



MEOSAR Performance and Moving Beacons

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Introduction



- Current MEOLUT Accuracy
 - EOC vs IOC
- Moving Beacons
- Composite vs elementals
- Improving Performance
 - New Master Scheduler
 - MEOLUT Upgrades
 - Commissioning Other MCCs
- Issues
 - New LEO/MEOs – processing old SARP data
- Future Work
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 - Phased Array MEOLUT
 - Buoys
 - Networking

MEOLUT Accuracy



- On 13 December 2016 the Cospas-Sarsat system entered the Early Operational Capability (EOC) for the MEOSAR System
- The MEOLUT location accuracy requirements for EOC are:
 - Single burst: 70% within 5 km; and 90% within 10 km
 - Multiple burst: 95% < 5 km and 98% < 10 km, within 20 minutes
- Location accuracy requirements for Initial Operational Capability/ Full Operational Capability (IOC/FOC):
 - Single burst: 90% within 5 km (no 10 km criteria)
 - Multiple burst: 95% < 5 km and 98% < 10 km, within 10 minutes
 - Slow Moving beacons (0.5 to 10 m/s):
 - Single burst: 70% within 10 km, 95% within 20km
 - Multiple burst: 75% within 5 km, 95% within 7 km, within 10 minutes
- The US MEOLUTs are currently meeting the EOC location accuracy requirements and in most cases the IOC/FOC requirements for static beacons

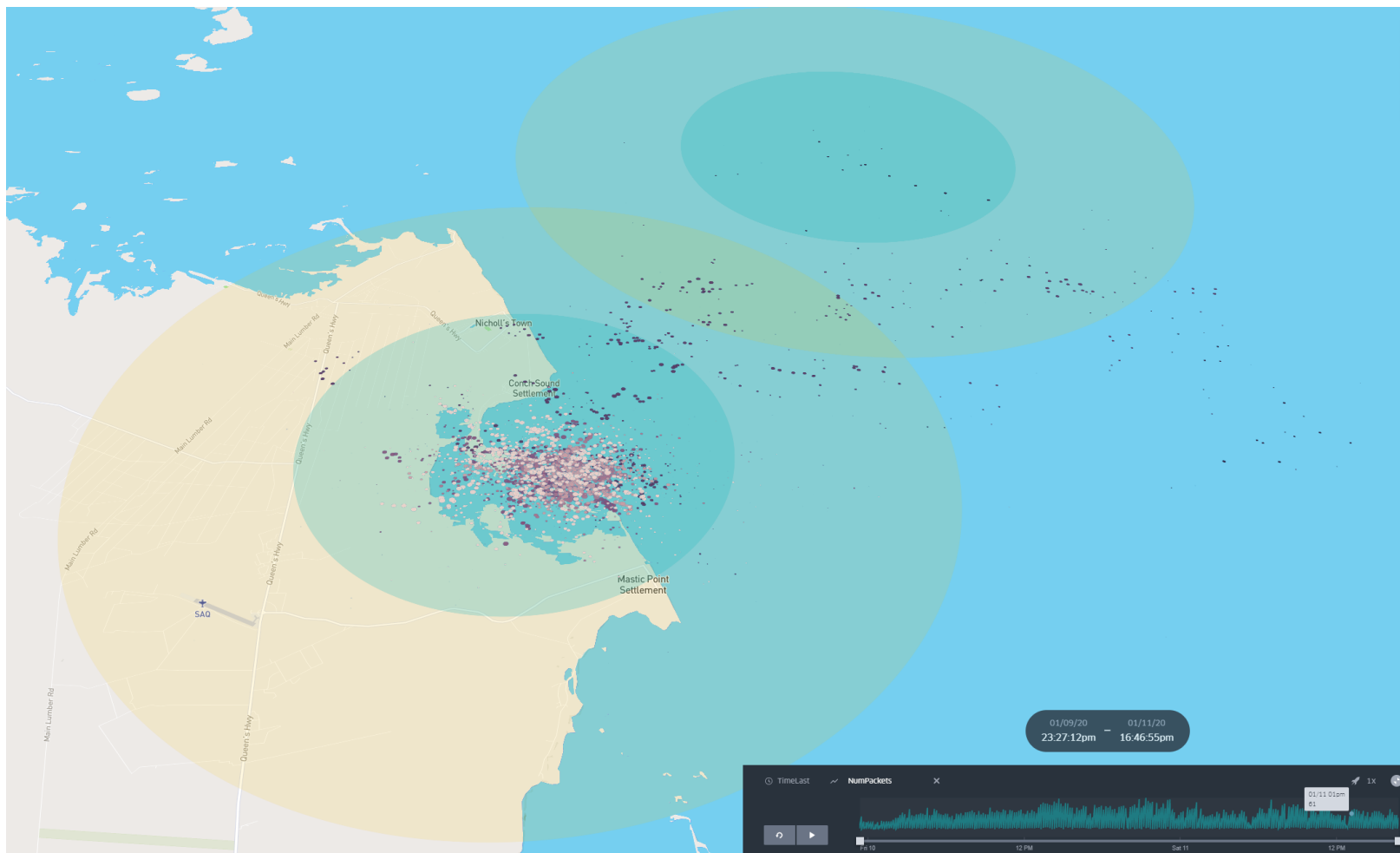


Moving Beacons

- Based on real-world cases, tests and analysis, we know that location accuracy is degraded for beacons that are moving.
- The USA SARSAT Program, has been actively studying the issue and ways to mitigate it.
- NASA SARLAB has conducted various moving beacon tests using UAVs as platforms.
- International Partners have done a great deal of work as well on the issue



Moving vs Static



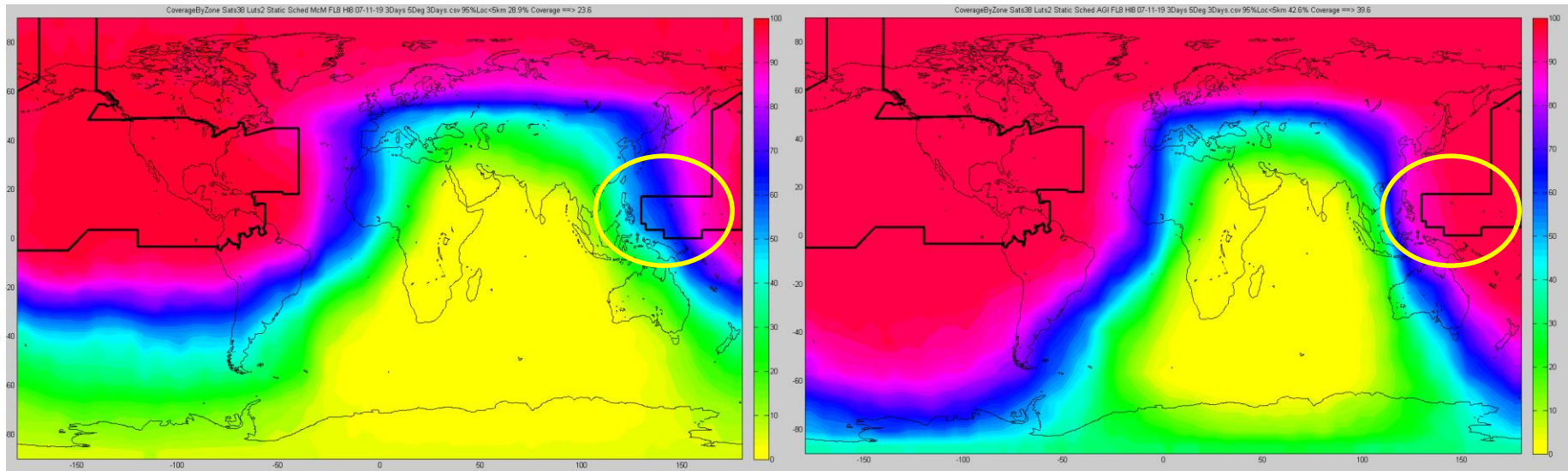
Recent System Improvements



- New LEO/MEOLUTs have been installed at FL, HI, MD, and AK. GU installation scheduled for end of Summer 2020. The LEO/MEOLUTs provide additional MEOSAR data when not tracking LEOSAR satellites
- The USMCC has implemented new coordinated antenna scheduling software that optimizes MEOSAR coverage of the entire US AOR. The USMCC completed this project in September 2019 and has seen a significant increase in MEOSAR coverage.
- The MEOLUT contractor updated the RF processing software in June 2019 to provide more accurate Time of Arrival / Frequency of Arrival (TOA/FOA) measurements.
- The USMCC is working diligently to commission other MCCs as “LGM” or LEO/GEO/MEO, so that they can send MEO data operationally.



Coverage Increase of New Scheduler



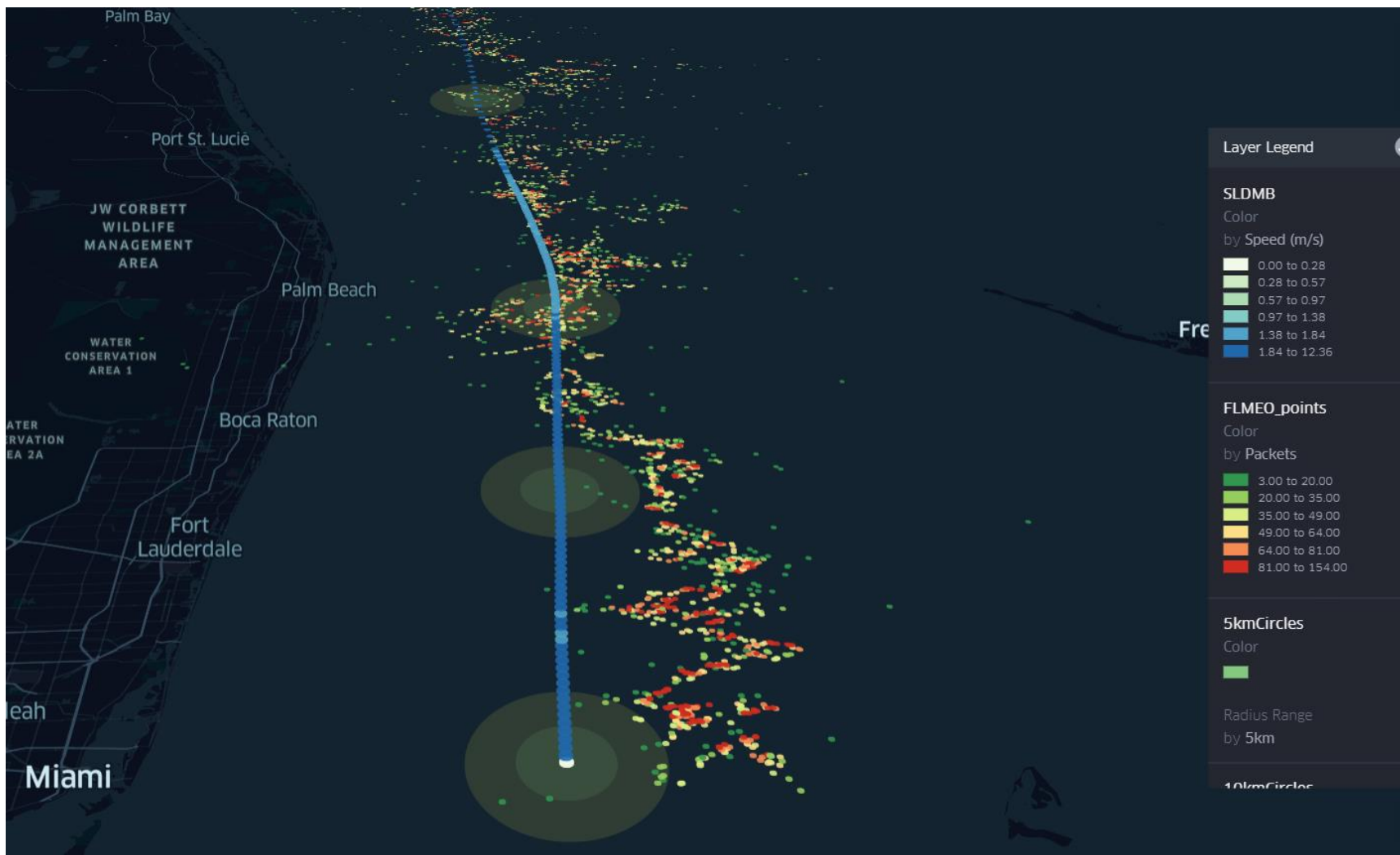
The optimized schedule implemented at the first two MEO ground stations (Florida and Hawaii) resulted in a 16% improvement in global coverage (with no additional antennae or ground station resources)

With 8 antennas at each MEOLUT, the target criterion of < 5 km accuracy can be extended from a 3500 km range to a 5000 km range.

Due to the more dynamic scheduling algorithm, the time required to confirm beacon positions by MEOSAR satellites has been significantly reduced.

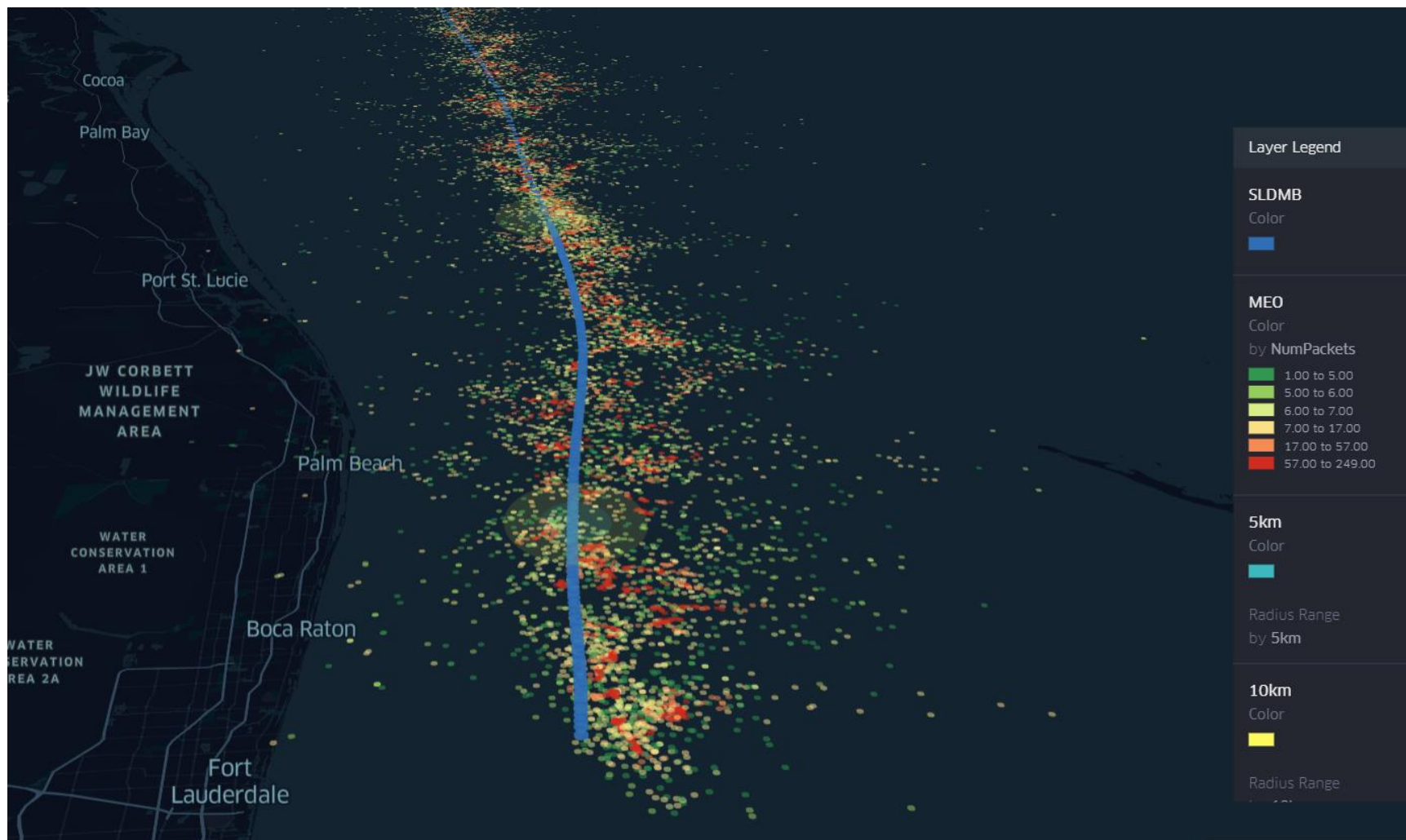


SLDMB test data – May 2019





SLDMB – Dec 2016



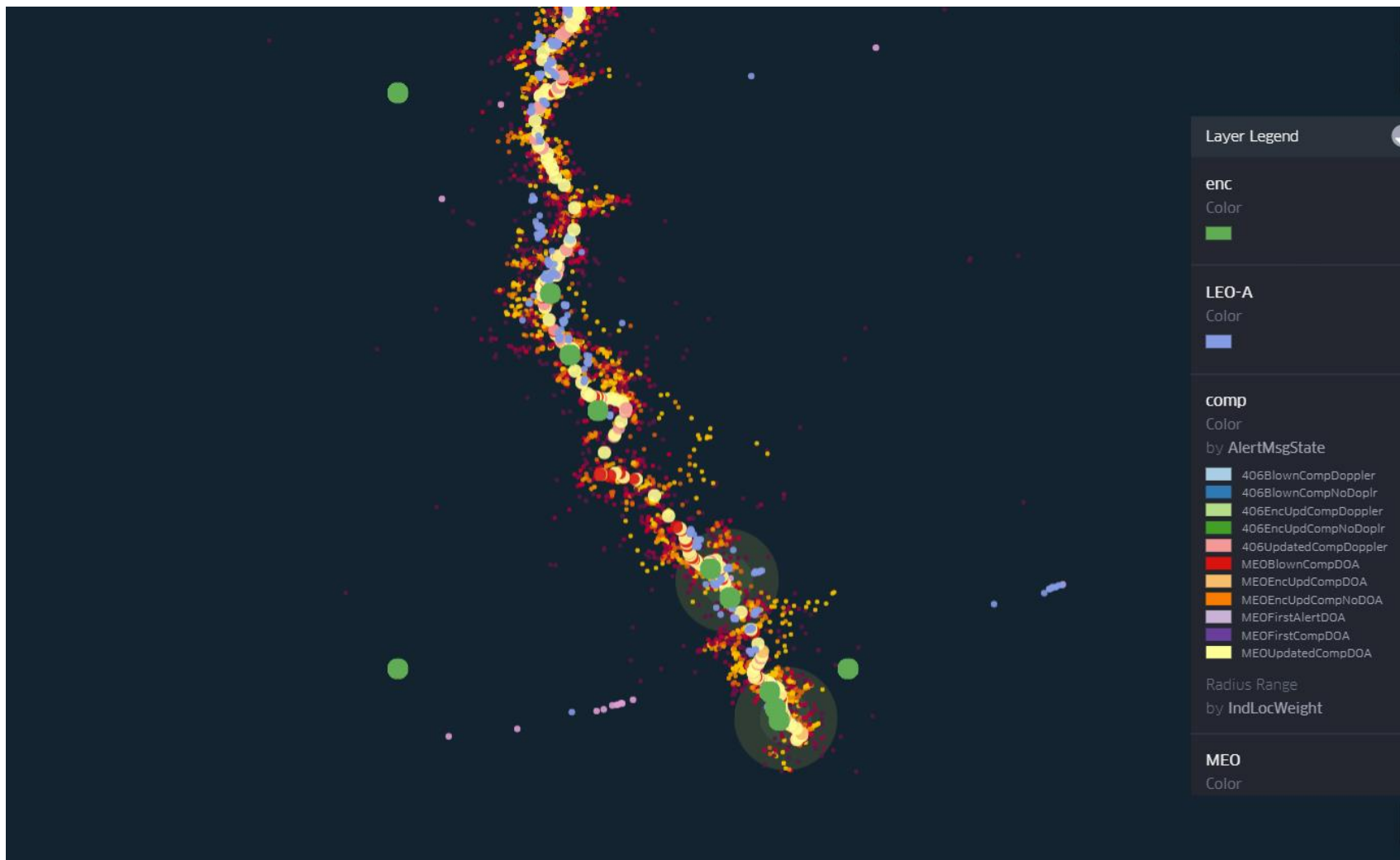


Real EPIRB – July 2019

- D1CC received a located 406 EPIRB alert for a Bermuda registered vessel (S/V SPIRIT OF BERMUDA), 280NM SE of Cape Cod. The captain stated that they were not in distress and that a 12' wave had knocked the EPIRB out of the bracket and washed it overboard, and that they lost sight of it.



Real EPIRB – July 2019



Future Work



➤ Growing Ground Segment

- NOAA has contracted for acquisition of a new phased array MEOLUT to be installed at Holloman AFB, New Mexico in August 2020 and a test phased array MEOLUT in Suitland, Maryland in March 2021.
- Canada will be installing two phased array MEOLUTs from the same vendor. There is a bilateral working group established to harmonize designs and eventually network MEOLUT data.
- Additionally, networking MEOLUT data with Australia and New Zealand have two MEOLUTs that we are pursuing networking with, once they are commissioned to do so. Networking MEOLUT data can provide a dramatic increase in MEOLUT coverage, redundancy, probability of location and location accuracy.

➤ Additional Development

- Current MEOLUT contractor has installed a development Location Processor used as test bed for improving location algorithms.
- NOAA has contract to acquire 3 reference beacons to be placed on buoys maintained by the National Data Buoy Center. These beacons will provide valuable test data and the ability to monitor real-world system performance in real-time.



Keep helping us!

We've received a number of cases from Erin that have helped identify anomalies, shortcomings, or just better understand the system.

Please keep them coming!