Data Standards for Navigation Systems
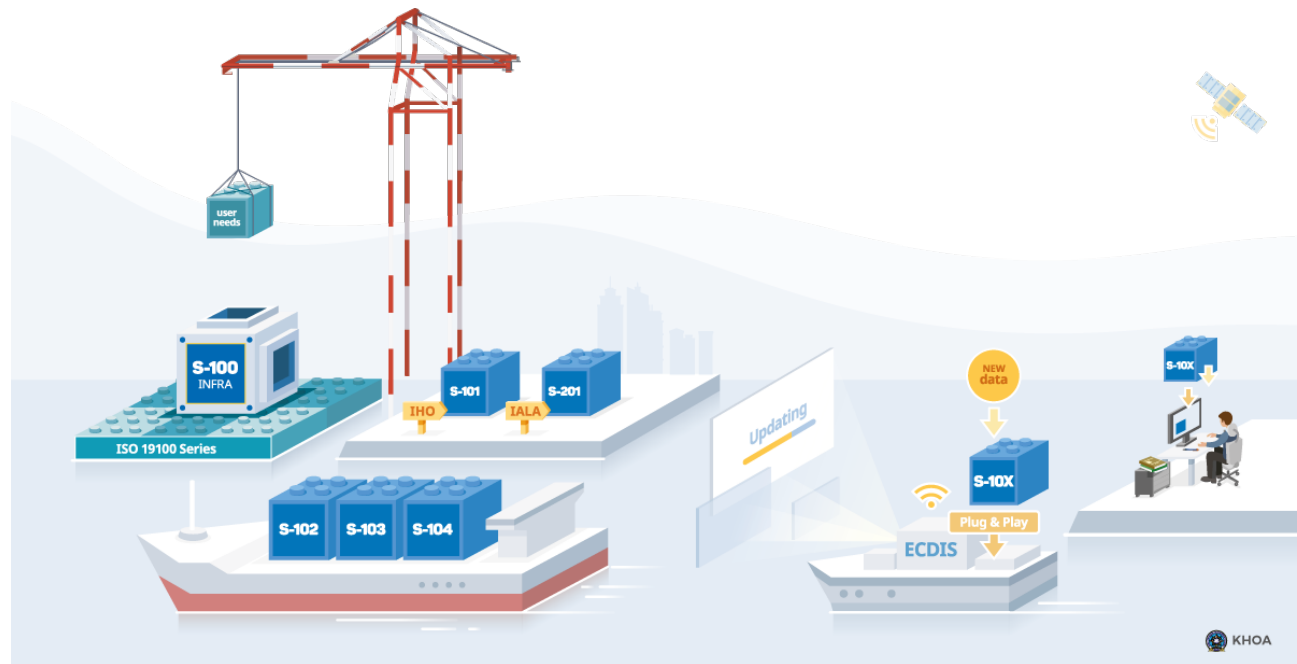
October 4, 2018

Julia Powell
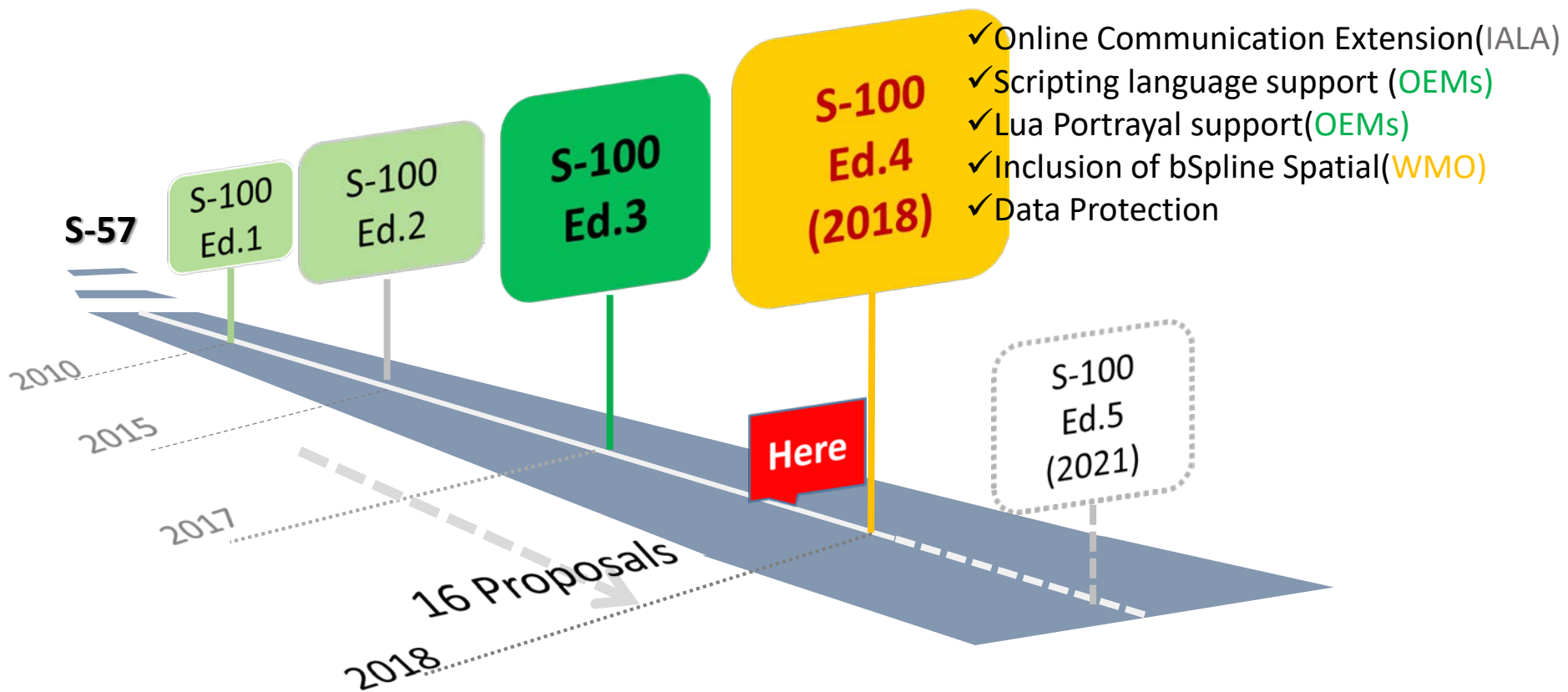
What is S-100

- *Provides the **data framework** for the development of the next generation Electronic Navigational Charting products, as well as other digital products required by the hydrographic, maritime and GIS communities*

What is S-100

S-57 → S-100 Ed.1 → S-100 Ed.2 → S-100 Ed.3 → S-100 Ed.4 (2018) → S-100 Ed.5 (2021)

Timeline: 2010, 2015, 2017, 2018 — 16 Proposals

Here (at S-100 Ed.4)

S-100 Ed.4 (2018):
- ✓ Online Communication Extension(IALA)
- ✓ Scripting language support (OEMs)
- ✓ Lua Portrayal support(OEMs)
- ✓ Inclusion of bSpline Spatial(WMO)
- ✓ Data Protection

S-100 in use

S-101
S-102
S-104
S-111
S-129

S-20x

S-421

IHO
· Electronic Navigational Charts
· Nautical Publications
· Surface Currents
· Bathymetry

WMO
· Ice
· Weather forecast

World Meteorological Organization

IALA
· AIS
  Auto Identification System
· VTS
  Vessel Traffic Service
· AtoNs
  Aids to Navigation

IMO
· e-Navigation

IEC
· Route exchange specification

S-411
S-412

What Developers need to know

- ## Feature Catalogue
  - XML machine readable catalogue
  - binds the features and attributes together
- ## Portrayal Catalogue
  - Two Mechanisms
    - .XSLT portrayal catalogues
    - LUA scripting for use in S-101
      - Complex portrayal rules
    - Symbols are in SVG
- ## Standardized Data encodings
  - ISO 8211 – slightly different flavor than S-57
  - S-100 GML profile
  - S-100 HDF Profile
- ## Metadata Exchange Catalogues
  - Tells you everything you need to know about the data and its location in the world

```xml
          </gmd:voice>
        </S100XC:phone>
      - <S100XC:address gco:isoType="gmd:CI_Address">
          - <gmd:deliveryPoint>
              <gco:CharacterString>1315 East West Highway</gco:CharacterString>
            </gmd:deliveryPoint>
          - <gmd:city>
              <gco:CharacterString>Silver Spring</gco:CharacterString>
            </gmd:city>
          - <gmd:postalCode>
              <gco:CharacterString>MD 20910</gco:CharacterString>
            </gmd:postalCode>
        </S100XC:address>
    </S100XC:contact>
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    <S100XC:exchangeCatalogueName>S101ed1.CAT</S100XC:exchangeCatalogueName>
    <S100XC:exchangeCatalogueDescription>S101TestDataXC001 exchange set contains 21 ENC test datasets develope
       and IHO to support S-101 version 1.0 test plan.</S100XC:exchangeCatalogueDescription>
    <S100XC:productSpecification>
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        <S100XC:version>1.0</S100XC:version>
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```

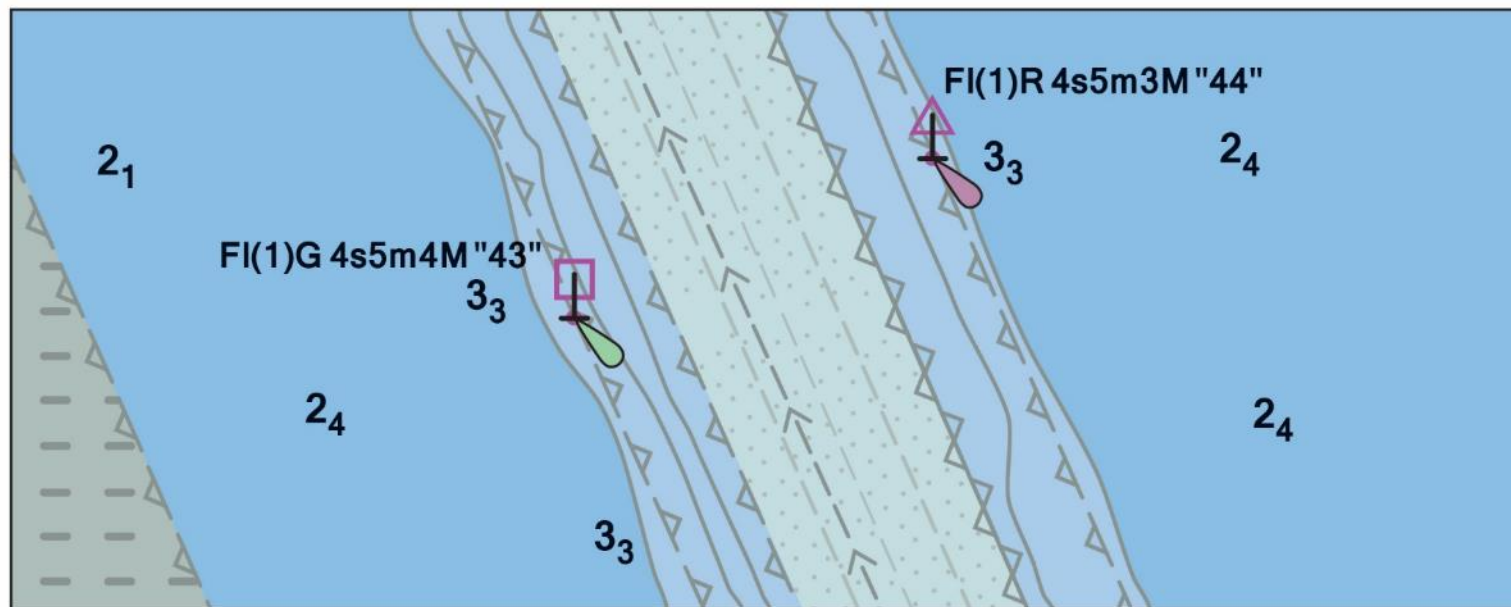National Oceanic and Atmospheric Administration

S-100 Product development at NOAA

S-101 Electronic Navigational Charts

- Improved Data Modeling
- Machine readable catalogues
- NOAA and ESRI developed an S-57 to S-101 Convertor
- S-101 Edition 1.0.0 scheduled for December 2018
  - Testing Edition for system implementers

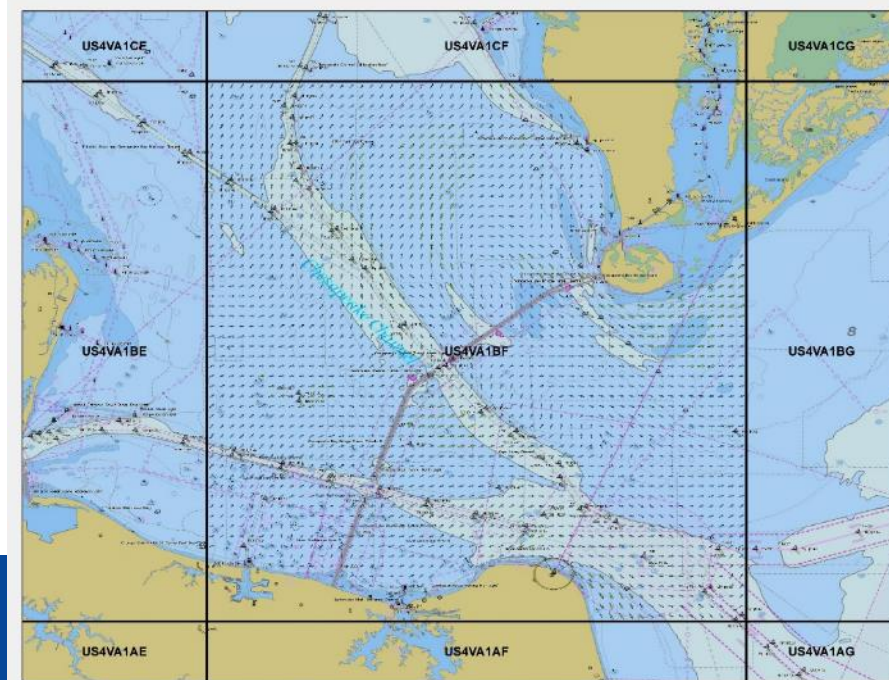# S-102 High Resolution Bathymetry for Navigation Systems

- Utilizes S-100 HDF encoding
- US Naval Oceanographic Office developed a BAG to S-100 HDF convertor for test data
- NOAA is upgrading the convertor to work on Windows and prototype test data for precision navigation
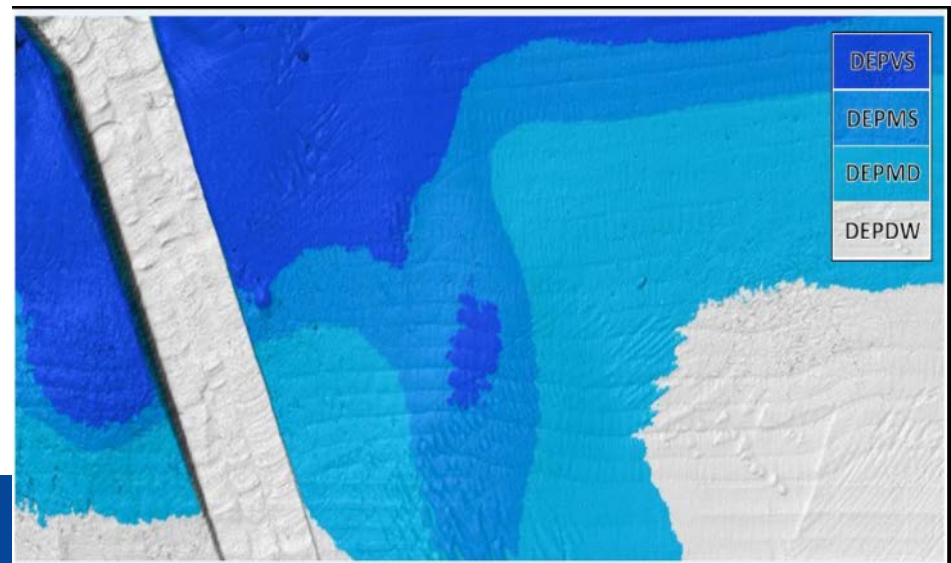
S-111 Surface Currents at NOAA

- Utilizes S-100 HDF encoding
- S-111 product bounds follow the same scheme as the new NOAA ENCs
- 500 meter resolution with 48 hour forecasts in 1 hour increments
- Chesapeake and Delaware Bay initial test area
- Working on the Data Discovery

ftp://ocsftp.ncd.noaa.gov/OFS_Data/

S-111 Animation of Chesapeake Bay
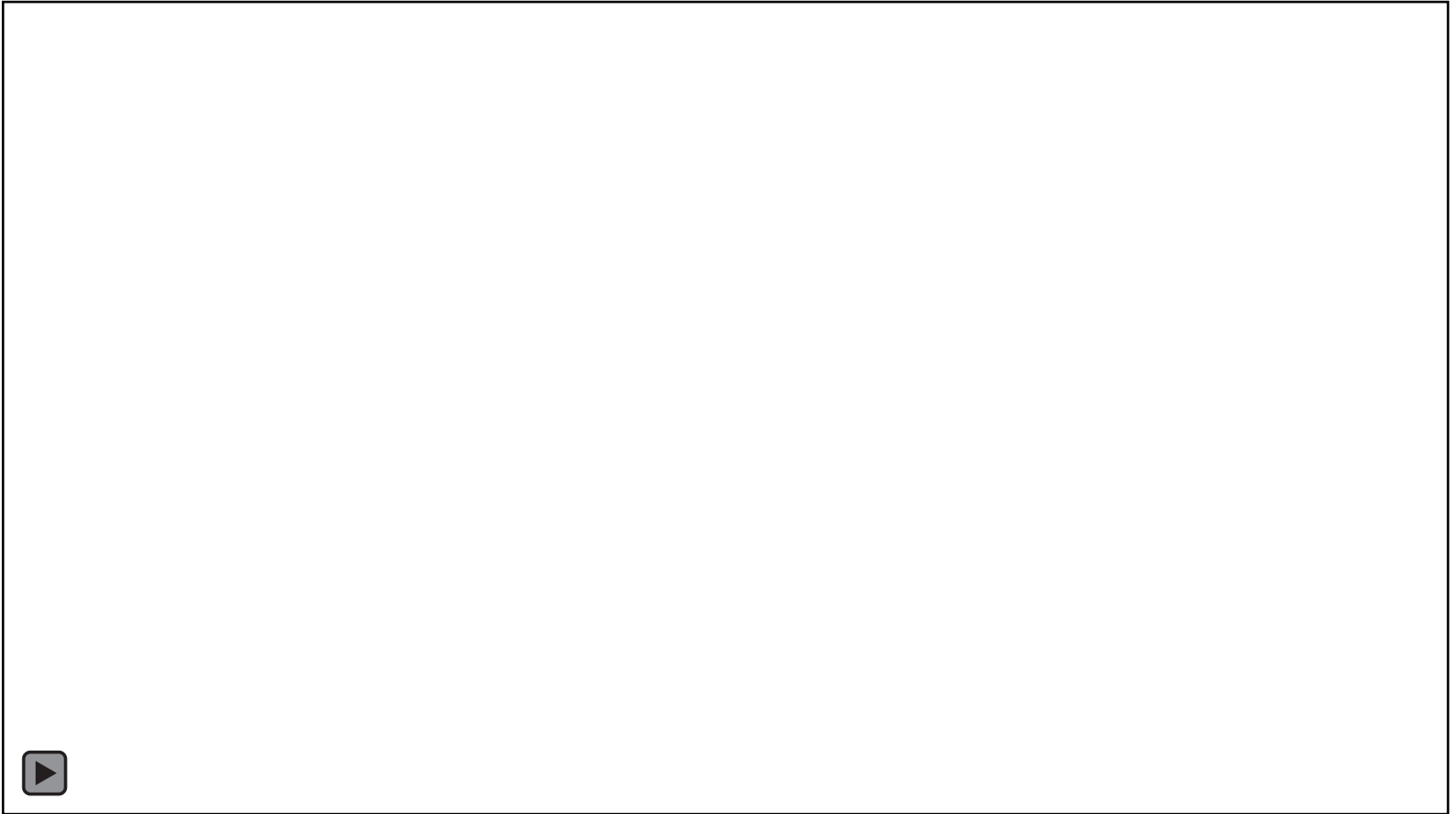
# S-412 Ocean Forecasts

- Weather and Wave Hazards
- S-100 GML

Weather Messages
- Weather message
- Tropical cyclone messages
- Thunderstorm message
- High wind message
- Freezing spray message
- Reduced visibility message
- Large seas message
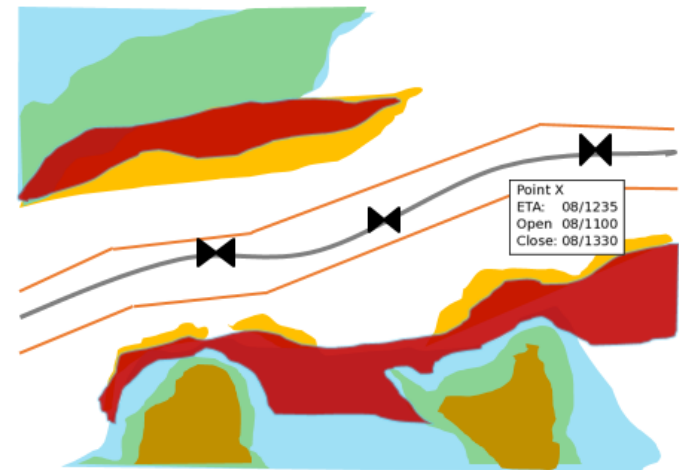- Precipitation message
- Temperature message

Weather Systems
- Tropical cyclone
- Low
- Convergent Boundary
- Front
- Ridge
- Squall
- Thunderstorm
- Cyclone Track
- Cone of Uncertainty

- Future Specifications include
  - Weather and Wave Conditions
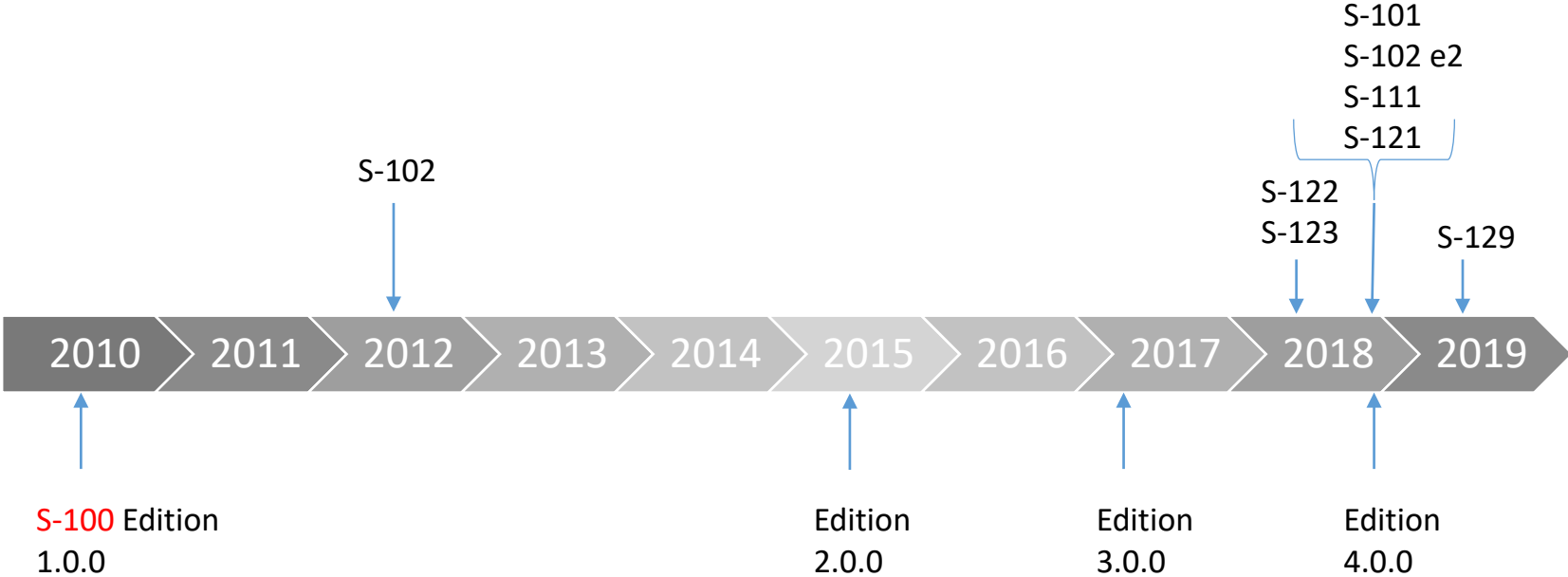 - Weather and Wave Observations
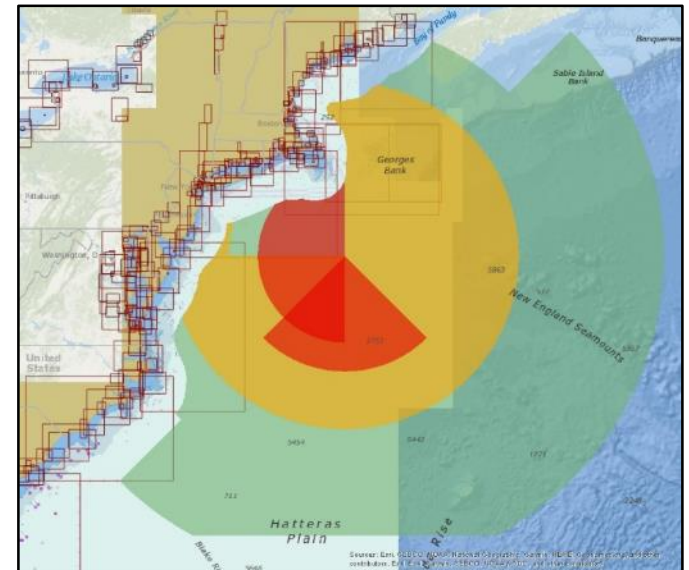
On the horizon

- ## S-104 Water Level
  - Predicted and Real Time?
  - Currently under development by the IHO

- ## S-129 Underkeel Clearance Management
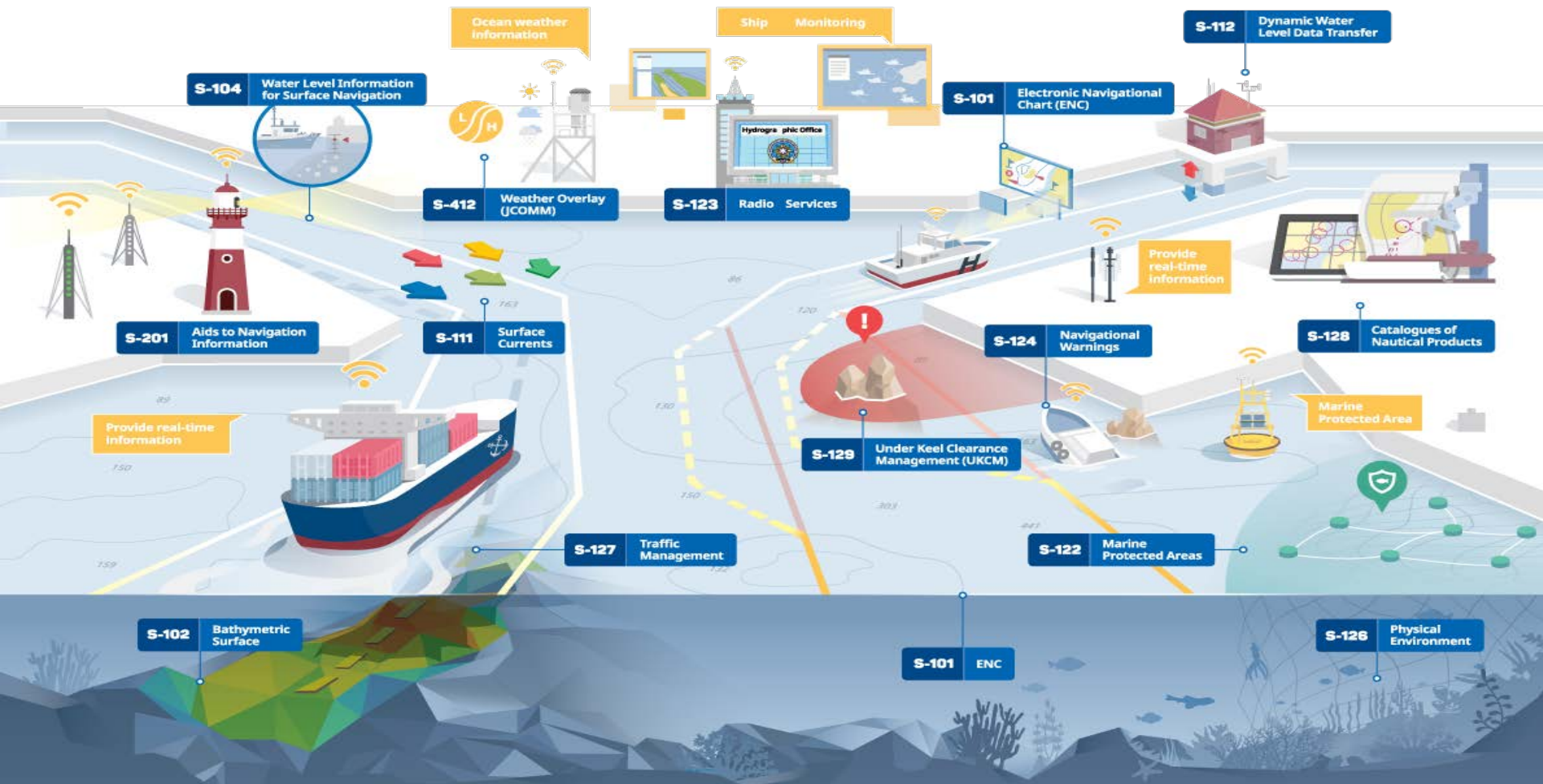 - Depicts go/no go areas based on inputs in UKC systems from bathymetry, surface currents and water levels

Point X
ETA: 08/1235
Open: 08/1100
Close: 08/1330

* Displaying InformationBox can be chosen by the user.

Sign of Progress

S-101
S-102 e2
S-111
S-121

S-122
S-123

S-129

S-102

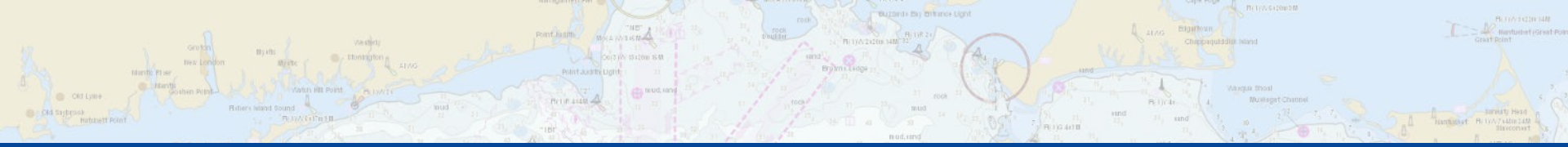| 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |

S-100 Edition
1.0.0

Edition
2.0.0

Edition
3.0.0

Edition
4.0.0

The World of S-100

Point of Contact:

Julia.Powell@noaa.gov

More Information on S-100

http://S100.iho.int