RIVAL Field Campaign
at the
ENA, NSA, & SGP ARM Sites

Radiosonde Intercomparison & VALidation

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What is RIVAL?
• RIVAL is an ARM field campaign in collaboration with JPSS & GRUAN
• Campaign idea was the result of discussions from ICM-8
• Approved July 2017 (many CO-Is here)

What is being done?
• Dual radiosonde soundings (RS92 & RS41 on same balloon) performed at ENA, NSA, & SGP weekly for 1-year (possibility of 2nd year extension)
• Launches occur at NOAA20 overpass times
• ARM providing 52-RS92 sondes per site +++
• JPSS (Tony Reale) providing RS41 sondes for each site

Goals:
• Assess RS92/RS41 differences ensuring continuity of ARM radiosonde dataset
• Use RIVAL to assess ancillary datastreams for use in Site Atmospheric State Best Estimate (SASBE) & delivery of satellite SDRs & EDRs to GRUAN
Historical dataset of JPSS (SNPP) sondes

ENA (since Feb 2015), NSA & SGP (Jul 2012)

Eastern North Atlantic (ENA)
North Slope Alaska (NSA)
Southern Great Plains (SGP)

Temperature (K)
H₂O (g/kg)
Thank you to Donna Holdridge, Scott Seabridge, and SGP crew!

- Upgraded multiple ground systems
- Designed and built mobile launch carts for each site
- Designed and built stands for sondes for each site
- Installed mass flow controller at SGP (will be installed at ENA & NSA)
- ENA now bringing helium on site for these launches

Thank you to Vaisala for loaner ground system!
Sonde Systems:

ENA:
-C1 (SPS311): MW41, 92&41 compatible - Currently set up for RS92
-S01 (SPS311): MW41, 92&41 compatible - Currently set up for RS41

NSA:
-C1 (SPS311): MW41, Autosonde, 41 compatible only. Can launch a 41 after dual launch.
-S01 (SPS311): MW41, Manual, 92&41 compatible
-S02 (SPS311): MW41, Manual, 92&41 compatible

SGP:
-C1 (SPS311): MW41, Manual, 92&41 compatible
-S01 (SPS311): MW41, Manual, 92&41 compatible
-S02 (SPS311): MW41, Manual, 92&41 compatible
-S03 - Vaisala loaner (SPS311): MW41, Manual, 92&41 compatible
Sonde & Sounding System Setup

SGP: 3800L helium, 6m/s ascent rate

Setup follows recommendations by GRUAN (images from GRUAN documentation)

Draft test plan documentation available:  
Sample Rigging

RIVAL rig

Rig from 2014 inter-comparison
Launch Criteria: JPSS & RIVAL launches
Launches **MAY** take place if:
- There is not steady precipitation
- There is cloud cover of 50% or LESS
- There is high cirrus clouds – this is okay
- There are NO thunderstorms or threatening skies in the area

Launches will **NOT** take place if:
- There is steady precipitation
- There is cloud cover of greater than 50%
- There are thunderstorms or threatening skies in the area
- The weather is rapidly changing in advance of storms blowing through

**Note:**
During a 2-balloon launch (either a dual-then-single or single-then-single), launch the 2nd balloon even if conditions have worsened and launch criteria are not met.
Launch Strategies at ARM Sites: **NSA (‘day’) & SGP (day & night)**

- **RS92 & RS41**
  - Launch: OP – 45min

- **NOAA20 Overpass**

- **RS41**
  - Launch: OP – 5min
Launch Strategies at ARM Sites: ENA (day & night)

Launch: OP – 15min
Datastreams Collected for RIVAL: SASBE & NOAA20 Comparisons

ARM:
- Vaisala processed radiosondes (sondewnpnC1.b1) & raw sondes
- Microwave radiometer (mwrlosC1.b1 or mwr3cC1.b1)
- Ceilometer (ceilC1.b1)
- AERI (aeriengineerC1.b1, aerich1C1.b1, sgpaerisummaryC1.b1)
- CFH (cfhC1.b1)

JPSS:
- SNPP & NOAA20 CrIS & ATMS RDR, SDR, EDR

Misc:
- RO dry temperature products (if they occur)

Needs:
- GRUAN processed RS92 & RS41 sonde files

Notes:
- ARM Data available from ARM archive
- Data also available to RIVAL team (via UW ftp site)
- Datastreams in red will be integrated into NPROVS
ENA: Awaiting permission to launch 1200g balloons from aviation authorities
• 2-ground systems now on site, both upgraded
• Received launch cart, stands, sondes, rigging, etc.

To Do:
• Receive/install mass flow controller (~2 week transit time + installation time)
• Perform practice launch(es). Balloon fill will be ‘eye-balled’ until controller installed.
• S01 data not being ingested by data center yet. Donna is following up on this.

Launch Strategies: coordinated w/NOAA20 (0300/1400 UTC)
• dual launch (RS92&41 on same balloon) day or night
**NSA: ** Ready to go next week (May 1st start w/predicted RO w/METOPA)
• 3 upgraded ground systems on site
• Received cart, stands, sondes, rigging, etc.

**To Do:**
• Install mass flow controller
• Practice launch may happen prior to May 1st

**Launch Strategies:** coordinated w/NOAA20 (2100 UTC)
• dual launch (RS92&41 on same balloon) day only
• dual-then-single day only

**NSA RO – 20180501 21:08:36UTC**
NOAA20 OP: 20:30 & 22:11UTC
SNPP OP: 21:21UTC
Sondes Launch: 21:26 & 22:06UTC

Thank you to Axel Von Engeln for RO prediction files!
• RO predictions checked regularly for 3 ARM sites
• Launch schedules modified to target golden cases w/RO and NOAA20 overpasses within 2hours & 200km
Sonde Launches at NSA

Cold, windy, dangerous = NO night launches

Donna Holdridge
Sonde Instrument Mentor - ARM
Launch Logistics: at NSA

- NSA: NO launches at NOAA20 ‘night’ time overpasses (dashed black line)
- **Daytime NOAA20 overpass** & **Night time NOAA20 overpass** (ignore red and yellow)
- Between mid-Nov & mid-Jan we will get some civil/nautical twilight launches

![Yearly Sun Graph for Barrow](https://www.timeanddate.com/sun/usa/barrow)
**SGP**: RIVAL launches began 13 February 2018
- Loaned Vaisala ground system is at SGP
- 2 practice RIVAL launches:
  - 20171222.1730 (left figure)
  - 20180124.1720 (right figure)
- Weekly launches alternating between 0800/1900 UTC

- **dual RS41 & RS92 launch**
- not coordinated w/NOAA20
- ascent rate too low
- burst at 57mb

- **dual RS41 & RS92 launch**
- not coordinated w/NOAA20
- ascent rate: 5.9 m/s
- burst at 7mb
Practice launch at SGP: 20180124 (5.9 m/s, balloon burst at 7mb)
First RIVAL launch at SGP – 20180213.1922

- dual-then-single launch:
- coordinated w/ 1922 UTC NOAA20 overpass
- ascent rate: 6 m/s
- burst at: 7 mb
RS-92

NOAA Products Validation System (NPROVS)

Dewpoint / Temperature (deg K)

Reference/Dedicated 74646  (80) Reference/Dedicated   2/13/2018 18:35:00Z   36.6 N / 97.5 W
RS-41

NOAA Products Validation System (NPROVS)

Dewpoint / Temperature (deg K)

Reference/Dedicated 74646   (80) Reference/Dedicated   2/13/2018 18:36:00Z   36.6 N / 97.5 W
CFH Collaboration w/RIVAL at SGP: METOP-A/B

CFH Launches: (Martin Stuefer is ARM Instrument Mentor for the CFH at ARM)
- CFH launches occur once a month at SGP
- Restricted to morning launches (overtime & sun angle)
- Previously included RS92 & iMET sondes w/CFH
- Martin has replaced iMET sonde w/RS41 (package includes: CFH, RS92, RS41)

Future CFH Launches:
- Coordinated w/METOP A/B
- Occur: ~1600 UTC
- Overpass times provided to Martin each month
- RO predictions checked

CFH launches will be added to RIVAL dataset
<table>
<thead>
<tr>
<th>RIVAL Milestones</th>
<th>Owner</th>
<th>Due</th>
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<tbody>
<tr>
<td>1. Launch Scheduling</td>
<td>Borg</td>
<td>M1</td>
</tr>
<tr>
<td>2. Data flow using RsLaunchcClient</td>
<td>DWD (Dirksen)</td>
<td>M1</td>
</tr>
<tr>
<td>3. Data available via ARM data repository</td>
<td>Dirksen, Holdridge</td>
<td>M3</td>
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<tr>
<td>4. Initial report on statistical properties of the co-launches</td>
<td>Fasso, Wang</td>
<td>~Sep</td>
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<tr>
<td>5. Initial report on the potential insights from satellites and on satellite validation</td>
<td>Borg, Reale, Tobin</td>
<td>~Sep</td>
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<tr>
<td>6. Initial study on the impact of the transition, etc</td>
<td>Wang</td>
<td>~Sep</td>
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<tr>
<td>7. Final report</td>
<td>Dirksen</td>
<td>~Sep</td>
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Is LC receiving RIVAL data?

Needed for request to extend RIVAL for year 2
Extension of RIVAL field campaign for 2\textsuperscript{nd} year:
• Submit by late September for Oct1st review?
• Requires final report from year-1 including justification for year-2
• Will GRUAN processing of RS92 & RS41 RIVAL sondes be available?

Ancillary & Satellite Data for RIVAL:
• How to provide ancillary and satellite data to LC?
• RIVAL & CFH sondes collocated w/JPSS or METOP (w/in NPROVS)
  • Does LC want: Satellite RDR, SDR, EDR?
  • Original files? File subsets (~500km radius)? Collocation file?
  • Should sondes converted to 100 layers be provided?
  • Does LC want satellite collocations for other sites GRUAN sites?