

### OceanGliders, the glider component of the Global Ocean Observing System: open, interoperable hydrography for multiple users

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## Ocean observations for societal benefit Climate, services, ocean health





GOOS coordinates provision and open distribution of ocean observations suitable for multiples ocean services, including security and defence, developed by research centres, public agencies, companies and defence agencies









#### **COPERNICUS MARINE SERVICE**

marine sea-borne observation infrastructure





Tide Gauges (252)

Tsunameter (32)

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## **GOOS Regional Alliances**

GRAs are the right context to work on GOOS programs such as OceanGliders



## How a glider works ? And Why gliders ?



#### "EYE of the Levantine" Project : 6 gliders south of Cyprus



#### **Glider Science**



Significant advances in physical, geochemical and biological ocean knowledge



There is a need to set up sustained (long term) glider observations to fill (regional) gaps left by other observing platforms, in the GOOS framework.

+++ Key role for gliders ! ++ Coordination activities started in 2005 ++ Near real time data flow

### **GOOS** evolution and strategic mapping

#### http://lists-ioc-goos.org/goos-strategic-mapping-graphic



- To be considered with a global perspective,
- Provides a roadmap for themes to be adressed with gliders

Climate
 Real time Services
 Ocean health

### **Building a community : From EGO to OceanGliders**

#### Everyone's Gliding Observatories (EGO) is a community:

- AU, BR, CA, CE, EU, IL, ME, PE, USA, ZA,...
- "Process studies" and "long term observation" Academy/users + manufacturers





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#### **OceanObs'09 Community White Paper**

Testor P., Meyers G., Pattiaratchi C., Bachmayer R., Hayes D., Pouliquen S., Petit de la Villeon L., Carval T., Ganachaud A., Gourdeau L., Mortier L., Claustre H., Taillandier V., Lherminier P., Terre T., Visbeck M., Krahman G., Karstensen J., Alvarez A., Rixen M., Poulain P.M., Osterhus S., Tintore J., Ruiz S., Garau B., Smeed D., Griffiths G., Merckelbach L., Sherwin T., Schmid C., Barth J.A., Schofield O., Glenn S., Kohut J., Perry M.J., Eriksen C., Send U., Davis R., Rudnick D., Sherman J., Jones C., Webb D., Lee C., Owens B., Fratantoni D., 2010:

**Gliders as a component of future observing systems**, in Proceedings of OceanObs'09: Sustained Ocean Observations and Information for Society (Vol. 2), Venice, Italy, 21-25 September 2009, Hall J., Harrison D.E., and Stammer D., Eds., ESA Publication WPP-306,

The **glider technology** could (directly or together with other ocean observations and ocean modeling/data assimilation) help to :

- reduce uncertainties due to small scale processes process studies on ocean sciences using gliders
- enhance the spatio-temporal (in-situ) sampling of the Global Ocean Observing System (GOOS), where required (coastal/marginal/regional seas, water formation sites, biogeochemical provinces, western and eastern boundary regions, straits, difficult access areas...) – *long term (sustained) observations with repeat glider measurements, in combination with the other components (Satellites ; in situ: Argo, OceanSites, GO-SHIP, DBCP,...)*
- develop ocean management: environmental studies, security, offshore,...

#### **OceanObs'09 Community White Paper**

#### Recommendations (2010) from OceanObs'09 for an integration in the GOOS



- the formation of the global glider system;
- the adoption of standards and a "Argo" like data system for gliders;
- the target of ~20 standard lines in the next 5 years and then, more;
- the setup of a network of shared resources and expertise;
- to distinguish between climate and process and NW(&Ocean)P objectives;
- to establish the adoption of a common and accessible portal for glider data.

#### → At OceanObs'19 a month ago in Hawaï, we are there !

Pierre Testor, Brad de Young, Daniel Rudnick, Scott Glenn, Daniel Hayes, Craig M. Lee, Charitha Pattiaratchi, Katherine Hill, Emma Heslop, Victor Turpin, et al., 2019: **OceanGliders: A Component of the Integrated GOOS**, *in Frontiers in Marine Sciences, July 1019, Volume 6, Article 422. https://doi.org/10.3389/fmars.2019.00422* 

#### A global glider coverage



- Thanks to data management efforts throughout the world, almost all glider data are stored in a few public data bases which allow the mapping of the glider activity.
- The glider data cover important gaps in the observation of the ocean, mainly in boundary areas and regional seas.
- There are today ~30 gliders at sea mapped by EGO/OceanGliders tools at any given time.

Rationale for OceanGliders as a component of the GOOS (long term observations)

- efficient near boundaries, as they can rely only on small boats
- connect the coast and open ocean
- missions can be sustained indefinitely in key areas
- glider sampling is a good match to the spatial/temporal resolution required by important processes/regions: Boundary Currents, Storms, Water Transformation, Polar regions, ...

### OceanGliders: a new "associated program" of the GOOS

# Technology is mature Gliders as a global observing network is pilot $\rightarrow$ mature





Started officially in September 2016 and endorsed by WMO/IOC JCOMM in October 2017 to support long term (sustained) glider observations, with a focus on scientific and societal stakes







### **OceanGliders - ToR**

- work through the WMO/IOC JCOMM Observations Coordination Group (OCG) to liaise with related global observing systems (e.g. Argo, OceanSITES, GO-SHIP,...) in the framework of the GOOS, its expert panels and development projects.
- assist national and regional programs to ensure sustained funding for the operation of the glider array and related activities. (support letters, technical assistance, ...)
- **report regularly to JCOMM OCG**. The GST shall supervise the activities of the Glider Technical Coordinator.
- establish the Terms of Reference for the Glider Technical Coordinator in consultation with the JCOMM OCG.
- explore requirements for international capacity development and develop a capacity building strategy/workplan.







### **OceanGliders - ToR**

- fully consider unique capabilities of gliders, complementarity with other observing systems, and incorporate recommendations from numerical design studies, e.g. OSSEs, and regional observing development activities/processes (e.g. TPOS-2020, AtlantOS, SOOS).
- promote the free and unrestricted exchange of glider data, including in real-time;
- promote interoperability, standards and standardization of best practices in glider operations and data management.
- advance plans for a global network of glider activities, identifying suitable objectives, targets, and metrics to assess progress and fitness for purpose.
- take responsibility for, and provide advice on, the contents, quality and timeliness of the glider data stream, in conjunction with the Glider Data Management Team (GDMT), to ensure scientific and operational requirements are met.
- provide advice and guidance relating to technical innovations and their adoption within the glider community







#### **OceanGliders Task Teams principles**

- Require a proposal approved by OGST
- Include international in membership
- Meet regularly (both virtually and in person)
- Report to the Steering Committee annually
- Present at EGO meetings
- Normally operate within two years (OceanObs'19)
- No money only prestige
- → Boundary Currents (D. Rudnick) Develop a global-scale program for ocean boundary currents
- → Hurricanes, Storms (S. Glenn) Develop a global-scale program for enhanced ocean observations to support forecasts of storms/hurricanes, air-sea interactions
- $\rightarrow$  Water tarnsformation (P. Testor) Develop a global-scale program for ocean processes
- → Data management (D. Hayes) Develop policies and procedures for the collection, processing and management of glider data

Other Task Teams are being developed : Polar, BioGeoChemistry, ...







## **Questions?**

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