



Game Changers – Technical Advancements in the Maritime Realm

Space Systems: Linking the Celestial to the Terrestrial

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From the Sea to the Sky (and back again) Common Themes

- Outside the realm of “normal” life
- Both high seas and space are “Global Commons”
- Regulations, treaties developed from consensus based behaviors
- Platforms are sovereign territory



Democratization of Space

- Technology enablers:
 - SmallSats, MicroSats and NanoSats.
 - Commercial launch vehicles
 - Big Data Analytics
- Growing commercial sector
 - Platforms
 - Communications
 - AIS and ADS-B
 - Earth Observation
 - Value-added analytical services



RADARSAT2 image (c) CSA 2013



RCM image (c) CSA 2013



Impact on Maritime Communications

- Connect from (almost) anywhere
- Reliable and reasonably secure
- Results:
 - (almost) Continuous contact
 - Ship and cargo tracking
 - Higher expectations for pre-arrival reporting
 - Self-reporting systems and just-in-time delivery of engineering support



Impact on Passage-Making

- Precise Navigation
- Storm, ice and surface current avoidance.
- Vessel traffic management, beyond range of shore-based radar.
- Uninhabited (?!) or nearly uninhabited “Drone” ships



Impact on Maritime Security

- Better knowledge of who is approaching shores (and what they are bringing with them)
- Decluttering the plot – separating the knowns from the unknowns
- Early detection of and response to SAR events
- Faster recognition of pollution plumes and identification of polluters
- Improved monitoring of fishing/surveying activities



Example of Global AIS contacts/tracks

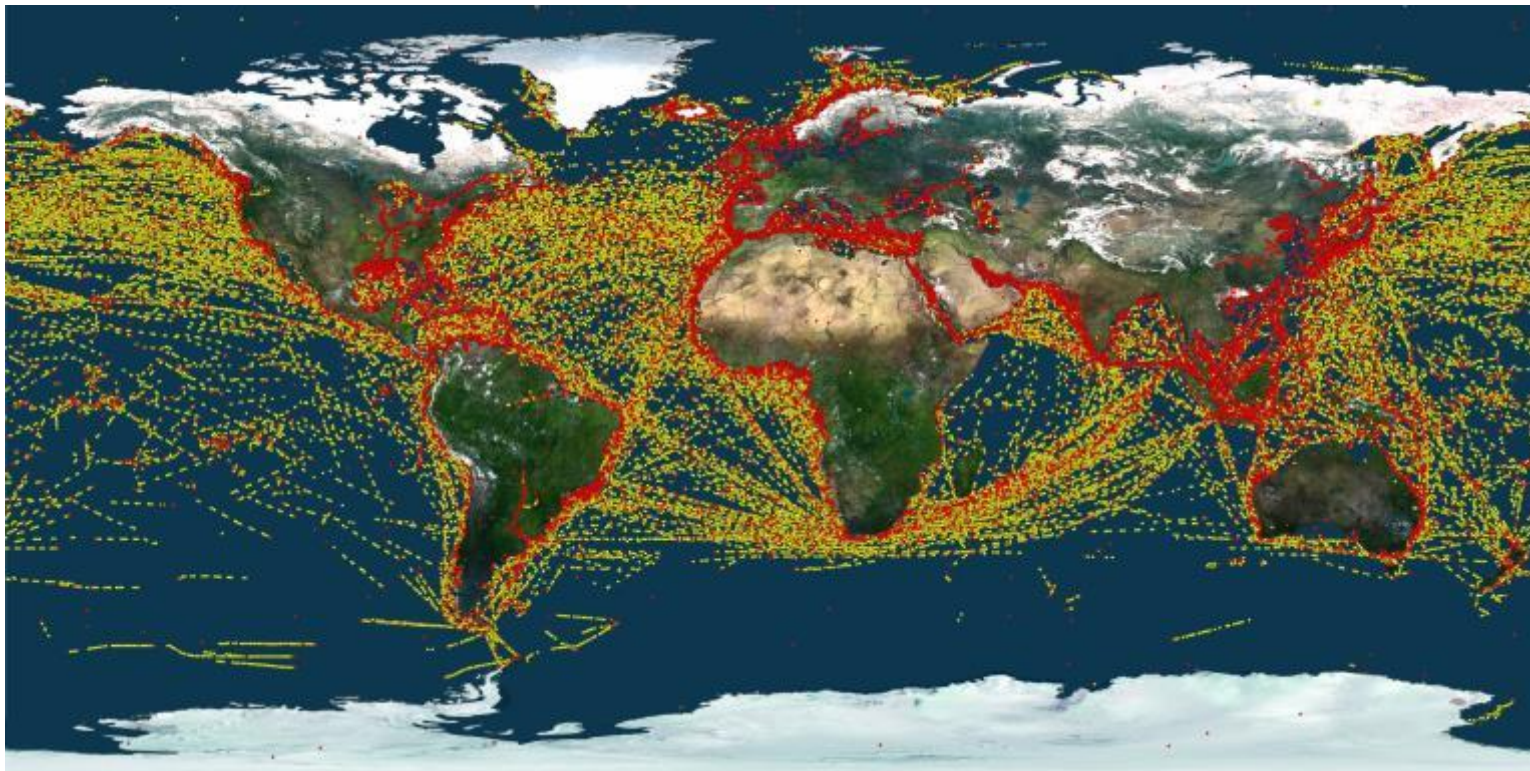
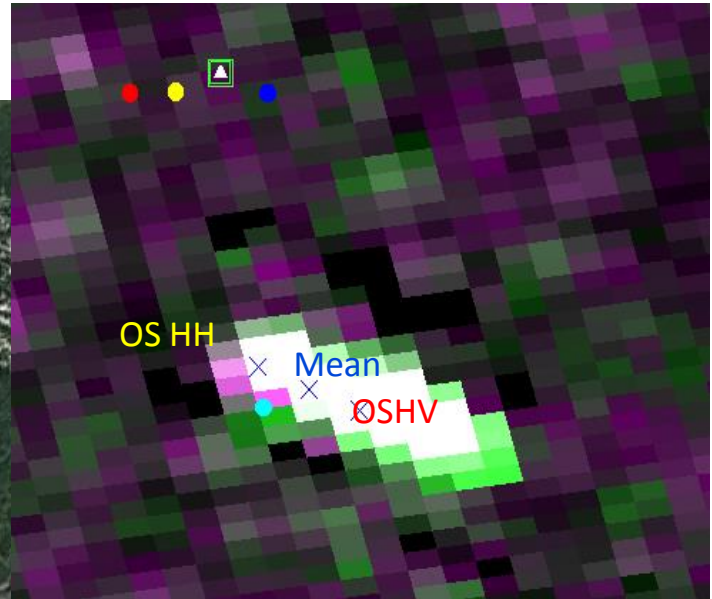
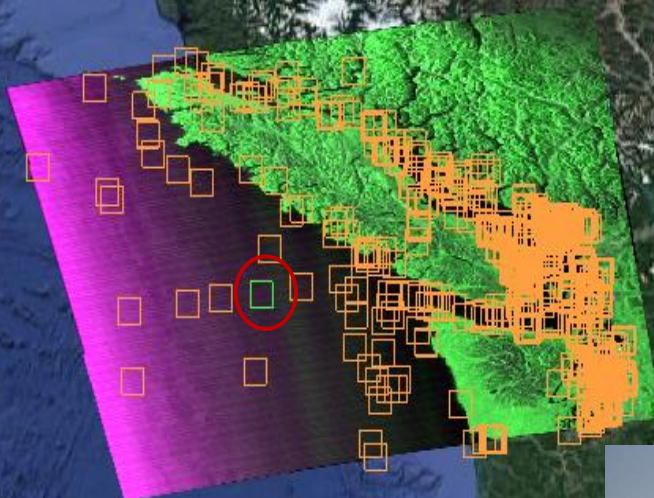


Image courtesy Anthony Isenor, DRDC Atlantic

SAR-AIS Association System in IA Pro

- Jan 11, 2013
- MSSR mode (OSVN)



- △ Azimuth de-shift
- Predicted
- Projected
- Post-image
- Pre-image



<https://www.vesselfinder.com/ship-photos/44581?s=1>

Credit to Google earth

Overseas Boston (USA)

- ~ 174 m
- Chemical/Oil products Tanker



The Down Side

- AIS & Piracy
- Counter law-enforcement tracking and communications
- Loss of traditional comms and navigation skills



What is not changing (at least not anytime soon)

- It is still a Big Ocean – especially outside of regular shipping lanes!
- Limited speed of advance
- The physical demands of taking ships to sea will continue to challenge sailors and ship owners.



Photo: Corporal Neil Clarkson, 14 Wing Imaging, Greenwood, Nova Scotia GD2016-0444-0034



Photo: Master Corporal (MCpl) John Mason, CFB Halifax, Formation Imaging Services



Conclusion

- Advances in space technology, particularly those driven by commercial space and data analytics will continue to have a significant impact on life at sea through improvements in communications, voyage planning, traffic management and emergency response.
- However, the sea remains a “harsh mistress”



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