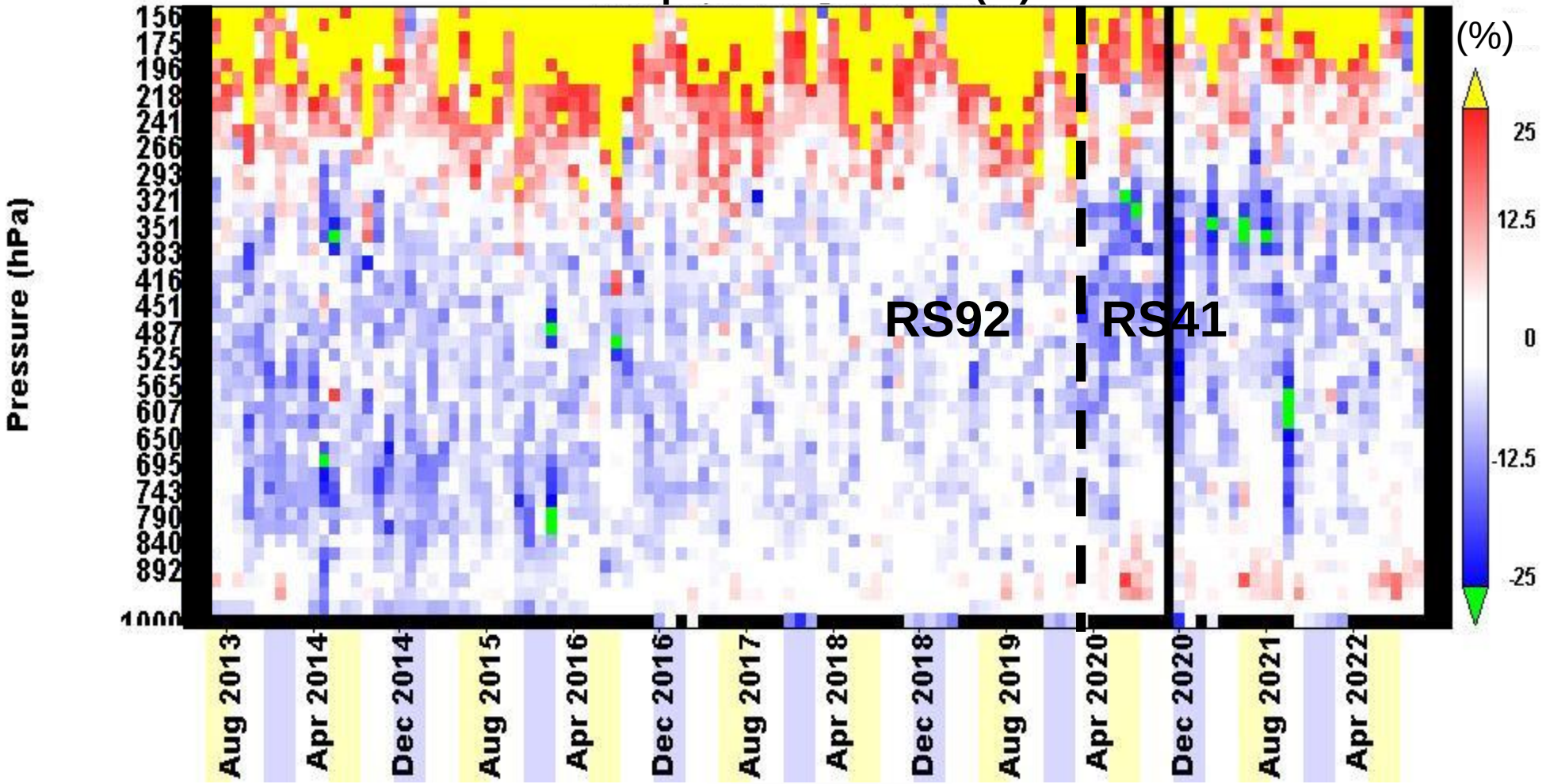



**Barrow (70026) 2/12/19**
**(monthly mean; 75)**




**Miramar (72293) 3/10/20**

## ECMWF Analysis – Radiosonde
## H20 Vapor MR Fraction (%)




**Miramar (72293) 3/10/20**
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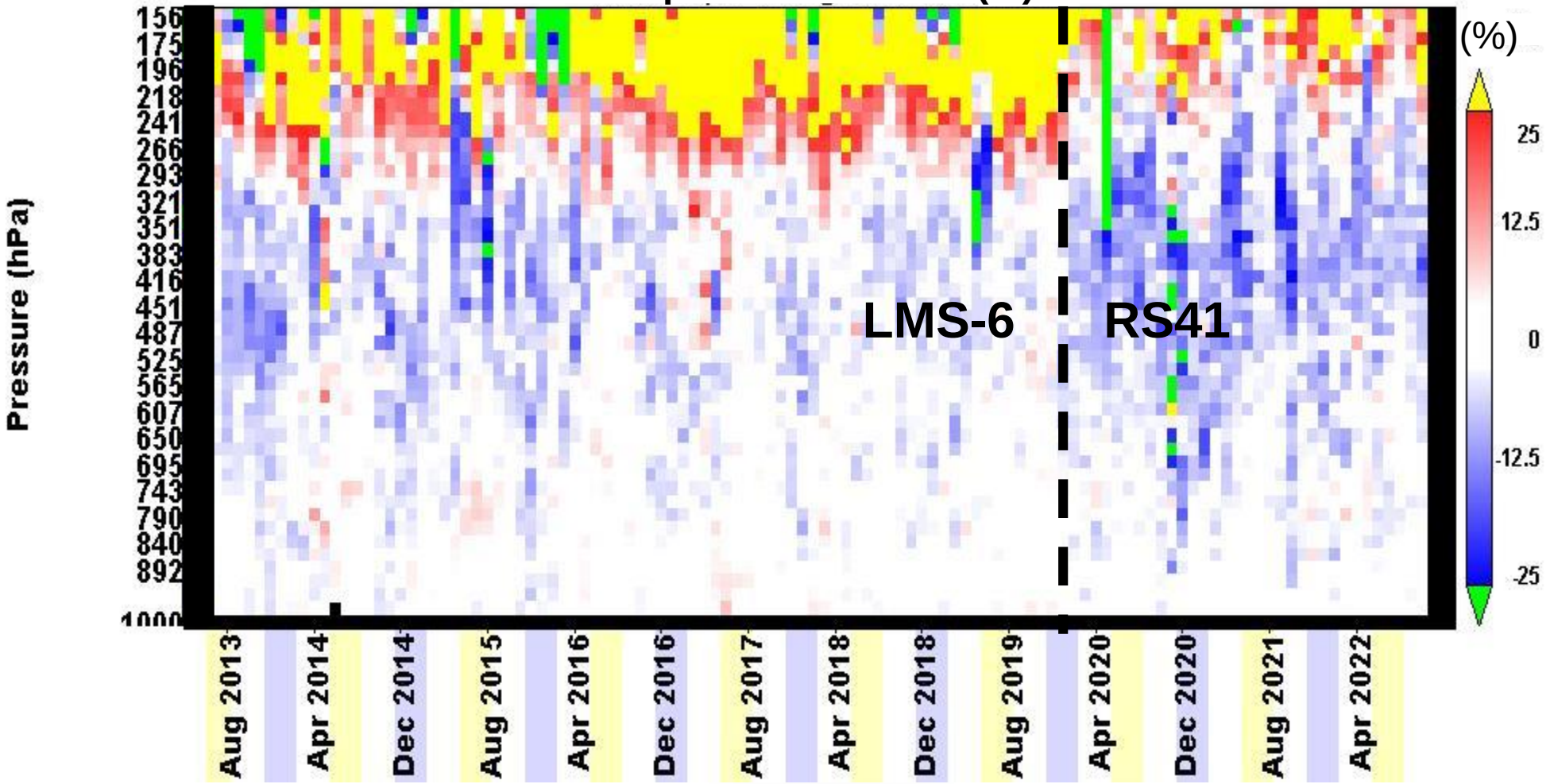
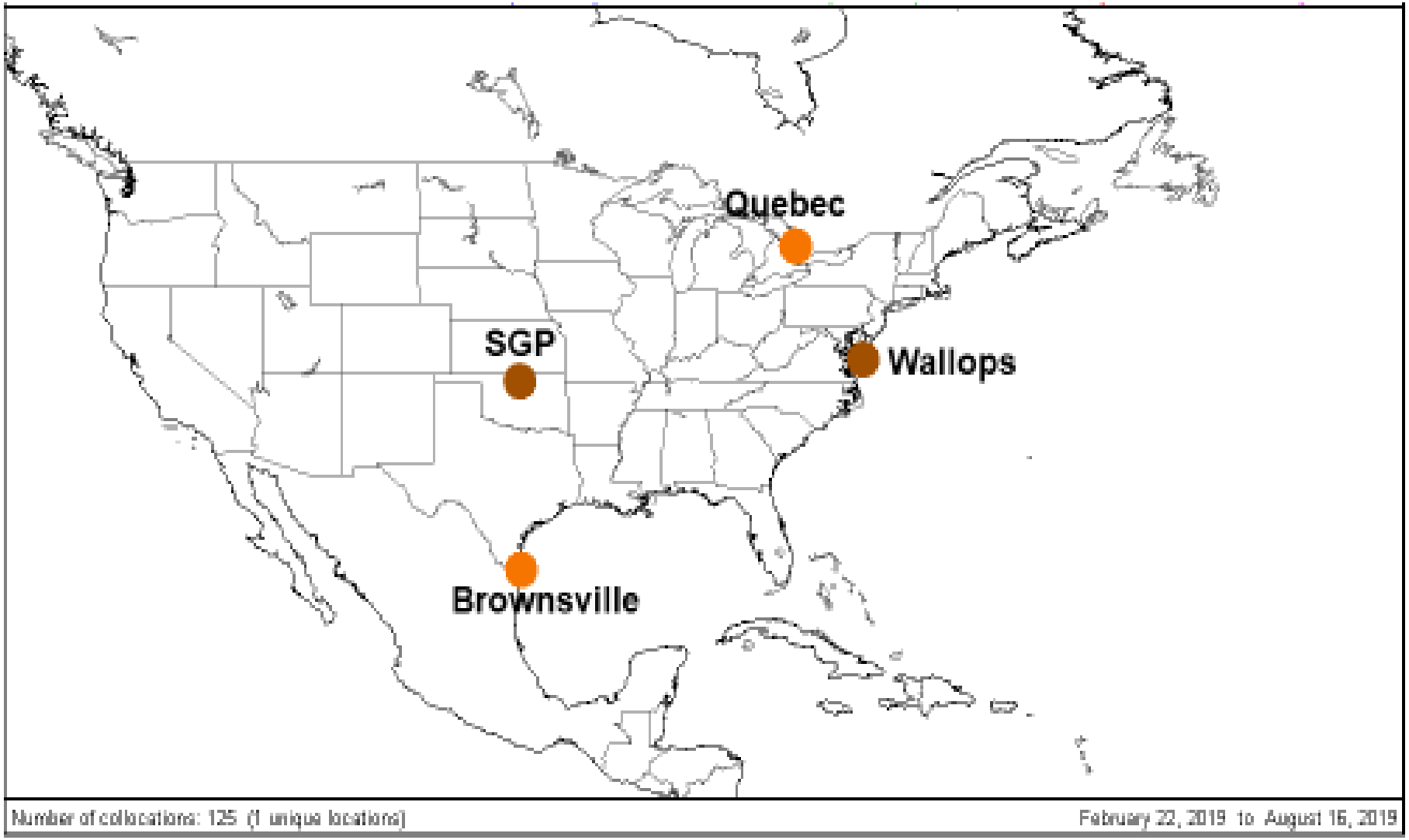
## ECMWF Analysis – Radiosonde
## H20 Vapor MR Fraction (%)



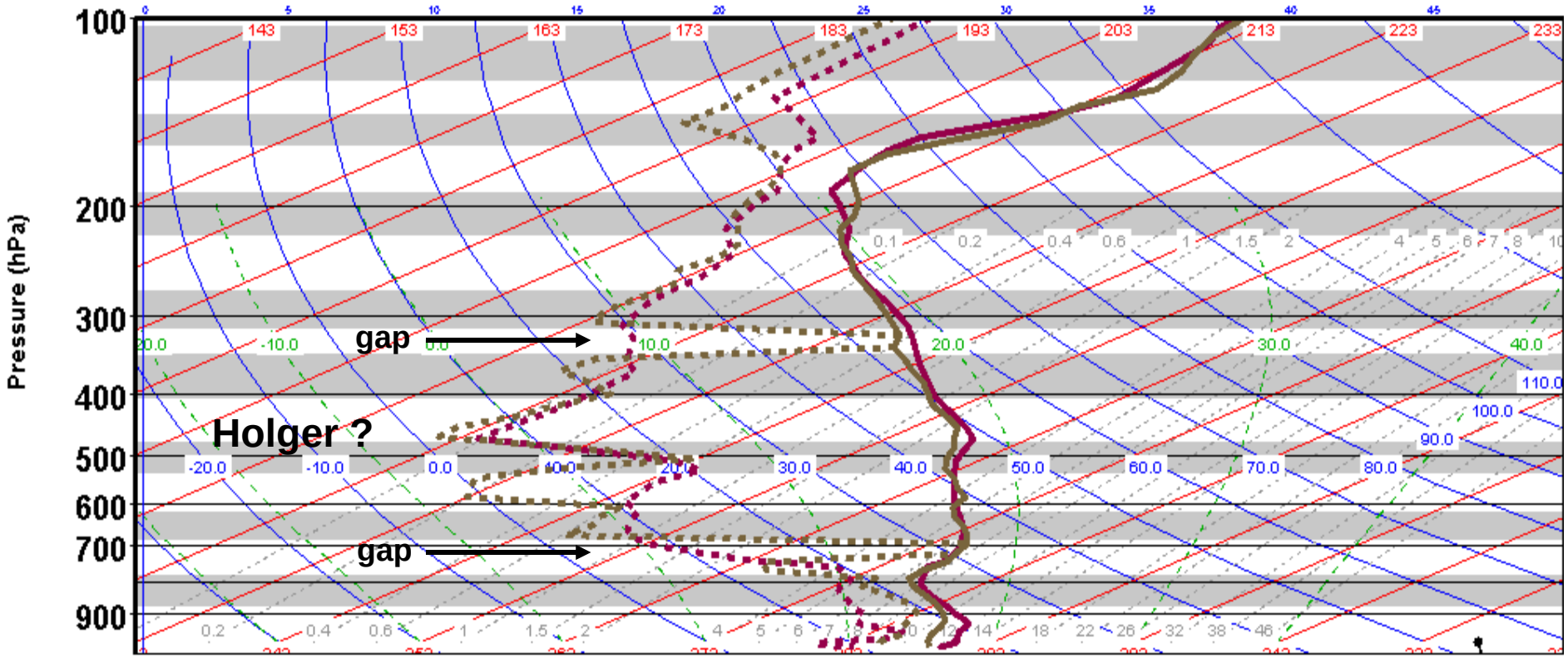

**Del Rio Texas (72261) 1/29/20**
**(monthly mean; 50)**




2019 NWS Radiosonde Inter-comparison Campaign with Sterling SFSC

## NOAA Products Validation System (NPROVS)

Dewpoint / Temperature (deg K)




| | | | |
|---|---|---|---|
| CFH SFSC (275) CFH | 5/7/2019 15:01:00Z (0 hours) | 37.8 N / 75.5 W (0 km) |
| ECMWF Analysis | 5/7/2019 18:00:00Z (3 hours) | 37.8 N / 75.5 W (10.6 km) |

# Summary

STAR/NPROVS-Special routinely compiles/archives GDP's collocated with "single-closest profile from respective national/international satellite and NWP datasets

1) used in routine Cal/Val for derived products and sensors
2) Periodic reprocessing needed to keep up with the science (ie new GDP's …)
3) useful to identify "collocated observation events" … *Satellite Task Team*

How to interpret uncertainty differences (k=2 vs k=1) for RS41 vs RS92 GDPs in the context NOAA JPSS Cal/val for soundings … example shown for RIVAL dual launch (SGP) ?

Time Series comparing (NWP – Raob) Bias before/after NWS transition from LMS6 to RS41 in Alaska region show characteristic signature wrt NWP(s) background

1) RS41 "moistening" through middle/upper troposphere, 10-15% H20 vapor fraction
2) Some "drying" aloft (UTLS), 10%
3) Also observed for transition at Southwest US sites …
4) Signature persists over time

As expected, differences reduced for transition from RS92 to RS41 … Barrow (ARM) and Miramar (Ca)