

# *OceanGliders program and (meta)data management*

Victor Turpin

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# Outline

## **The OceanGliders program**

A component of the integrated GOOS

## **OceanGliders - BOON**

Bringing Sustainable observation to the ocean boundary regions

## **The role of JCOMMOPS**

Technical support to the ocean observations program's development

## **Metadata : The key toward an integrated system**

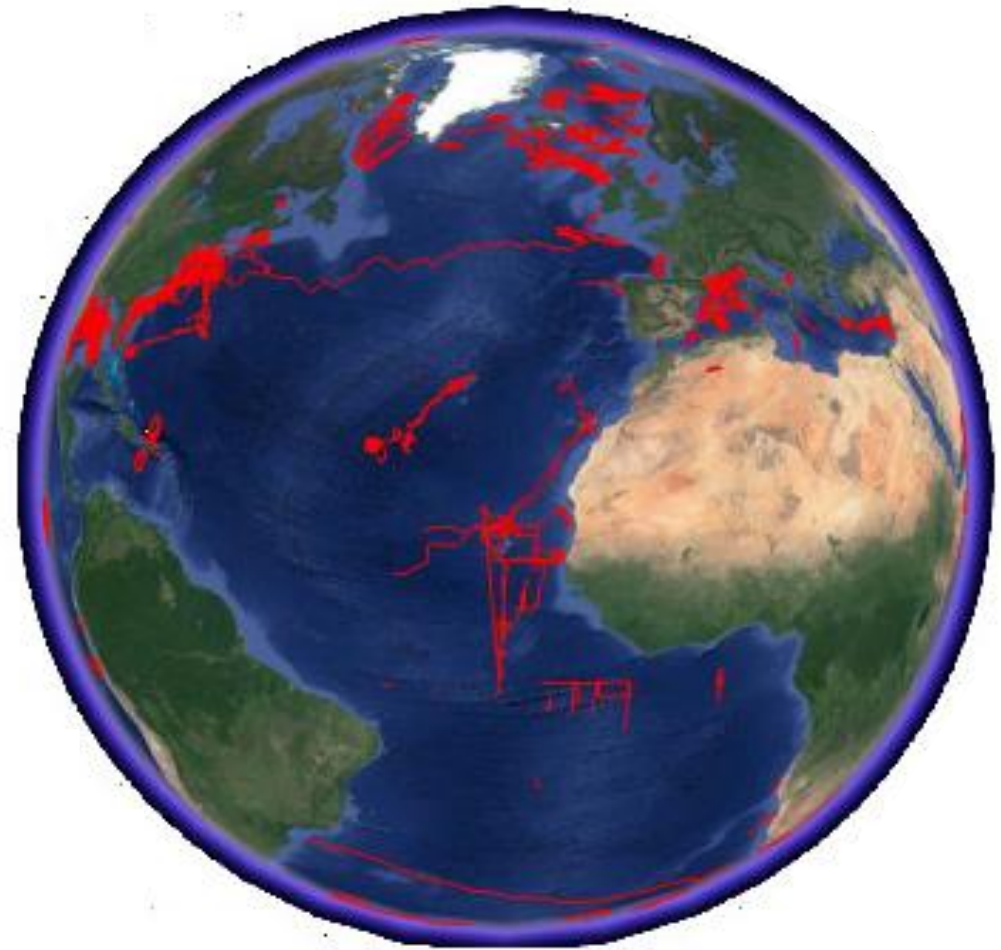
OG1.0 : a global glider format

# The OceanGliders program

A component of the integrated GOOS



Glider tracks until December 2009



Glider tracks until October 2018

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JCOMM Observation Coordination Group (OCG) adopted OceanGliders as an 'emerging' network in 2016



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OceanGliders “strategy” - 2018

- recommend the development of a global operational program to undertake **key ocean observing challenges addressing societal needs.**
- recommend that the global glider program first consider three key areas of ocean observation: **Ocean Boundary Currents, Storms, and Water Transformation.** We recommend that OceanGliders lead an assessment by the ocean observation community on how best to address these three areas of societal need for ocean data.
- recommend the development **of a global data management system to ensure the effective sharing and use of ocean data** from underwater gliders.
- recommend that OceanGliders develop **an implementation plan for a sustained Boundary Ocean Observing Network** to meet the societal needs of improving ocean observing in this key region of the global ocean.

# The OceanGliders program

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- **Boundary Current** › Sustained glider observations in the ocean boundaries

- **Storms** › Increase extreme weather forecast with unique ocean observations

- **Water Transformation** › Monitor shelf/open sea water formations & (sub)mesoscale variability

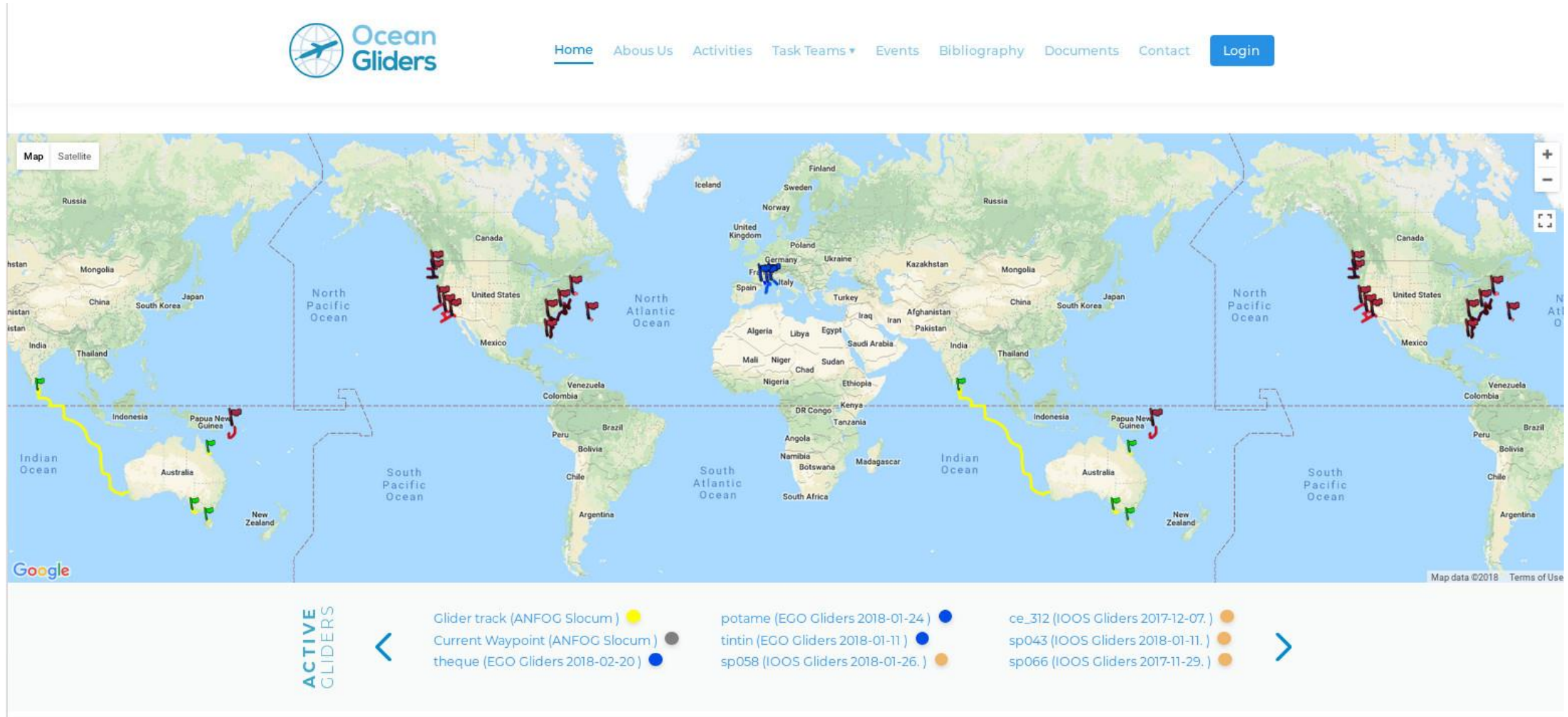
- **Ocean Health & Ecosystems** › Observe variability, change and environmental stress in marine habitats

- **Data Management** › Harmonize globally and support implementation

- **Best Practices** › Support operations efficiency, harmonization and capacity development

# The OceanGliders program

A component of the integrated GOOS



[www.oceangliders.org](http://www.oceangliders.org)

# OceanGliders

## a component of the integrated GOOS

Testor P.<sup>1</sup>, **B. de Young**<sup>2</sup>, D. Rudnick<sup>3</sup>, S. Glenn<sup>4</sup>, D. Hayes<sup>5</sup>, C. M. Lee<sup>6</sup>, C. Pattiaratchi<sup>7</sup>, K. Hill<sup>8</sup>, E. Heslop<sup>9</sup>, V. Turpin<sup>1</sup>, P. Alenius<sup>10</sup>, C. Barrera<sup>11</sup>, J. Barth<sup>12</sup>, N. Beaird<sup>4</sup>, G. Bécu<sup>13</sup>, A. Bosse<sup>14</sup>, F. Bourrin<sup>15</sup>, A. Brearley<sup>16</sup>, Y. Chao<sup>17</sup>, S. Chen<sup>18</sup>, J. Chiggiato<sup>19</sup>, L. Coppola<sup>20</sup>, R. Crout<sup>21</sup>, J. Cummings<sup>22</sup>, B. Curry<sup>6</sup>, R. Curry<sup>23</sup>, R. Davis<sup>24</sup>, K. Desai<sup>25</sup>, S. DiMarco<sup>26</sup>, C. Edwards<sup>27</sup>, S. Fielding<sup>16</sup>, I. Fer<sup>14</sup>, E. Frajka-Williams<sup>28</sup>, H. Gildor<sup>29</sup>, G. Goni<sup>30</sup>, D. Gutierrez<sup>31</sup>, P. Haugan<sup>14</sup>, D. Hebert<sup>32</sup>, J. Heiderich<sup>33</sup>, S. Henson<sup>28</sup>, K. Heywood<sup>34</sup>, P. Hogan<sup>35</sup>, L. Houpert<sup>28,36</sup>, S. Huh<sup>37</sup>, M. E. Inall<sup>36</sup>, M. Ishii<sup>38</sup>, S. Ito<sup>39</sup>, S. Itoh<sup>39</sup>, S. Jan<sup>40</sup>, J. Kaiser<sup>34</sup>, J. Karstensen<sup>41</sup>, B. Kirkpatrick<sup>42</sup>, J. Klymak<sup>43</sup>, J. Kohut<sup>4</sup>, G. Krahnemann<sup>41</sup>, M. Krug<sup>44</sup>, S. McClatchie<sup>45</sup>, F. Marin<sup>46</sup>, E. Mauri<sup>47</sup>, A. Mehra<sup>48</sup>, M. P. Meredith<sup>16</sup>, T. Meunier<sup>49</sup>, T. Miles<sup>4</sup>, J. Morrel<sup>50</sup>, L. Mortier<sup>51</sup>, S. Nicholson<sup>44</sup>, J. O'Callaghan<sup>52</sup>, D. O'Conchubhair<sup>53</sup>, P. Oke<sup>54,4</sup>, E. Pallas Sanz<sup>49</sup>, M. Palmer<sup>28</sup>, J. Park<sup>55</sup>, L. Perivoliotis<sup>56</sup>, P.-M. Poulain<sup>57</sup>, R. Perry<sup>58</sup>, B. Queste<sup>34</sup>, L. Rainville<sup>6</sup>, E. Rehm<sup>13</sup>, M. Roughan<sup>59</sup>, N. Rome<sup>25</sup>, T. Ross<sup>32</sup>, S. Ruiz<sup>60</sup>, G. Saba<sup>4</sup>, A. Schaeffer<sup>59</sup>, M. Schönau<sup>61</sup>, K. Schroeder<sup>19</sup>, Y. Shimizu<sup>62</sup>, B. Sloyan<sup>54</sup>, D. Smeed<sup>28</sup>, D. Snowden<sup>63</sup>, Y. Song<sup>55</sup>, S. Swart<sup>64,65</sup>, M. Tenreiro<sup>49</sup>, A. Thompson<sup>66</sup>, J. Tintore<sup>67</sup>, R. Todd<sup>68</sup>, C. Toro<sup>69</sup>, H. Venables<sup>16</sup>, T. Wagawa<sup>62</sup>, S. Waterman<sup>70</sup>, R. Watlington<sup>71</sup>, D. Wilson<sup>71</sup>



(Community White Paper, *Frontiers Marine Sciences*, *OceanObs'19*)

|                                 |  |  |                                       |                            |                                    |
|---------------------------------|--|--|---------------------------------------|----------------------------|------------------------------------|
| 1 CNRS/LOCEAN, France           | 13 Takuvik, Canada                       | 25 OceanLeadership, USA                                | 27 KIOST, South Korea                 | 49 CICESE, Mexico          | 61 (AOS, USA                       |
| 2 MUN, Canada,                  | 14 UiB, Norway                           | 26 Texas A&M University, USA                           | 38 MRI, Japan                         | 50UPRM, Puerto Rico        | 62 JFREA, Japan                    |
| 3 SIO, USA                      | 15 CEFREM, France                        | 27 Skidaway Insti. of Oceanogr./, Uni. of Georgia, USA | 39 University of Tokyo, Japan         | 51 ENSTA/LOCEAN, France    | 63 NOAA, USA                       |
| 4 Rutgers Univ., USA            | 16 BAS, UK                               | 28 NOC, UK   | 40 National Taiwan University, Taiwan | 52 NIWA, New Zealand       | 64 Univ of Gothenburg, Sweden      |
| 5 OC-UCY, Cyprus                | 17 Seatrec & JPL, China                  | 29 The Hebrew University of Jerusalem, Israel          | 41 GEOMAR, Germany                    | 53 MI, Ireland             | 65 Univ of Cape Town, South Africa |
| 6 Univ. Washington, USA         | 18 NRL-Monterey, USA                     | 30 NOAA AOML   | 42 GCOOS, USA                         | 54 CSIRO, Australia        | 66 Caltech, USAn                   |
| 7 UWA, Australia                | 19 CNR-ISMAR, Italy                      | 31 IMARPE, Peru  | 43 University of Victoria, Canada     | 55 KUGON, South Korea      | 67 SOCIB, Spain                    |
| 8 WMO, Switzerland              | 20 LOV, France                           | 32 DFO, Canada   | 44 CSIR, South Africa                 | 56 HCMR, Greece            | 68 WHOI, USA                       |
| 9 UNESCO, France                | 21 NRL-Stennis, USA                      | 33 MIT, USA  | 45 FishOcean Ent., New Zealand        | 57 CMRE, Italy             | 69 IOC-UNESCO, IOCARIBE            |
| 10 FMI, Finland                 | 22 NRL-Monterey, USA                     | 34 UEA, UK   | 46 LEGOS/IRD, France                  | 58 Shell, USA              | 70 Univ. British Columbia, Canada  |
| 11 PLOCAN, Spain                | 23 Bermuda Insti. of Ocean Sciences, USA | 35 NRL, USA  | 47 OGS, Italy                         | 59 UNSW, Australia         | 71 USVI, USA                       |
| 12 Oregon State University, USA | 24 Dalhousie Univ., Canada               | 36 SAMS, UK  | 48 NOAA NCEP, USA                     | 60 IMEDEA, CSIC-UIB, Spain |                                    |



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Bringing Sustainable observation to the ocean boundary regions

## The role of JCOMMOPS

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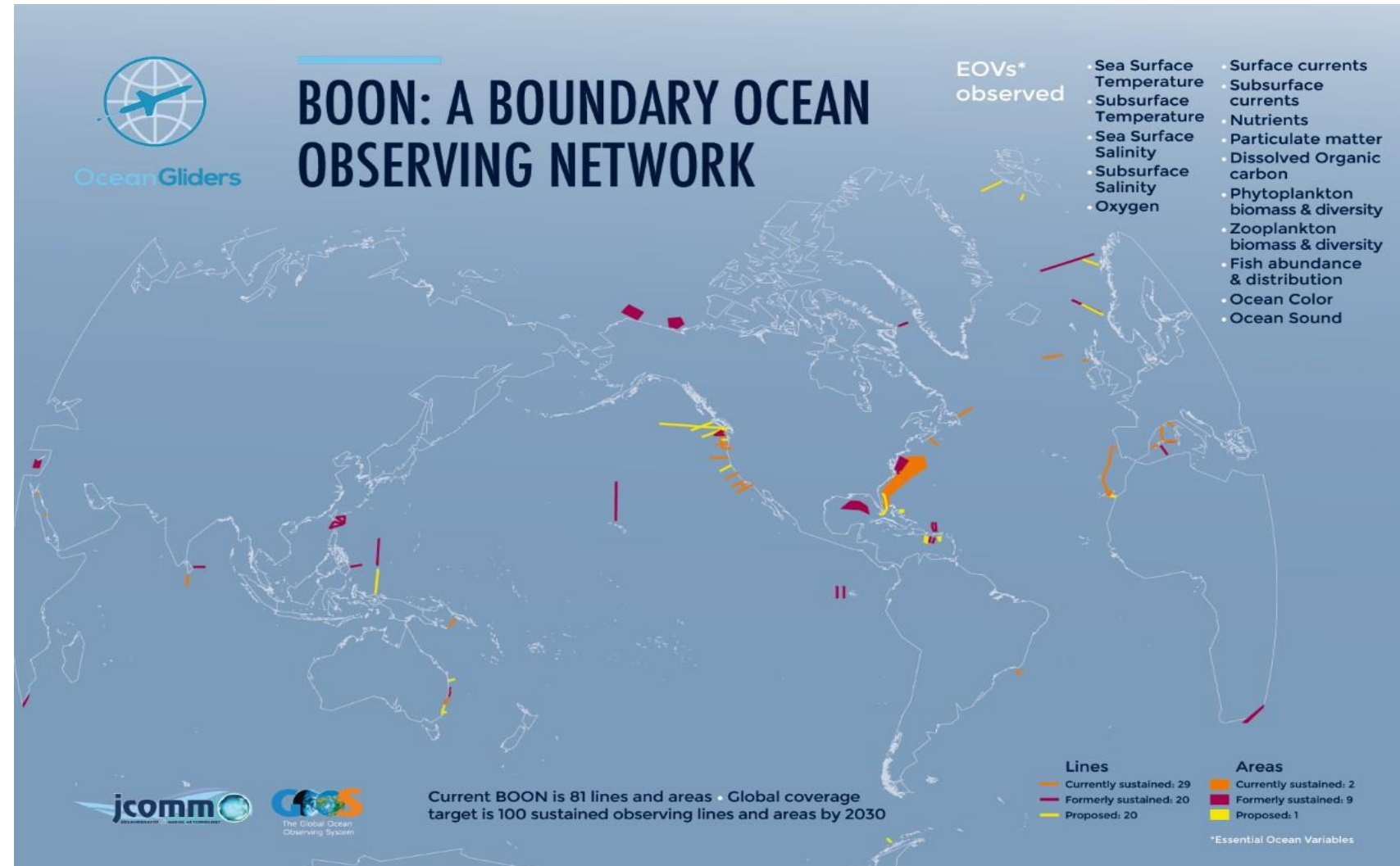
## Metadata : The key toward an integrated system

OG1.0 : a global glider format

# OceanGliders in the next decade

Bringing Sustainable observation to the ocean boundary regions

recommend that OceanGliders develop an **implementation plan for a sustained Boundary Ocean Observing Network** to meet the societal needs of improving ocean observing in this key region of the global ocean.

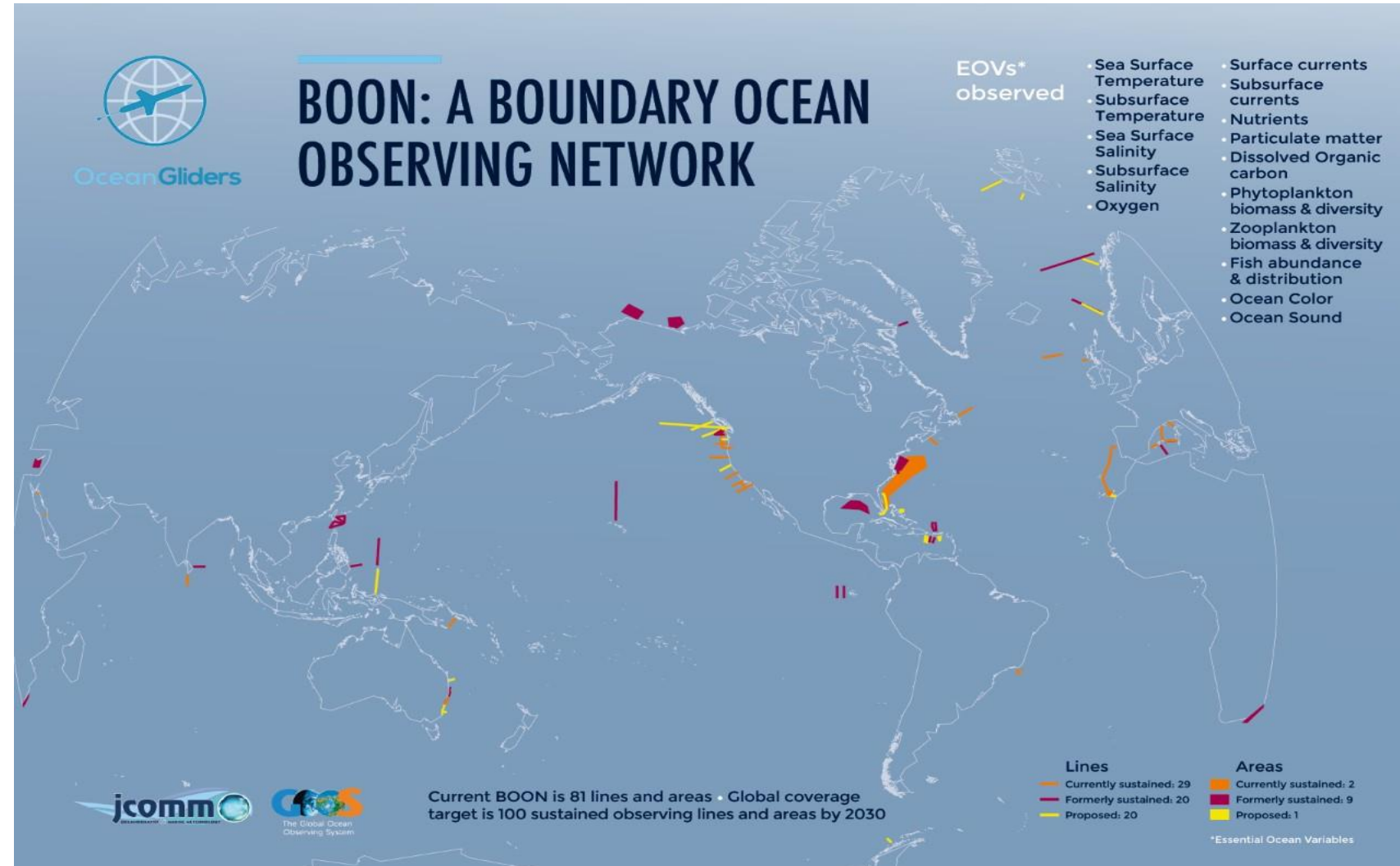


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Bringing Sustainable observation to the ocean boundary regions

**Global coverage target : 100 sustained gliders lines and areas by 2030**

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# OceanGliders in the next decade

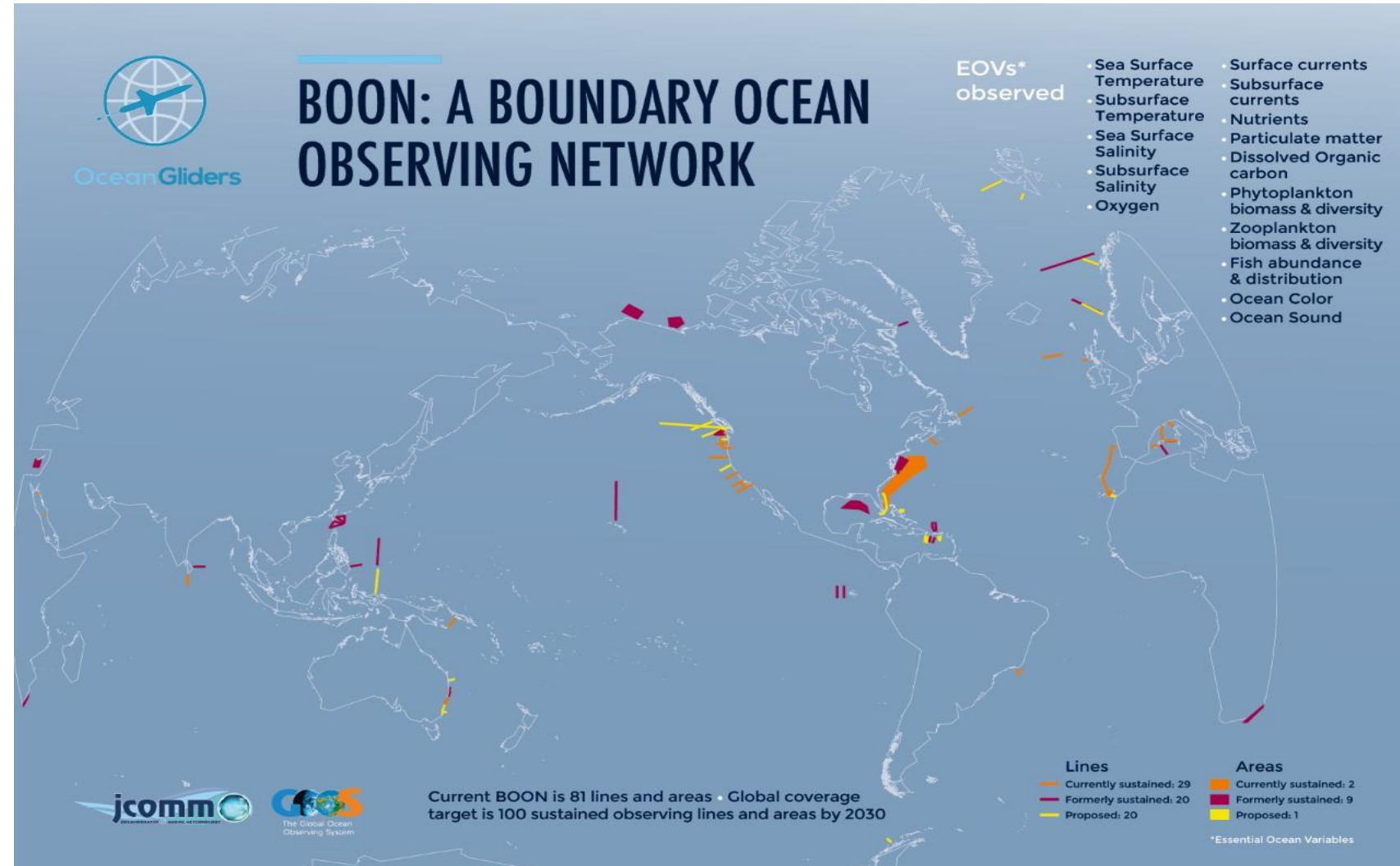
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## Next Steps

- Highlight the need for a sustained glider network
- Work to develop monitoring capability in under sampled areas
- Link to forecasting systems
- Develop regional products



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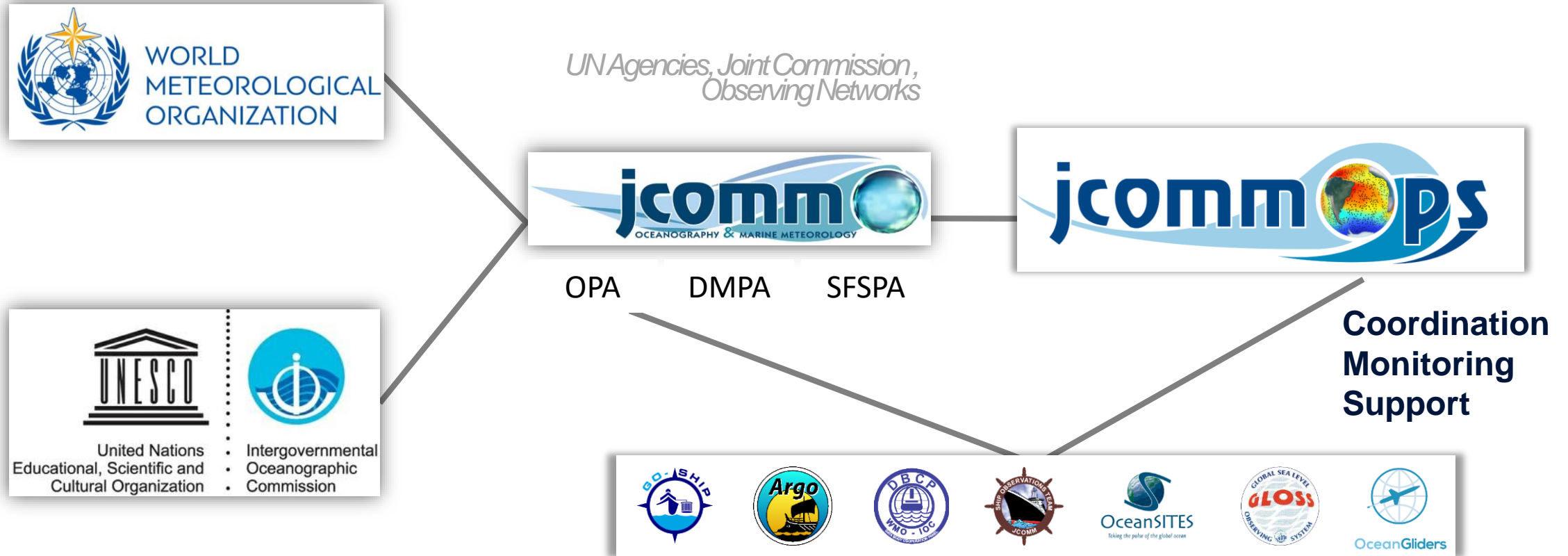
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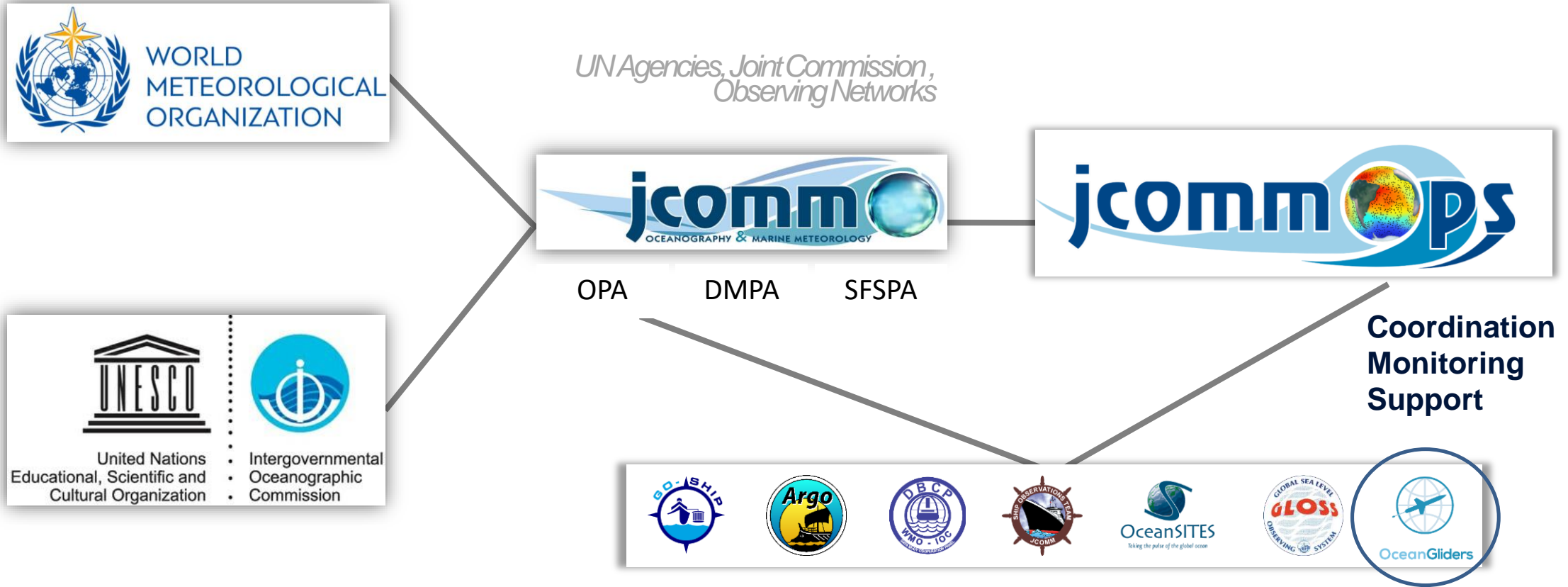
# The role of JCOMMOPS

## Governance



# The role of JCOMMOPS

Governance



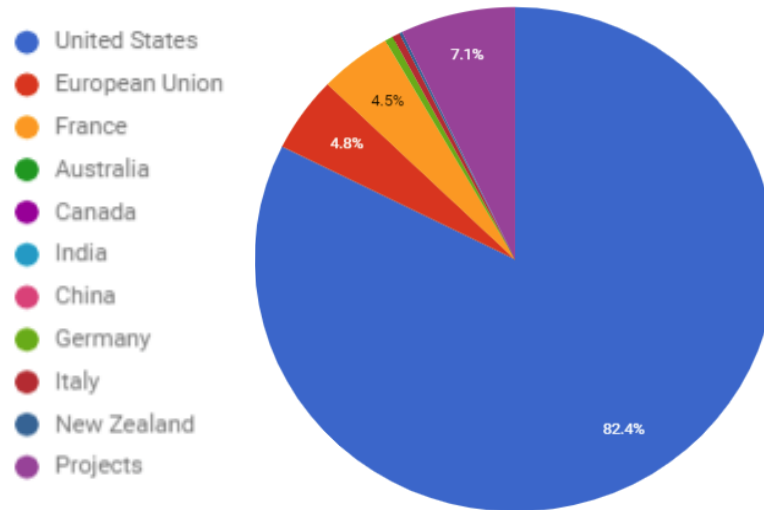
Recently integrated into the scope of JCOMMOPS – May 2019

# The role of JCOMMOPS

Technical support to the ocean observations program's development

- Resources
  - Premises hosted by Ifremer (Brest - FRANCE)
  - IS powered by CLS (Toulouse - FRANCE)
  - 7-person team: 4 TCs, 2 IT, 1 oceanographer Sc./communication/outreach
  - JCOMMOPS funded by yearly voluntary contributions from MS and EU

2018 JCOMMOPS Contributors





# The role of JCOMMOPS

International partners

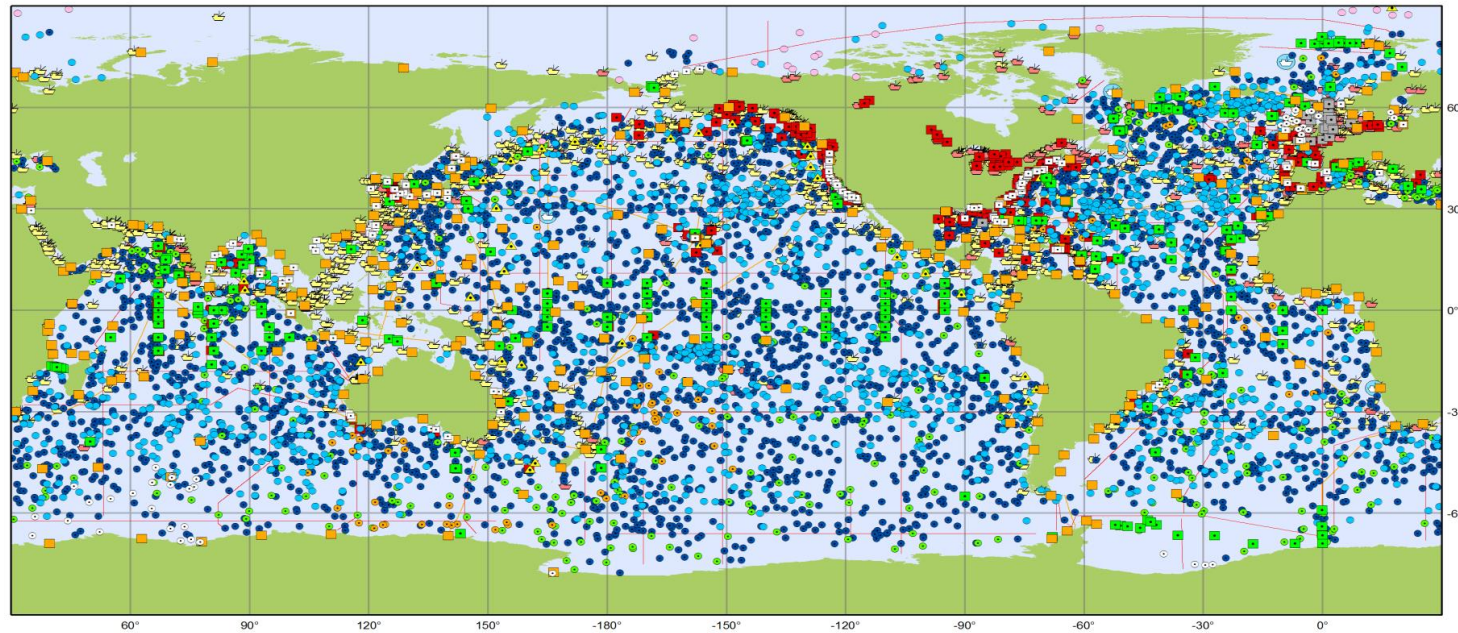
Based on operational platforms registered at JCOMMOPS as of June 2018



# The role of JCOMMOPS

Implementation, Data/Metadata exchange, Monitoring

*10 000 instruments deployed at the sea for observing the ocean*



Main in situ Elements of the Global Ocean Observing System

July 2019

## Profiling Floats (Argo)

- Core (3845)
- Deep (81)
- BioGeoChemical (368)

## Data Buoys (DBCP)

- Surface Drifters (1505)
- Offshore Platforms (92)
- Ice Buoys (23)
- Moored Buoys (361)
- Tsunameters (35)

## Timeseries (OceanSITES)

- Interdisciplinary Moorings (347)
- Repeated Hydrography (GO-SHIP)
- Research Vessel Lines (63)
- Sea Level (GLOSS)
- Tide Gauges (290)

## Ship based Measurements (SOT)

- Automated Weather Stations (266)
- Manned Weather Stations (1379)
- Radiosondes (12)
- eXpendable BathyThermographs (34)

## Other Networks

- HF Radars (270)
- Animal Borne Sensors (53)

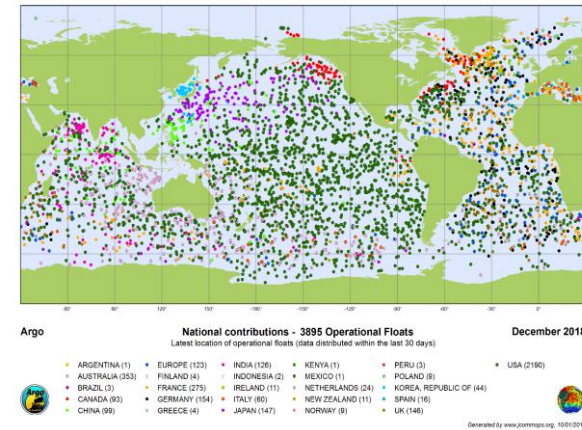


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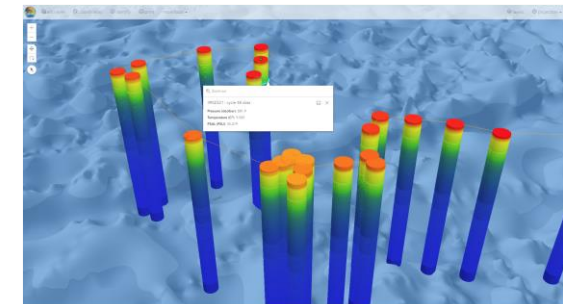
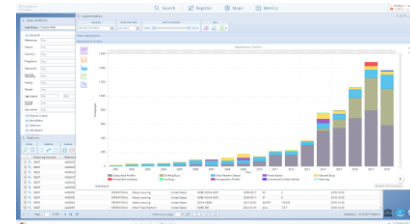
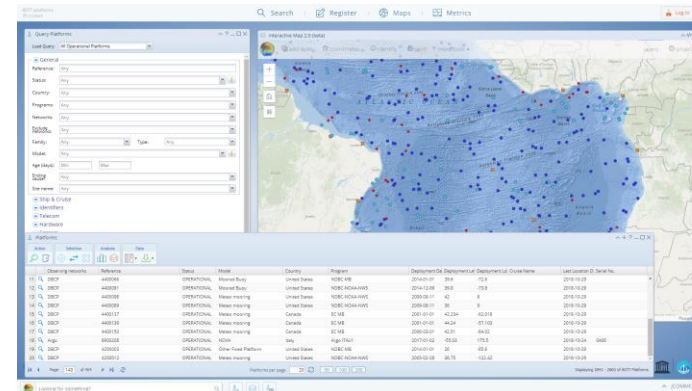
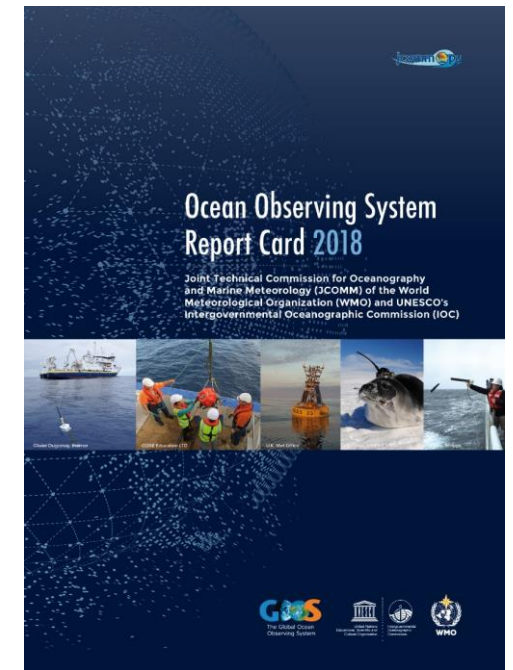
- Coordinate all actors
- Encourage collaborations and the free exchange of data/metadata
- Facilitate the access to the Exclusive Economic Zones (EEZ notifications)
- Assist in the implementation and deployment of the observing networks
- Encourage the data harmonization and we evaluate the performance of the system
- Improve the overall effectiveness and development of the system
- Develop and provide the tools to monitor the observing system status and the data/metadata distribution

# The role of JCOMMOPS : Distribute metadata and monitor the networks

- Monthly authoritative status maps: [www.jcommops.org/map](http://www.jcommops.org/map)
- Annual JCOMM Report Card to inform ocean observing stakeholders, society and decision-makers about the status and value of the GOOS : [www.jcommops.org/reportcard](http://www.jcommops.org/reportcard)
- Web application to make query, maps, graphs, stats, 3D data visualization : [www.jcommops.org](http://www.jcommops.org)



*What can we do with it?*



# The role of JCOMMOPS : Communication and outreach

Disseminate the importance of the ocean observations

- Participation to local/international ocean observations-related events
- Educational activities in the classrooms
- Collaboration with civil society (race yachts, ONGs, boaters)



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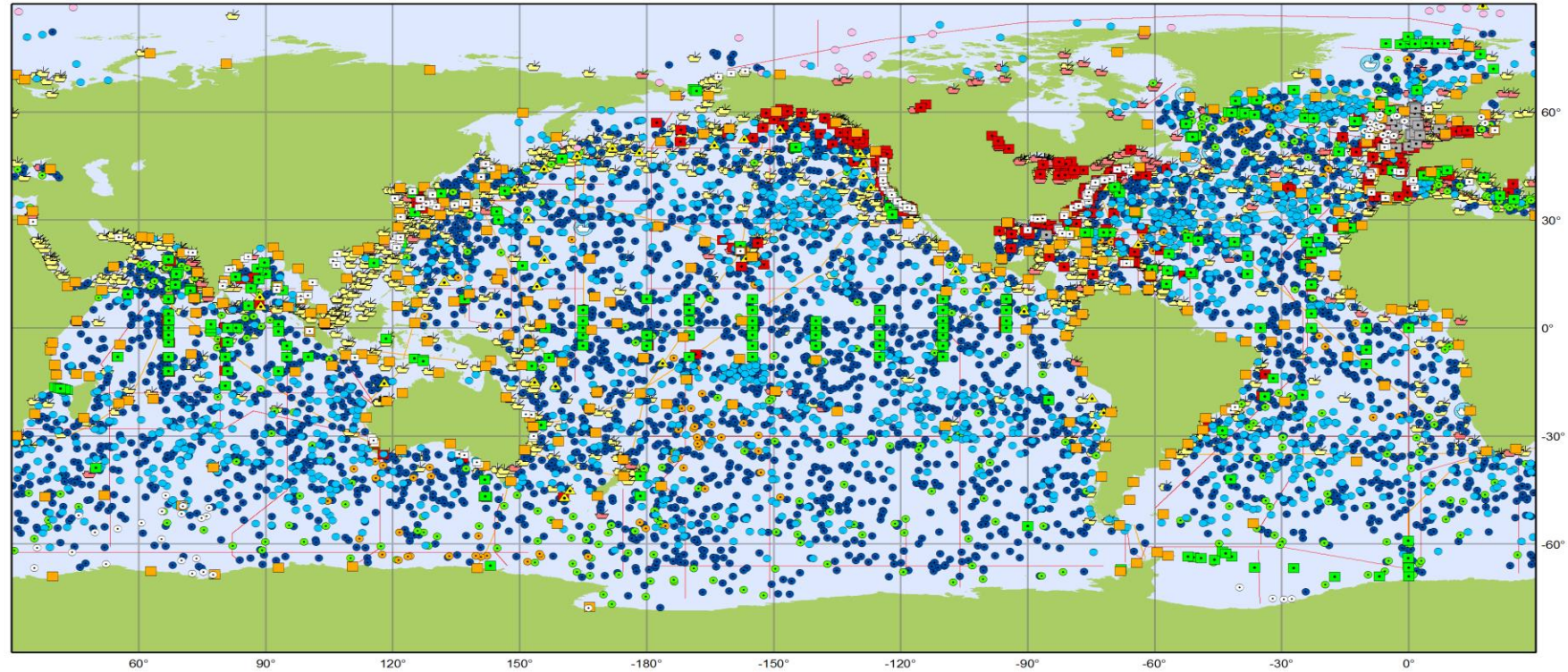
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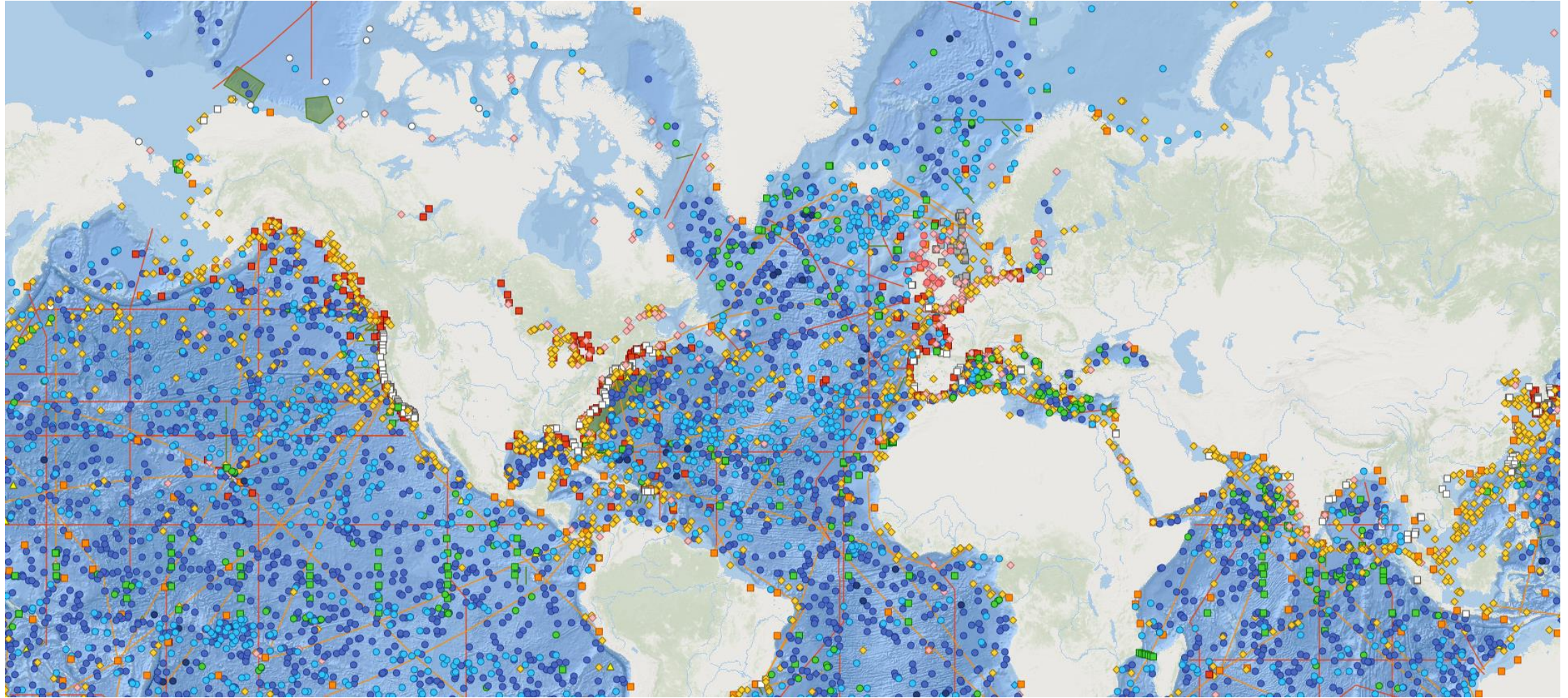
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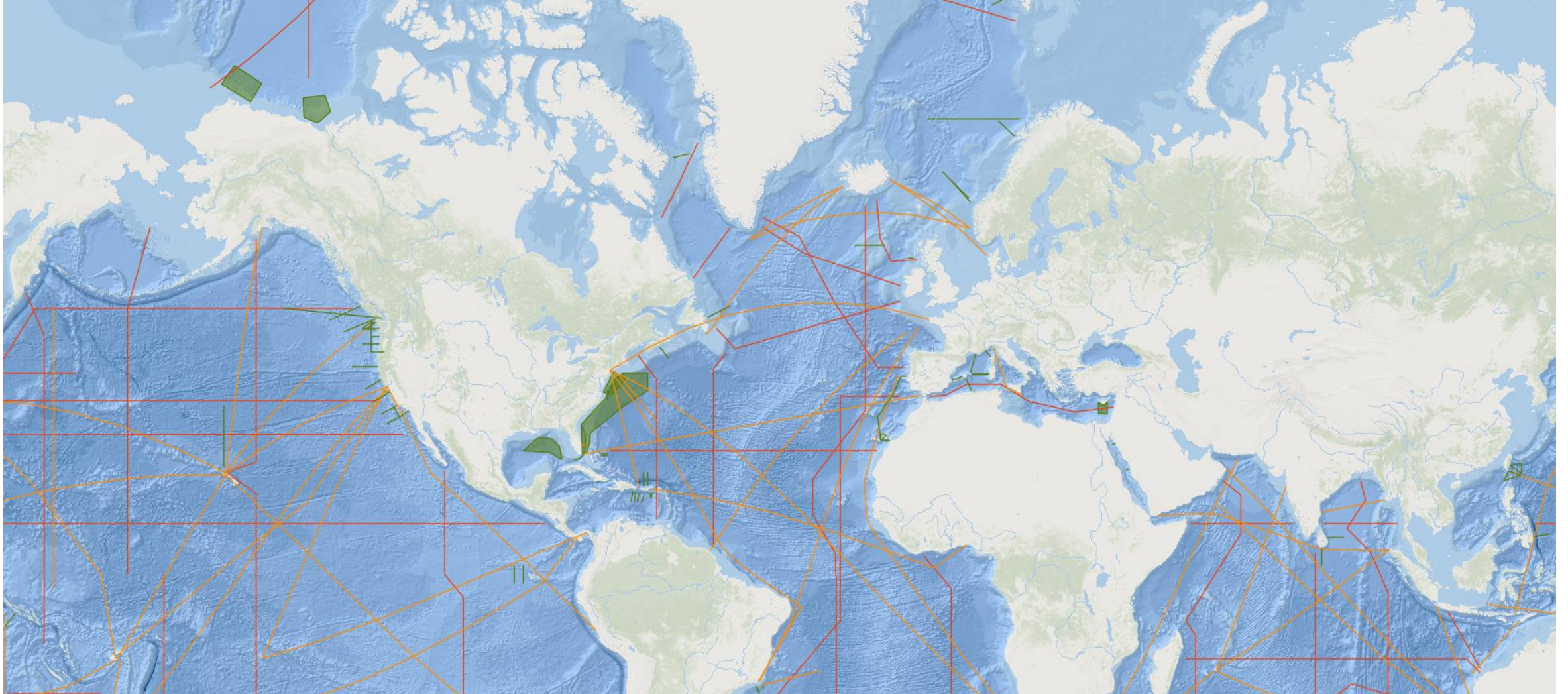
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# Metadata : The key toward an integrated system

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# Metadata : The key information toward an integrated system

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## Recommendations

- recommend the development **of a global data management system to ensure the effective sharing and use of ocean data** from underwater gliders.
- recommend that OceanGliders develop **an implementation plan for a sustained Boundary Ocean Observing Network** to meet the societal needs of improving ocean observing in this key region of the global ocean.

## Needs

- Harmonization of the glider format across Data Assembly Center
- Harmonization of the metadata mandatory information across glider groups.

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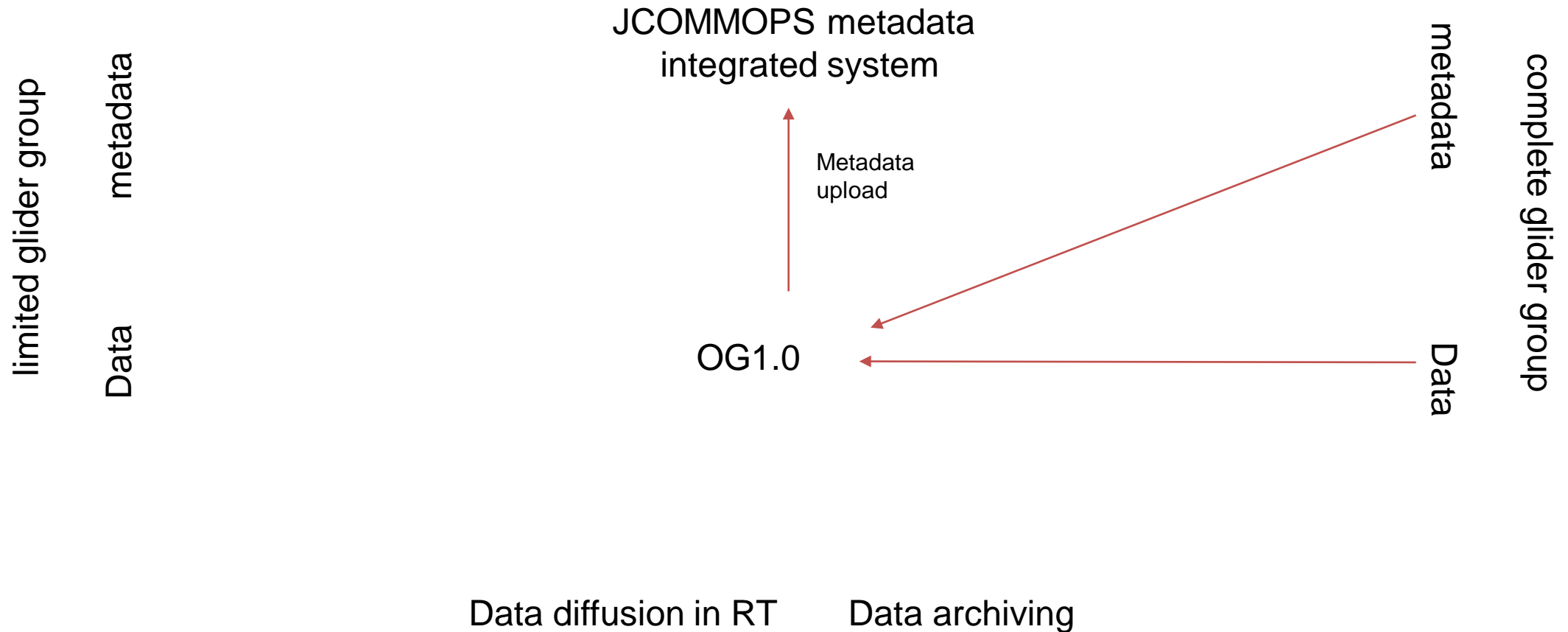
- Harmonization of the glider format across Data Assembly Center
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## Strategy

- Agreement on a label OG1.0 : under review [Comparative analysis of glider formats and requirements toward OG1.0](#))
- Harmonization of the metadata mandatory information across glider groups : [OceanGliders Reference tables](#)
- Development of JCOMMOPS website to integrate properly OceanGliders activity
- Development of (meta)data management tools for easy implementation

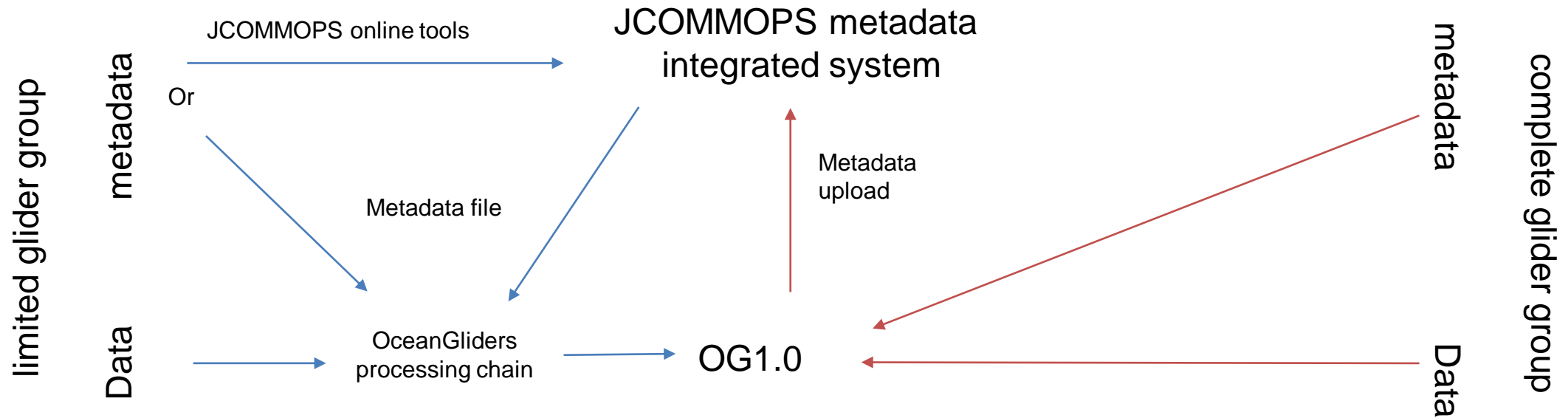
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OG1.0 : a global glider format and a new data flow



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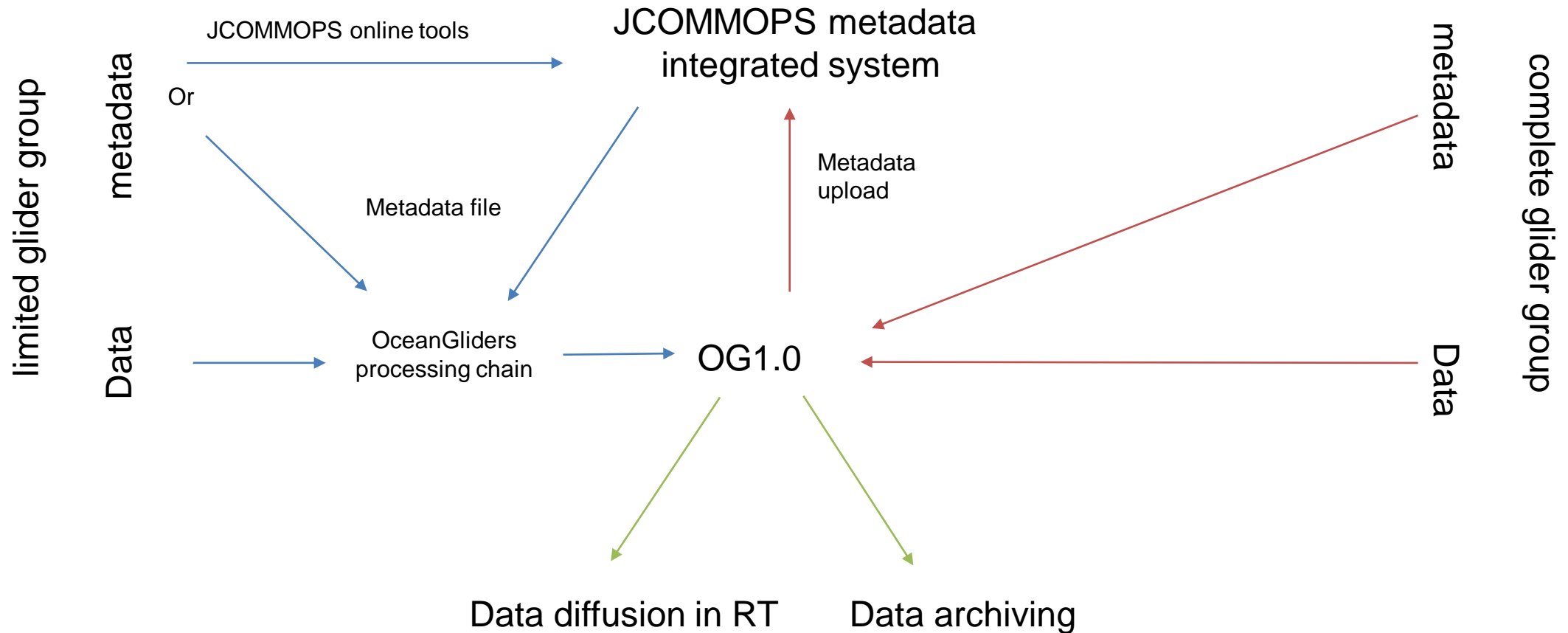


Data diffusion in RT

Data archiving

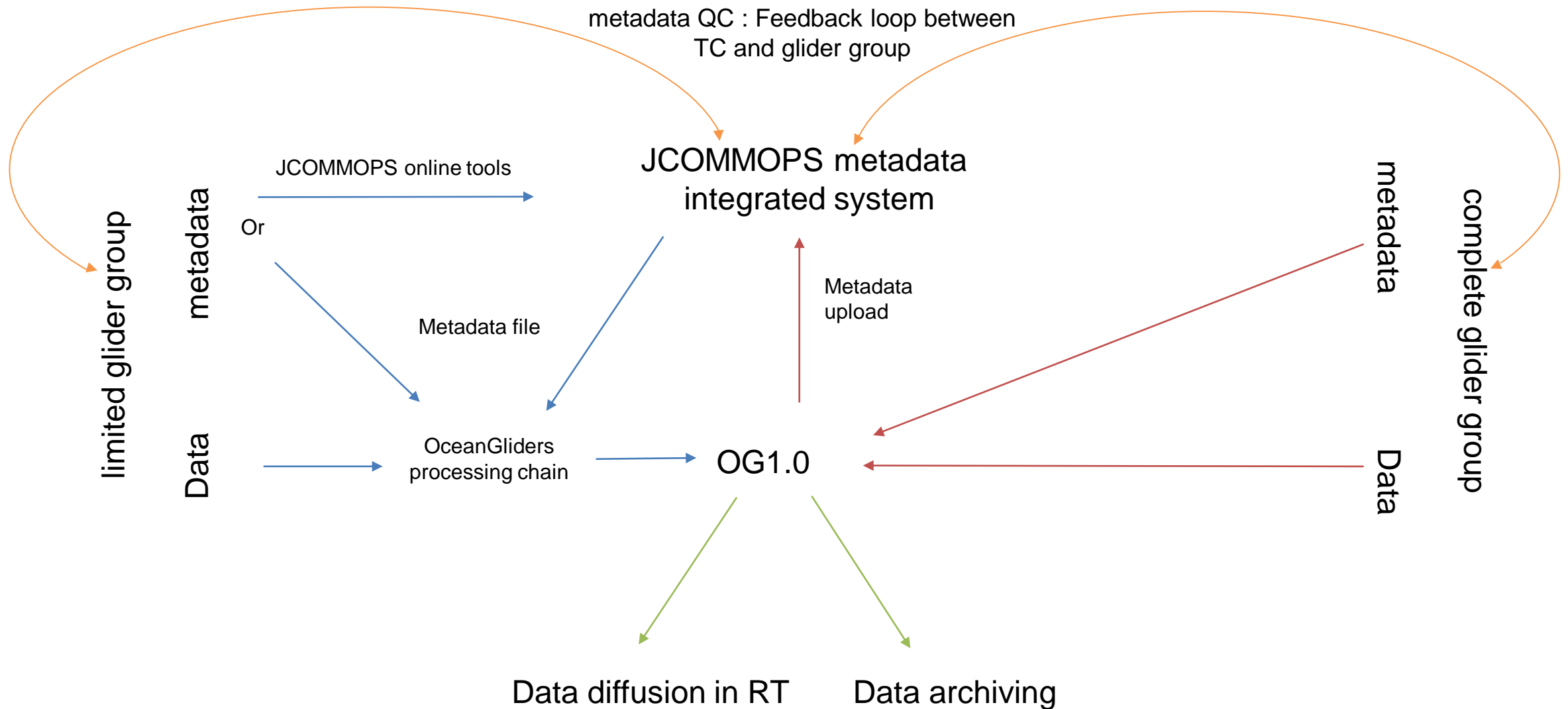
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# Thanks for your attention !



See *in situ* and emerging networks tables for map legend. Symbol size is not to scale, in the maps they are exaggerated to an order of hundreds kilometers for readability.





# The OceanGliders program

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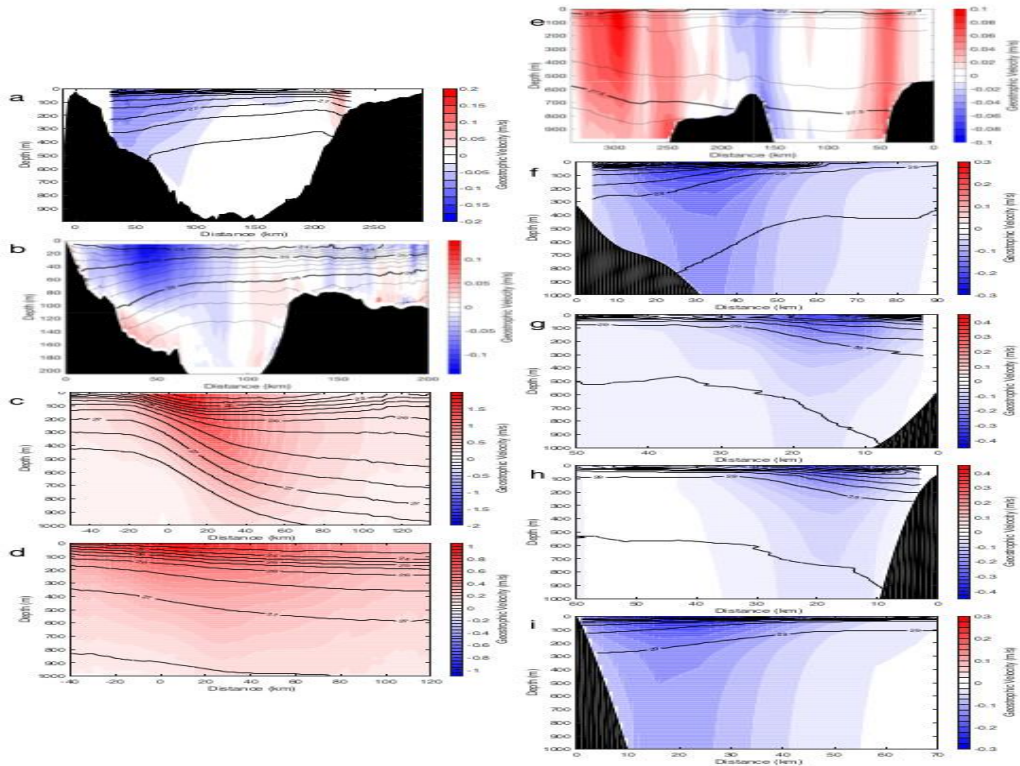
## Boundary Current

Sustained glider observations in the ocean boundaries

Chair : Dan Rudnick, SCRIPPS

Mailing list : [og-boundary-network@jcommops.org](mailto:og-boundary-network@jcommops.org)

*Mean sections of geostrophic velocity from the Atlantic and Mediterranean and Indian Ocean. In the Atlantic are (a) the North Atlantic Current west of the UK, (b) the Nova Scotia Current off the east coast of Canada, (c) the Gulf Stream off the eastern US coast, (d) the Gulf of Mexico Loop Current. Sections in the Northern Current System of the Mediterranean Sea are (e-h) along the southern coast of France, (i) between the Spanish coast and the island of Ibiza. Community White Paper, OceanObs'19*

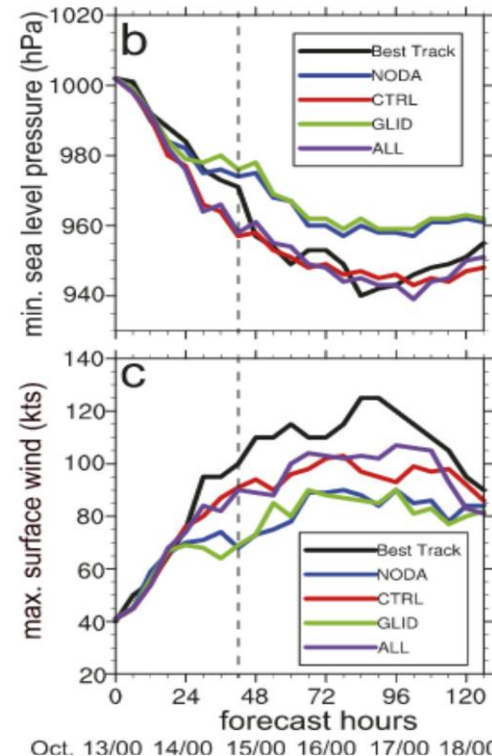
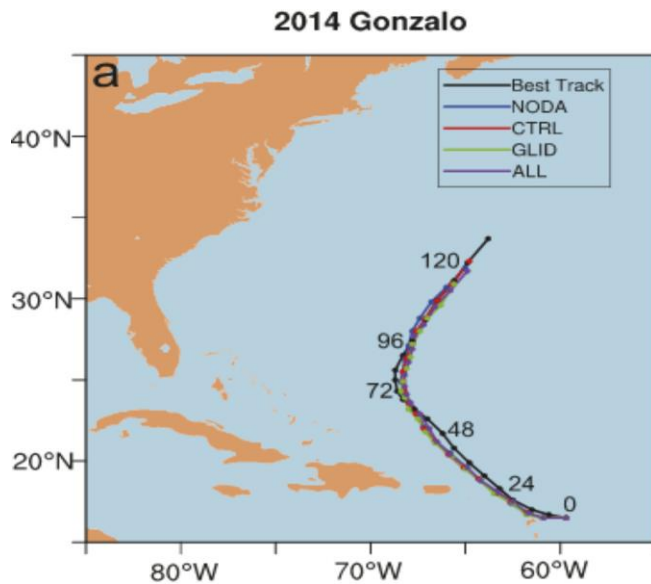


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## Storms



Increase extreme weather forecast with unique ocean observations

Chair : Scott Glenn, Rutgers University

Mailing list : [og-storms@jcommops.org](mailto:og-storms@jcommops.org)

(a) Hurricane Gonzalo track forecast, (b) minimum sea level pressure, (c) maximum wind forecast, along with the best track. Gliders improve hurricane forecast. The dashed line denotes the track location closest to the glider at 0000 UTC 13 Oct 2014 (Dong et al. 2017)

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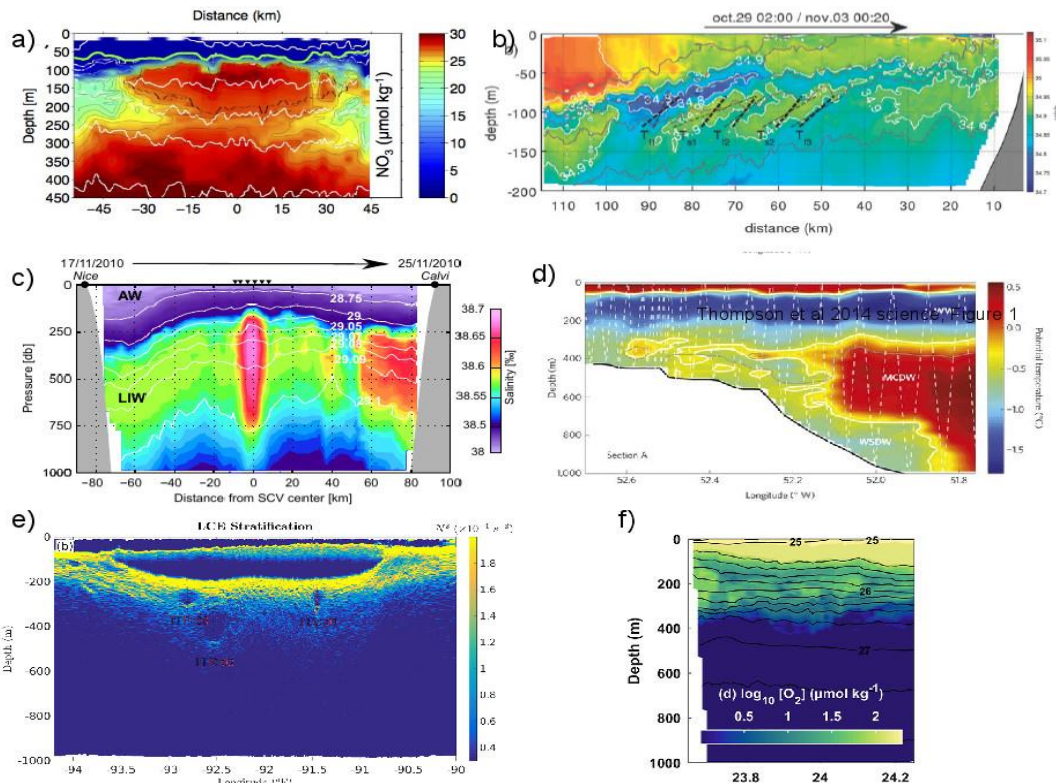
## Water Transformation

Monitor shelf/open sea water formations & (sub)mesoscale variability

Chair : Pierre Testor, CNRS – LOCEAN

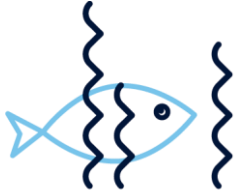
Mailing list : [og-water-transformation@jcommops.org](mailto:og-water-transformation@jcommops.org)

*Some highlights of (sub)mesoscale oceanic processes revealed by gliders that have been identified as important for the functioning of the physical, chemical and biological ocean (Community White Paper, OceanObs'19)*



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**Ocean Health  
& Ecosystems**

Chair : Grace Saba, Rutgers University

Mailing list : [saba@marine.rutgers.edu](mailto:saba@marine.rutgers.edu)



**Best  
Practices**

Chair : Emma Heslop, IOC/UNESCO  
Inmaculada Ruiz, SOCIB

Mailing list : [e.heslop@unesco.org](mailto:e.heslop@unesco.org)  
[iruiz@socib.es](mailto:iruiz@socib.es)



**Data  
Management**

Chair : Dan Hayes, UC-UCY  
Victor Turpin, JCOMMOPS

Mailing list : [og-dm@jcommops.org](mailto:og-dm@jcommops.org)