

Using Automated Weather Stations: heads up on hazardous weather



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Ferry Safety + Technology Conference
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Outline

AIS Background

AIS Wx Concept

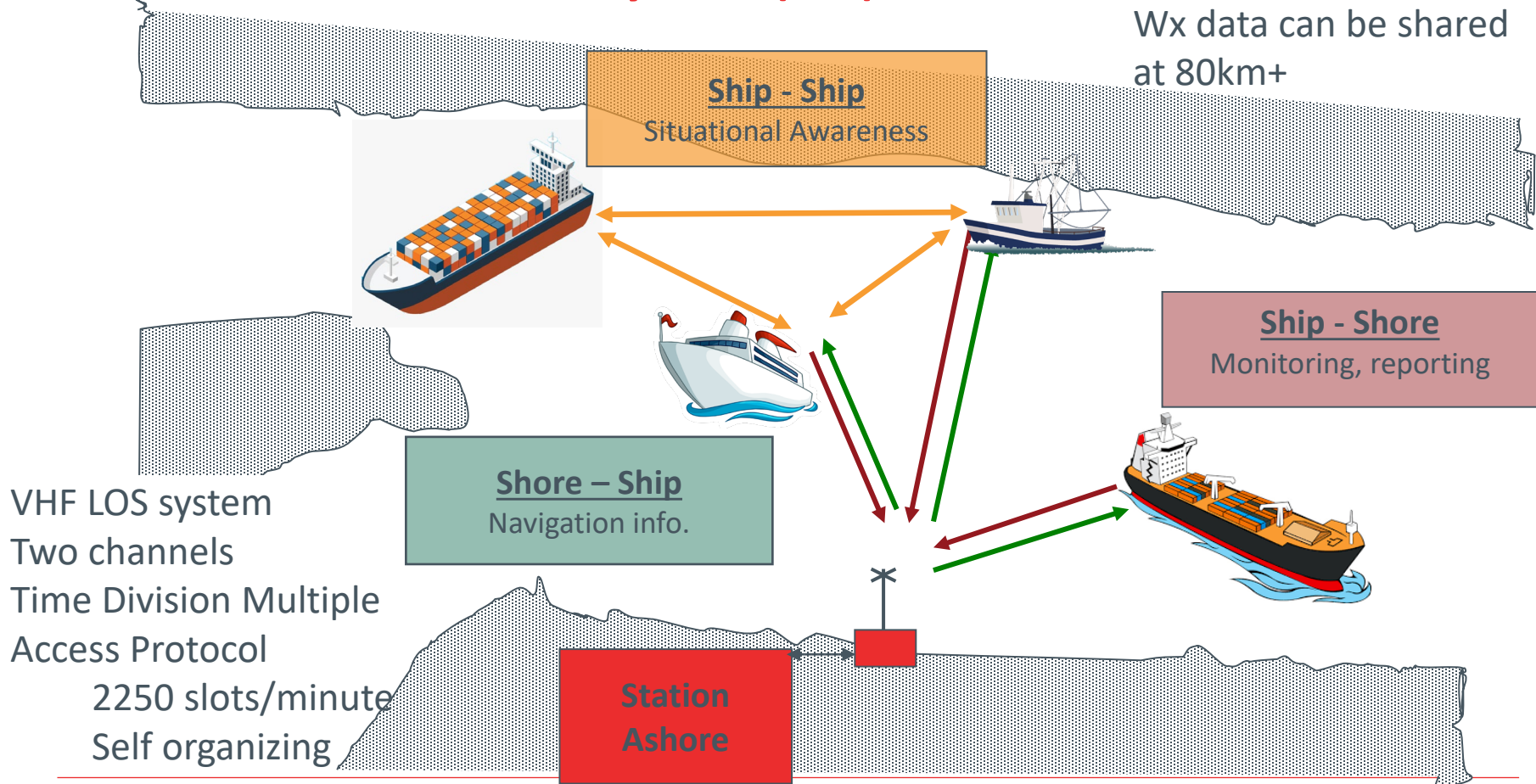
AIS Wx Installations

System Performance

Conclusions

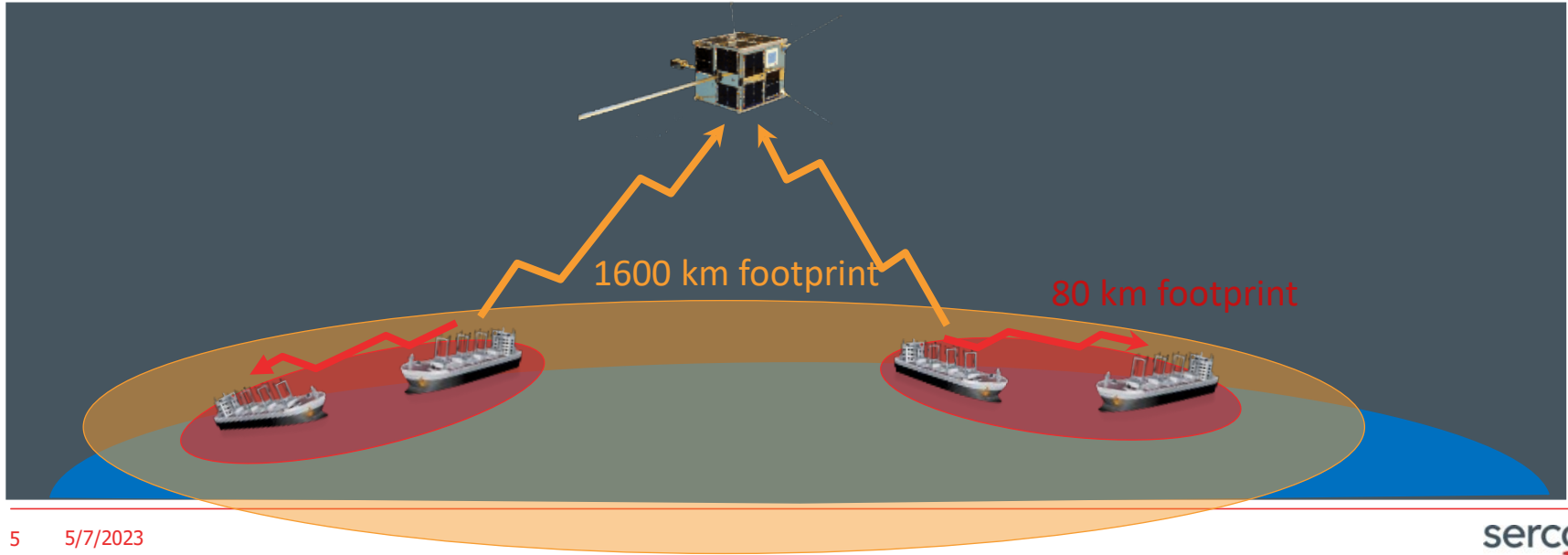
AIS Background

Automatic Identification System (AIS)



Satellite AIS

- Satellite reception provides worldwide coverage
- Some reduction in performance
 - Collisions due to large satellite footprint and additional delay
 - Longer latency
 - Duplicates



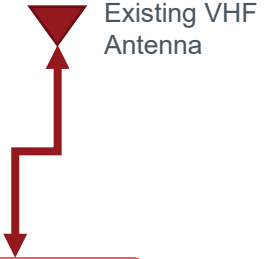
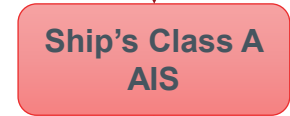
AIS Wx Concept

Ships Ais Wx System

Weather Station



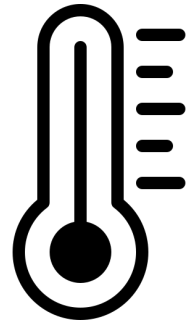
Rugged Processor



Existing VHF Antenna

Ships Ais Wx System

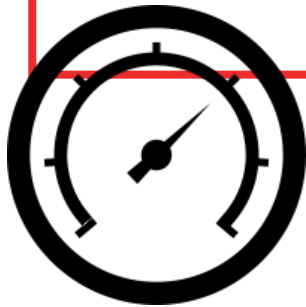
Weather Station



temperature



Wind speed/direction



Sea level pressure



Rugged Processor

Ship's Class A AIS

Existing VHF Antenna

Ships Ais Wx System

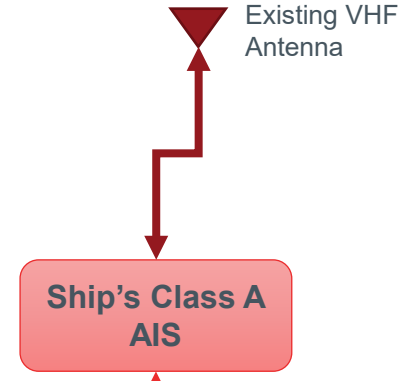
Weather Station



\$WIMDA,29.9611,I,1.0146,B,-0.9,C,,,61.5,,-7.3,C,321.7,T,328.1,M,30.1,N,15.5,M*6C
\$WIMWD,330.2,T,336.6,M,32.6,N,16.8,M*50

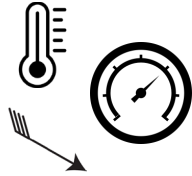


Rugged Processor



Ships Ais Wx System

Weather Station

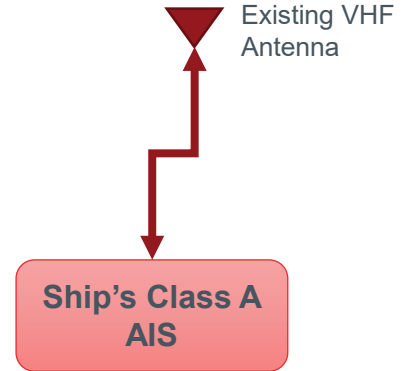


Air temp
Wind speed/direction
pressure

\$WIMDA,29.9611,I,1.0146,B,-0.9,C,,,61.5,,7.9,C,321.7,T,328.1,M,30.1,N,15.5,M*6C
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Rugged Processor

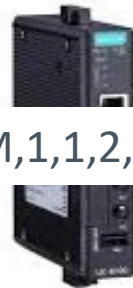


Ships Ais Wx System

Weather Station

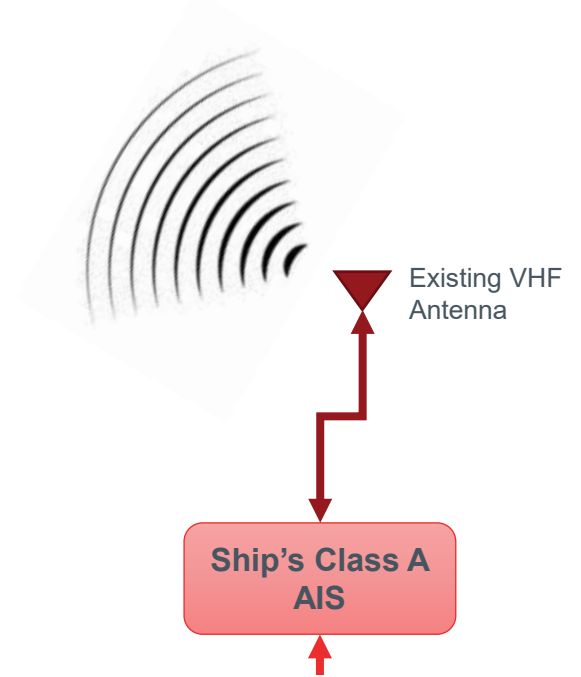


Air temp
Wind speed/direction
pressure



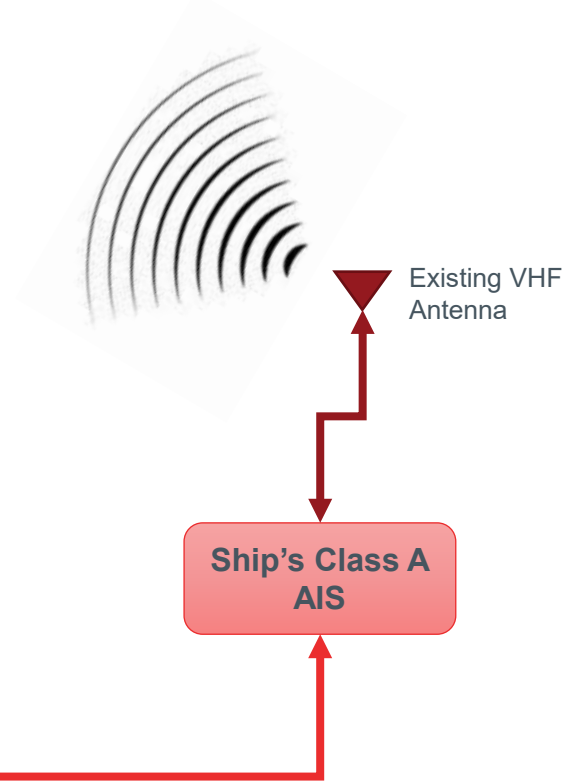
Rugged Processor

Ship's Class A AIS



Ships Ais Wx System – near future

Weather Station



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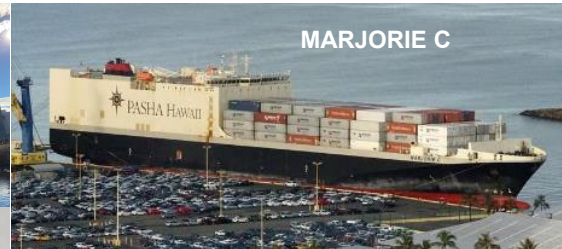
AIS Wx Installations

Commercial Ship Installations

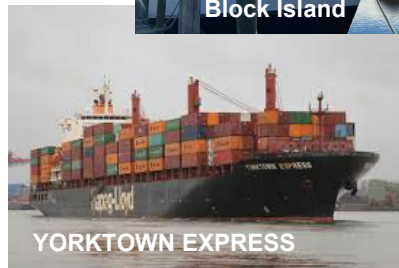
Ship	Company	MMSI	Call Sign	Route	Start
Manoa	Matson	366562000	KDBG	LA/LB to China	8/12/2019
President Wilson	APL Maritime	367578740	WDG8555	LA/LB to China	8/12/2019
Marjorie C	Pasha	367641230	WDH6745	LA/LB to Honolulu	8/13/2019
Perla Del Caribe	Tote	338789000	KPDL	Jacksonville to San Juan	9/26/2019
El Coqui	Crowley	367781630	WDJ4838	Jacksonville to San Juan	9/26/2019
Mesabi Miner	Interlake	366904880	WYQ4356	Great Lakes	9/18/2019
James R. Barker	Interlake	366905890	WYP8657	Great Lakes	10/23/2019
Paul R. Tregurtha	Interlake	366904940	WYR4481	Great Lakes	10/2/2019
Stewart J. Cort	Interlake	367050550	WDC6055	Great Lakes	10/15/2019
Ronald Brown	NOAA	368996000	WTEC	Various	11/21/2019
Maersk Atlanta	Maersk	338078000	WNTL	Houston to Middle East	11/22/2019
Yorktown Express	Hapag-Lloyd	367168650	WDD6127	Houston to UK	11/22/2019
Mirador Express	Lomar	636020941	5LBM5	Indonesia	7/16/2021
Cape Henlopen	DRBA Ferry	366914180	WYR8756	Cape May to Lewes	6/24/2021
Block Island	Interstate Nav Co.	367305040	WCX6756	Pt Judith to Block Is.	12/3/2021



Block Island



MARJORIE C



YORKTOWN EXPRESS



MANOA



PERLA DEL CARIBE



PRESIDENT WILSON



CAPE HENLOPEN



RONALD BROWN



JAMES R BARKER



EL COQUI



STEWART J CORT



MESABI MINER



PAUL R TREGURTHA

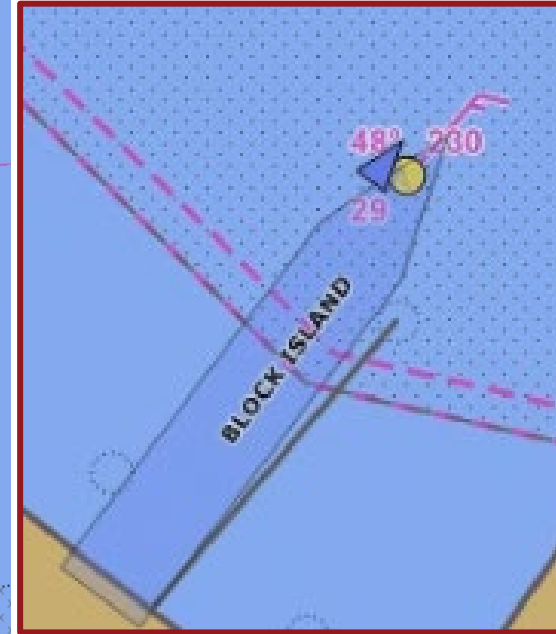


MAERSK ATLANTA



Typical AWS Installation

Message Display – RosePoint ECS

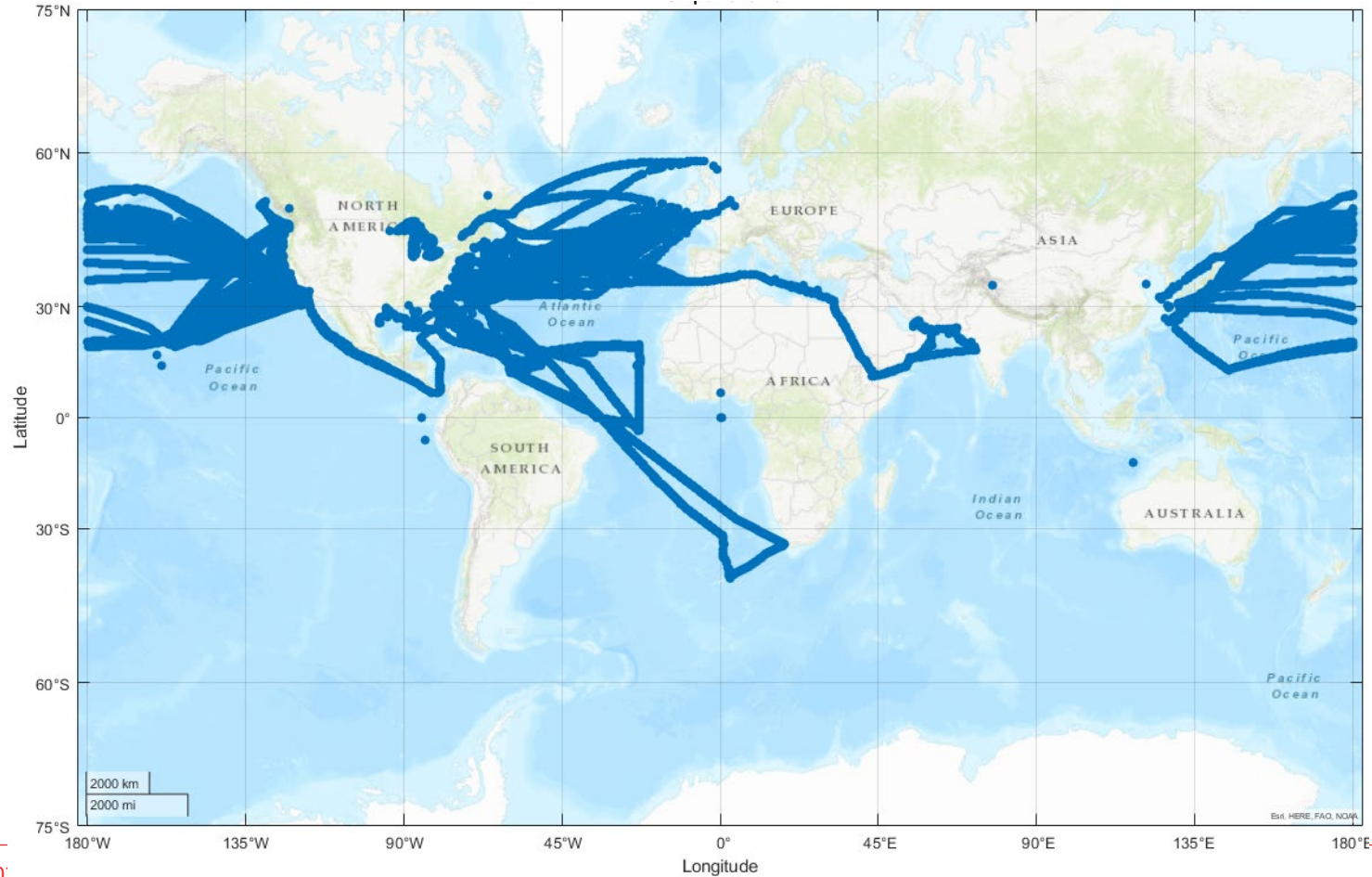


Getting the data where it needs to go

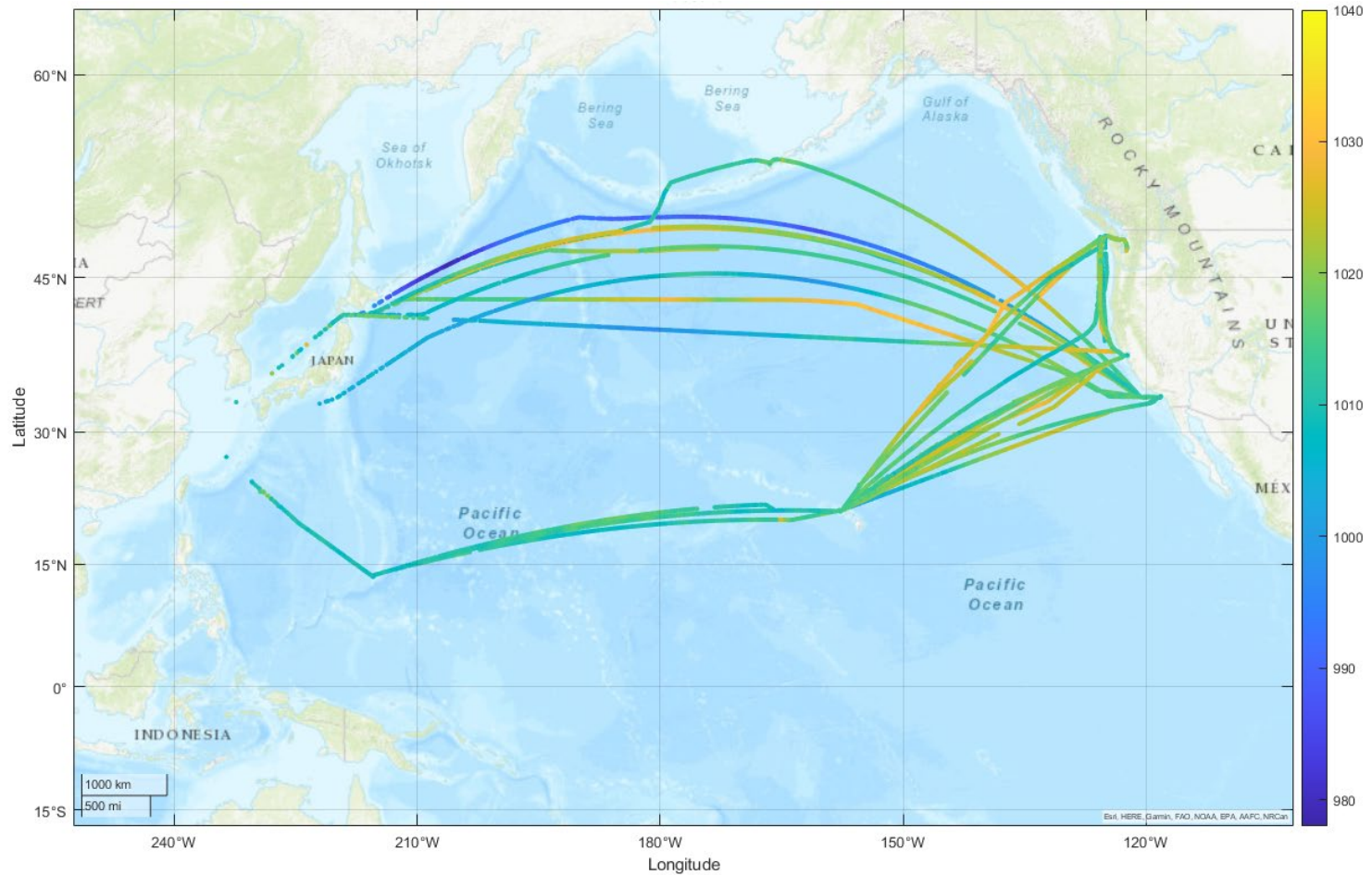
- Data is being received via Satellite
- Parsed by computer process at Serco
 - ftp'd to NOAA NDBC every 30 minutes
- Reformatted by NOAA into BUFR format and posted to GTS
- Accessible by researchers/forecasters in US and Internationally

System Performance

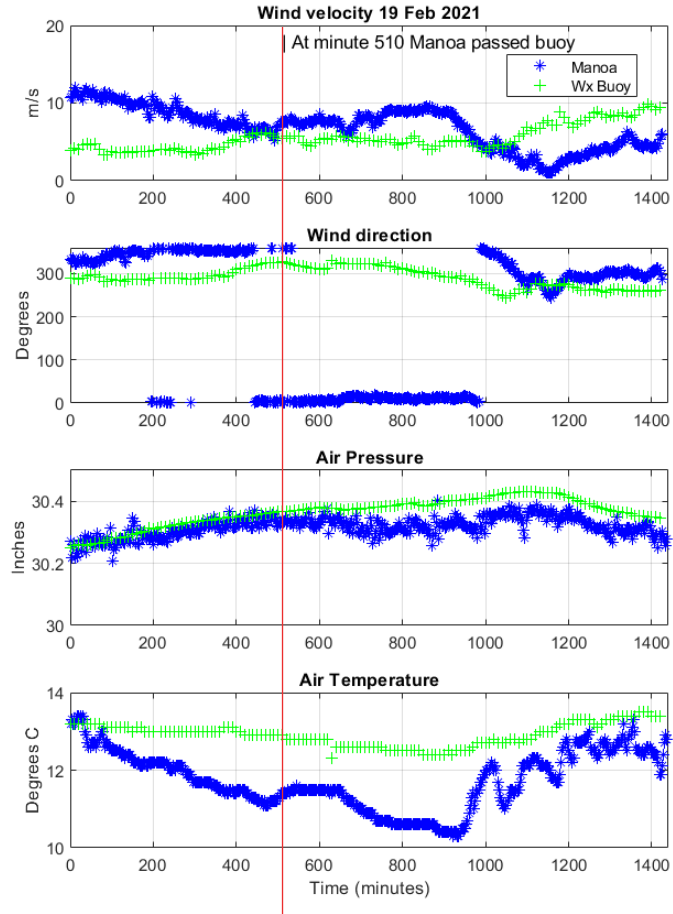
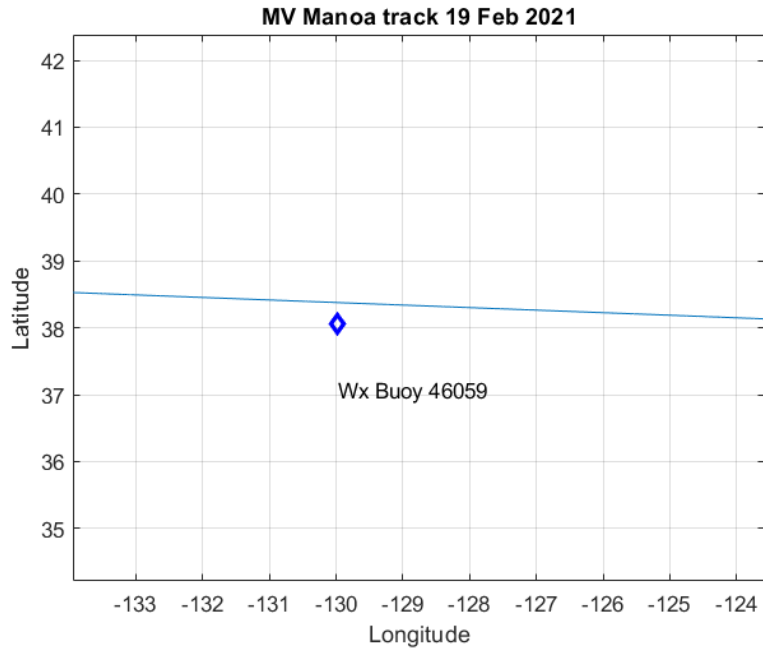
Data Collected from All Ships 2020-22



Pressure Data from Manoa



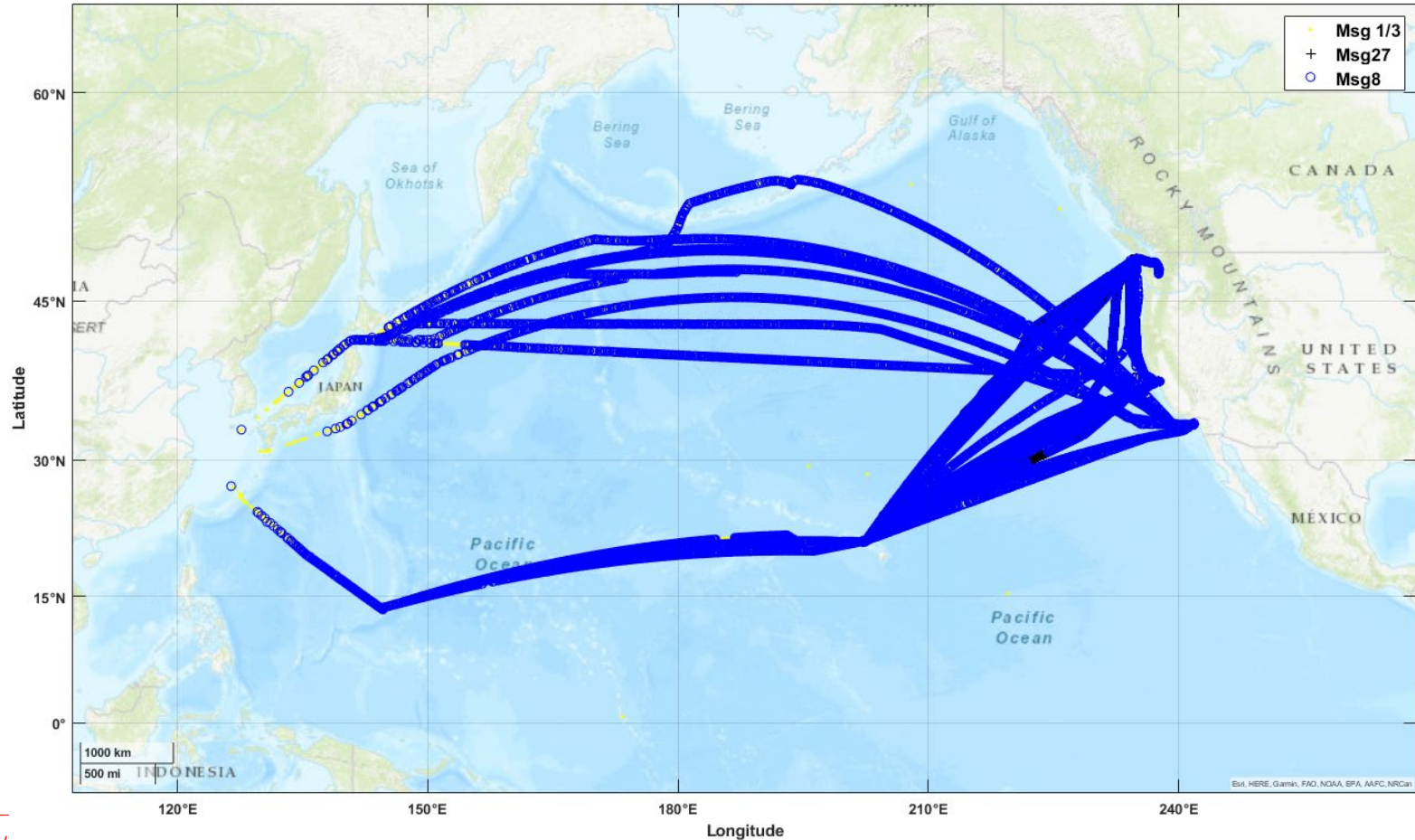
Manoa Compared to Wx Buoy



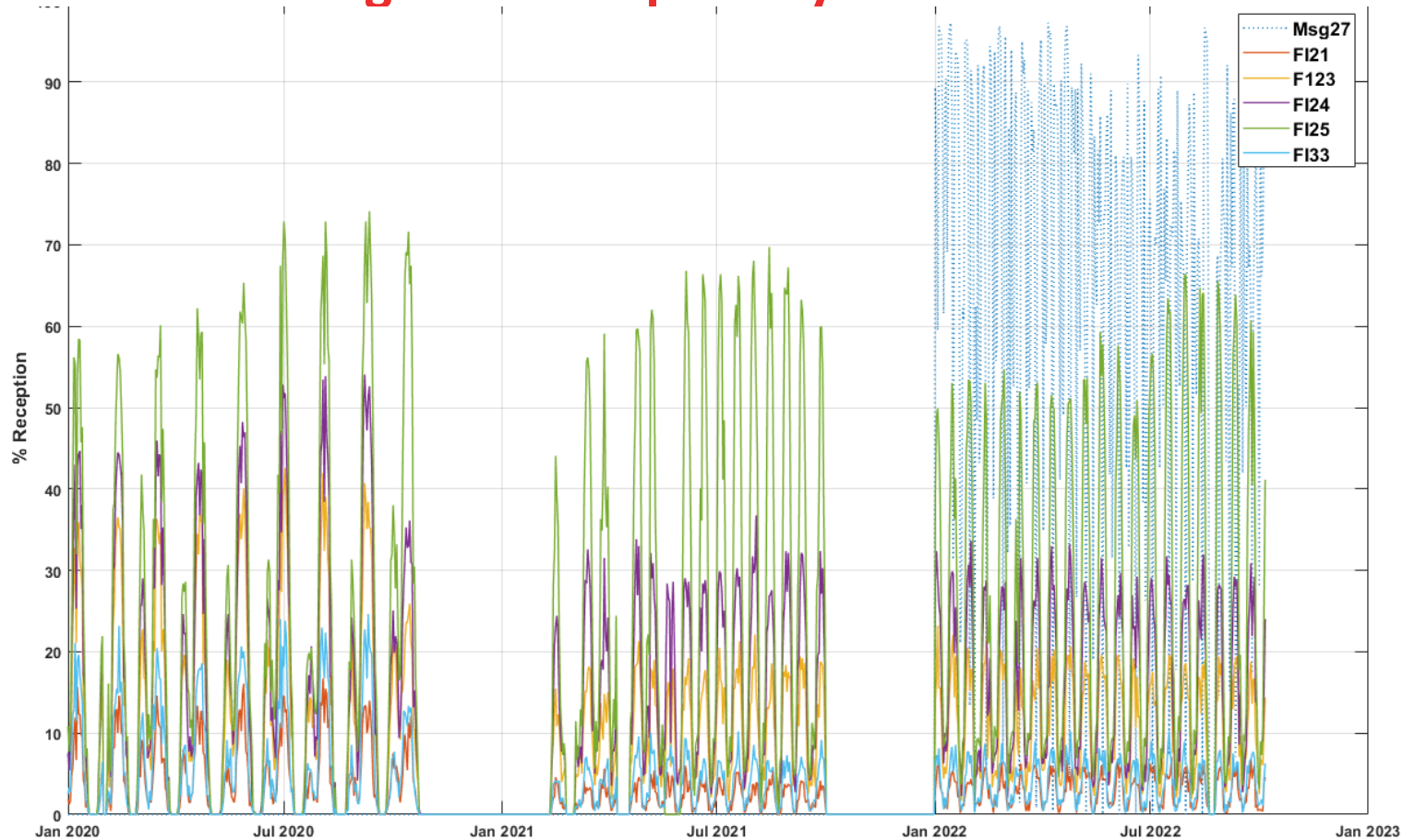
Messages Used for Commercial Ship Trials

DAC/FI	Title	Slots
001/21	Wx obs from ship	2
001/31	Met/hydro data	2
367/33	Environmental	~3
367/23	Satellite Ship wx	1 (168 bits)
367/24	Satellite ship wx small	<1 (128 bits)
367/25	Satellite ship wx tiny	<1 (96 bits)

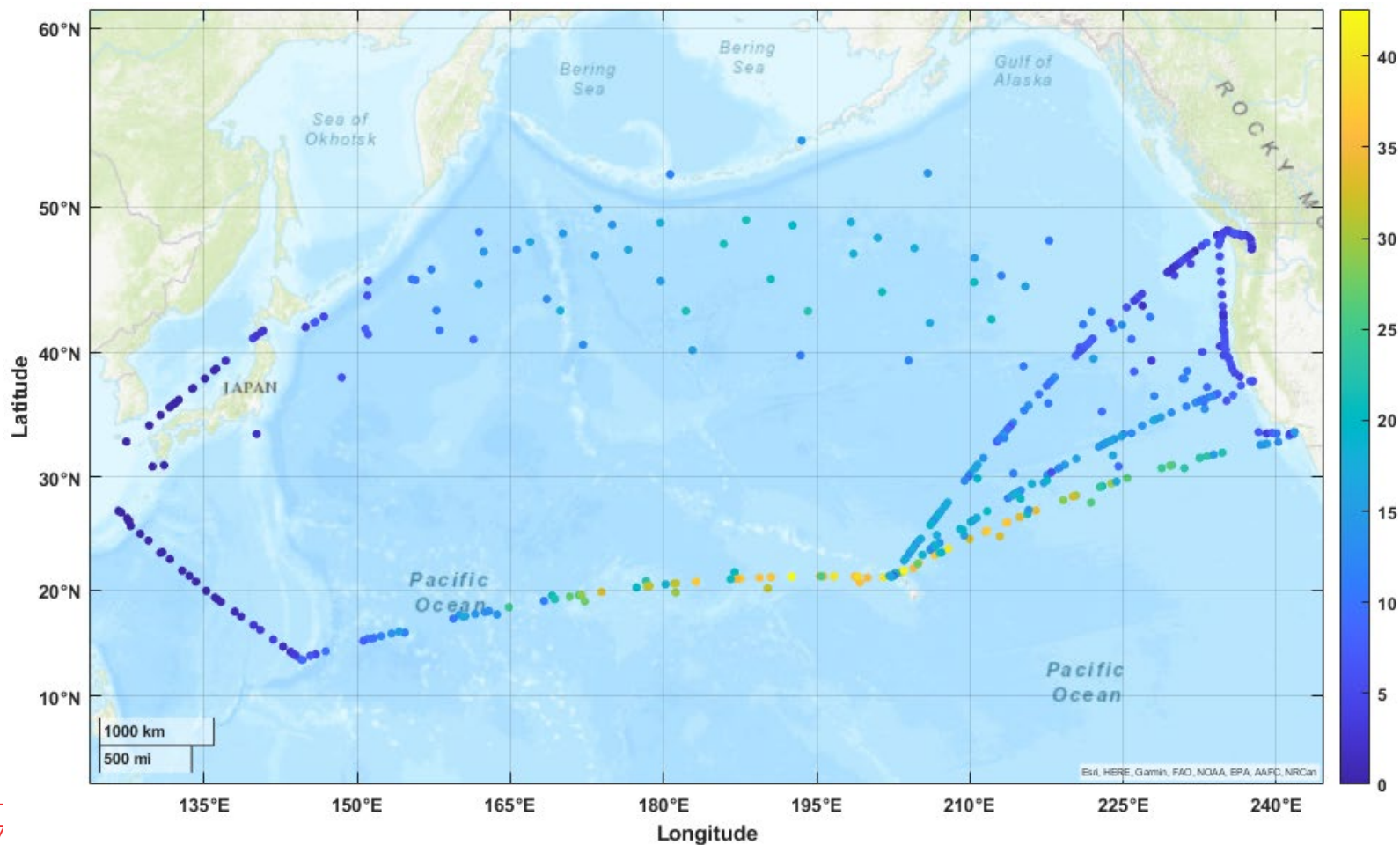
MANOA



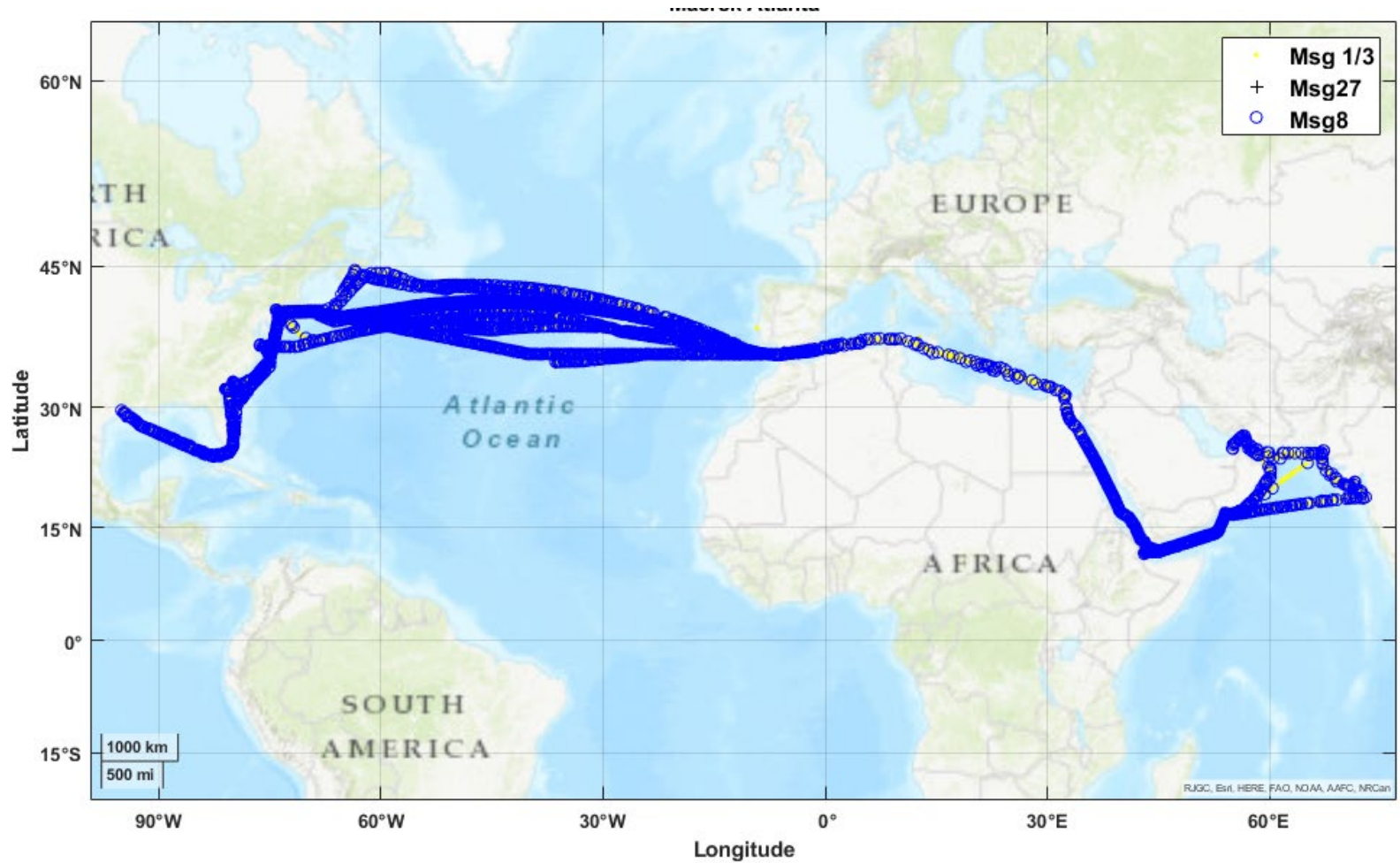
MANOA – Wx Messages % Rcvd per Day



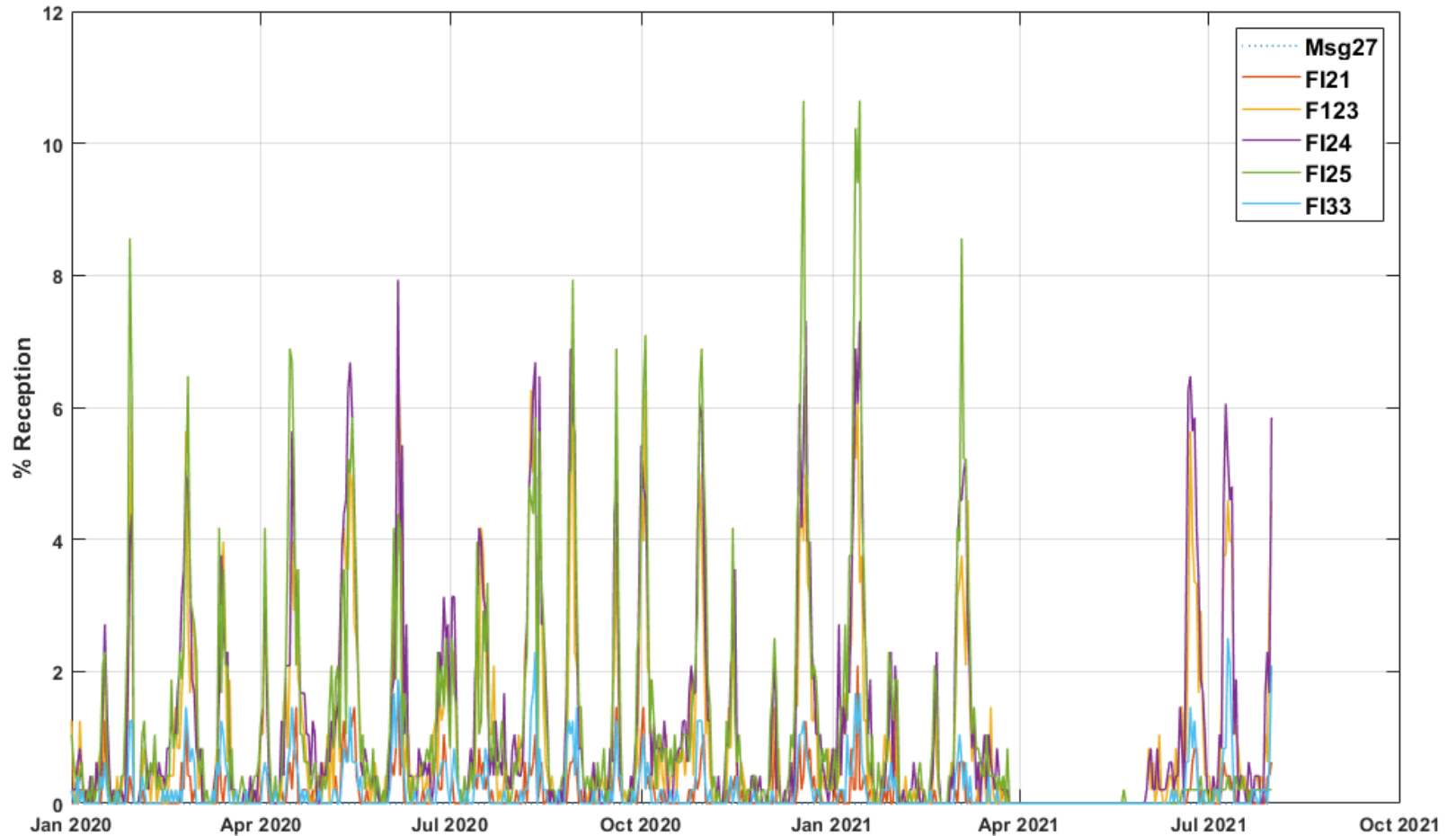
MANOA– FI23 % Rcvd Each Day



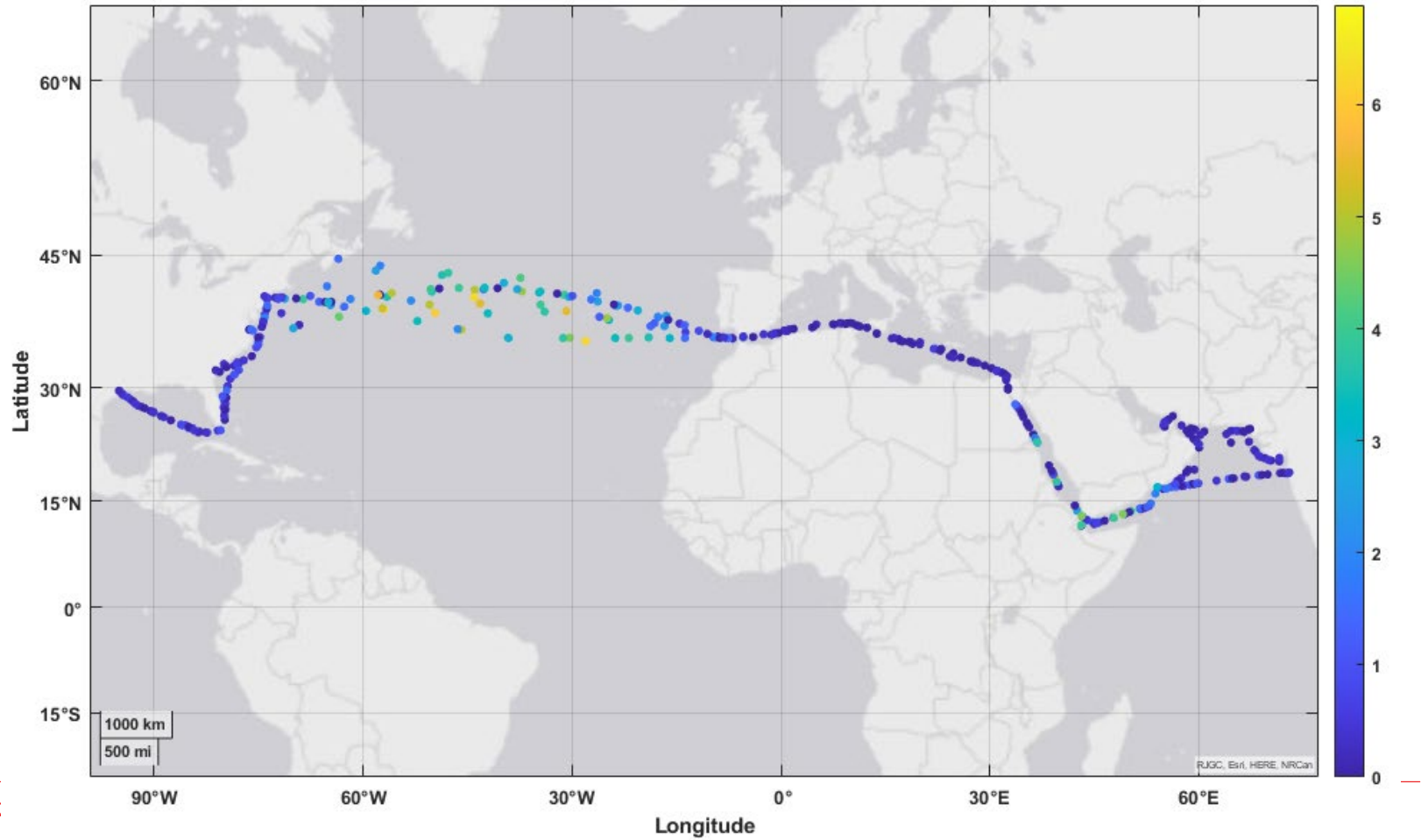
ATLANTA



ATLANTA - Wx Messages % Rcvd per Day



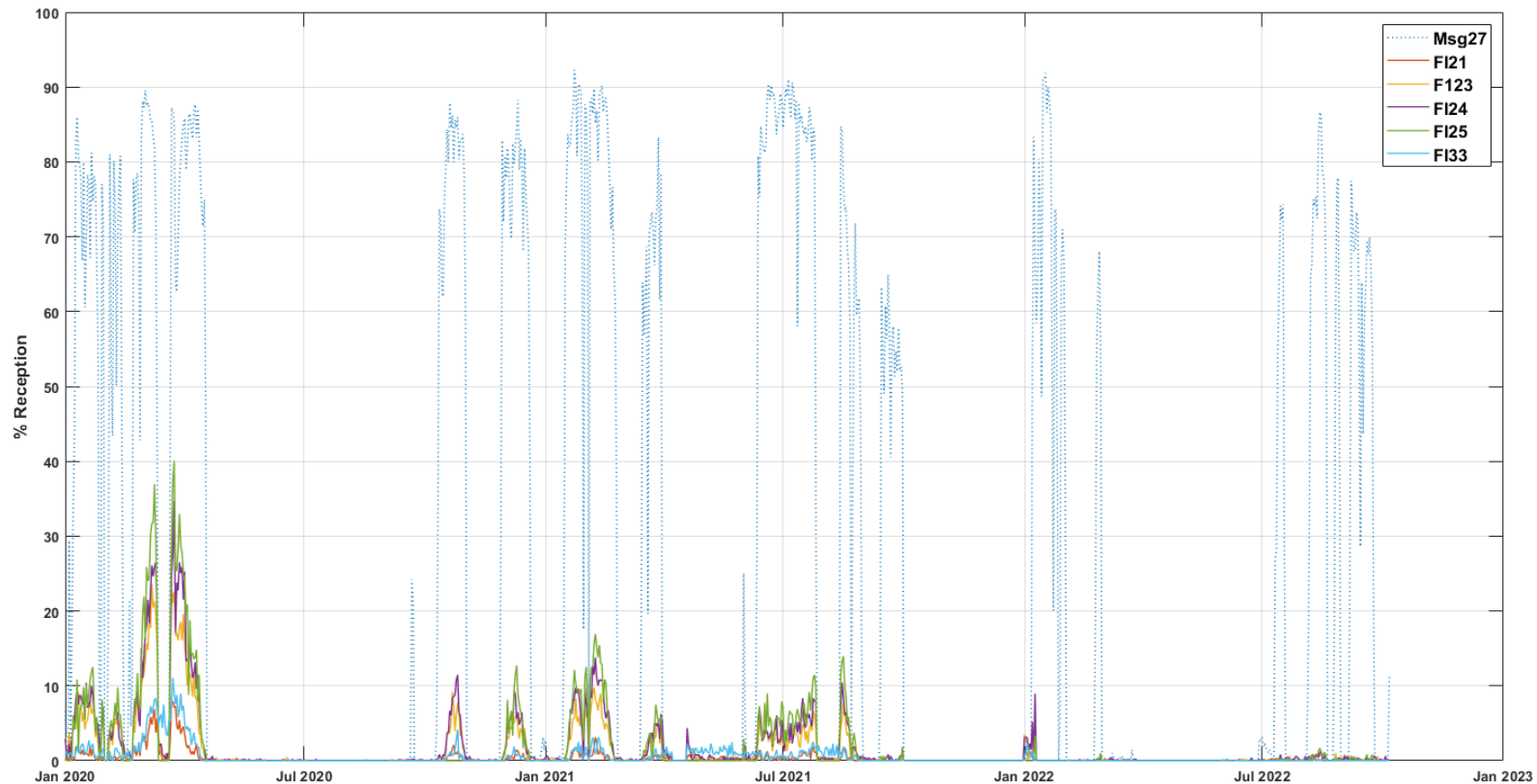
ATLANTA – FI23 % Rcvd Each Day



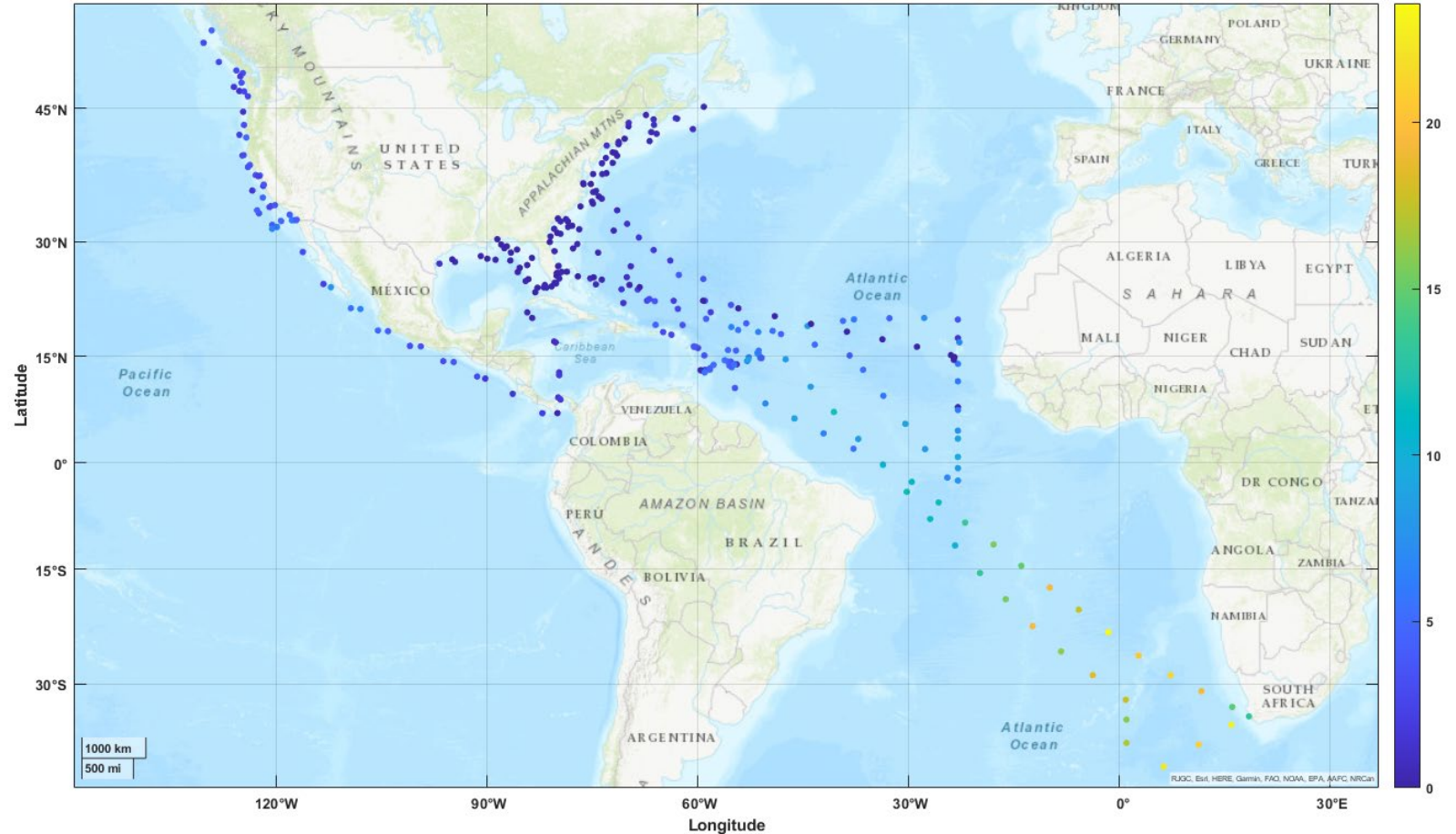
RONALD BROWN



RONALD BROWN - Wx Messages % Rcvd per Day



RONALD BROWN – FI23 % Rcvd Each Day



Conclusions

- AIS works as an automated delivery mechanism for ship's weather data
 - For Sudden Hazardous Weather Events, Ship-to-Ship reporting can allow vessels to share weather information across 80km+ distances.
 - Shore-to-ship reporting can be used to push weather information out to vessels within range of shore transmitters (80km++)
 - Satellite reception can be used for bringing mid-ocean weather data back to shore to be added to the GTS
- Satellite Performance
 - At the 3min interval used, 2% per day is 10 messages
 - VOS is typically 4 messages per day
 - Most areas the % is much better
- Satellite Complements Terrestrial Receivers
 - Satellite percentage received is higher where needed (open ocean)
 - Where lower (near coast) terrestrial reception is available
 - Shore reception is very good (in the 90% range)
- Can transit messages more frequently
 - We transmitted 5 messages every 3 minutes – this could be reduced to 2 messages every 1 to 2 minutes.
- Overall number of messages delivered was 30 to over 500 per day
 - These statistics include areas near shore where reception from satellite is poor

Acknowledgements

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Additional Team Members

- Kevin O'Brian, NOAA
- Kevin Kohlman, MARAD
- Brian Tetreault, USACE



Questions?

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