

SATELLITE UPPER AIR
NETWORK
(SUAN)

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WHAT IS SUAN ?

- Global network of radiosonde sites flying a reference **Radiosonde** coincident with NOAA polar satellite overpass

WHY SUAN ?

- Polar satellite radiometers, derived products and associated science *require* absolute scientific calibration ...**CALVAL**
- Global **Radiosondes** “can” provide the necessary ground truth data
- Current available collocated radiosonde and satellite data are **Not Adequate**

WHY NOT ADEQUATE ?

- Satellite and Radiosonde data each have **Systematic Uncertainties** ... so does the Science
- **Different Satellites** collocate with radiosondes in **Different Regions** ... Oceans neglected
- Collocation sample integrity are further compromised by **time and distance** windows

WHAT IS NEEDED

- Acknowledge the requirement for global radiosondes to provide polar satellite **CALVAL**
- Design global program to launch reference radiosondes coincident with polar satellite overpass ... **SUAN**
- Commit to remote ocean observations from **Ships**

BENEFITS

- Quantify *satellite radiometer and product* uncertainty
- Quantify *radiosonde* data uncertainty
- Quantify *scientific algorithm* uncertainty (OPTRAN, RTTOV ...)
- Long-term *traceability* ... *Past, Present, and Future*
- *Positive impacts* on weather forecast and climate applications

Support

- **International ATOVS Study Conference (Feb., 2002)**
 - *idea proposed; with recommendations to gain support, define requirements ... WMO presence*
- **NOAA Council on Long-Term Climate Monitoring (Jan., 2003)**
 - *includes specific recommendations for “integrated global observing systems which include reference radiosonde and overflying satellite observations ... **long term, accurate global temperature, moisture ...***
- **Workshop to Improve Usefulness of Radiosondes (March, 2003)**
 - *formal recognition of important role of global radiosondes to validate polar satellite data (via) a carefully designed network of reference radiosondes coincident with satellite overpass ...*

WHATS THE PLAN?

- Determine “Candidate” **SUAN** radiosonde sites
- Select final sites (... to alter launch schedules)
- Establish launch protocol, provide launch schedules ...
Education and Training (WMO)
- Pursue special “*Intensive*” sites for additional ground truth,
upper stratosphere ... *Ships !!!*

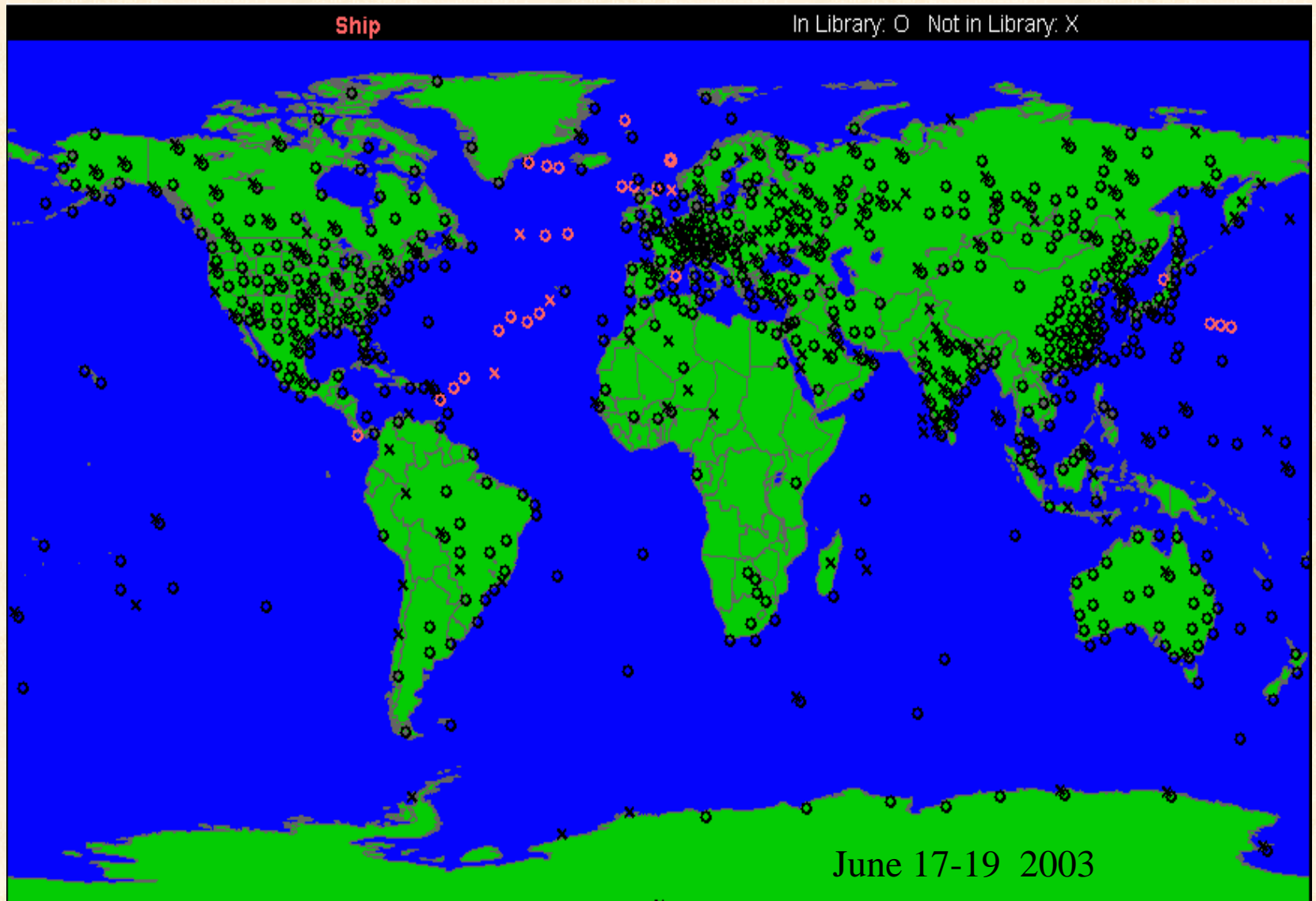
CANDIDATE SITE

- Not specified for NWP or Climate
 - **GUAN, GCOS, etc**
 - *“Thorne Scores”*
- Active, with “Suitable” Radiosonde
- Adequate Global Distribution
- **Ships !!!**
- Willing and able to change launch schedules
(... *no additional launches* ...)

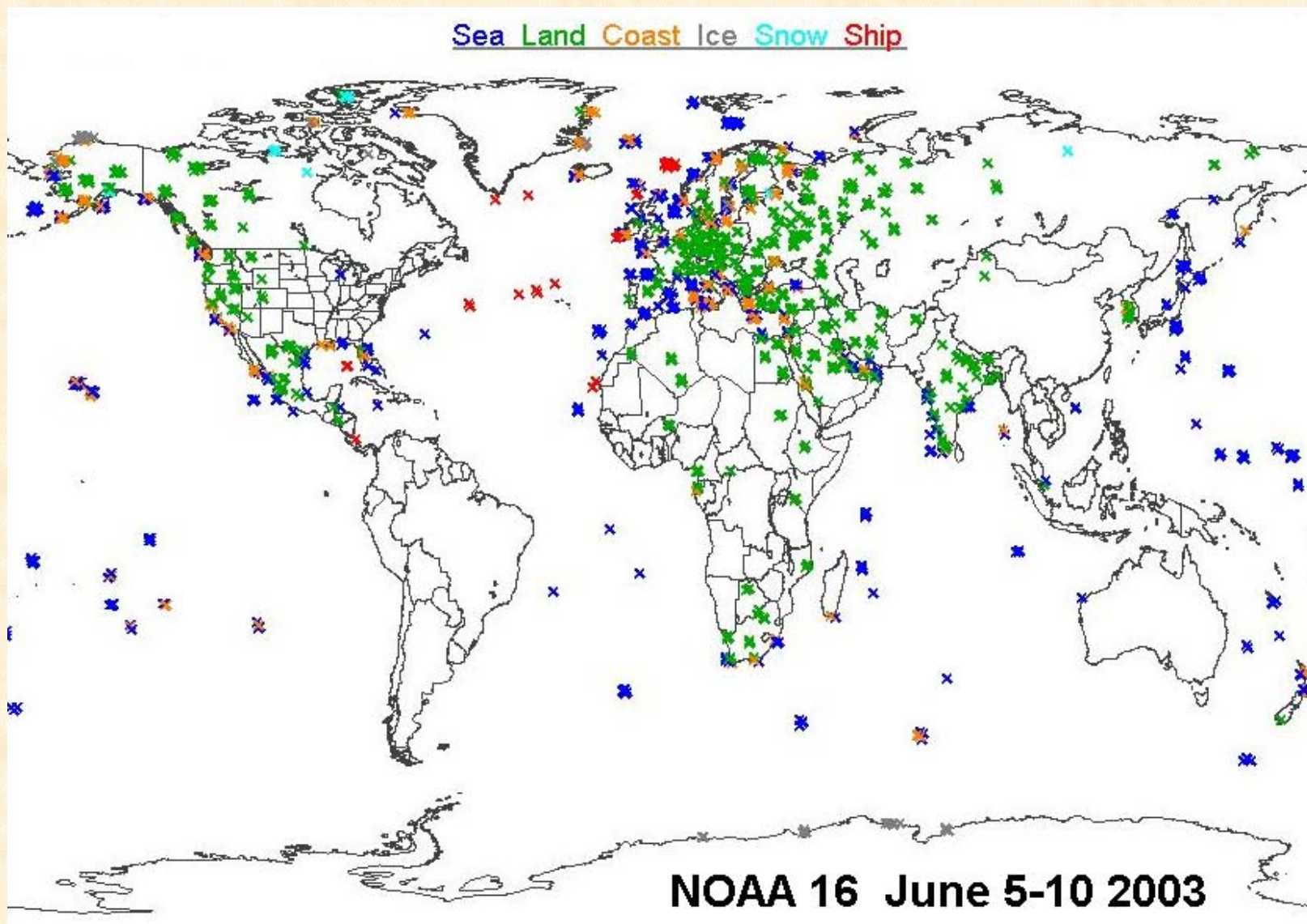
STATUS

- **Current Operational Baseline of Collocations**
- Climate and NWP Radiosonde Lists
- Radiosonde Scores (Thorne, HadleyCentre)
- Instrument used (WMO Pub-9, TTBB, EMC Dictionary)
- Preliminary SUAN Candidates
- Ships

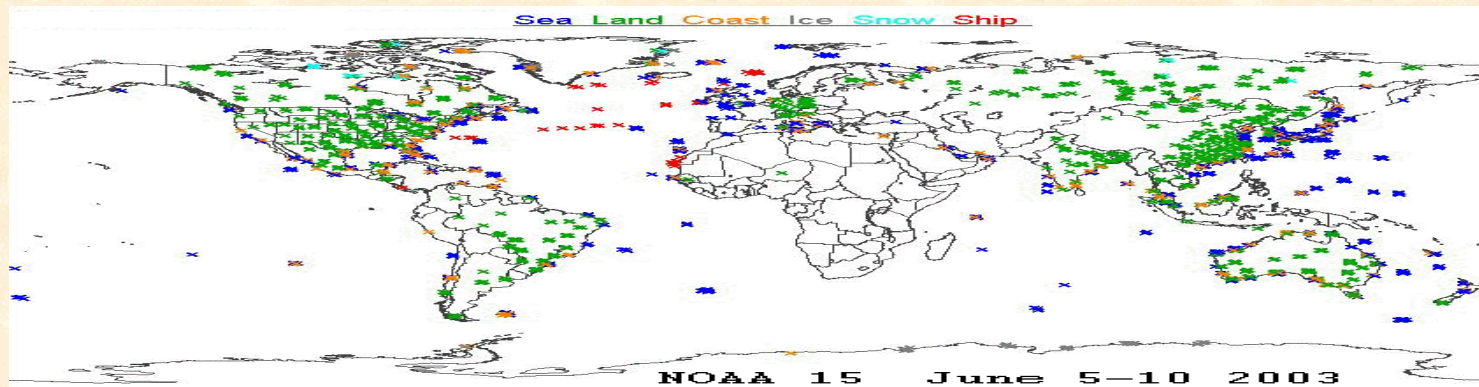
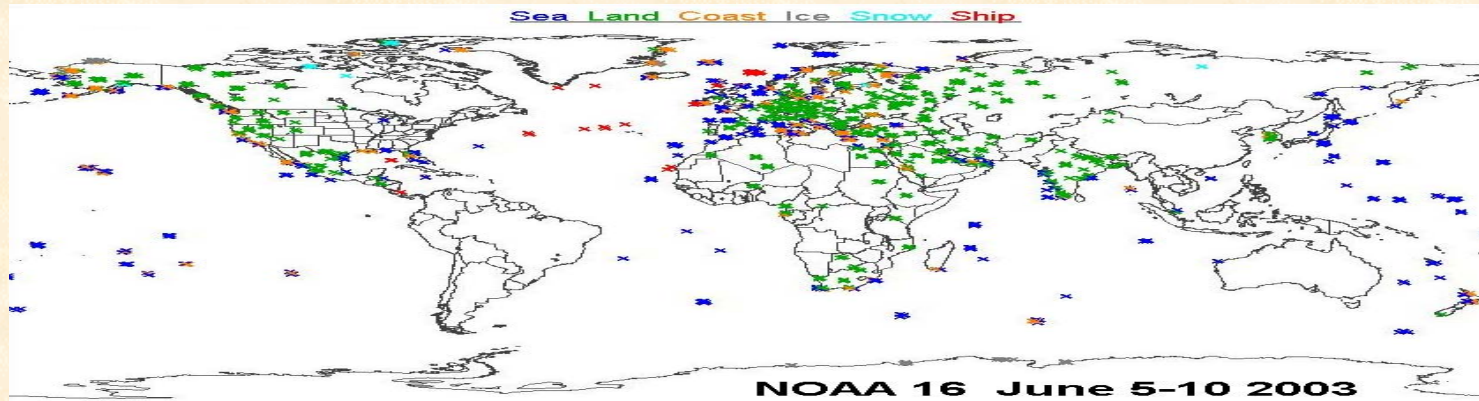
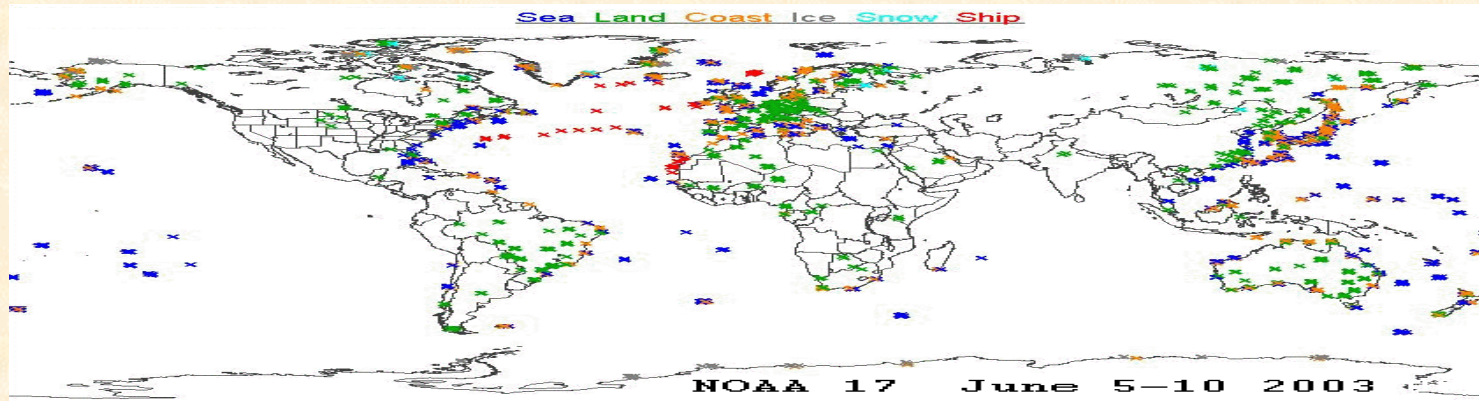
Global Radiosondes



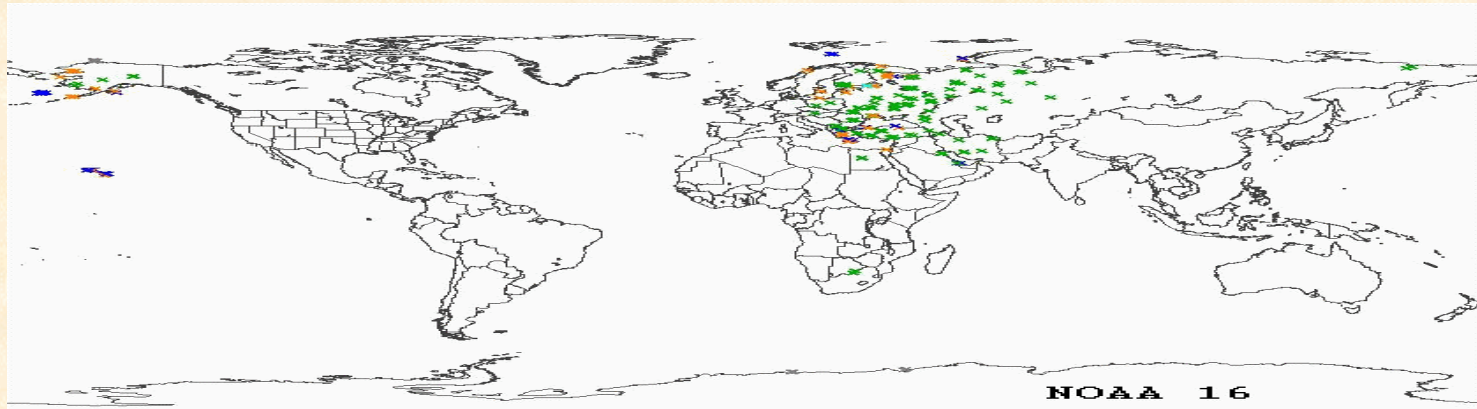
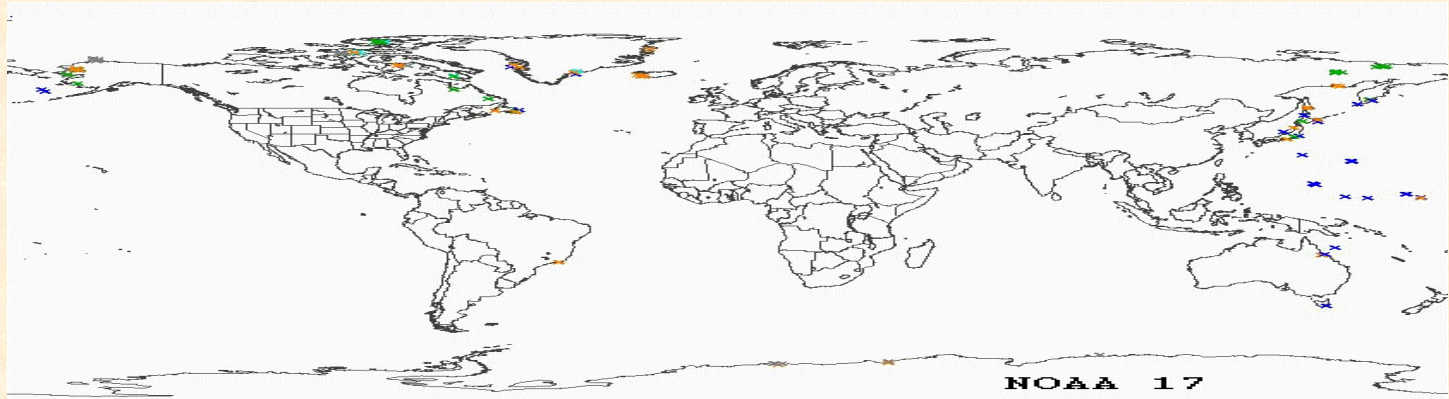
Collocated Radiosonde and Satellite Observations (± 3 hrs, land; ± 5 hrs, Sea)



SATELLITE COLLOCATIONS (\pm 3hrs, land; \pm 5hrs, sea)



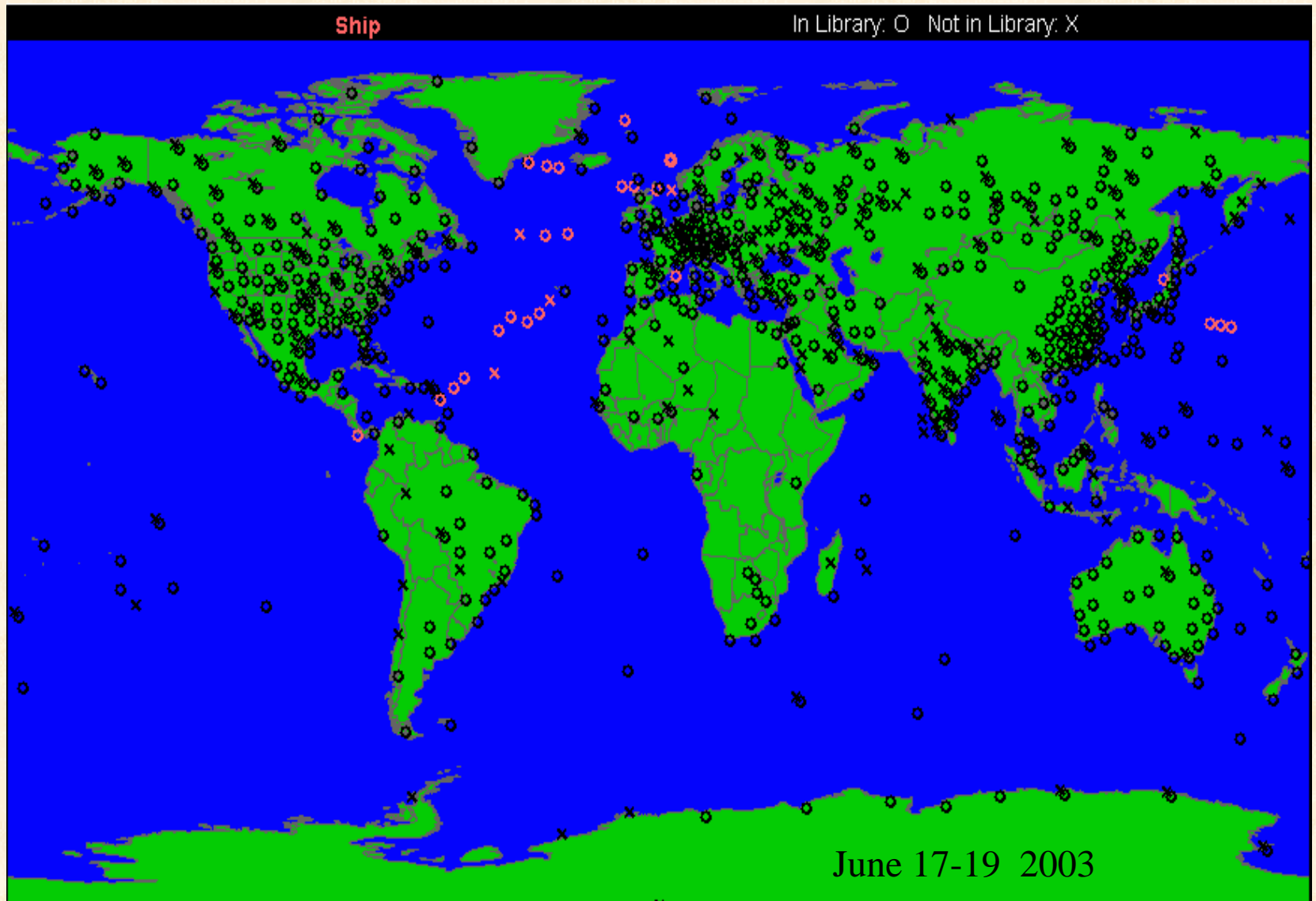
COLLOCATIONS @ +/- 1 HR



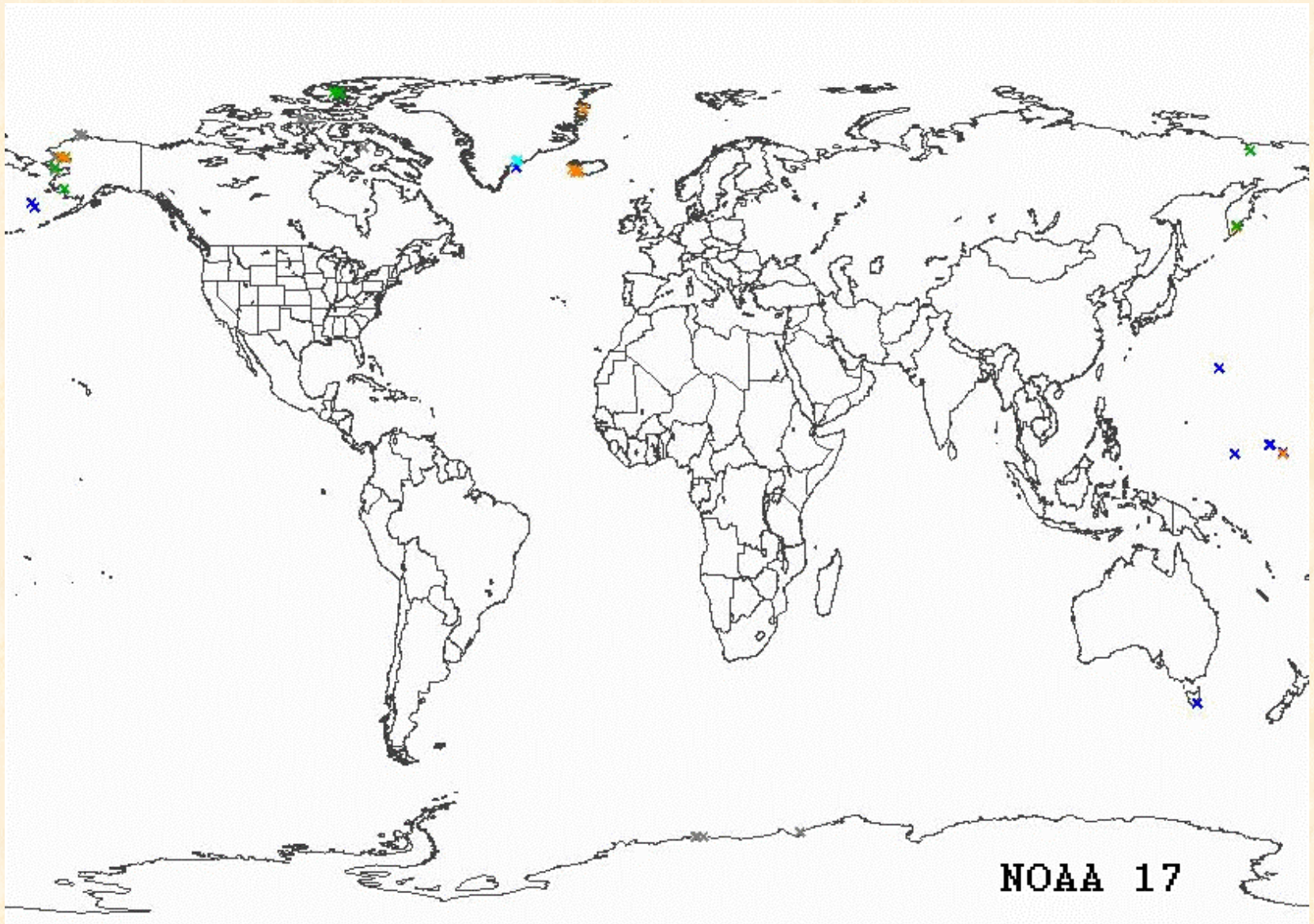
COLLOCATIONS @ - 1 HR



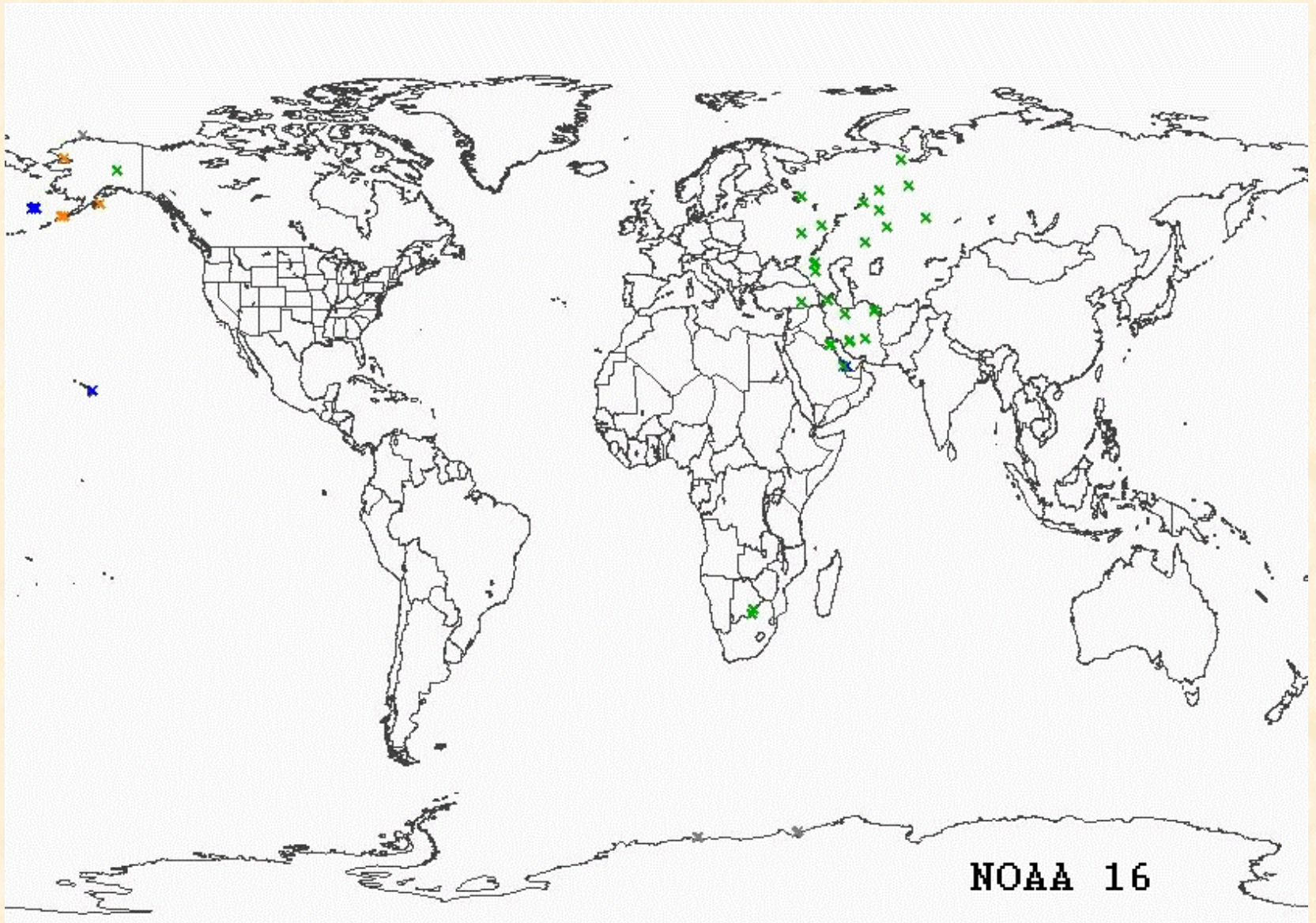
Global Radiosondes



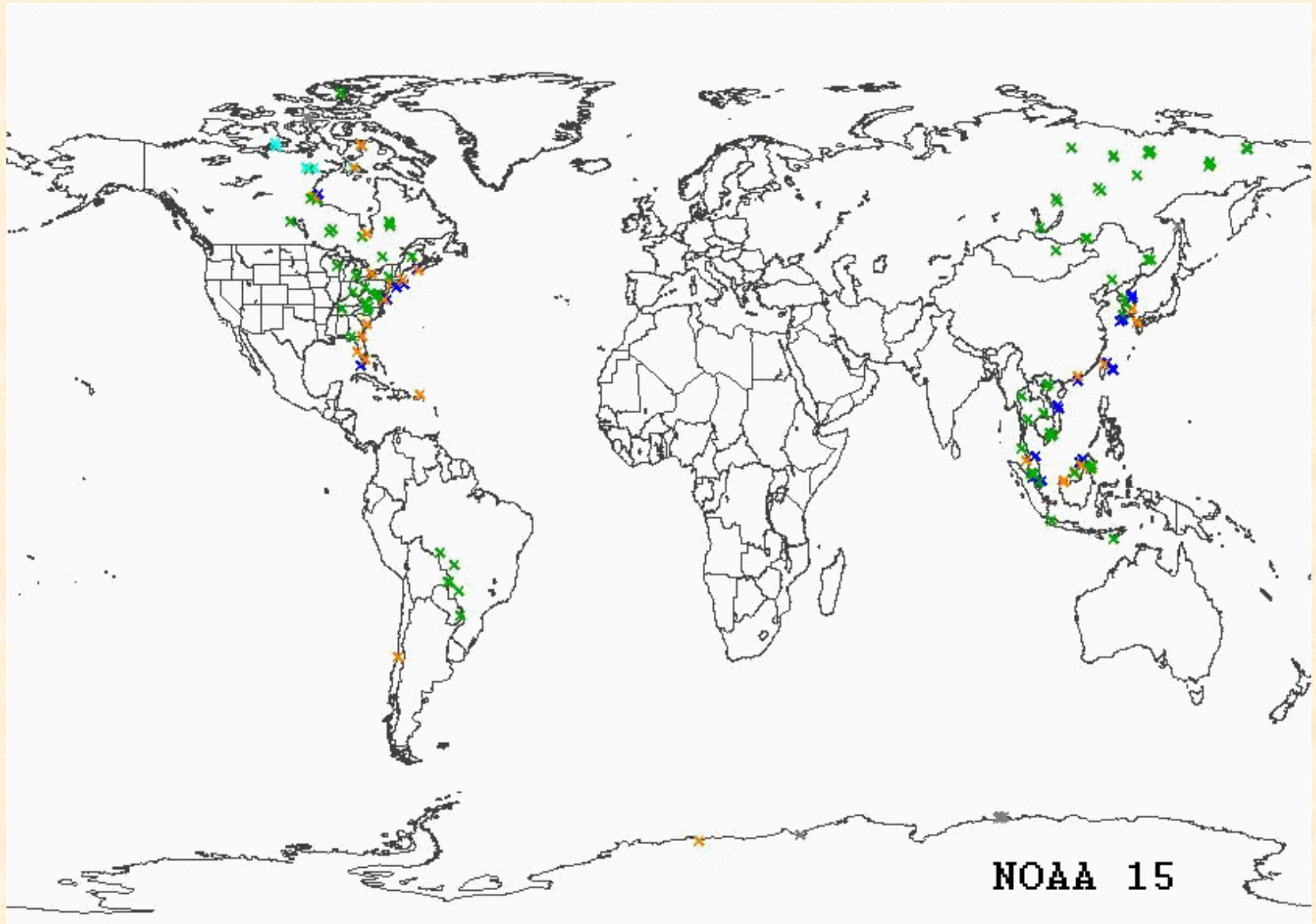
NOAA-17 @ -1hr



NOAA-16 @ -1 hr



NOAA-15 @ -1 hr



STATUS

- Current Operational Baseline of Collocations
- **NWP (GUAN) and Climate (GCOS) Radiosondes**
- **Radiosonde Scores (Peter Thorne, HadleyCentre)**
- Instrument used (WMO Pub-9, TTBB, EMC Dictionary)
- Preliminary SUAN Candidates
- Ships

“Thorne” Scores Spread Sheet

	4	4	2	1				
WMO id	GUAN	Lanz	477	277	Score	Inst. No.	Radiosonde	Alternate
04018	1	1	1	1	11	61	VRS80G	
04202			1	1	3	61	VRS80	
04220			1	1	3	71	RS90-AG	
04270	1		1	1	7	71	RS90-AG	
04320				1	1	71	VRS90L	RS90-AL RS80-AG
04339			1	1	3	71	RS90-AL	RS80-L (+ Ozone)
04360		1	1	1	7	71	VRS90L	
06011			1	1	3	61	RS90-AL	
06060					0	9	VIZ II	
06181					0	71	RS90-AL	RS90-AG
06260			1	1	3	71	RS90-AL	RS90-AG
06447				1	1	61	VRS80L	
06476			1	1	3	61	VRS80L	
06496					0	9		
06610			1	1	3	26	ML-SRS	
07110			1	1	3	74	VRS90L	
07145			1	1	3	74	VRS90L	
07180				1	1	74	VRS90L	
07481				1	1	74	VRS90L	
07510			1	1	3	61	VRS90L	
07645			1	1	3	74	VRS90L	

STATUS

- Current Operational Baseline of Collocations
- Climate and NWP Radiosonde Lists
- Radiosonde Scores (Thorne, HadleyCentre)
- **Instrument Type (WMO Pub-9, TTBB (31313 Re.), EMC Dictionary)**
- Preliminary SUAN Candidates
- Ships

WMO Pub-9 vs EMC Dictionary

Country	id	loc	La	Lo											Type	Alt				
	04270	NARSARSUAQ	61 09N	45 26W	5		4	R	.	R	.	T	N	AUT	Y	MW11	400-	RS90-AG		
		DANMARKSHAV																		
	04320	N	76 46N	18 40W	12		11	R	.	R	.	CT	N	AUT	Y	MW11	406	VRS90L	AL,RS80-AG	
		II TOQQOR TOOK															400-		RS80-	
	04339	MIT	70 29N	21 57W	69		65	R	.	R	.	CT	N	AUT	Y	MW11	406	RS90-AL	L(+Ozone)	
	04360	TASILAQ	65 36N	37 38W	52		50	R	.	R	.	CT	N	AUT	Y	MW11	400-	VRS90L		
GUADELOUPE, ST	27/03/2000																			
	78894	GUSTAVIA, ST.	17 54N	62 51W	52		48	.	.	P	.		N	N						
	78897	LE RAZET,	16 16N	61 36W	11		11	RW	.	RW	.	CT	N	AUT	Y	V93	Degreane	403	VRS90G	-

Available Raob Instrument Types

<input type="checkbox"/> 01 Reserved	<input type="checkbox"/> 26 Meteorlabor Basora (Swiss)	<input checked="" type="checkbox"/> 51 VIZ-B2 (USA)	<input type="checkbox"/> 76 AVK-RF95-ARMA (Russian Fed)
<input type="checkbox"/> 02 no raob - passive target	<input checked="" type="checkbox"/> 27 AVK-MRZ (Russian Federation)	<input checked="" type="checkbox"/> 52 Vaisala RS80-57H	<input type="checkbox"/> 77 GEOLINK GPSONDE (France)
<input type="checkbox"/> 03 no raob - active target	<input checked="" type="checkbox"/> 28 Meteorit Marz2-1 (Russian Fed)	<input type="checkbox"/> 53 AVK-RF95 (Russian Fed)	<input checked="" type="checkbox"/> 78 Reserved
<input type="checkbox"/> 04 no raob - passive temp	<input checked="" type="checkbox"/> 29 Meteorit Marz2-2 (Russian Fed)	<input type="checkbox"/> 54 Reserved	<input type="checkbox"/> 79 Reserved
<input type="checkbox"/> 05 no raob - active temp	<input type="checkbox"/> 30 Oki RS2-80 (Japan)	<input checked="" type="checkbox"/> 55 Reserved	<input type="checkbox"/> 80 Reserved
<input type="checkbox"/> 06 no raob - radio-acoustic sounder	<input type="checkbox"/> 31 VIZ/Valcom type A (Canada)	<input type="checkbox"/> 56 Reserved	<input type="checkbox"/> 81 Reserved
<input type="checkbox"/> 07 Reserved	<input type="checkbox"/> 32 Shanghai Radio (China)	<input type="checkbox"/> 57 Reserved	<input type="checkbox"/> 82 Reserved
<input type="checkbox"/> 08 Reserved	<input type="checkbox"/> 33 UK Met Office MK3 (UK)	<input type="checkbox"/> 58 Reserved	<input type="checkbox"/> 83 Reserved
<input checked="" type="checkbox"/> 09 no raob - system unknown	<input type="checkbox"/> 34 Vinohrady (Czechoslovakia)	<input type="checkbox"/> 59 Reserved	<input type="checkbox"/> 84 Reserved
<input type="checkbox"/> 10 VIZ type A pressure (USA)	<input type="checkbox"/> 35 Vaisala RS18 (Finland)	<input checked="" type="checkbox"/> 60 Vaisala RS80/MicroCora (Fin)	<input type="checkbox"/> 85 Reserved
<input type="checkbox"/> 11 VIZ type B time (USA)	<input type="checkbox"/> 36 Vaisala RS21 (Finland)	<input checked="" type="checkbox"/> 61 Vaisala RS80/DigiCora (Fin)	<input type="checkbox"/> 86 Reserved
<input checked="" type="checkbox"/> 12 RS Space Data Corp (USA)	<input checked="" type="checkbox"/> 37 Vaisala RS80 (Finland)	<input checked="" type="checkbox"/> 62 Vaisala RS80/PCCora (Fin)	<input type="checkbox"/> 87 Reserved
<input type="checkbox"/> 13 Astor (Australia)	<input type="checkbox"/> 38 VIZ LOCATE Loran-C (USA)	<input checked="" type="checkbox"/> 63 Vaisala RS80/Star (Fin)	<input type="checkbox"/> 88 Reserved
<input type="checkbox"/> 14 VIZ Mark I Microsonde (USA)	<input type="checkbox"/> 39 Sprenger E076 (Germany)	<input type="checkbox"/> 64 Orbital Sciences Corp (USA)	<input type="checkbox"/> 89 Reserved
<input type="checkbox"/> 15 EEC Company type 23 (USA)	<input type="checkbox"/> 40 Sprenger E084 (Germany)	<input type="checkbox"/> 65 VIZ transponder (USA)	<input checked="" type="checkbox"/> 90 Unknown Radiosonde
<input type="checkbox"/> 16 Elin (Austria)	<input type="checkbox"/> 41 Sprenger E085 (Germany)	<input checked="" type="checkbox"/> 66 Reserved	<input type="checkbox"/> 91 Reserved
<input type="checkbox"/> 17 Graw G (Germany)	<input type="checkbox"/> 42 Sprenger E086 (Germany)	<input checked="" type="checkbox"/> 67 Reserved	<input type="checkbox"/> 92 Reserved
<input type="checkbox"/> 18 Reserved	<input type="checkbox"/> 43 AIR IS-4A-1680 (USA)	<input type="checkbox"/> 68 Reserved	<input type="checkbox"/> 93 Reserved
<input checked="" type="checkbox"/> 19 Graw M60 (Germany)	<input type="checkbox"/> 44 AIR IS-4A-1680 X (USA)	<input type="checkbox"/> 69 Reserved	<input type="checkbox"/> 94 Reserved
<input type="checkbox"/> 20 Indian Met Service MK3 (India)	<input checked="" type="checkbox"/> 45 RS MSS (USA)	<input type="checkbox"/> 70 Reserved	<input type="checkbox"/> 95 Reserved
<input type="checkbox"/> 21 VIZ/Jin Yang Mark I (S Korea)	<input type="checkbox"/> 46 Air IS-4A-403 (USA)	<input checked="" type="checkbox"/> 71 RS90/DigiCora (Fin)	<input type="checkbox"/> 96 Reserved
<input type="checkbox"/> 22 Meisei RS2-80 (Japan)	<input checked="" type="checkbox"/> 47 Meisei RS2-91 (Japan)	<input type="checkbox"/> 72 RS90/PC-Cora (Fin)	<input type="checkbox"/> 97 Reserved
<input type="checkbox"/> 23 Mesural FMO 1950A (France)	<input type="checkbox"/> 48 VALCOM (Canada)	<input type="checkbox"/> 73 RS90/Autosonde (Fin)	<input type="checkbox"/> 98 Reserved
<input type="checkbox"/> 24 Merural FMO 1945A (France)	<input checked="" type="checkbox"/> 49 VIZ MARK II (USA)	<input checked="" type="checkbox"/> 74 RS90/Star (Fin)	<input type="checkbox"/> 99 Reserved
<input type="checkbox"/> 25 Mesural MH73A (France)	<input checked="" type="checkbox"/> 50 GRAW DFM-90 (Germany)	<input type="checkbox"/> 75 AVK-MRZ-ARMA (Russian Fed)	<input type="checkbox"/> 100 Reserved

Sea
 Land
 Coast
 Ice
 Snow
 Ship
 In Library
 Not In Library

WMO Pub-9 vs EMC Dictionary (Radiosonde Type)

EMC WMO Pub-9

WMO id	GUAN	Lanz:	477	277	Score	Inst. No.	Radiosonde	Alternate	
11520			1	1	3	61	VRS90LH	VRS80L	X
11722					0	61	VRS80		
11952				1	1	71	VRS90LH	VRS80L	
12120				1	1	71	VRS90L		
12330				1	1		?		
12374				1	1	61	VRS90L		X
12425				1	1	71	VRS90L		
12843				1	1	61	RS90-AL H		X
12982				1	1	62	RS90-AL H		X
13275			1	1	3	61	VRS80L		
42874					0	12	IM MK3		X
42971				1	1	12	IM MK3		X
43014					0	12	IM MK3		X
43041					0	12	IM MK3		X
43128				1	1	12	IM MK3		X
47058				1	1	9	Shang		X
50774					0	19	Shang		X
50953			1	1	3	19	Shang		X
51076			1	1	3	19	Shang		X
51431				1	1	19	Shang		X

WMO Pub-9 vs EMC Dictionary (Radiosonde Types)

WMO Pub-9

EMC id's

AIR	43	44	46		
Graw DFM90	50				
IM MK3	20				
J/YANG	21				
MARK II	49				
Mars	28	29			
MEIS RS2-80,91	22	47			
ML-SRS	26				
MRZ	27	75			
MRZ-3A	27	75			
MRZ-T	27	75			
MSS	45				
RF95	53	76			
RF95/MRZ	27	75	53	76	
RS SDC	12				
Shang	32				

WMO Pub-9 vs EMC Dictionary

(...RS80...)

RS80-57H	52						
----------	----	--	--	--	--	--	--

RS80	60	61	62	63	37		
RS8015G							
RS80-18G							
RS80G							

VRS8015G	60	61	62	63			
VRS8015GA							
VRS80A							
VRS80G							
VRS80G							
VRS80G							
VRS80GA							
VRS80GH							
VRS80L							
VRS80L							
VRS80LA							
VRS80LH							
VRS80N							

WMO Pub-9 vs EMC Dictionary

(...RS90...)

RS90A	71	72	73	74		
RS90-AG						
RS-90AL						
RS90-AL H						

VRS90	71	72	73	74		
VRS90-AL G						
VRS90G						
VRS90G						
VRS90L						
VRS90LH						

VIZ A	10					
VIZ B	11					
VIZ B2	51					
VIZ II	49	51				
VIZ II L	49	51				

Acceptable Instrument Types

ID

PUB - 9

47

Mesei RS2-91

49

VIZ MARK II

51

VIZ-B2

37, 52, 60, 61, 62, 63

Vaisala RS80 ...

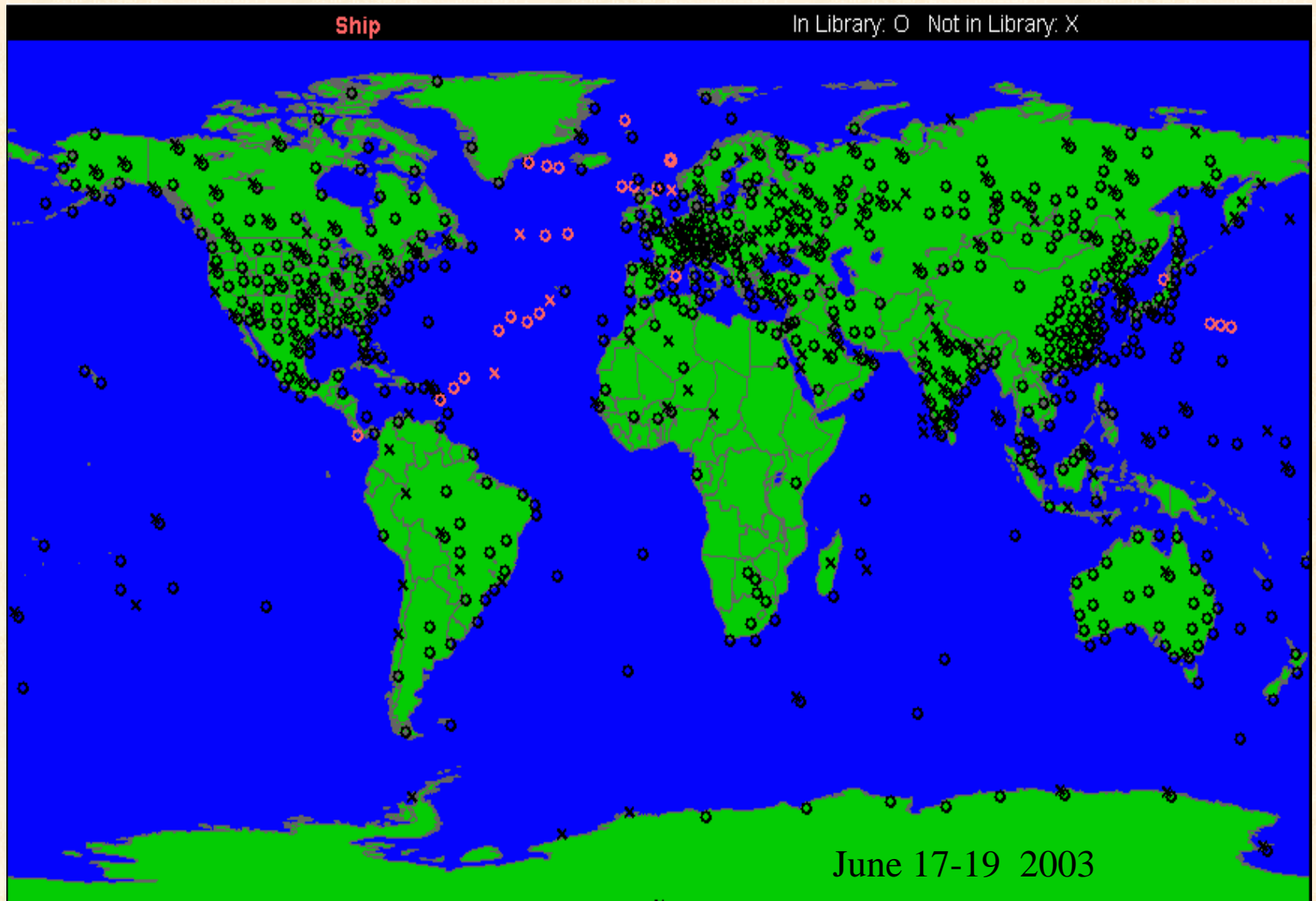
71, 74

RS90 ...

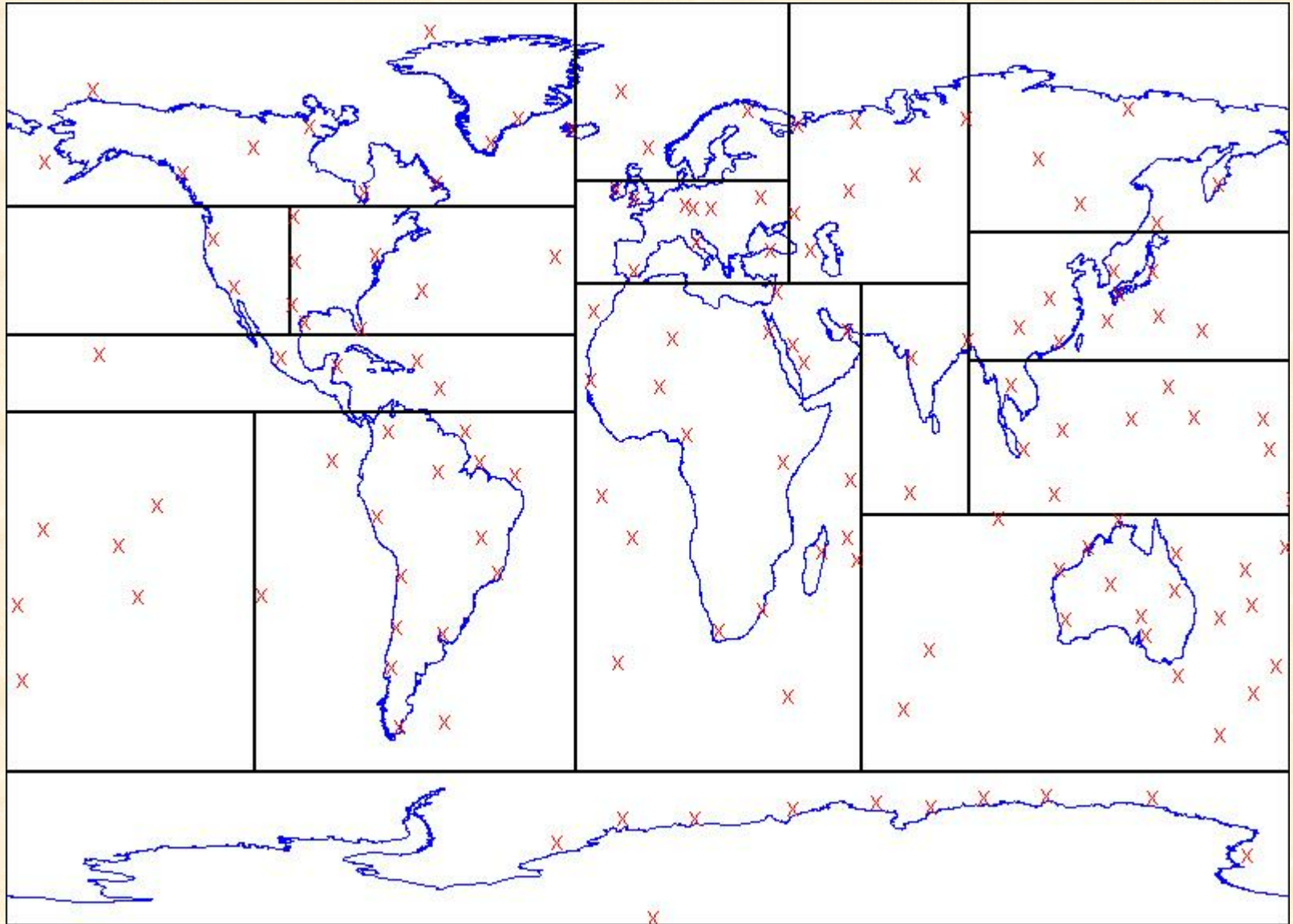
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- Climate and NWP Radiosonde Lists
- Radiosonde Scores (Thorne, HadleyCentre)
- Instrument used (WMO Pub-9, TTBB, EMC Dictionary)
- **Preliminary SUAN Candidates**
- Ships

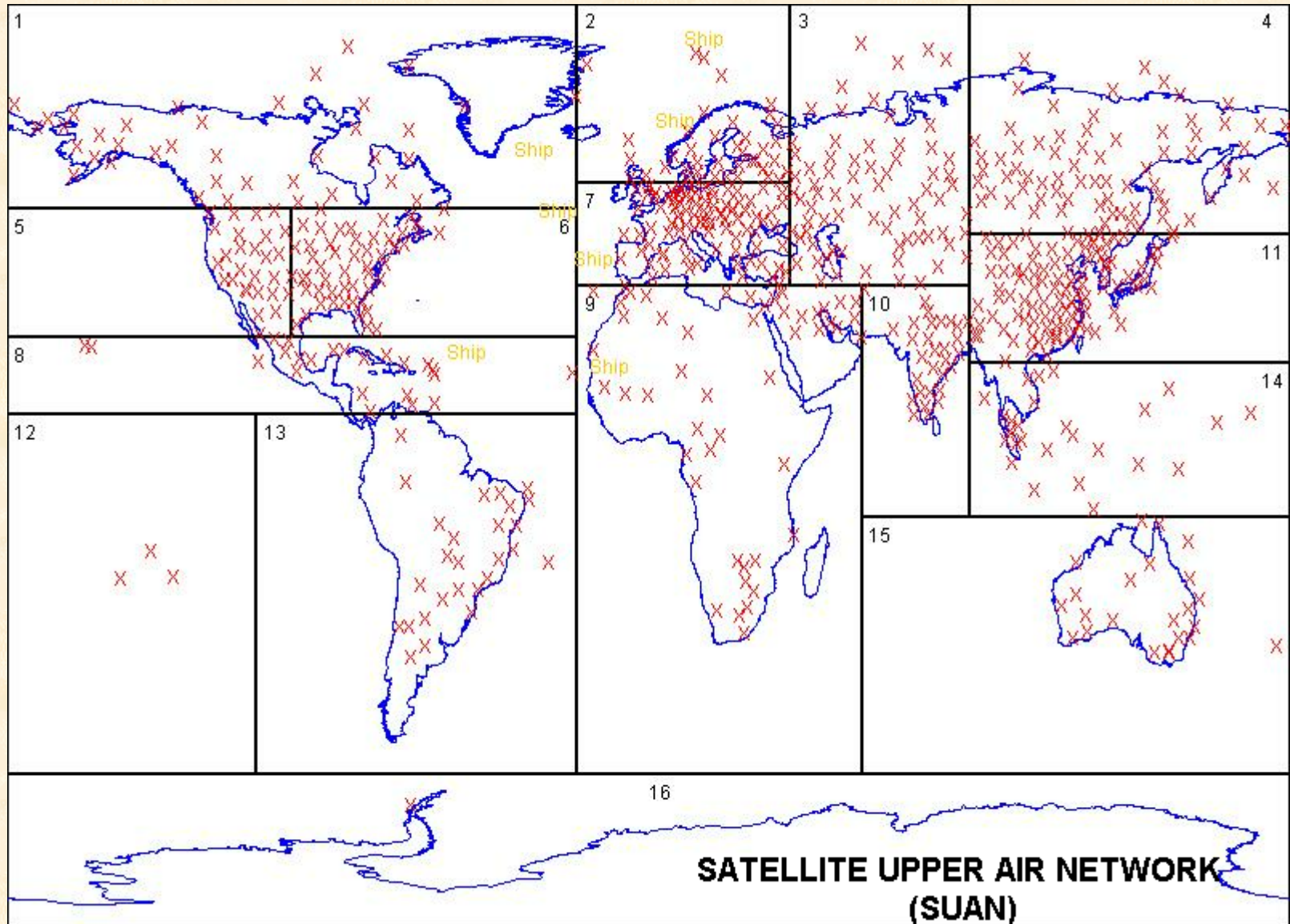
Global Radiosondes



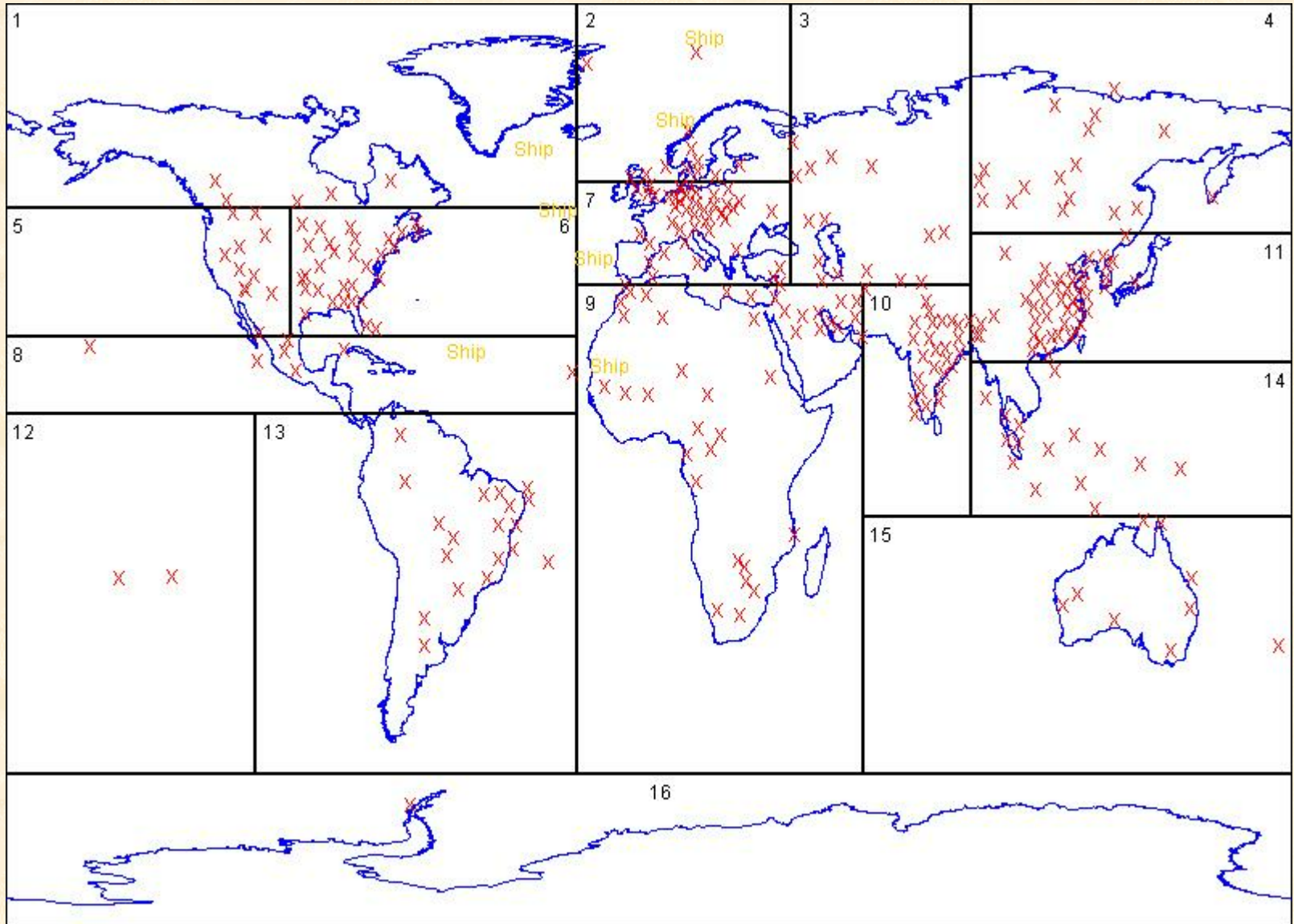
the “Untouchables”: Score > 4



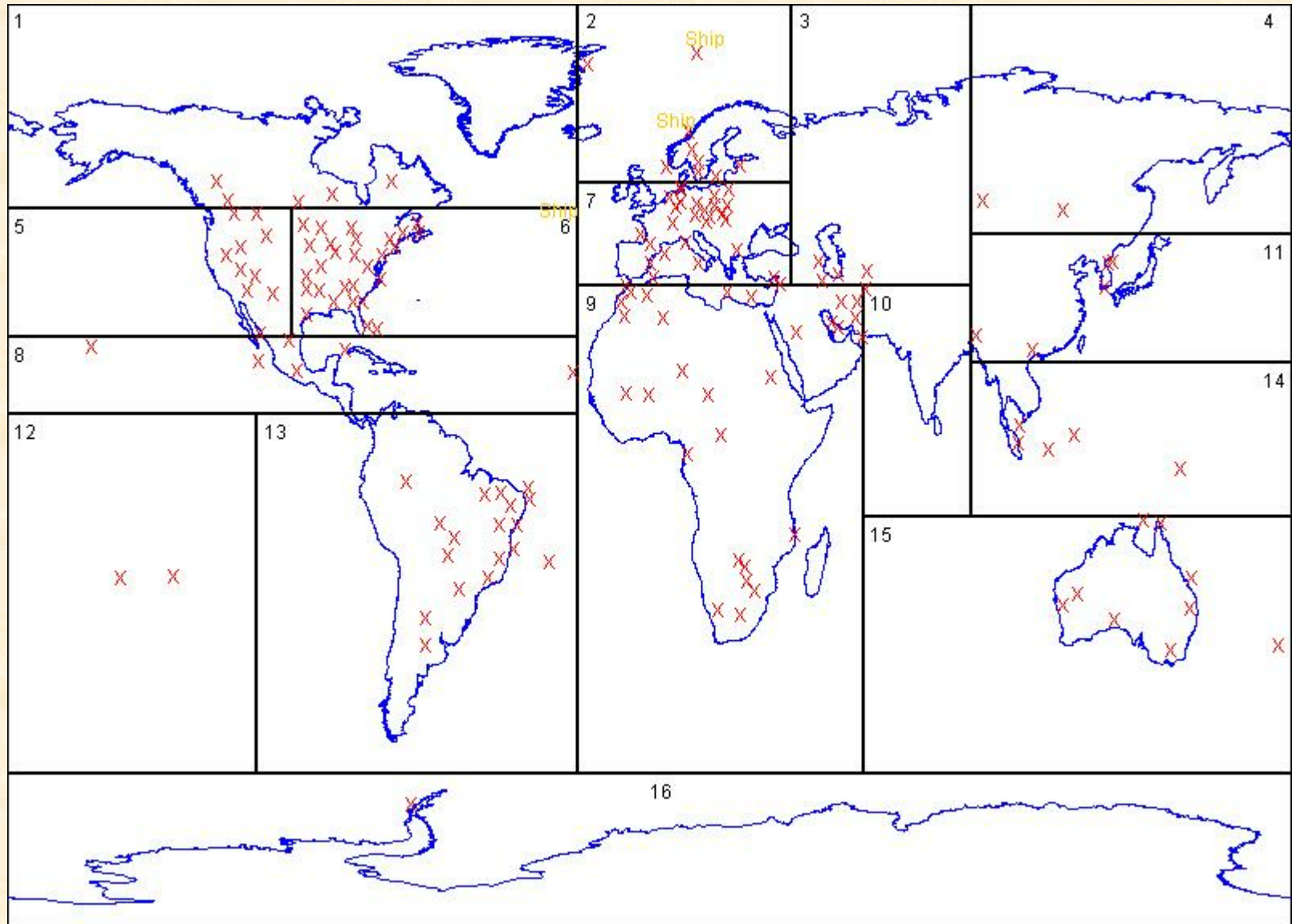
SUAN CANDIDATES: Score < 4



SUAN CANDIDATES: Score @ 1, 0



SUAN CANDIDATES: Score @ 1, 0; Raob Id's 37...74



Candidate Site Analysis

- “*Thorne*” Score ... < 4
- Acceptable Radiosonde Types
- Global Distribution
- Avoid Coasts
- Low Terrain (*456m ... 950mb*)
- Active

SUAN Candidate Sites

Green.....	Score 1 or 0 “and” Acceptable Raob Type	(24)	23 Sea (3 Ice)
Yellow....	Score 2 or 3 “and” Acceptable Raob Type	(11)	
Red.....	Score 4 or more “and/or” Unacceptable Raob Type	(8)	20 Land

Box 1: 71203 *, 71823, 71917, 70316 +, 70133, 71867 *

Box 2: 01004, 06011, 02185

Box 3: 40875, 28661

Box 4: 31736, 24343, 70414 +

Box 5: 74004

Box 6: 78073, 72230, 71600, 08508

Box 7: 08160, 16429, 12982

Box 8: 91176, 08594, 78897, 76692

Box 9: 60630, 64700, 67237, 68994

Box 10: 61967

Box 11: 41923, 47945, 47420

Box 12: 91948

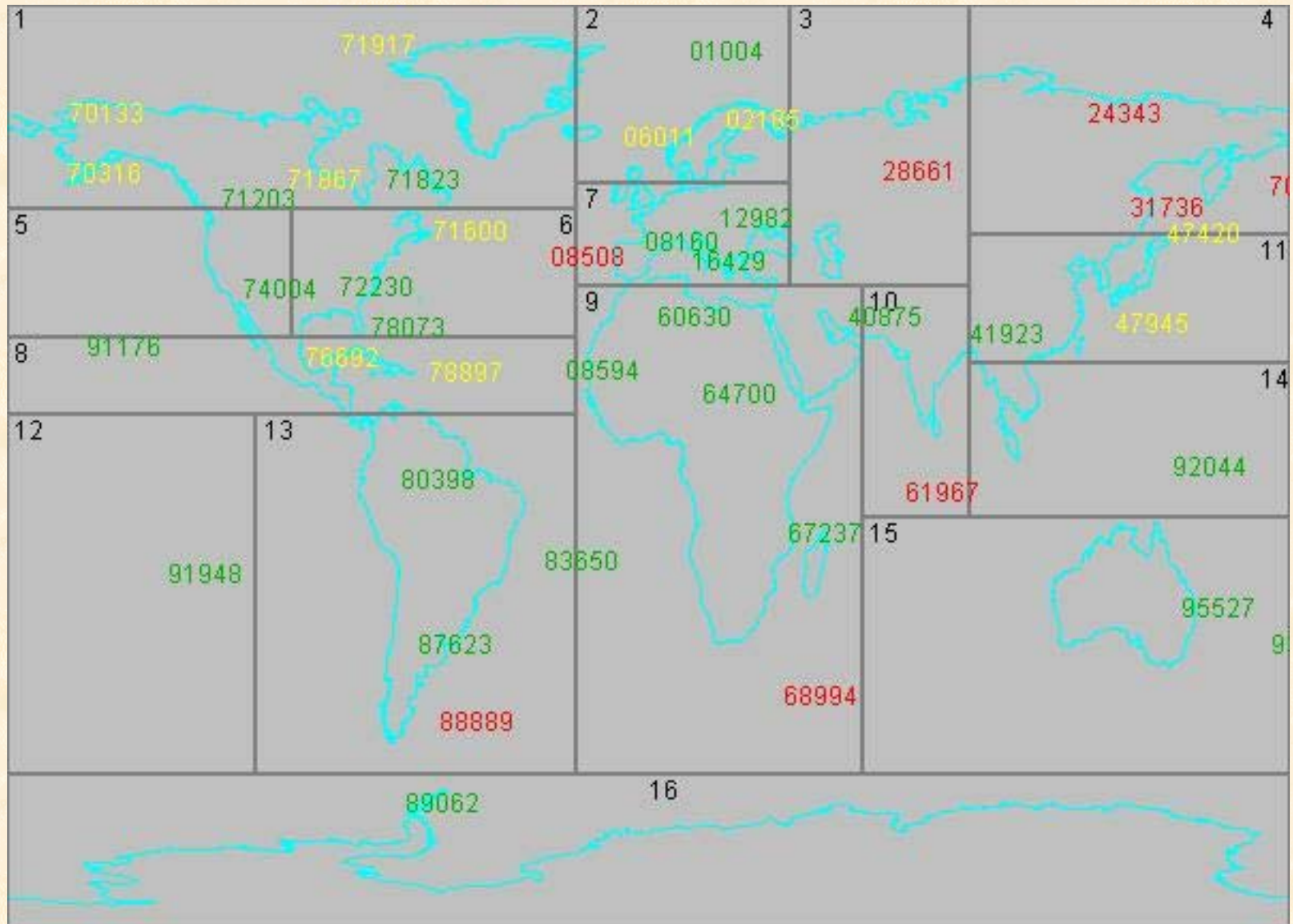
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Box 14: 92044

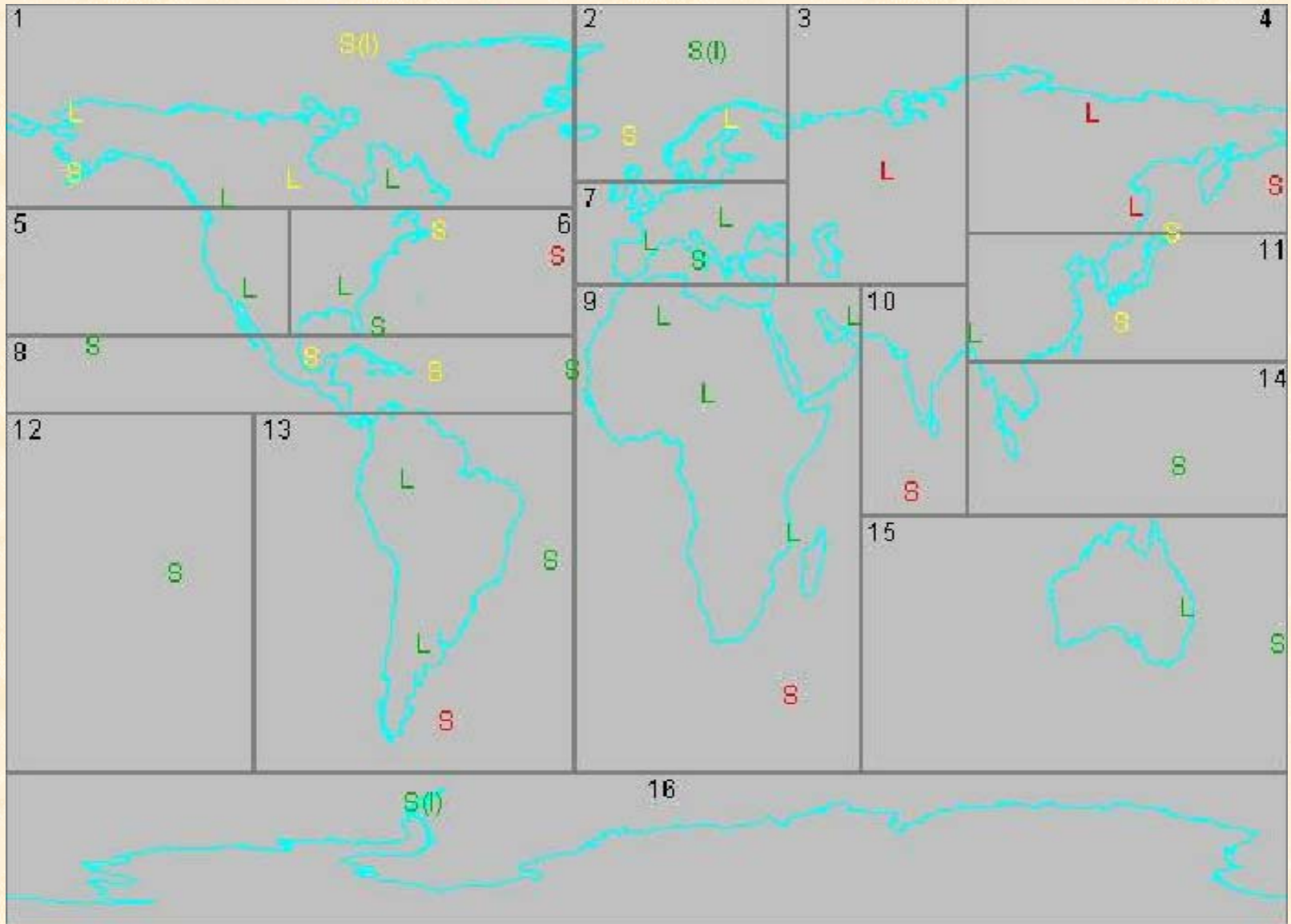
Box 15: 93112, 95527

Box 16: 89062

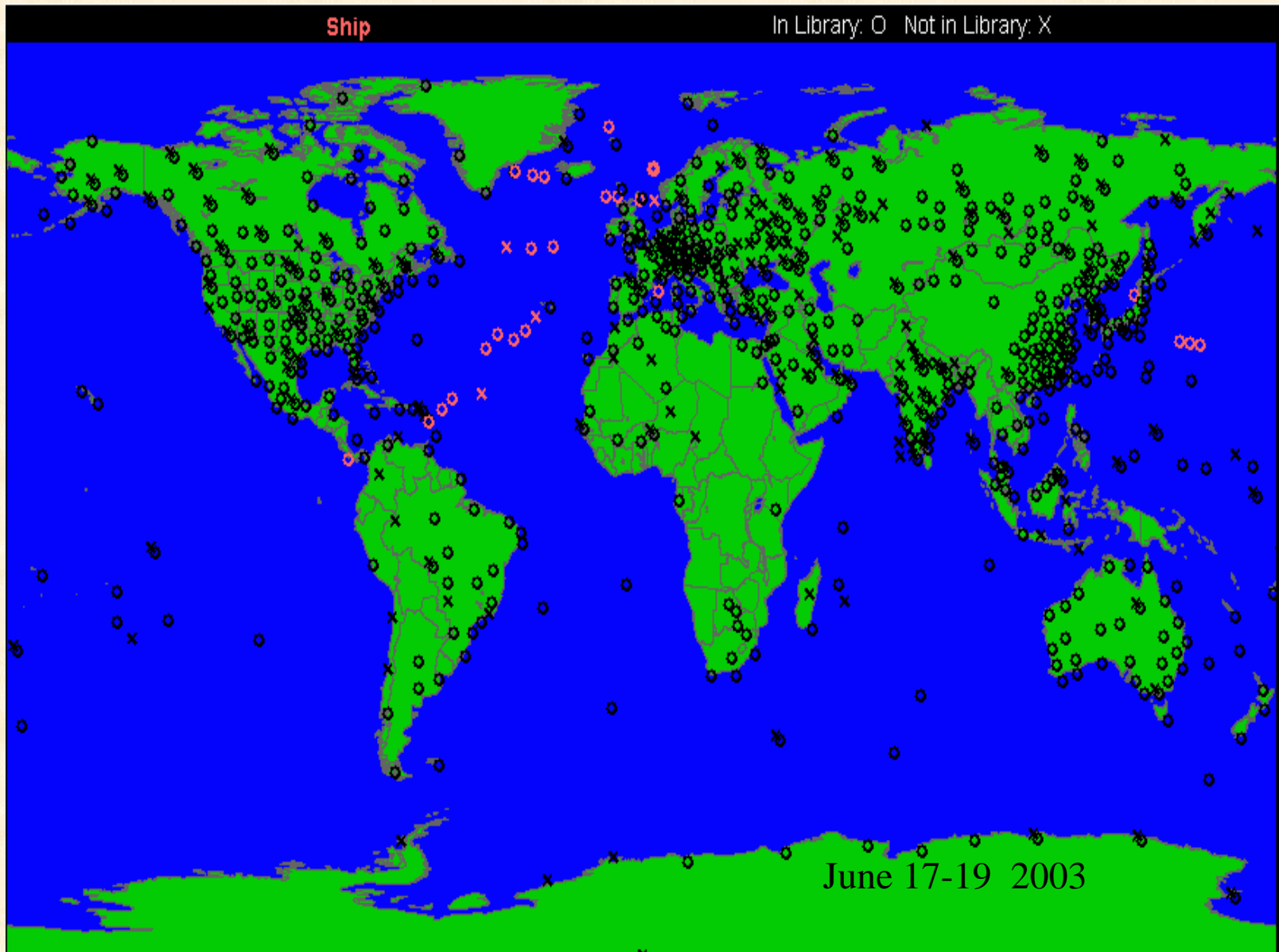
SUAN Candidates



SUAN Candidates



Global Radiosondes



Perspective

- **Question of tradeoffs:** What is potential impact of these sites in current *Synoptic* versus proposed *SUAN* platform?
 - In current Synoptic platform, Raobs provide independent single point impacts for NWP
 - In the proposed SUAN (5%) platform, Raobs provide global impact on all satellite data, science, and the Radiosondes ... *Past, Present, and Future*
- **Conclusions:**
 - Since satellite data are a primary input for NWP and Climate, the benefits of *SUAN* are across the board ... *a transfer standard*
 - *SUAN* platform makes sense ... *it adds (much) more than it subtracts!*

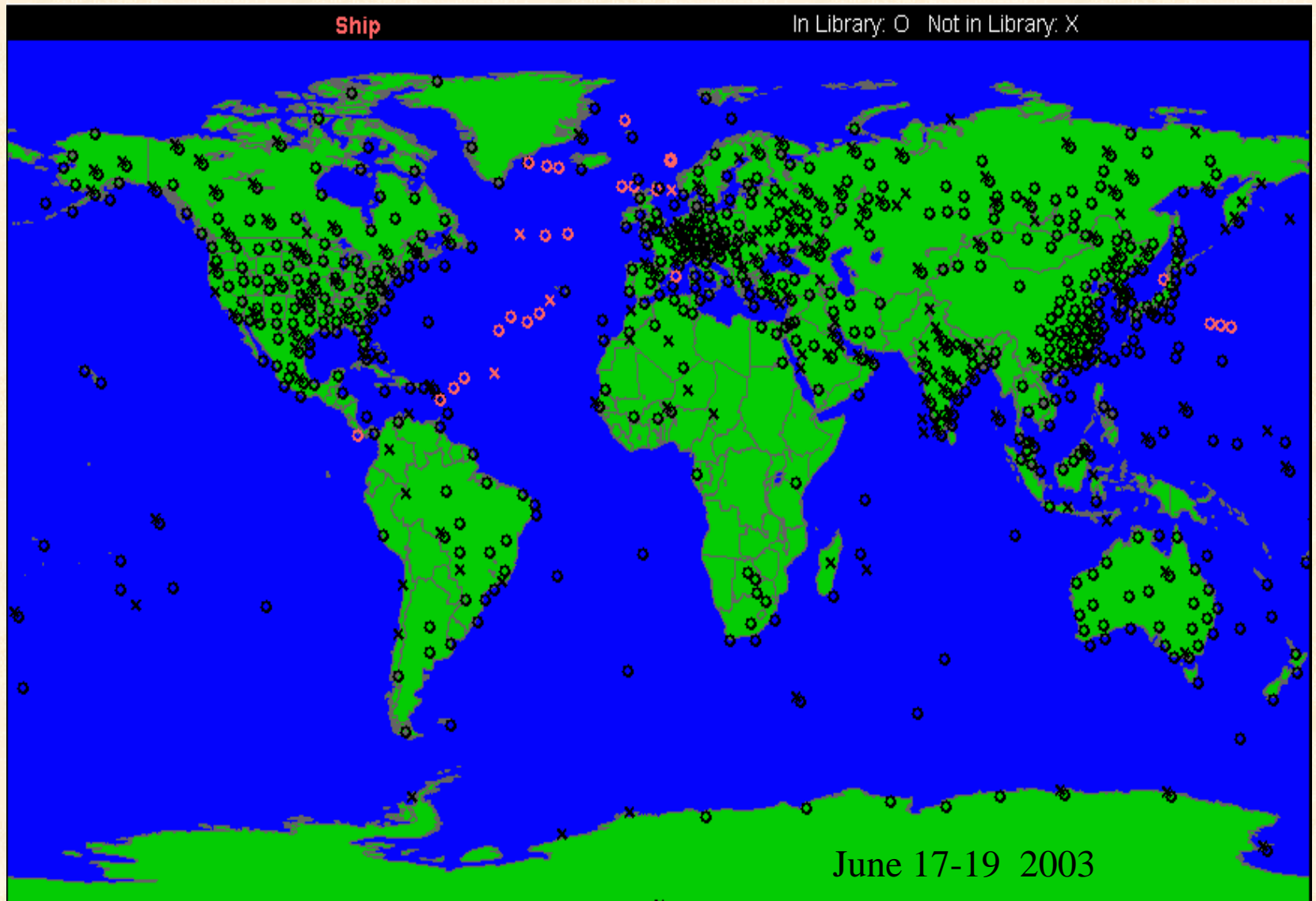
Follow-up

- Willing and able to change launch schedules
(... *no additional launches ... !?*)
- NOAA, EUMETSAT, WMO ... ITSC roles
- Launch protocols, schedules ... Land vs Ship
- **Operational means SUAN !!!**
- Monitoring ...

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Global Radiosondes



SHIPS (31 Active)

SHIP STATIONS																						
Station#	StationName	Latitude	Hp	Hh	HHa	Upp	Upp	Upp	CLI	GU	Geopot	Ra	Radio	GroundEquip	Frequen	RegularR	Alt	WindFg	Windfm	Remarks		
CGDX	DES CROSELLERS (CANADA)						X				N	AUTO	Y	V86	MARWIN	401-406	VRS80G		GPS	MARW	ADDED 11/1997- LAST EDITED 01/11/1997	
DASAP	(GERMANY)																					
DBBH	FS METEOR (GERMANY)		6				X				N	AUTO	Y	V86	DIGCORA	401-406	VRS80G		GPS	DIGCO	RESEARCH VESSEL,Operates in Atlantic,EUCOS	
DBLK	POLARSTERN (GERMANY)		10				X				N	AUTO	Y	V93	DIGCORA	401-406	VRS80G		GPS	DIGCO	RESEARCH VESSEL,Operates in Atlantic and N and S Polar regions ,EUCOS	
EBUK	ESPERANZA DELMAR (SPAIN)						X				N	AUTO	Y	V93	DIGCORA	401-406	VRS80G		GPS	DIGCO	new ship with same name as hospital ship,began operations Oct 2001 ,Canaries to Mauritania	
EHOA	ESPERANZA DELMAR (SPAIN)		6								N	AUTO	Y	V93	DIGCORA	401-406	VRS80G		GPS	DIGCO	Hospital ship, man. Launch, operated N. Atlantic, now ceased (see EBUQ)	
ELML7	HORN BAY (GERMANY)		10				X				N	AUTO	Y	V93	DIGCORA	401-406	VRS80G		GPS	DIGCO	Container vessel,Operates in N Atlantic/Caribbean ,EUCOS - last updated 09/06/03	
FNOR	FORT ROYAL (FRANCE)		13				X				N	AUTO	Y		GEOLNK	401-406	GP SONDE G		GPS	GEOLF	ASAP ,merchant vesselFRANCE-W-INDIES ,EUCOS - LAST EDITED 09/06/2003	
FNOU	FORT FLEUR D'EE (FRANCE)		13				X				N	AUTO	Y		GEOLNK	401-406	GP SONDE G		GPS	GEOLF	ASAP ,merchant ship FRANCE-W-INDIES ,EUCOS - LAST EDITED 8/6/03	
JNSR	MIRAI (JAPAN)		16				X				N	AUTO	Y		DIGCORA	401-406	VRS80G		GPS	DIGCO	ASAP JAPANESE RESEARCH SHIP ,operating area variable - LAST EDITED 08/6/03	
JPBN	KEIFUMARU (JAPAN)		8				X				N	AUTO	Y		DIGCORA	401-406	VRS80G		GPS	DIGCO	ASAP JAPANESE RESEARCH SHIP ,operates N. Pacific, irregular obs - LAST EDITED 08/6	
JCCX	CHOFUMARU (JAPAN)		6	X	X		X				N	AUTO	Y	V93	DIGCORA	404.5	VRS80G		GPS	DIGCO	ASAP JAPANESE RESEARCH SHIP ,operates seas near Japan - LAST EDITED 08/6/03	
JDWX	KOFUMARU (JAPAN)		6	X	X		X				N	AUTO	Y	V93	DIGCORA	404.5	VRS80G		GPS	DIGCO	ASAP JAPANESE RESEARCH SHIP ,operates seas near Japan - LAST EDITED 08/6/03	
JGQH	RYOFUMARU (JAPAN)		8	X	X		X				N	AUTO	Y	V93	DIGCORA	404.5	VRS80G		GPS	DIGCO	ASAP JAPANESE RESEARCH SHIP ,operates N. Pacific - LAST EDITED 08/6/03	
JIVB	SEIFUMARU (JAPAN)		6	X	X		X				N	AUTO	Y	V93	DIGCORA	401-406	VRS80G		GPS	DIGCO	ASAP JAPANESE RESEARCH SHIP ,operates seas near Japan - LAST EDITED 08/6/03	
JDSS	HAKUHO MARU (JAPAN)		-				X				N	AUTO	Y	V93	DIGCORA	401-406	VRS80G		GPS	DIGCO	ASAP JAPANESE RESEARCH SHIP ,operating area variable - LAST EDITED 08/6/03	
LDWR	OWS MIKE (N 66 00N 02 00E)		X	X	X	X					N	AUTO	Y	V86	DIGCORA	401-406	VRS80L		LORA	DIGCO	LAST EDITED 08/06/03	
OVYA2	ARINA ARCTICA (DENMARK)		14									AUTO	Y		DIGCORA		VRS90G/L		GPS/L	DIGCO	Merchant ship,Container launch, Operates in N. Atlantic , EUCOS - Last edited 9/6/03	
OXTS2	IRENA ARCTICA (DENMARK)		9									AUTO	Y		DIGCORA		VRS90G/L		GPS/L	DIGCO	Merchant ship,Container launch, Operates in N. Atlantic , EUCOS - Last edited 9/6/03	
OXVH2	NAJA ARCTICA (DENMARK)						X				N	AUTO	Y	V86	MARWIN	401-406	VRS80G		GPS?	MARW	CHANGED TO GPS? LAST EDITED 01/11/1997	
OXYH2	NUKA ARCTICA (DENMARK)		18	X	X	X	X				N	AUTO	Y	V86	DIGCORA		VRS90G		GPS	MARW	Merchant ship,Container launch, Operates in N. Atlantic , EUCOS - Last edited 9/6/03	
WTEC	RVDISCOVERER (USA)						X				N	AUTO	Y		UNKNOWN		UNKNOWN		UNKNC	UNKNC	LAST EDITED 01/01/1996	no obs 2003
WTEV	?						X				N	AUTO	Y		UNKNOWN		UNKNOWN		UNKNC	UNKNC	LAST EDITED 01/01/1998	no obs 2003
XXBA	?						X				N	AUTO	Y		UNKNOWN		UNKNOWN		UNKNC	UNKNC	LAST EDITED 01/01/1998	no obs 2003

NOAA RONALD H BROWN



The NOAA science vessel RHB provides radiosonde launch, insitu measurement, cloud observation and polar satellite direct receipt capabilities optimal for SUAN demonstration.



At about \$250 per raob, twice per day, 250 days per year, estimated SUAN support is \$125K yearly, a fraction of RHB and NOAA polar program budget.....\$250M

TOVS-1b and Radiosonde Collocation History (1979 - 2001)

- Related Activity ... *pending “ESDIM” proposal*
- GTS Radiosondes ... NCAR
- Field Experiment Radiosondes:
 - ARM
 - JOSS (NCAR)
 - *Need More Sources*
- TOVS historical 1b-level data ... *overlap satellites!*
- **Goals:**
 - Collocations, Directories ... *user friendly*
 - Operational ... *ATOVS and Beyond*

SUMMARY

- Continuous Global “**CALVAL**” Program for Polar Satellites Needed
- **Radiosondes** and In-situ Measurements “**Can**” Provide Ground-truth
- **Satellite Upper Air Network (SUAN)** ... Global Program to Launch Reference Radiosondes “*Coincident*” with Polar Satellite Overpass
- Support for **SUAN** growing:
 - International ATOVS Study Conference* (Feb., 2002)
 - NOAA Council on Long-Term Climate Monitoring* (Jan., 2003)
 - Workshop to Improve Usefulness of Radiosondes* (March, 2003)
- Work to finalize **SUAN** ... complimentary TOVS-1b/Raob Archive
- Contributions from ships ... **NOAA RHB**

