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# Utility of Historical Collocations of Radiosonde, Rocketsondes, TOVS ... GPSRO ( ? )

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NOAA/NESDIS/STAR

**Workshop on Microwave Sensor CDR**  
**March 22-24, 2010**  
**Silver Spring, Md**



# Collocations at STAR

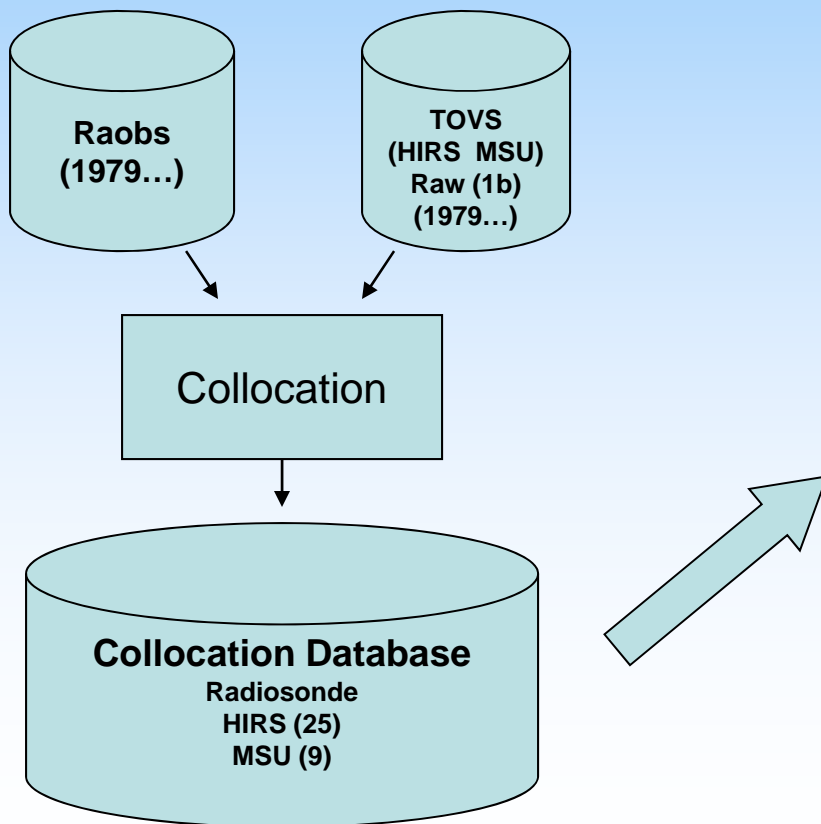
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- **HIRS/MSU/Raob 1979-2006**
- *Individual Projects*
- **NPROVS (2008- ...)**
- **GPSRO/Raob/Satellite (2002 (1995) ... )**

# Collocated Radiosonde and TOVS Satellite Observation Database (1979-2001)

Support of NOAA Study of Environmental Arctic Change (SEARCH), 2005  
... Francis, Schweiger

Concluded with STAR support, 2008,

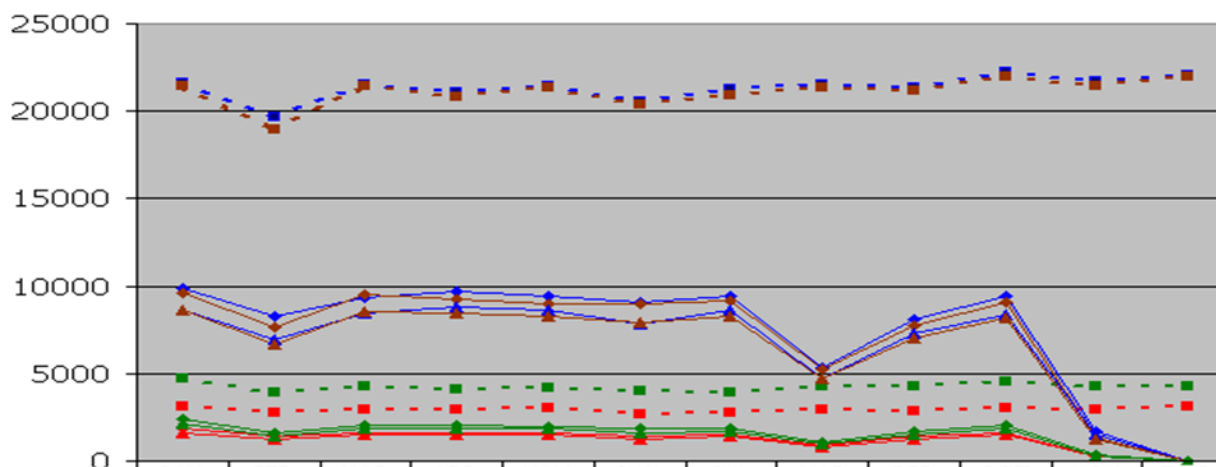


- **1979-2006**
- **HIRS(17-39); MSU (4-8)**
- **Approaching ½ million collocations per satellite per year**
- **Over 50 TOVS satellite years (NOAA 6 to 14)**
- **Over 25 million collocations (STAR CEDR)**



# NOAA-9 1988

RAOB Totals vs NOAA-09 'HIRS'/'MSU' Collocations 1988



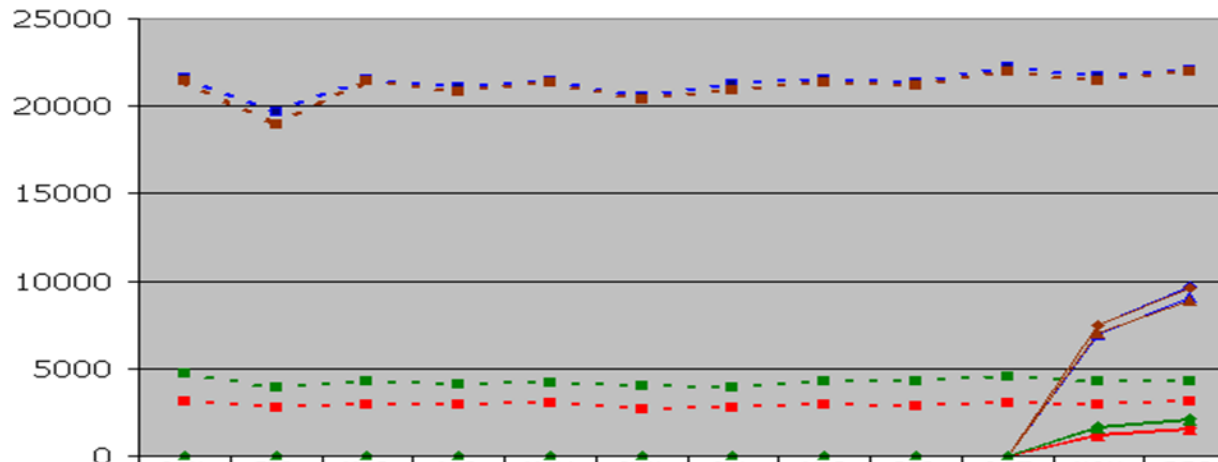
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
- -■- RAOB 00Z	21628	19619	21508	21046	21400	20516	21251	21574	21390	22250	21677	22031
- -■- RAOB 06Z	3131	2776	2907	2915	2987	2681	2716	2908	2849	2984	2940	3074
- -■- RAOB 12Z	21413	18919	21411	20848	21335	20398	20926	21383	21178	21973	21439	22001
- -■- RAOB 18Z	4685	3909	4306	4052	4211	3963	3946	4229	4277	4557	4253	4310
- ◆- HIRS 00Z	9851	8250	9347	9716	9418	9076	9440	5358	8108	9405	1660	0
- ◆- HIRS 06Z	1830	1453	1602	1620	1628	1438	1531	925	1381	1645	248	0
- ◆- HIRS 12Z	9578	7647	9546	9264	9028	8984	9204	5260	7781	9036	1348	0
- ◆- HIRS 18Z	2361	1625	2039	2049	1973	1908	1877	1099	1699	2040	322	0
- ▲- MSU 00Z	8605	6938	8493	8839	8660	7841	8630	4732	7302	8337	1479	0
- ▲- MSU 06Z	1592	1215	1469	1484	1482	1288	1408	828	1243	1475	229	0
- ▲- MSU 12Z	8597	6690	8571	8441	8232	7946	8259	4729	7007	8170	1220	0
- ▲- MSU 18Z	2113	1419	1846	1864	1827	1641	1703	958	1536	1844	278	0

Collocation Sample Sizes



# NOAA-11 1988

RAOB Totals vs NOAA-11 'HIRS'/'MSU' Collocations 1988



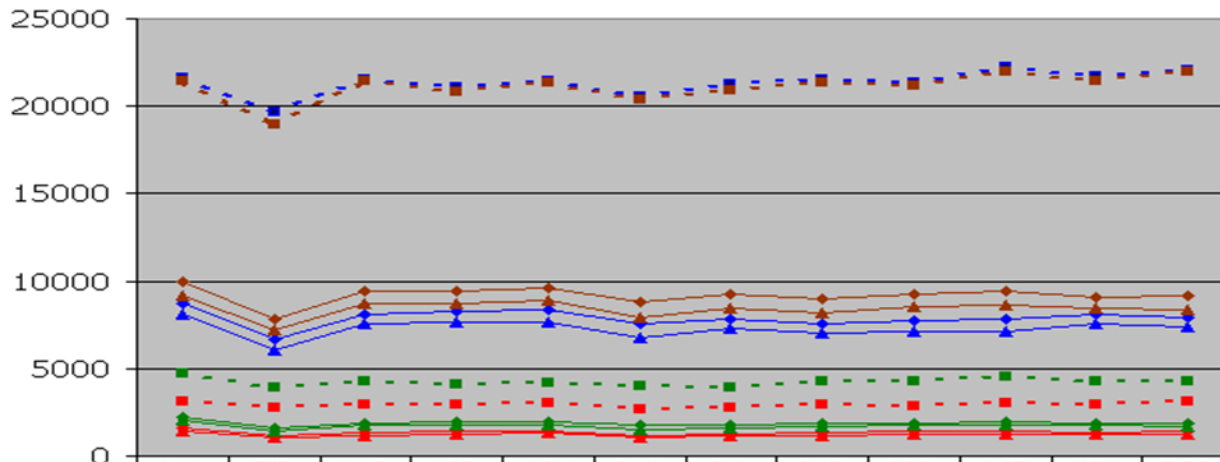
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
- -■- RAOB 00Z	21628	19619	21508	21046	21400	20516	21251	21574	21390	22250	21677	22031
- -■- RAOB 06Z	3131	2776	2907	2915	2987	2681	2716	2908	2849	2984	2940	3074
- -■- RAOB 12Z	21413	18919	21411	20848	21335	20398	20926	21383	21178	21973	21439	22001
- -■- RAOB 18Z	4685	3909	4306	4052	4211	3963	3946	4229	4277	4557	4253	4310
—◆— HIRS 00Z	0	0	0	0	0	0	0	0	0	0	7471	9665
—◆— HIRS 06Z	0	0	0	0	0	0	0	0	0	0	1226	1630
—◆— HIRS 12Z	0	0	0	0	0	0	0	0	0	0	7513	9653
—◆— HIRS 18Z	0	0	0	0	0	0	0	0	0	0	1699	2156
—▲— MSU 00Z	0	0	0	0	0	0	0	0	0	0	6977	9064
—▲— MSU 06Z	0	0	0	0	0	0	0	0	0	0	1168	1539
—▲— MSU 12Z	0	0	0	0	0	0	0	0	0	0	6992	8929
—▲— MSU 18Z	0	0	0	0	0	0	0	0	0	0	1611	2044

Collocation Sample Sizes



# NOAA-10 1988

RAOB Totals vs NOAA-10 'HIRS'/'MSU' Collocations 1988



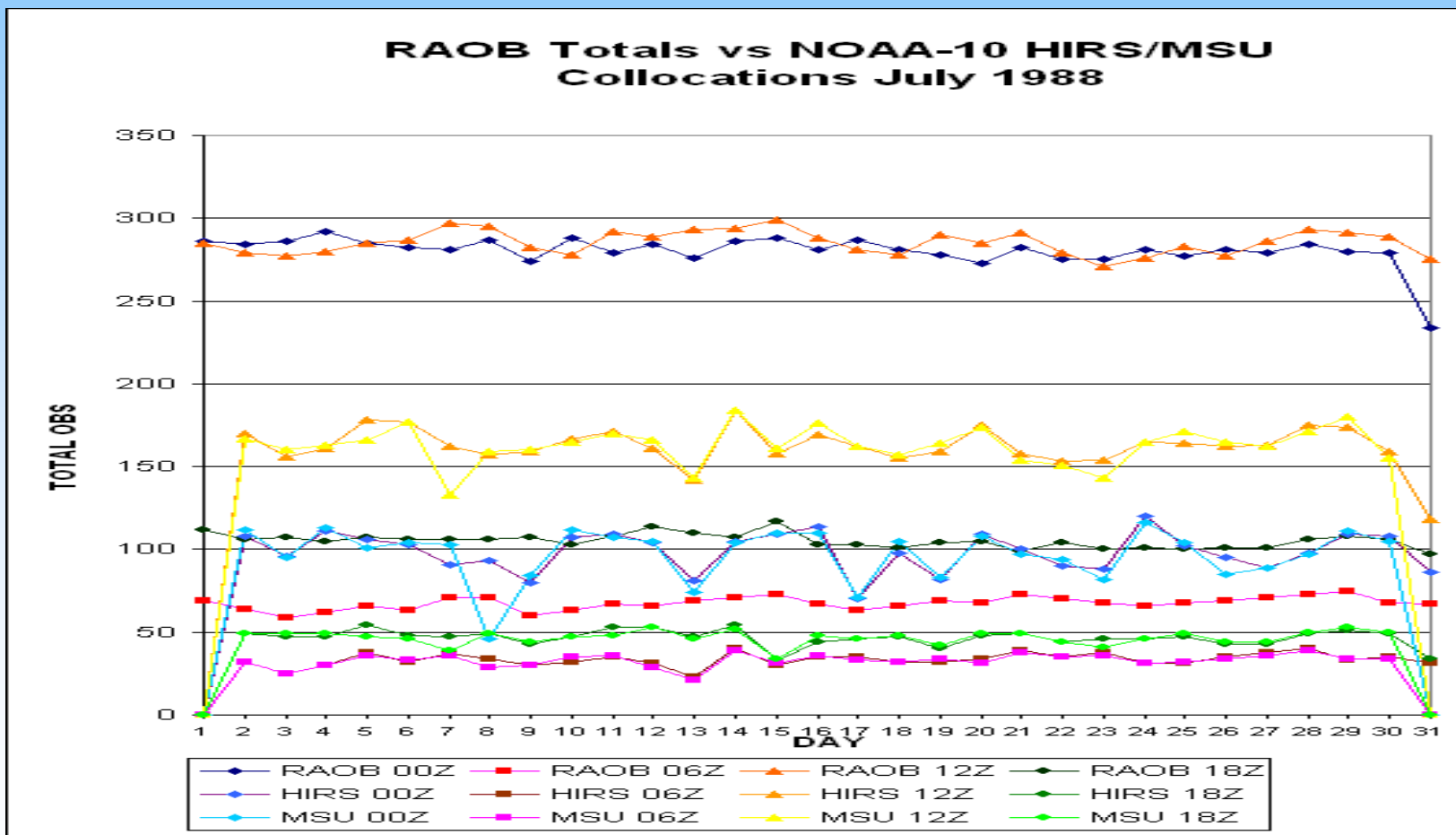
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
- -■- RAOB 00Z	21628	19619	21508	21046	21400	20516	21251	21574	21390	22250	21677	22031
- -■- RAOB 06Z	3131	2776	2907	2915	2987	2681	2716	2908	2849	2984	2940	3074
- -■- RAOB 12Z	21413	18919	21411	20848	21335	20398	20926	21383	21178	21973	21439	22001
- -■- RAOB 18Z	4685	3909	4306	4052	4211	3963	3946	4229	4277	4557	4253	4310
- ◆- HIRS 00Z	8705	6707	8114	8291	8321	7595	7864	7578	7717	7810	8097	7944
- ◆- HIRS 06Z	1600	1180	1305	1400	1420	1200	1228	1296	1385	1398	1350	1394
- ◆- HIRS 12Z	9972	7857	9404	9450	9565	8789	9236	9020	9214	9470	9045	9157
- ◆- HIRS 18Z	2258	1593	1894	1924	1968	1750	1744	1832	1907	1976	1903	1835
- ▲- MSU 00Z	8057	6054	7557	7692	7627	6749	7254	6989	7079	7157	7549	7381
- ▲- MSU 06Z	1457	1074	1180	1284	1291	1085	1147	1133	1276	1238	1254	1264
- ▲- MSU 12Z	9161	7199	8680	8754	8902	7892	8462	8190	8543	8648	8452	8341
- ▲- MSU 18Z	2065	1427	1750	1757	1813	1534	1590	1654	1755	1810	1762	1699

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Collocation Sample Sizes



# NOAA-10 1988, July





# Expand (?)

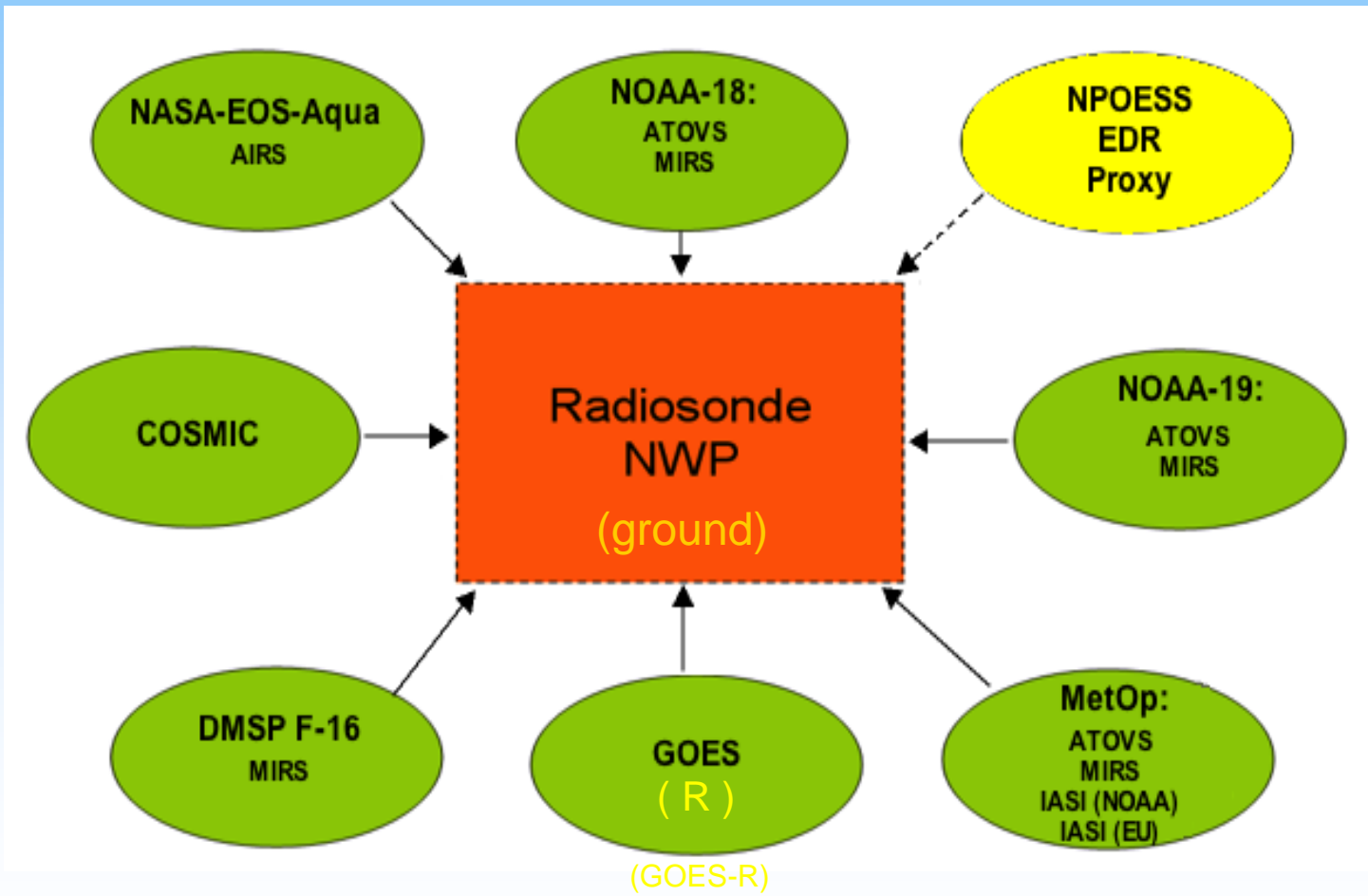
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- SNO Adjustments
- SSU and Rocketsondes ...
- Radiosonde Homogeneity ...
- Append DMSP SSMT1,T2, I
- ATOVS ...
- Append Soundings (operational, reprocess ...)
- NWP Anal and Re-Anal
- ...





# NOAA Products Validation System (NPROVS)



... collocation dataset



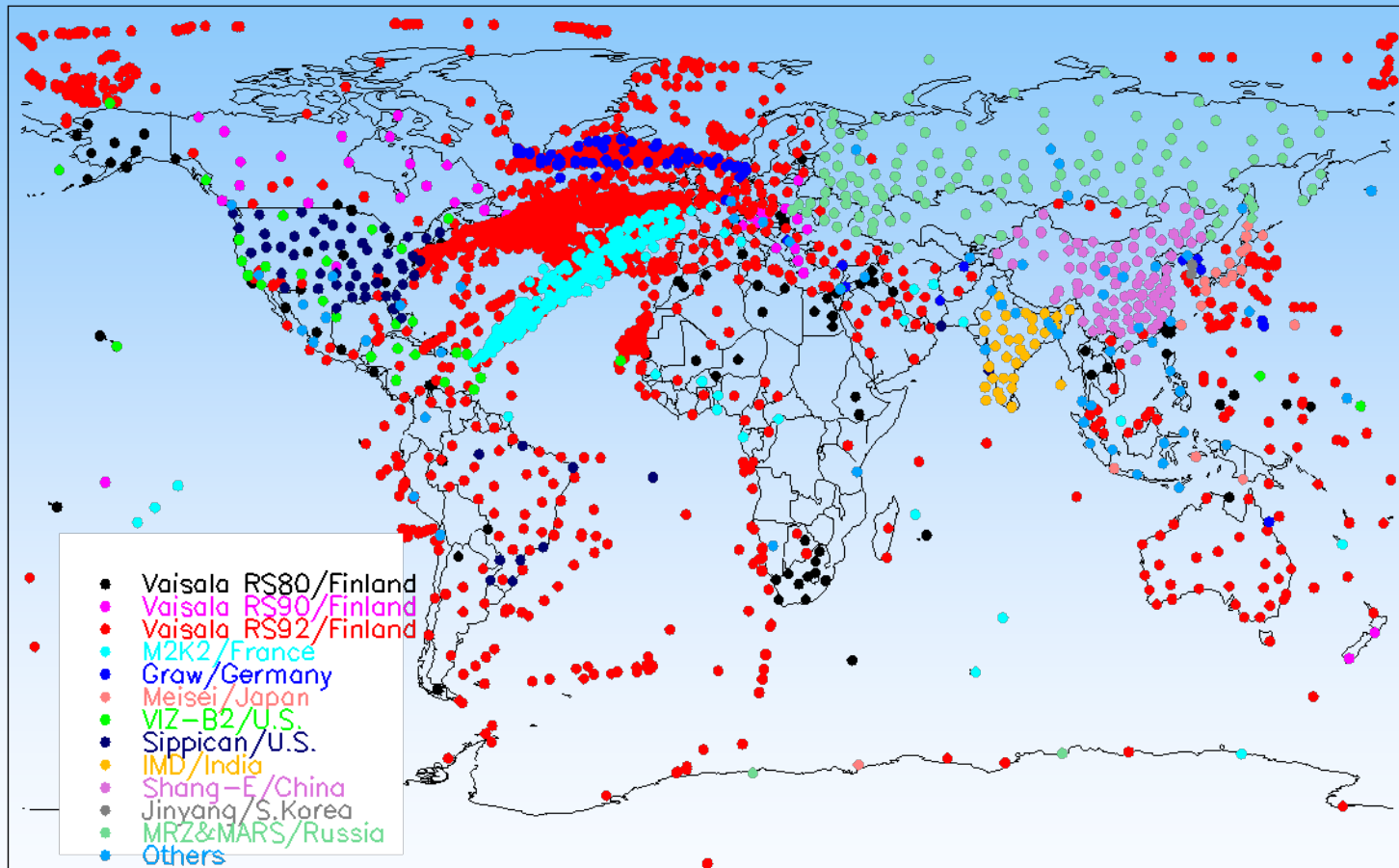
# NPROVS

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- Centralized NOAA-STAR facility to monitor / inter-compare (real-time) “**satellite derived products**” ...
- Support “JPSS” *Product* (EDR) Cal-Val Program (Chris Barnet ...)
- ***GRUAN Monitoring / Analysis Support***  
(*ICM-2, March 2010*)
  - *Satellites (spectra, retrievals) as transfer standard for site monitoring*
  - *RT model validation optimal at GRUAN*



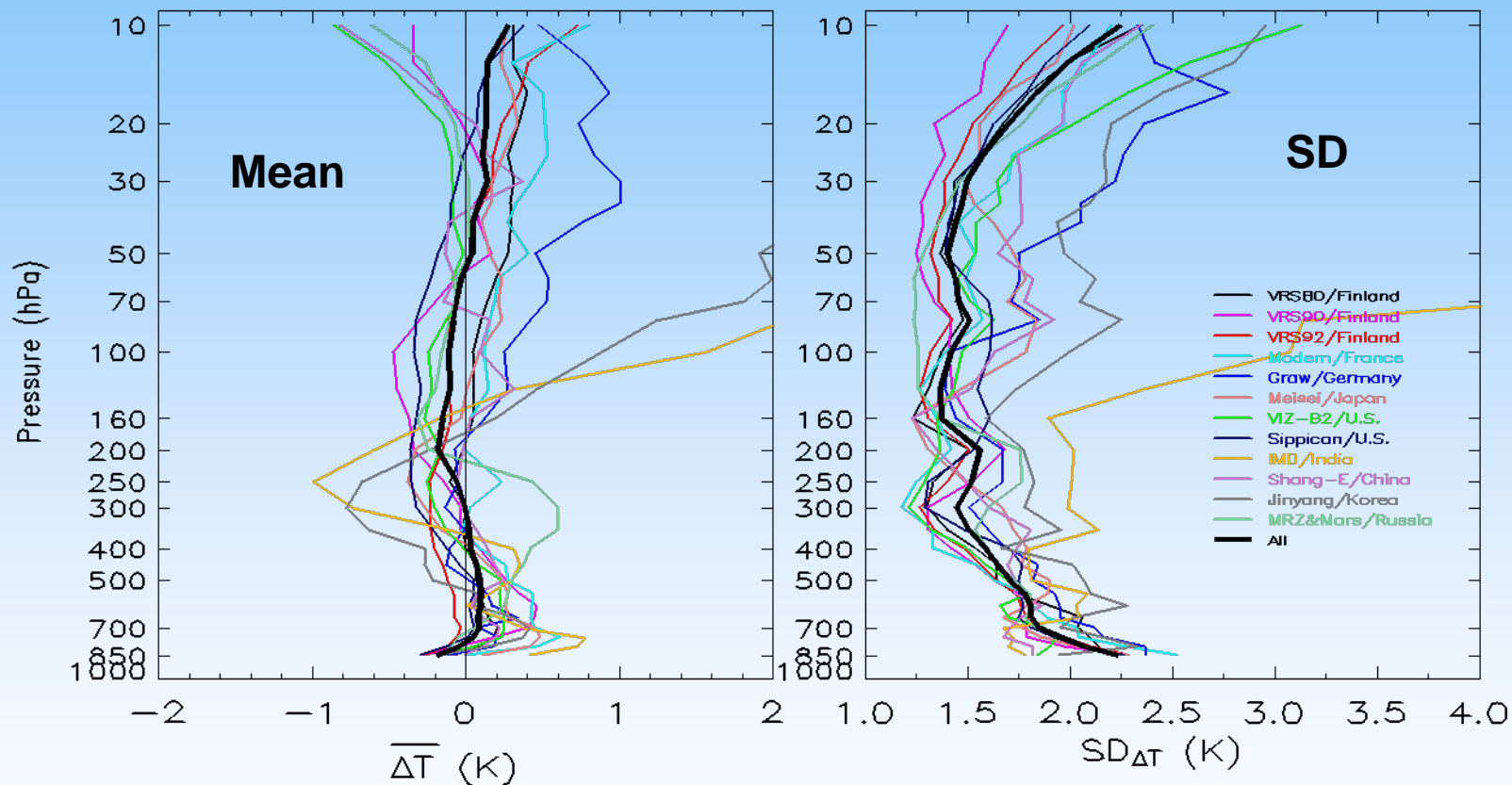
## Radiosonde Instrument Type Inter-comparisons



Bomin Sun *et.al*, .... pending JGR



# Temperature inter-comparison among radiosonde types based on Raob-minus-COSMIC difference



Sun *et.al*, .... pending JGR



# Distance Mismatch Impact

$SD_{\Delta X}$  per 100 km

	T (K)	RH (%)	Fractional N (%)
<b>Globe</b>	<b>0.42 (0.030)</b> <i>0.22 (0.025)</i>	<b>3.05 (0.290)</b>	<b>0.36 (0.023)</b>
<b>Mid-high Latitudes</b>	<b>0.46 (0.031)</b> <i>0.22 (0.025)</i>	<b>3.19 (0.298)</b>	<b>0.35 (0.021)</b>
<b>Low Latitudes</b>	<b>0.20 (0.048)</b> <i>0.22 (0.052)</i>	<b>2.58 (0.461)</b>	<b>0.32 (0.050)</b>

SD errors introduced by **distance mismatch per 100 km** averaged from 850 hPa to 200 hPa for the troposphere (*and 200 hPa to 10 hPa for the stratosphere T, second row*); values within the parentheses are the standard errors of the estimations; mid-high latitude is poleward 30° (Sun et.al, .... pending JGR)

... weather scale



# GPSRO Oriented Collocation Database (... 2002 - 2010 ...)

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- **COSMIC, CHAMP, GRACE, GRAS ....**
- **AIRS, IASI, ATOVS (SNO ...)**
- **Atmospheric Profile**
- **Radiosonde (+special), GPS ...**
- **NWP Analysis, Re-analysis**
- **other**

Available Radiosonde, GPS  
and  
STAR product suites  
for  
AIRS, IASI and Microwave  
and  
NWP  
collocated to  
GPSRO "profile"

Weather Scale  $\longleftrightarrow$  Climate Scale

# Collocations at STAR ... *atmospheric profiles*

