6th EGO Meeting and Final Symposium of the COST Action ES0904

Abstracts book

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Abstract ID : 2

PLOCAN: A gliderport infrastructure in the East-Central North Atlantic

Content :

Unmanned autonomous marine vehicles presence is becoming nowadays normality across world oceans. Significantly more affordable than other marine observing platforms in terms of operation and maintenance, UAVs, and more specifically underwater (AUVs) and surface (ASVs) gliders, represent one of the best new technological approaches to increase ocean presence in a sustainable and cost-effective way and therefore, improve data quality and derived products in benefit to a wide range of socio-economic sectors.
Despite still futuristic look for many, gliders are consolidated as key ocean observing tool for several reasons. A noteworthy variety of commercial models and prototypes developed on the same physical principle (buoyancy) for those labeled as profilers (AUVs), and the use of renewable energies (wind and waves) for the surface (ASVs) versions, offer all together a broad range of features and capabilities in comparative terms between them and respect other ocean observing platforms, where highlights the “low and blue-power device” concept, allowing to monitor under new spatiotemporal scales, mainly due to higher presence and endurance in terms of autonomy.
The regular use of these autonomous devices implies to dispose dedicated infrastructures (gliderport) and highly qualified technical staff (glider school) that enable such efficiency and sustainability of use. Within this context, the Oceanic Platform of the Canary Islands (PLOCAN) represents a prime example of faithful glider infrastructure, providing on one side the spaces, equipment, technical staff and easily accessible operational scenarios where to run regularly and test in a cost-effective way new technological developments (test site). In parallel, an increasingly recognized International Glider School with the support and involvement by leading manufacturers and company providers, where to train upcoming glider pilots and technicians under common standards and procedures, represents a key part of the PLOCAN glider program.

Primary authors : Mr. BARRERA, Carlos (PLOCAN)

Co-authors : Mr. VIERA, Josue (PLOCAN) ; Mrs. MORALES (PLOCAN) ; Ms. VEGA, Daura (PLOCAN) ; Dr. RUEDA, Mª Jose (PLOCAN)

Presenter : Mr. BARRERA, Carlos (PLOCAN)

Track classification : Developments on glider vehicles, sensors, and "gliderports" infrastructures (on-board capacities, ground-segment)

Contribution type : --not specified--

Submitted by : Mr. BARRERA, Carlos

Submitted on Saturday 22 March 2014

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Status : SUBMITTED

Track judgments :

Track : Developments on glider vehicles, sensors, and "gliderports" infrastructures (on-board capacities, ground-segmer

Judgment :

Abstract ID : 3

THE EDDY FIELD OF THE LOFOTEN BASIN FROM SEAGLIDER

Content :

This study deals with two Seaglider (SG) missions across the Lofoten Basin along the 70th latitude between Norway and Jan Mayen Island during July 2012-February 2013, and February-September 2013; resulting in six successful transects with CTD-profiles and average currents down to 1000m depth. The operations were parts of the Norwegian Atlantic Current Observatory (NACO) infrastructure program. The SGs559/561 accomplishing six 900km crossings of the Lofoten Basin show observations of Atlantic water (AW) down to about 800m depth with a major baroclinic front toward the Jan Mayen. A striking feature is the vigorous eddy field along the entire sections being most energetic in the central Lofoten Basin. There the gliders revealed a deepening dome of AW with adiabatic conditions down to about 1000m depth with an associated anticyclone showing maximum orbit velocities of 0.7m/s; the Lofoten Basin Eddy (LBE). An extraordinary event was observed during the February-March transect, showing two baroclinic anticyclones with diameter of 150-200km between Norway and the LBE, deepening westward toward the LBE, and demonstrating eddy shedding of AW from the eastern boundary current (Eastern Norwegian Atlantic Current).

Primary authors : Dr. ORVIK, Kjell Arild (Geophysical Institute, University of Bergen)

Co-authors :

Presenter : Dr. ORVIK, Kjell Arild (Geophysical Institute, University of Bergen)

Track classification : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling, sub-mesoscale features, air-sea interactions,...)

Contribution type : oral Presentation

Submitted by : Dr. ORVIK, Kjell Arild

Submitted on Friday 11 April 2014

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Comments :

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Track judgments :

Track : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling

Judgment :

Abstract ID : 4

A microstructure sensor equipped glider for continuous measurement of turbulent mixing in the ocean

Content :

There is a pressing need to better understand the spatial and temporal variability of turbulent mixing in the global ocean in order to increase the skill of ocean circulation and climate models and to improve our understanding of the physical processes that control the distribution of primary productivity and carbon sequestration. Mixing is crudely parameterised in global models, typically as a spatially uniform diffusivity, but climate predictions are sensitive to mixing location. Hence, there is a need for both high-resolution surveys and long timeseries of turbulence measurements to understand the processes that control where and when mixing occurs, with the eventual goal of a global spatially and temporally varying mixing parameterisation for inclusion in models. The UEA Seaglider group is in the process of procuring a microstructure sensor equipped glider, currently being developed in collaboration with turbulence measurement specialists Rockland Scientific. The microstructure sensors (shear probes and fast thermistors) will be fully integrated into the glider system. This will be an ideal instrument for undertaking these key spatial surveys and timeseries as it will have the capability to continuously measure ocean turbulence for a period of several weeks to months, over a wide area, without the constant research vessel presence required for conventional microstructure profiler deployments.

Primary authors : Dr. HALL, Rob (Centre for Ocean and Atmospheric Sciences, School of Environmental Sciences, University of East Anglia)

Co-authors : Prof. HEYWOOD, Karen (Centre for Ocean and Atmospheric Sciences, School of Environmental Sciences, University of East Anglia)

Presenter : Dr. HALL, Rob (Centre for Ocean and Atmospheric Sciences, School of Environmental Sciences, University of East A

Track classification : Developments on glider vehicles, sensors, and "gliderports" infrastructures (on-board capacities, ground-segment)

Contribution type : Poster

Submitted by : Dr. HALL, Rob

Submitted on Monday 14 April 2014

Last modified on : Wednesday 16 April 2014

Comments :

Status : SUBMITTED

Track judgments :

Track : Developments on glider vehicles, sensors, and "gliderports" infrastructures (on-board capacities, ground-segmer

Judgment :

Abstract ID : 5

Vertical motion and chlorophyll patterns from a high-resolution glider experiment in the Balearic Sea

Content :

We present the results of a multi-platform experiment carried out in May 2009 along the northwest coast of Mallorca Island. The strategy allowed to investigate the mesoscale and sub-mesoscale processes associated with the Balearic Current, the main oceanographic feature of the area. A mission using 2 Slocum gliders was performed simultaneously in combination with other type of measurements (drifters, CTDs from ship and remote sensing data). In this experiment the coastal glider operated between surface and 200 m while the deep (1000 m maximum depth), was set-up to reach only 600 m. The autonomous platforms covered an area of 50x40 km2 collecting 811 hydrographic (temperature and salinity) and bio-geochemical (turbidity, oxygen and chlorophyll) profiles. The horizontal resolution in the along track direction was around 0.3 km for the coastal glider and around 1.1 km for the deep glider and about 4 km between gliders tracks. The preliminary analysis of in-situ and remote sensing data reveals the presence of an anomalous anticyclonic eddy near the northwest coast of Mallorca island of about 60 km diameter. This structure blocked the usual path of the Balearic Current along the coast, deflecting the main northeastward flow to the north. The relative fresh waters from Atlantic origin (37.4) found in previous studies near the coast were not detected in this experiment. Instead, the signature of the Mediterranean Water (salinity of 38 and higher), typical from open ocean water, was dominant in the study area. The influence of this anomalous anticyclonic eddy on the chlorophyll distribution is investigated diagnosing the quasi-geostrophic vertical motion.

Primary authors : Dr. RUIZ, Simon (CSIC-IMEDEA)

Co-authors : Dr. PASCUAL, Ananda (CSIC-IMEDEA) ; Prof. TINTORE, Joaquin (SOCIB)

Presenter : Dr. RUIZ, Simon (CSIC-IMEDEA)

Track classification : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling, sub-mesoscale features, air-sea interactions,...)

Contribution type : Poster

Submitted by : Dr. RUIZ, Simon

Submitted on Wednesday 16 April 2014

Last modified on : Wednesday 16 April 2014

Comments :

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Track judgments :

Track : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling

Judgment :

Abstract ID : 6

Use of SARAL/AltiKa data in a multi-sensor approach: Application to the study of a coastal current in the Balearic Sea

Content :

This paper presents the results of the G-AltiKa mission conducted along a SARAL-AltiKa track south-west of Ibiza (Balearic Islands, Western Mediterranean Sea) from 1 to 5 August 2013. The main feature of the mission is that the glider measurements are almost synchronous with the altimeter pass. The HF radar system operated by the Balearic Islands Coastal Observing and Forecasting System (SOCIB) constitutes a complementary tool to describe the circulation in the study area. The work is focused on the data processing step (interpolation, filtering, corrections) applied to the measurements and on the comparison of the geostrophic velocity across the satellite track. The absolute dynamic topography, computed by adding filtered 1 Hz and 40 Hz along-track sea-level anomalies Mediterranean Sea Mean Dynamic Topography, and the dynamic height, computed from glider temperature and salinity, both exhibited a signal characterized by weak gradients and amplitudes (2 cm), close to the expected accuracy of the AltiKa instrument. The corresponding geostrophic velocities and the HF radar velocities projected on the SARAL/AltiKa track all depicted a northwestward coastal current with a maximal velocity larger than 20 cm/s. The lack of synopticity due to the time interval between the satellite pass (August 1, 2013, 18:26:12 UTC) and the end of the glider transect (August 5, 2013, 04:17:22 UTC) resulted in a spatial shift between the glider and the altimeter along-track signal, around 5 km. The time evolution of the HF radar currents during the mission duration confi rmed the plausibility of such a shift.
After the application of a 5 km lag to the glider dynamic height, the correlation and RMS dif ference between the di fferent platforms were computed. The agreement between the altimetry, glider and HF radar cross-track velocities was synthesized in a Taylor diagram that evidenced the lowest root mean square di fference (9.72 cm/s) and the highest correlation (0.64) between the velocities obtained from the glider dynamic height and those from the filtered 40 Hz sea-level anomalies. The 40 Hz data are particularly valuable as they enable us to use the SARAL-AltiKa data closer to the coast than typically possible with altimetry.

Primary authors : Dr. TROUPIN, Charles (CSIC-IMEDEA)

Co-authors : Dr. PASCUAL, Ananda (CSIC-IMEDEA) ; Dr. VALLADEAU, Guillaume (CLS) ; Dr. LANA, Arancha (CSIC-IMEDEA) ; Ms. HESLOP, Emma (CSIC-IMEDEA) ; Dr. RUIZ, Simon (CSIC-IMEDEA) ; Mr. TORNER, Marc (SOCIB) ; Dr. PICOT, Nicolas (CNES) ; Prof. TINTORE, Joaquin (SOCIB)

Presenter : Dr. RUIZ, Simon (CSIC-IMEDEA)

Track classification : Glider networks, links with observing systems and data dissemination (synergies with other observing networks)

Contribution type : Poster

Submitted by : Dr. RUIZ, Simon

Submitted on Wednesday 16 April 2014

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Status : SUBMITTED

Track judgments :

Track : Glider networks, links with observing systems and data dissemination (synergies with other observing networks

Judgment :

Abstract ID : 7

Seagliders as a tool for persistent dissolved oxygen monitoring in the central and northern North Sea, and updates from recent UEA Seaglider deployments

Content :

This paper aims to present results from recent Seaglider deployments from the University of East Anglia. Updates from recent deployments in both the Amundsen Sea (Antarctica) and the North Sea highlight limitations of gliders in extreme environments. Results will be presented from two studies aiming to assess the viability of Seagliders as persistent monitoring platforms for dissolved oxygen in the North Sea. We deployed a Seaglider in a region of known low oxygen during August 2011 and October 2013 to investigate the processes regulating supply and consumption of dissolved oxygen below the pycnocline. The glider provided extremely high resolution observations (one profile every 15 min, 0.2 Hz) during a three day deployment of cross-thermocline biological, chemical and physical processes. The Seaglider identified cross-pycnocline mixing features responsible for re-oxygenation of the bottom mixed layer not currently resolved by models of the North Sea. Using the data, we were also able to constrain the relative importance of different sources of organic matter leading to oxygen consumption. Observations of organic matter fluxes also led to preliminary estimates of carbon export to the bottom mixed layer. The Seaglider proved to be an excellent tool for monitoring shelf sea processes despite challenges to glider flight posed by high tidal velocities, shallow bathymetry, and very strong density gradients (8 σ over 3 m). Data collected with the Seaglider are used to improve biogeochemical models in order to provide useful policy advice about future development in the North Sea.

Primary authors : Dr. QUESTE, Bastien (University of East Anglia)

Co-authors :

Presenter : Dr. QUESTE, Bastien (University of East Anglia)

Track classification : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling, sub-mesoscale features, air-sea interactions,...)

Contribution type : oral Presentation

Submitted by : Dr. QUESTE, Bastien

Submitted on Wednesday 16 April 2014

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Comments :

Status : SUBMITTED

Track judgments :

Track : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling

Judgment :

Abstract ID : 8

Measurements of dissipation rate of turbulent kinetic energy and temperature variance using a glider

Content :

The gliders provide an attractive low-noise platform for turbulence measurements because of their buoyancy-driven motion independent of propellers and other mechanical vibration sources. In a recent project exploring the mixing of the Faroe Bank Channel overflow, we tested a deep Teledyne Webb Slocum glider equipped with an additional turbulence instrument (MicroRider, Rockland Scientific, Canada) fitted with airfoil shear probes and fast-response thermistors.

Dissipation rate of turbulent kinetic energy, e, and of temperature variance, c, are measured using shear probes and the thermistors, respectively. Additionally, temperature gradient spectra are fitted to theoretical models (Batchelor and Kraichnan) that give independent measurements of e. Care is taken to exclude any segments of data when contamination by recirculation from the wake of the instrument is expected. The glider speed through water and the angle of attack are obtained from a hydrodynamic flight model. The noise level of shear probes, in terms of e, is less than 5x10-11 W kg-1, comparable to the best microstructure profilers. The measurements of e from the shear probes are compared to profiles collected from the ship using a vertical microstructure profiler (VMP). The two data sets are based on different sampling schemes and are not co-located in time or space. Survey-averaged profiles and probability distribution functions compare favorably, agree to better than a factor of two in the turbulent bottom layer of the overflow plume, and beneath the stratified and sheared plume-ambient interface. The glider average values are approximately a factor of 3 and 9 times larger than the VMP values in the upper part of the interface and above. The discrepancy is attributed to different sampling scheme and the intermittency of turbulence. The dissipation rates measured by the shear probes and the thermistors, on the other hand, are from the same platform and are separated by only a few cm. For large values of e (> 10-7 W kg-1) time response corrections on the thermistors become large and the measurements become uncertain. For less energetic turbulence, e can be successfully measured by the thermistors. The dissipation measurements from the glider meet expectations and return data of sufficient quality suitable for studies of ocean mixing processes.

Primary authors : Prof. FER, Ilker (University of Bergen, Norway)

Co-authors : Mr. PETERSON, Algot K. (University of Bergen, Norway) ; Dr. ULLGREN, Jenny E. (Nansen Environmental and Remote Sensing Center, Bergen, Norway)

Presenter : Prof. FER, Ilker (University of Bergen, Norway)

Track classification : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling, sub-mesoscale features, air-sea interactions,...)

Contribution type : oral Presentation

Submitted by : FER, Ilker

Submitted on Wednesday 16 April 2014

Last modified on : Wednesday 16 April 2014

Comments :

If you have a tight schedule, a poster presentation is also fine.
Thanks,
Ilker

Status : SUBMITTED

Track judgments :

Track : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling

Judgment :

Abstract ID : 9

Testing a pCO2-sensor on gliders: A presentation of the sensor, methods of lag compensation and calibration, and a discussion on the suitability of gliders as a platform.

Content :

The ocean carbonate system plays an essential role in the life and growth of shell-producing organism, from commercially important species like mussels or oysters, to important primary production organism like dinoflaggelates. It is being influenced by anthropogenic carbon emissions both directly through seawater absorption of atmospheric CO2 and indirectly by rising temperatures. To fully quantify the complete carbon system in seawater it is necessary to determine at least two of the following five parameters; pH, total alkalinity (AT), inorganic carbon (CT), carbonate ion (CO3) and the partial pressure of CO2 (pCO2).

Since March 21st we have been testing a pCO2 sensor from Aanderaa on a Seaglider on the Svinøy section off western Norway. The mission is planned to continue until October 2014. We will be monitoring sensor drift, the influence of temperature, depth and other parameters on the sensor performance, and calibrate against water samples taken from passing research ships.

Gliders are always on the move, and the pCO2 sensor has a response time of approximately 5 minutes. This means a method of lag compensation will be needed to avoid a significant hysteresis loop between up- and downcast measurements. Also, it appears that the response time is temperature dependent, meaning lag is greater on upcast than downcast. We will therefore need to identify the various aspects influencing lag, and then construct a post-processing algorithm that will make the sensor measurements match on both up- and downcast, and with control water samples. Also, the gliders “loiter” functionality will allow us to hover at a given depth and let the sensor stabilize there.

The testing has just started, but so far things look promising, even though some work will be needed to validate the sensor measurements and to process them to the point that we can make a good presentation of the pCO2 content of the water column at a glance.

Primary authors : Mr. KVALSUND, Karsten (Runde Environmental Centre)

Co-authors : Mr. BRUVIK, Erik Magnus (University of Bergen) ; Dr. SKJELVAN, Ingunn (Uni Research - Climate) ; Dr. ATAMANCHUK, Dariia (University of Gothenburg) ; Dr. TENGBERG, Anders (Aanderaa Data Instruments AS) ; HOVDENES, Jostein (Aanderaa Data Instruments AS)

Presenter : Mr. KVALSUND, Karsten (Runde Environmental Centre) ; Mr. BRUVIK, Erik Magnus (University of Bergen)

Track classification : Developments on glider vehicles, sensors, and "gliderports" infrastructures (on-board capacities, ground-segment)

Contribution type : oral Presentation

Submitted by : Mr. KVALSUND, Karsten

Submitted on Friday 18 April 2014

Last modified on : Tuesday 22 April 2014

Comments :

As the work that we will present have only just started, it is quite likely that we will need to make changes to the abstract later.

Status : SUBMITTED

Track judgments :

Track : Developments on glider vehicles, sensors, and "gliderports" infrastructures (on-board capacities, ground-segmen

Judgment :

Abstract ID : 10

TUCPA project : toward a gliding observatory of coastal particles dynamics

Content :

Meteorological events such as floods and storms play an important role on the land-to-sea transfer of particulate matter through the coastal area. The timing of these events is very short (few days) and there is a need of specific instrumental package and platform to measure and understand their role on the suspended particles dynamics. Classical methods such as measurements from research vessels, fixed platforms (buoys, moorings) are costly but permit to understand the high temporal variability of those phenomenon at small spatial scale. Remote sensing data are also interesting to cover an area at the scale of a basin but are available during cloud-free days.
The TUCPA (Coastal Turbidity and Autonomous Platforms) project emphasize the role of gliders to measure the impact of meteorological events on the dynamics of suspended particles in the coastal zone. We tested in this project the potential of deploying coastal gliders in the coastal area were anthropic activities can interact the progress of such mission.
Gliders equipped with bio-optical payload were deployed in the Gulf of Lions during spring bloom condition in March/April 2013 and during flooding condition in January/February 2014. First results show that the composition of suspended particles is highly variable depending on the season, the location on the shelf and the meteorological situation. During the first deployment, in March/April 2013, coastal glider section show a bloom period with high value of Chlorophyll a (more than 3 µg/L) between 20 and 40 m depth. Coastal waters were stratified and a bottom nepheloid layer (few mg/L) was present on the entire shelf. The second glider deployment was the opportunity to measure the impact of floods in coastal Mediterranean waters. We observed a high turbid plume (more than 20 NTU close to Rhône mouth) of 50km long and 40 to 20m of thickness. Water samples were taken from CTD rosette bottles close to the glider location and analysed to calibrate optical sensor in units of mg/L for suspended matter and ug/L for chlorophyll a concentration.
Gliders are useful to study the hydrodynamics and suspended particles dynamics through particular meteorological conditions at the scale of a basin. Continuous glider deployments will allow us to describe particles dynamics at seasonal and inter-annual scales.

Primary authors : Mr. MANY, Gaël (CEFREM-UPVD)

Co-authors : Dr. BOURRIN, François (CEFREM - UPVD)

Presenter : Mr. MANY, Gaël (CEFREM-UPVD)

Track classification : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling, sub-mesoscale features, air-sea interactions,...)

Contribution type : oral Presentation

Submitted by : Mr. BOURRIN, François

Submitted on Friday 18 April 2014

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Status : SUBMITTED

Track judgments :

Track : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical couplin

Judgment :

Abstract ID : 11

Glider data management, Argo concepts to new technologies

Content :

Under the GROOM project and with significant support from national programmes the building blocks to a glider data system akin to Argo have been assembled as a demonstrator. This work has included, the definition of a data format for glider data and harmonisation of this format with the Australian national facility for gliders and the US Integrated Ocean Observing System, production of freely available common software tools for conversion of glider data to the EGO NetCDF format, and establishment of the data infrastructure for a global data assembly centre at Ifremer, France.
Simply creating a system akin to Argo is only the beginning and the investigation of new data technologies and concepts is an ongoing activity. Under the joint EU/USA/Australian Ocean Data Inoperability Platform project a prototype OGC Sensor Observation Service is being tested. These concepts and ideas will become operational if the AtlantOS proposal is successful as brokerage services between glider data repositories as data distribution portals such as EMODnet and GEOSS.

Primary authors : Dr. BUCK, Justin (NERC-BODC) ; CARVAL, Thierry (Ifremer) ; POULIQUEN, Sylvie (Ifremer)

Co-authors :

Presenter : Dr. BUCK, Justin (NERC-BODC)

Track classification : Glider networks, links with observing systems and data dissemination (synergies with other observing networks)

Contribution type : oral Presentation

Submitted by : Dr. BUCK, Justin

Submitted on Friday 18 April 2014

Last modified on : Friday 18 April 2014

Comments :
Cost action funding is requested for attendance please.

Status : SUBMITTED

Track judgments :

Track : Glider networks, links with observing systems and data dissemination (synergies with other observing networks

Judgment :

Abstract ID : 12

Slocum Gliders Expanding our Understanding of the Oceans

Content :

"...I walk into our control room, with its panoply of views of the sea. There are the updated global pictures from the remote sensors on satellites, there the evolving maps of subsurface variables, there the charts that show the positions and status of all our Slocum scientific platforms, and I am satisfied that we are looking at the ocean more intensely and more deeply than anyone anywhere else."
Henry Stommel, The SLOCUM Mission, 1989.

Henry Stommel's imagination was sparked by the opportunity gliders could provide to broaden our understanding of the oceans and, perhaps even more important to him, by the potential it had to draw peoples interest and excitement for ocean dynamics.

Teledyne Webb Research has maintained a core focus and commitment to providing tools that excel in long-endurance worldwide remote sensing while operating in harsh environments. The fundamental goal is to better enable our understanding of the world's oceans.

One of the key oceanographic tools is the Slocum G2 glider and presented are advanced features that allow greater mission flexibility including hybrid thruster capabilities, increased buoyancy pump displacement, extended energy payload bays, and the latest sensor suites.

Discussed also are National Science Foundation (NSF) Ocean Observatories Initiative (OOI) Slocum Gateway gliders, integrated with Telesonar acoustic modems, that are playing a key role in the data telemetry from, and command and control to, deep water sub-surface moorings. Another component of the OOI Open Ocean program, are the virtual mooring Slocum Global Profiling Gliders, while the Coastal Gliders are in place in both the Atlantic and Pacific, providing a persistent sampling presence.

Provided is an update on the energy harvesting Slocum Thermal E Twin. Supported by the Office of Naval Research (ONR) and in cooperation with the Jet Propulsion Laboratory (JPL), energy is being harvested from the thermal stratification of the ocean not only for buoyancy drive, but also converted into electricity for on-board battery recharging to support hotel and sensor loads.

Antarctic glider work continues with both the US and the UK. Slocum gliders are routinely flown from both Palmer Station and McMurdo and several new under ice behaviors have been tested with the British Antarctic Survey (BAS) at Rothera this past austral summer season.

Combining Teledyne Marine expertise in gliders, hydrophones, and low frequency sound sources we present a feasible approach to both navigate and provide long-range communication flying gliders under shelf-ice.

The Challenger Mission continues. A Slocum G2 named Silbo has completed the Iceland - Azores - Canary Islands - Barbados legs and it being refitted for another sojourn. The Rutgers University RU 29 is presently transiting to Brazil from South Africa. With these endeavors, we continue to draw together the International Consortium of Ocean Observing Labs (I-COOL) focusing on international and educational outreach.

Procurements of Slocum gliders in large numbers by both the US Navy and the Ocean Observation Initiative (OOI) Coastal and Open Ocean bring us closer to realizing Stommel's vision of glider fleets roaming the oceans.

Primary authors : Mr. JONES, Clayton (Teledyne Webb Research)

Co-authors : Mr. ALLSUP, Ben (Teledyne Webb Research)

Presenter : Mr. JONES, Clayton (Teledyne Webb Research)

Track classification : Developments on glider vehicles, sensors, and "gliderports" infrastructures (on-board capacities, ground-segment)

Contribution type : oral Presentation

Submitted by : Mr. ALLSUP, Ben

Submitted on Friday 18 April 2014

Last modified on : Friday 18 April 2014

Comments :

Status : SUBMITTED

Track judgments :

Track : Developments on glider vehicles, sensors, and "gliderports" infrastructures (on-board capacities, ground-segme

Judgment :

Abstract ID : 13

Primary Production inferred from Seaglider

Content :

Primary production in the ocean is fundamentally light limited, and can be modelled as a function of PAR and chlorophyll concentration. The attenuation of light through the water column is influenced by the scattering and absorption of the water itself as well as the concentration of phytoplankton.
Estimates of primary production from satellite algorithms typically underestimate the variability of primary production in the ocean. High resolution measurements of PAR and chlorophyll from Seaglider are used to improve these algorithms by including subsurface measurements. However glider derived datasets are difficult to calibrate. In this study we show how the inclusion of a PAR sensor on autonomous gliders can be used to calibrate chlorophyll fluorescence using the shape of the light profile through the water and the influence of chlorophyll on light attenuation.
Satellite derived estimates of primary production using surface chlorophyll and PAR measurements are compared to glider based in situ measurements of chlorophyll and PAR. The glider measured PAR and chlorophyll profiles allow an improved assessment of primary production to be modelled given the greater resolution of subsurface chlorophyll distributions.
Comparison of glider based primary production estimates with satellite primary production estimates demonstrates how glider acquired data will help increase confidence in satellite primary production algorithms particularly in remote or hostile ocean regions.

Primary authors : Ms. HEMSLEY, Victoria (NOCS)

Co-authors : Dr. PAINTER, Stuart (NOCS) ; Dr. MARTIN, Adrian (NOCS) ; Dr. SMYTH, Tim (PML) ; Dr. FRAJKA-WILLIAMS, Eleanor (NOCS)

Presenter : Ms. HEMSLEY, Victoria (NOCS)

Track classification : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling, sub-mesoscale features, air-sea interactions,...)

Contribution type : oral Presentation

Submitted by : Ms. HEMSLEY, Victoria

Submitted on Friday 18 April 2014

Last modified on : Friday 18 April 2014

Comments :

Status : SUBMITTED

Track judgments :

Track : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling

Judgment :

Abstract ID : 14

Expansion of Rothera Time Series across western Antarctic Peninsula shelf

Content :

In the last two Antarctic summer seasons two Slocum gliders (1000m) have been flown from Rothera, the British Antarctic Survey base on the Antarctic Peninsula. This has enabled much wider scale sampling of the surface physical and biological parameters, showing that the time series location is representative of the wider area. This helps in the interpretation, in relation to the wider shelf sea region, of the more intense biogeochemical sampling of current and past seasons at the time series site. New insights have also been gained into the processes controlling the flow of deep water, and the nutrients and heat content it contains, across the shelf. A software update from Webb for the 2013/14 season allowed much greater confidence in using the gliders in the presence of icebergs.

Primary authors : Dr. VENABLES, Hugh (British Antarctic Survey)

Co-authors : Mr. ALLSUP, Ben (Teledyne Webb Research) ; Prof. MEREDITH, Michael (British Antarctic Survey)

Presenter : Dr. VENABLES, Hugh (British Antarctic Survey)

Track classification : Glider networks, links with observing systems and data dissemination (synergies with other observing networks)

Contribution type : --not specified--

Submitted by : Dr. VENABLES, Hugh

Submitted on Saturday 19 April 2014

Last modified on : Saturday 19 April 2014

Comments :

Status : SUBMITTED

Track judgments :

Track : Glider networks, links with observing systems and data dissemination (synergies with other observing networks

Judgment :

Abstract ID : 15

The Norwegian Atlantic Current Observatory - a national facility for gliders

Content :

The Norwegian Atlantic Current Observatory (NACO) was initiated in 2010 with a grant from the Norwegian Research Council following a competitive call for research infrastructure across all disciplines. It is organized as a project at the Geophysical Institute, University of Bergen, with Runde Environmental Centre and Institute of Marine Research (IMR) as partners. NACO purchased 6 Seagliders following a competitive call for tender and took over operating responsibility for 3 existing Slocum gliders from IMR. In addition a reference current meter mooring with surface buoy and real time data transfer was established in the core of the eastern Norwegian Atlantic Current.

In the period May 2012 to 1 June 2014 NACO has performed 20 repeats of the Svinøy section in the Norwegian Sea and 10 repeats of a section across the Lofoten basin between Lofoten and Jan Mayen, using Seagliders. A total of almost 4000 dives to maximum depth 1000m have been performed, sampling temperature, salinity, oxygen and occasionally other parameters. In addition several shorter missions for process studies have been conducted with both Slocums and Seagliders. A dedicated software package Gliderpage has been put together for smooth piloting operations and a 24/7/365 watch has been established with trained personnel. A gliderport and glider lab with ballasting tank has been established in Bergen with refurbishment capabilities for Seagliders.

From 2015 the facility shall finance running expenses with income from user projects. Project applicants to the Norwegian Research Council will not be funded to purchase own gliders but will rather be directed to use the national facility and if necessary expand its instrument pool and areas of operation. The paper will discuss experience from the establishment phase of such a glider facility, strategies for outreach, and prospects for future development and interaction with users.

Primary authors : Prof. HAUGAN, Peter (Geophysical Institute, University of Bergen)

Co-authors : Prof. ORVIK, Kjell Arild (Geophysical Institute, University of Bergen, Norway) ; Mr. HESSEVIK, Idar (Geophysical Institute, University of Bergen) ; Mr. BRUVIK, Erik Magnus (Geophysical Institute, University of Bergen) ; Mr. KVALSUND, Karsten (Runde Environmental Centre) ; Dr. SØILAND, Henrik (Institute of Marine Research, Bergen, Norway)

Presenter : Prof. HAUGAN, Peter (Geophysical Institute, University of Bergen)

Track classification : Glider networks, links with observing systems and data dissemination (synergies with other observing networks)

Contribution type : oral Presentation

Submitted by : Prof. HAUGAN, Peter

Submitted on Sunday 20 April 2014

Last modified on : Sunday 20 April 2014

Comments :

The presentation also touches upon item (ii) "gliderports" infrastructures, but is essentially an overview of a complete system and its achievements to date.

Status : SUBMITTED

Track judgments :

Track : Glider networks, links with observing systems and data dissemination (synergies with other observing networks

Judgment :

Abstract ID : 16

NACO Gliderpage – Integrated web-tool for piloting seagliders

Content :

To support NACO's glider operations, a web-tool has been developed to allow monitoring, mapping and piloting of seagliders. This online glider piloting tool is based on Google Maps with inclusion of a variety of global and regional wms-layers. The tool is focused on the Norwegian Sea with detailed contour mapping and integrated ocean weather services (marinogram) from met.no. Included in the global map services are also depth profiles of any map section, depth contour maps and distance measurement tools. The solution provides an integrated web-tool for monitoring and editing essential files (cmdfile, targets, science etc), graphical dive plots, monitoring technical health of each glider and detailed map services. The tool offers online piloting of current missions and monitoring all archived missions. To our experience it is an intuitive, stable and reliable tool for piloting seagliders, the code is in general open source. The tool is also available from the general project website in "monitoring only mode" for the public interested in following our seagliders. Future enhancement may include modules for slocum gliders, flexible visualisation of selectable sections and inclusion of more advanced maps like prognosis for waves, currents and updated icemaps.

Primary authors : Mr. HESSEVIK, Idar (Geophysical Institute, University of Bergen, Norway)

Co-authors : Mr. BRUVIK, Erik Magnus (Geophysical Institute, University of Bergen, Norway) ; Mr. KVALSUND, Karsten (Runde Environmental Centre)

Presenter : Mr. HESSEVIK, Idar (Geophysical Institute, University of Bergen, Norway)

Track classification : Piloting and artificial intelligence (automated procedures for single gliders or "fleets")

Contribution type : oral Presentation

Submitted by : Prof. HAUGAN, Peter

Submitted on Sunday 20 April 2014

Last modified on : Sunday 20 April 2014

Comments :

Status : SUBMITTED

Track judgments :

Track : Piloting and artificial intelligence (automated procedures for single gliders or "fleets")

Judgment :

Abstract ID : 17

Improving Source Data for Eddy Path Planning

Content :

Ocean gliders are vehicles specially suited for long duration missions. However, there are more and more examples proving that they can also be used opportunistically in short-term missions. The sampling of ocean mesoscale structures constitute an interesting scenario to illustrate these possibilities.

The problem of glider path planning has received the attention of many research groups in the recent years. The difficulties to control the vehicle trajectory in presence of strong ocean currents demand the availability of automatic path planning tools that can assist both oceanographers and pilots.

In the particular case of ocean eddies, the high spatial/temporal variability of the structure makes the path planning problem a real challenge. There is no possibility of applying low-risk reactive planning strategies, as the observing opportunity can be lost. We have developed a series of automatic path planning tools for gliders, based in optimization and genetic algorithms to tackle this issue. The main aim of these tools is to generate feasible paths for sampling mesoscale structures in general and eddies in particular.

In this work we further investigate the source data pre-processing stage in order to maximize the glider short-term mission success expectations. The idea is to combine different sensor data and regional forecast models in a multi-evidence fusion approach.

Primary authors : Dr. HERNANDEZ, Daniel (SIANI - University of Las Palmas de Gran Canaria)

Co-authors : Mr. ADLER, Leonhard (SIANI - ULPGC)

Presenter : Mr. ADLER, Leonhard (SIANI - ULPGC)

Track classification : Piloting and artificial intelligence (automated procedures for single gliders or "fleets") ; High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling, sub-mesoscale features, air-sea interactions,...)

Contribution type : --not specified--

Submitted by : Dr. HERNANDEZ, Daniel

Submitted on Sunday 20 April 2014

Last modified on : Sunday 20 April 2014

Comments :

Status : SUBMITTED

Track judgments :

Track : Piloting and artificial intelligence (automated procedures for single gliders or "fleets")

Judgment :

Track : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling

Judgment :

Abstract ID : 18

Time variability of the ocean circulation around New Caledonia from altimetry, gliders and other in situ observations

Content :

The South-West Pacific basin is a key region for the ocean circulation and the climate system of the tropical Pacific:
• it is a region where a broad westward-flowing current – the South Equatorial Current (SEC) – encounters a large number of islands and subdivides into multiple intense zonal jets.
• it is the region where thermocline waters of subtropical origin transit in their route towards the equator, giving to this area a potential role for the low-frequency modulation of El Niño – Southern Oscillation (ENSO).

In this presentation, we will focus on the spatial and time variability of two major oceanic currents of the regional circulation in the South-West Pacific – the East Caledonia Current and the South-Caledonian Jet - that flow along the coasts of New Caledonia. This variability is analyzed from the combination of altimetry measurements and in situ observations. This study relies both on the new SARAL/AltiKa altimeter measurements that are expected to provide accurate observations of sea level and associated geostrophic velocities in coastal regions, and on a dedicated in situ observing system that was carried out since 2010 to get insight in the main properties of these currents. This observing system includes a long-term subsurface current mooring, repeated hydrographic surveys with SLOCUM and SPRAY gliders and a dedicated oceanographic cruise.

Primary authors : Dr. MARIN, Frédéric (IRD - LEGOS)

Co-authors : Mr. FUDA, Jean-luc (INSU-CNRS) ; Dr. DURAND, Fabien (IRD - LEGOS)

Presenter : Dr. MARIN, Frédéric (IRD - LEGOS)

Track classification : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling, sub-mesoscale features, air-sea interactions,...)

Contribution type : oral Presentation

Submitted by : Dr. MARIN, Frederic

Submitted on Sunday 20 April 2014

Last modified on : Sunday 20 April 2014

Comments :

Status : SUBMITTED

Track judgments :

Track : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling

Judgment :

Abstract ID : 19

Diagnosing ocean vertical velocities off New Caledonia from a SPRAY glider

Content :

A SPRAY glider has been operated in the Coral Sea (South-Western tropical Pacific ocean) since 2011, with the primary goal of monitoring the boundary currents and jets. In this presentation, we will describe how oceanic vertical velocities can be estimated from SPRAY glider measurements, with application to the observation of internal waves off New Caledonia in May-June 2012.

Pressure measurements by the glider allow estimating the vertical velocities of the glider (relative to ocean bottom) at each time. These vertical velocities are the sum of the vertical velocities of the glider relative to the water body (governed by the laws of motion of the glider) and of the oceanic vertical velocities (due to ocean internal dynamics). If we solve the laws of motion of the glider (via an adequate flight model), we can thus retrieve oceanic vertical velocities. On account of their small magnitude, the retrieval of ocean vertical velocities would be tricky – if not impossible – through other conventional instruments such as ADCPs.

Following a couple of similar previous studies on the SLOCUM and SEAGLIDER gliders, we describe a simplified flight model for the SPRAY glider. This model has three parameters that only depend on the characteristics of the glider: the compressibility and thermal expansion coefficients (that are constant) and the drag coefficient (that is allowed to change dive after dive, because of potential fouling of the hull). We estimate these parameters under the assumption that the absolute vertical water velocity average to zero over a long enough spatio-temporal window (typically: a profile or a group of profiles). Unlike previous studies, our flight model takes into account the vehicle roll to assess its impact on the flight model and oceanic vertical velocity retrieval. We apply this approach to the 40-day/250 dives/800km mission performed in May-June 2012 along 167°E south of New Caledonia. Dramatic water vertical velocities variations (up to 3-4 cm/s with periods of tens of minutes) were observed at all depths (from surface down to 1000 m), above a steep topographic slope in the northern part of the transect. Further offshore, these velocities were found to significantly weaken, though remaining significant, as the SPRAY started to navigate out of this topographic feature. These observations indicate a strong link between local topography and the amplitude of oceanic vertical velocities, an interesting result that remains to be further investigated in the light of internal waves generation/propagation theory.

Primary authors : Mr. FUDA, Jean-luc (DT INSU, La Seyne sur mer, France)

Co-authors : Dr. MARIN, Frederic (IRD) ; Dr. DURAND, Fabien (IRD, LEGOS, Toulouse, France)

Presenter : Mr. FUDA, Jean-luc (DT INSU, La Seyne sur mer, France)

Track classification : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling, sub-mesoscale features, air-sea interactions,...)

Contribution type : --not specified--

Submitted by : Dr. DURAND, Fabien

Submitted on Tuesday 22 April 2014

Last modified on : Tuesday 22 April 2014

Comments :

Please note that this would be a poster presentation

Thanks

Status : SUBMITTED

Track judgments :

Track : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling

Judgment :

Abstract ID : 21

Glider endurance line monitoring, unravelling variability at a key circulation ‘choke’ point in the Western Mediterranean Sea

Content :

In order to detect long-term climatic change and to better constrain our model forecasts it is increasingly important to understand variability in our major circulation systems. In 2011 SOCIB, the Balearic Islands Coastal Ocean Observing and Forecasting System, commenced regular, quasi-continuous glider monitoring of an ‘endurance’ line across the Ibiza Channel, an important ‘choke’ point in the Western Mediterranean Sea. Here, the basin scale geostrophic circulation is overlain by energetic mesoscale activity and modulated by the variable winter formation of deep and intermediate watermasses. The effects of this interaction are concentrated in the Ibiza Channel, a well-established biodiversity hotspot. Which, with its narrow width (80 km) and sill (800 m), governs an important north/south exchange of watermasses, known to affect local ecosystems of global interest. The repeated ‘burst’ monitoring provided by the gliders has observed high frequency variability in this exchange, with changes of order of the seasonal cycle (0.9 Sv) occurring over periods of days to a week. Importantly, this monitoring strategy has also allowed the prevailing dynamics to emerge over a 15 – 20 day (mission) period, enabling the pinpointing of events in time and the interconnection between months to seasons to develop. In a region previously described as a ‘complex and variable’. We can now characterise this exchange at a variety of scales, from high frequency to seasonal, and, with the integration of historical ship based survey data, define the first long-term inter-annual means at this key ‘choke’ point.

Primary authors : Ms. HESLOP, Emma (SOCIB & IMEDEA (CSIC-UIB))

Co-authors : Dr. RUIZ, Simon (CSIC-IMEDEA) ; Dr. ALLEN, John (University of Portsmouth & SOCIB) ; Prof. TINTORÉ, Joaquín (SOCIB & IMEDEA) ; Mr. LÓPEZ-JURADO, José-luis (IEO-COB)

Presenter : Ms. HESLOP, Emma (SOCIB & IMEDEA (CSIC-UIB))

Track classification : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling, sub-mesoscale features, air-sea interactions,...)

Contribution type : oral Presentation

Submitted by : Ms. HESLOP, Heslop

Submitted on Monday 19 May 2014

Last modified on : Monday 19 May 2014

Comments :

Status : SUBMITTED

Track judgments :

Track : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling

Judgment :

Abstract ID : 22

Surveying a “dead-zone eddy” in the tropical North Atlantic Ocean

Content :

Open-ocean dead-zones in the Northeast Atlantic are recently discovered ocean features that can develop in cyclonic and anticyclonic modewater eddies. Through a combination of eddy dynamics and biogeochemical cycling within the eddies, a hypoxic/close to anoxic environment is created. So far the description of the eddies was limited by the availability of only few opportunistic observations; the high- resolution eddy structure and the distribution of nutrients is unknown. In order to survey anomalous eddies in greater detail, a SLA/Argo/SST based eddy tracking and characterizing scheme was developed and applied to the region between the Cape Verdes Islands and the Mauritanian coast in 2013. In December 2013 a potential “dead-zone eddy” was identified via the system and in March/April 2014 a multi-platform survey of that eddy was performed, which comprised the usage of three gliders (T, S, oxygen, Chl-a, Turbidity) and two ships (CTD, ADCP).
The survey revealed that indeed an open-ocean dead-zone eddy was successfully identified through the alert system. The lowest oxygen concentrations were around 4 µmol/kg and found close to the mixed layer base at 80m depths were also the maximum swirl velocities are observed. Before the survey, the eddy propagated a distance of about 800 km in 8 month (3.4 km/day) along a quasi zonal track along about 18°N. A water mass analysis indicate that the eddy core was composed of South Atlantic Central Water, similarly found in the eddy formation region, off Mauretania, which is largely in contrast to the background T/S characteristic. This suggests that the eddy core was well isolated from the surrounding waters during the eddy’s westward passage.
One glider was additionally equipped with an optical nitrate sensor (SUNA) and high-resolution nitrate profiles were acquired within the eddy. In the eddy core an increase in nitrate concentration was observed, directly below the mixed layer (60-70m), down to 250m. As nitrate was highest at shallow depths we expect that most of the signal is associated with regenerative nutrient cycling and comparable minor export production.

Primary authors : Mr. SCHÜTTE, Florian (GEOMAR)

Co-authors : KARSTENSEN, Johannes (GEOMAR Helmholtz Centre for Ocean Research Kiel) ; Dr. KRAHMANN, Gerd (GEOMAR) ; Prof. BRANDT, Peter (GEOMAR) ; Dr. FIEDLER, Björn (GEOMAR) ; Dr. LÖSCHER, Carolin (GEOMAR) ; Prof. KÖRTZINGER, Arne (GEOMAR)

Presenter : Mr. SCHÜTTE, Florian (GEOMAR)

Track classification : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling, sub-mesoscale features, air-sea interactions,...)

Contribution type : oral Presentation

Submitted by : Mr. SCHÜTTE, Florian

Submitted on Monday 19 May 2014

Last modified on : Monday 19 May 2014

Comments :

Status : SUBMITTED

Track judgments :

Track : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling

Judgment :

Abstract ID : 23

On the setup of an operational autonomous underwater glider facility

Content :

We present the evolution, from its conception until today, of an established and internationally recognized Glider Facility. During 8 years of glider activity, new infrastructures and methodologies have been developed; increasing glider missions, data quality and data availability. From 2005 to 2010, IMEDEA operated 4 Slocum G1 gliders following a research project approach. From 2011, SOCIB developed the Glider Facility, with in kind support from IMEDEA, increasing the glider fleet with 4 new vehicles (2 Slocum G2 gliders and 2 iRobot Seagliders), extending the glider operation and maintenance infrastructure, and establishing a permanent glider 'endurance' line in the Balearic Islands. The SOCIB Glider Facility also provides open access glider time to third party research groups, and to date has successfully completed two such missions, with more planned. The glider data processing and QC is now automated for both RT and DM visualisation and display, including specific 'follow the glider' tool for classroom use. We describe the progress of the Glider Facility, the results obtained, the lessons learnt and the objectives and actions foreseen for the future.

Primary authors : Mr. TORNER, Marc (SOCIB)

Co-authors : Mr. CUSI, Simo (UTM-CSIC) ; Mr. ROQUE, David (CSIC-ICMAN) ; Mr. MARTINEZ-LEDESMA, Miguel (IMEDEA (CSIC-UIB)) ; Mr. BELTRAN, Joan-pau (SOCIB) ; Dr. RUIZ, Simon (CSIC-IMEDEA) ; Mr. CASAS PÉREZ, Benjamín (IMEDEA (UIB-CSIC)) ; Mr. CASTILLA, Carlos (SOCIB) ; Ms. IRENE, Lizarán (SOCIB) ; Mr. SEBASTIAN, Lora (SOCIB) ; Ms. HESLOP, Emma (SOCIB & IMEDEA (CSIC-UIB)) ; Prof. TINTORÉ, Joaquín (SOCIB & IMEDEA (UIB-CSIC))

Presenter : Ms. HESLOP, Emma (SOCIB & IMEDEA (CSIC-UIB))

Track classification : Developments on glider vehicles, sensors, and "gliderports" infrastructures (on-board capacities, ground-segment)

Contribution type : Poster

Submitted by : Ms. HESLOP, Heslop

Submitted on Monday 19 May 2014

Last modified on : Monday 19 May 2014

Comments :

Status : SUBMITTED

Track judgments :

Track : Developments on glider vehicles, sensors, and "gliderports" infrastructures (on-board capacities, ground-segmer

Judgment :

Abstract ID : 24

"Follow The Glider" : a web-based educational tool for glider mission follow up

Content :

"Follow the Glider" (www.followtheglider.com) is a web-based educational tool aimed at students and developed by CEFAS, IMEDEA (CSIC-UIB) and SOCIB (Balearic Coastal Monitoring and Forecasting System) as part of the European FP7 – JERICO project. This tool is based on SOCIB's glider monitoring technology that allows quasi real-time glider monitoring, available at www.socib.es. The objective is to help students and teachers, from a variety of different grade levels, to find out what underwater gliders are and gain awareness of their importance for coastal research. We also strive to enable students to monitor the progress and results of different gliders that SOCIB is currently using in the Western Mediterranean.
This tool describes the major elements of a glider, visualization of real data measurements, specific and adapted explanations for kids on why we measure this data and why is important for ocean monitoring and also presents some introductory notions on the navigation and ocean monitoring as well as the relation to key issues of general interest for students and society: climate change, the role of the oceans, operational oceanography, etc.

Primary authors : Dr. CANYELLAS, Bartolomeo (SOCIB)

Co-authors : Ms. HESLOP, Emma (SOCIB & IMEDEA (CSIC-UIB)) ; Mr. MARC, Torner (SOCIB) ; Mr. TINTORÉ, Joaquín (SOCIB & IMEDEA (UIB-CSIC))

Presenter : Ms. HESLOP, Emma (SOCIB & IMEDEA (CSIC-UIB))

Track classification : Glider networks, links with observing systems and data dissemination (synergies with other observing networks)

Contribution type : Poster

Submitted by : Ms. HESLOP, Heslop

Submitted on Monday 19 May 2014

Last modified on : Monday 19 May 2014

Comments :

Status : SUBMITTED

Track judgments :

Track : Glider networks, links with observing systems and data dissemination (synergies with other observing networks

Judgment :

Abstract ID : 25

The GESSEB glider mission for analysing mesoscale eddies in the southeastern Bay of Biscay

Content :

The two-month GESEBB mission, carried out in summer 2013, was designed to sample a stationary Slope Water anticyclonic eDDY (SWODDY) that usually appears during winter in the southeastern Bay of Biscay. Previous studies based on in situ data and remote sensing images/data, didn't allow a vertical sampling, which could help to know the vertical structure of this mesoscale structure. For the GESEBB mission a Slocum-1000 type glider equipped with a CTD, dissolved oxygen, and fluorescence-turbidity sensors; as well as two drifters with a holey sock drogue centred at 50 m depth were deployed near the target oceanic structure. For monitoring the dynamic of the study area, satellite data from altimetry, as well as near-real time SST (AVHRR 1 km) and Chlorophyll-a concentration (MODIS 1 km) maps were processed. The flexibility of the glider for changing the mission plan, that is, for modifying the navigation and sensors related configuration, permitted to follow the eddy and to save the battery-energy, in order to successfully complete the planned mission.

The mixed layer depth during the campaign was centred at 30-50 m depth. At the surface the temperature and salinity ranged between 19.6ºC-24.4ºC and 33.9-35.6, respectively; the ranges decreased at 1000 m depth (9.5ºC -10.2ºC and 35.6-35.9). With regard to the fluorescence the maximum was centred at 50 m depth, that is, at the bottom of the mixed layer depth.

The glider not only crossed an anticyclonic eddy, but also two cyclonic structures. The water column notably changes below these structures, depending on the rotation of the gyres. The cores of cyclonic eddies are characterized by a depression of the isopycnals from the surface to 150-200 m depth and a doming between 200 m and at least 1000 m. The opposite behaviour is observed for the anticyclones, but the doming of the isopycnals occurs up to 100 m depth. Hence, the observed cyclones and anticyclones expand and contract the mixed layer. This vertical variability also affects the fluorescence and the concentration of the dissolved oxygen, whose maximums as well as quantity varies.

Primary authors : Dr. CABALLERO, Ainhoa (Marine research Division, AZTI-Tecnalia)

Co-authors : Dr. TESTOR, Pierre (LOCEAN-IPSL/CNRS) ; Dr. RUBIO, Anna (Marine research division, AZTI-Tecnalia) ; Mr. HERNÁNDEZ, Carlos (Marine research division, AZTI-Tecnalia) ; Mr. MADER, Julien (Marine research division, AZTI-Tecnalia)

Presenter : Dr. CABALLERO, Ainhoa (Marine research Division, AZTI-Tecnalia)

Track classification : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling, sub-mesoscale features, air-sea interactions,...)

Contribution type : --not specified--

Submitted by : Mrs. CABALLERO, Ainhoa

Submitted on Monday 19 May 2014

Last modified on : Monday 19 May 2014

Comments :

Status : SUBMITTED

Track judgments :

Track : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical couplin

Judgment :

Abstract ID : 26

Unmanned Surface Vehicles: Wave Glider, at the sea-air interface

Content :

There is no doubt that after pioneering the exploration of our land and the outer space, there is a large appetite for exploration of our oceans. The autonomous resources applied to this exploration have been focused on the deep ocean and water column, leaving the surface sparsely covered by fixed buoys and occasional vessel studies.

With some of the new Unmanned Surface Vehicles, it is possible today to provide full spatial and temporal coverage of the critical sea-air interface.

The paper will discuss how the Wave Glider, developed by Liquid Robotics is an innovative wave propelled green technology that uniquely provides persistent monitoring in remote and vast spreads of ocean and coastal water bodies. It is unique in its ability to bridge the sea-air interface thus providing data from the seafloor throughout the water column to the sea-air surface and all the way back to shore where it can be used for analysis, management and decision making. In the open ocean, the robotic solutions derived from this technology can easily be scaled to planetary dimensions.

We discuss the development of the new persistent USV platform (“SV-3”), which now offers the first hybrid wave-electric propulsion system extending its reach and duration. For this technology, we provide technical details of the existing capabilities, review performance results from sea trials and operational deployments, and discuss our technology roadmaps for further development. Finally, we present results from operational missions with the USV. Taken together, these mature and developing technologies and operational capabilities validate our concept for persistent and economical monitoring and data gathering of large areas of the ocean with a self-deploying, unmanned system of systems.

Such scales will commend new autonomy and collaborative behavior for robots, which will soon self-manage operations and survival in their environment where they can work as fleets and networks of inter-connected assets for regional governance.

Primary authors : Mr. LEROY, Francois (Liquid Robotics)

Co-authors :

Presenter : Mr. LEROY, Francois (Liquid Robotics)

Track classification : Glider networks, links with observing systems and data dissemination (synergies with other observing networks) ; Piloting and artificial intelligence (automated procedures for single gliders or "fleets") ; High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling, sub-mesoscale features, air-sea interactions,...)

Contribution type : oral Presentation

Submitted by : Mr. LEROY, Francois

Submitted on Monday 19 May 2014

Last modified on : Monday 19 May 2014

Comments :

Depending on which Track you select, we will emphasize the capabilities of the Wave Glider and operational missions related to that Track. Looking forward to participating.

Status : SUBMITTED

Track judgments :

Track : Glider networks, links with observing systems and data dissemination (synergies with other observing networks

Judgment :

Track : Piloting and artificial intelligence (automated procedures for single gliders or "fleets")

Judgment :

Track : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling

Judgment :

Abstract ID : 27

SEAGLIDER Activities in Fram Strait and the western Nordic Seas – Past and Future

Content :

Since 2008 AWI has carried out glider measurements as part of the Fram Strait Observatory between Svalbard and Greenland. These measurements supplemented mooring observations and annual CTD surveys in the area. Additionally acoustic navigation of gliders, with the target of under-ice surveys by gliders in the Arctic Mediterranean, was tested.
The experience gained in the time span 2008 to 2012 showed that the effort needed to establish acoustic navigation of gliders in combination with an extremely harsh environment and remote research area was an unsolvable task – at least at that time.

In the near future AWI glider missions will concentrate on the observation of freshwater in the western Nordic Seas excluding under-ice excursions. During these missions the dives shall be adapted to reach a high-resolution in space and time in the upper part of the water column (0 – 500m).
Logistical tasks are the establishment of in-house-piloting and the organization of deployment and recovery in remote areas.

Primary authors : Mrs. LATARIUS, Katrin (Alfred-Wegener-Institut)

Co-authors : VON APPEN, Wilken-jon (Alfred-Wegener-Institut) ; BEHRENDT, Axel (Alfred-Wegener-Institut) ; BESZCZYNSKA-MÖLLER, Agnieszka (Institute of Oceanology PAS) ; KANZOW, Torsten (Alfred-Wegener-Institut) ; ROHARDT, Gerd (Alfred-Wegener-Institut) ; SCHAUER, Ursula (Alfred-Wegener-Institut)

Presenter : SCHAUER, Ursula (Alfred-Wegener-Institut)

Track classification : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling, sub-mesoscale features, air-sea interactions,...)

Contribution type : Poster

Submitted by : Dr. LATARIUS, Katrin

Submitted on Monday 19 May 2014

Last modified on : Monday 19 May 2014

Comments :

Status : SUBMITTED

Track judgments :

Track : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling

Judgment :

Abstract ID : 28

Latest capabilities in glider technologies: SeaExplorer

Content :

After a 6-year R program, SeaExplorer is a breakthrough in glider design based on several innovations.

Main new capacities in glider technologies are the following:
- Cost-effectiveness
Months of autonomy with rechargeable batteries.
- Interchangeable payload
Easy and fast payload replacement between two tasks without disassembling.
- Multi-Sensor capabilities
Off-the-shelf nose sections could include physical, biological, chemical and acoustical sensors.
- Open source firmware.
Easy integration of custom sensor.
- Robust & reliable.
No wings, no breaks, nor moving parts.

SeaExplorer has been design for low logistics facilitating operations and minimizing operational and maintenance costs.

Primary authors : Mr. PLA, Patrice (ACSA)

Co-authors : Mrs. COULOMB, Dorothee (ACSA)

Presenter : Mr. PLA, Patrice (ACSA)

Track classification : Developments on glider vehicles, sensors, and "gliderports" infrastructures (on-board capacities, ground-segment)

Contribution type : Poster

Submitted by : Mrs. COULOMB, Dorothee

Submitted on Monday 19 May 2014

Last modified on : Monday 19 May 2014

Comments :

Status : SUBMITTED

Track judgments :

Track : Developments on glider vehicles, sensors, and "gliderports" infrastructures (on-board capacities, ground-segme

Judgment :

Abstract ID : 29

First transects of the glider SeaExplorer: data quality control and intercomparison within the mediterranean ocean observing system

Content :

Newly arrived among the autonomous observing platforms, the glider SeaExplorer already shows its capability to resolve in-situ dynamical features at regional scales and associated biogeochemical processes. Its first long-term mission lasted two months with several transects across the Ligurian Sea (NW Mediterranean), acquiring hydrological profiles with a Seabird pumped CTD and Oxygen sensor until 500m depth. The dataset is validated in contrasted hydrodynamical patterns (geostrophic jets, frontal structures, rapid surface mixing events) comparing contemporaneous low-resolution but high-quality data from ship borne CTD-rosette as well as simultaneous unpumped CTD Slocum glider survey. Data processing is performed following up some discussions within the GROOM community by adapting the working algorithm that corrects for issues caused by thermal lag and short-time mismatch between Temperature and Conductivity signals. This first achievement, assessed in the frame of the operational ocean observing system MOOSE, confirms the performance of the engine to collect scientific quality data over long-term missions and encourages for a following mission with bio-optical sensors.

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Track classification : Glider networks, links with observing systems and data dissemination (synergies with other observing networks)

Contribution type : Poster

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Judgment :

Abstract ID : 30

Internal Waves off Peru observed with Gliders

Content :

In spring 2013 an experiment was conducted on the Peruvian coast to study exchange processes between the shelf and the open ocean. Seven Slocum gliders were deployed over a the experiment period of nearly 2 months. Most of the gliders ran parallel sections perpendicular to the coast.
Strong irregularities were frequently visible in the vertical velocities already during the piloting of the gliders.
A comparison of the expected and observed vertical velocities indicates the presence of internal wave trains running up-shelf. The magnitude of these internal waves occasionally reaches the gliders' own vertical velocities bringing the gliders to a stand-still in depth. Here we analyse the occurence of the bores and examine what effect they have on glider measurements and on local property distributions.

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Track classification : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling, sub-mesoscale features, air-sea interactions,...)

Contribution type : --not specified--

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Track : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling

Judgment :

Abstract ID : 31

Gliders in the Baltic Sea – a future perspective

Content :

Up to now gliders have been used in the Baltic Sea only in a few short duration occasions. We know only five tests, three of which did not give any data but two of them were successful. The Baltic Sea is a marginal sea with mean depth of about 60 m. There are deeper places as well, but basins with average depth of more than 120 m are rare. The sea is divided to many sub-basins and the stratification conditions are at some places demanding for gliders having vertical salinity difference between upper and lower layers over 10. Because of the small dimensions of the sea, meso-scale processes are dominant. The internal Rossby-radius is about 10 km in the central part of the sea and much smaller down to 1.5 km in the gulfs. The topography is usually complicated and the ship traffic is heavy. The sea is divided to economic zones and territorial waters of nine countries. Thus there are natural, operational and political challenges to overcome in using gliders in the Baltic Sea. GROOM is an excellent project to address and clarify all these. Though the Baltic Sea is well-monitored sea, the need for automated monitoring is increasing. Finnish Meteorological Institute has tested the use of ARGO buoys with success in the Bothnian Sea and central Baltic Sea. Within GROOM we did glider experiments in the Bothnian Sea and Archipelago Sea with a deep-sea Slocum glider from PLOCAN. The experiment consisted of two parts, a section mission from coast to open sea and a virtual mooring mission on a small archipelago basin surrounded by small islands. Both mission were successful in the sense that the glider did the planned mission and got data. We also did CTD-measurements from the research ship along the mission section and at the virtual mooring. Our two experiments made us believe that use of gliders has a future in Baltic Sea research and monitoring as a part of the European glider infrastructure.

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Track classification : Glider networks, links with observing systems and data dissemination (synergies with other observing networks)

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Judgment :

Abstract ID : 32

Vertical fluxes of suspended sediment observed from gliders flown in formation

Content :

The glider is a versatile platform to observe a wide range of processes that can occur in the water column. Glider measurements typically have a high time and vertical spatial resolution. The horizontal resolution is significantly coarser in the direction of flight, and undefined perpendicular to the direction of flight. To improve the horizontal resolution multiple gliders can be deployed concurrently to cover a larger area. This is useful for, for example, data-assimilation procedures and identifying the extent of certain features. However, other research questions may require to quantify the local rate of change of some parameter, such as suspended sediment concentration. Because of the horizontal velocity of the glider with respect to the ambient water, the rate of change observed by the glider is generally different from the local rate of change. From the data of multiple gliders in each others proximity, horizontal gradients can be estimated so that the local rate of change can be calculated from observed rate of change. This work presents a method and the infrastructure required on how two or more gliders can be flown in a more or less rigid constellation. The method was applied to a two-week field experiment in the German Bight (North Sea) in August 2013, where two gliders were flown in a leader-follower configuration. During this experiment, the water column (~40 m) was stratified, and the method was used to calculate the local rate of change for the layer averaged suspended sediment concentration. Using a layer averaged advection-diffusion equation, describing the vertical transport of suspended sediment, the sediment fluxes across the thermocline and sea-bed interface were quantified.

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Track classification : Piloting and artificial intelligence (automated procedures for single gliders or "fleets") ; High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling, sub-mesoscale features, air-sea interactions,...)

Contribution type : oral Presentation

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Track judgments :

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Judgment :

Track : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling

Judgment :

Abstract ID : 33

Towards a virtual AIS system for underwater gliders

Content :

Gliders are increasingly used in coastal water. It is in these waters that shipping can be intense and a collision with a ship becomes a real possibility. The Automatic Identification System (AIS) was developed as an aid to increase the visibility of ships at sea, besides radar systems. With AIS, data such as position, heading and speed are transmitted automatically to near-by ships via radio waves. Being compulsary for larger vessels, these days almost any seagoing ship sports a AIS system. Therefore, AIS would be an ideal system to make gliders visible to other ships too and therefore increase safety at sea.

For technical reasons, however, fitting an AIS transponder on to a glider is not feasible. Therefore, the Helmholtz-Zentrum Geesthacht has been developing a system, in cooperation with the German shipping authority Wasser-und-Schifffahrtsverbund (WSV), that provides virtual AIS to the gliders. Virtual AIS is a setup whereby the AIS message is broadcasted by a station on behalf of an object that has no means of transmitting the AIS message itself. In virtual AIS implementation for the Slocum glider, GPS positions are broadcasted whenever the glider is at the surface and a satellite communication link with the dockserver is up. For the time the glider is underwater, no GPS positional information is available, so that forecasted positions are broadcasted. To forecast glider positions, the system uses a model of the glider that simulates both the behaviour of the glider, based on the active mission configuration data files, and its hydrodynamics. The advection by the currents is accounted for by depth-averaged currents estimated from a two-stage Kalman filter. The Kalman filter accounts for the main tidal component (M2) and uses the depth-averaged current estimates, computed by the glider's dead-reckoning algorithm.

The system was dry-run tested during a two-week glider experiment in the German Bight (North Sea) in August 2013, that is, although no AIS messages were actually transmitted, all generated messages were saved to disk for analysis later. It was found that, despite strong tidal currents of up to 80-100 cm/s, the average prediction error only grows to about a mere 600 m for three-hour dives. This result was acceptable to the German shipping authorities, who decided to start with the implementation of the broadcasting system in the course of 2014.

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Track classification : Piloting and artificial intelligence (automated procedures for single gliders or "fleets")

Contribution type : oral Presentation

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Track judgments :

Track : Piloting and artificial intelligence (automated procedures for single gliders or "fleets")

Judgment :

Abstract ID : 34

Submesoscale frontal processes at the margin of a deep convection area: a case study in the NW Mediterranean Sea

Content :

The NW Mediterranean Sea is known to be one of the few places of the world's oceans, where open-ocean deep convection can occur. This convection is triggered in winter by intense dry northerlies blowing over the ocean surface leading to strong buoyancy loss in the Gulf of Lions area. The deep convection takes place in the center of a cyclonic gyre whose northern part is formed by the Northern Current (NC) and its southern part by the North-Balearic Front (NBF). These two baroclinic flows are related to density fronts that are especially enhanced during periods of deep convection when the offshore mixed layer depth reaches great depths, thus leading to a rich submesoscale frontal activity.

Since 2010, sustained observations of the circulation and water properties of the NW Mediterranean Sea have been carried out by gliders within the framework of the MOOSE observatory (Mediterranean Ocean Observatory System for the Environment: http://www.moose-network.fr/) in particular. During wintertime, they regularly sampled the NC, the deep convection zone as well as the NBF. In gliders data, the NC front and the NBF both exhibit clear evidences of vertical exchanges of tracers. In order to investigate the dynamical characteristics of the front, we estimated the Ertel Potential Vorticity (EPV) based on the glider data. In particular, we found layers of negative EPV that can stretch down to about 100m depth within the stratified part of the NC front. Under such specific conditions, symmetric instability might be able to grow and result in along isopycnal overturning circulations at a prescribed wave length, which is well correlated with the glider observations.

We use a numerical model (Symphonie) to further assess the ability of the gliders to accurately estimate the EPV at the front, and the driving mechanisms being able to significantly extract potential vorticity and trigger frontal instabilities. The model is run in a regional configuration of the NW Mediterranean Sea at 1km horizontal resolution, which is able to well represent the deep convection processes, as well as submesoscale circulation features. In the model, we found that during episodes of strong northerlies, EPV is significantly extracted at the NC front as a result of down-front winds, especially in the western part of the Gulf of Lions. This leads to negative potential vorticity stripes extended in the area of down-front winds down to about 100m depth that last for the short period of a few days. This is similar to the observations made by the gliders and could thus explain the initiation of vertical exchanges of oceanic tracers at the front. These vertical circulations might also have an impact on the heat transport of the NC (and thus on the heat/salt budget of the deep convection), as well as on the biogeochemistry of the basin.

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Track classification : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling, sub-mesoscale features, air-sea interactions,...)

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Track : High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical couplin

Judgment :

Abstract ID : 35

Damage analysis of a ship-glider collision with a finite element method

Content :

Underwater gliders have become a commonly used platform to measure physical and optical properties in the ocean. Besides the open ocean, they are also increasingly used in coastal areas. Using gliders in coastal waters may result in situations where the safety of shipping is at risk. The deployment of gliders by the Helmholtz-Zentrum Geesthacht, Germany, for example, is subject to permission granted by the shipping authorities (Wasser- und Schifffahrtsamt). One of the considerations to issue permission depends on the expected impact the presence of gliders can have with respect to the safety at sea. Currently it is unknown to what extent gliders can cause damage to ships in the case of a collision. The aim of this study is to quantify the stress and strain responses of the glass-fiber reinforced plastic hull of a typical high-speed craft, caused by a collision with a glider and to assess if the integrity of the ship's hull is likely to be lost.

To investigate the impact of a collision, the structural and the mechanical properties are represented by a finite element model for the glider and the hull of the ship. The collision of both structures is simulated numerically for a number of scenarios. The parameters varied for these scenarios are the angle of the glider and the location at impact as well as the speed of the ship. To verify the numerical model setup, a comparison with simplified analytical solutions is made.

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Track classification : Other

Contribution type : oral Presentation

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Track : Other

Judgment :

Abstract ID : 36

Seagliders in a multi-purpose acoustic network in the Fram Strait

Content :

The project 'Arctic Ocean under Melting Ice' (UNDER-ICE), running from 2014 to 2017, aims to improve our knowledge of ocean, sea ice, and biological processes in the Fram Strait, the deepest gateway to the Arctic Ocean. This follows a previous project, ACOBAR, in which a multi-purpose system for acoustic thermometry, low-frequency passive acoustics, and glider navigation was deployed in the Fram Strait for two years. Acoustic tomography builds on accurate measurements of the travel times between positioned sources and receivers, which through inversion provide synoptic depth-range, averaged sound speed. Sound speed is converted to mean ocean temperature and currents over pre-defined ocean volumes at high temporal resolution, but low spatial resolution. Glider data can complement acoustic tomography by providing information with high spatial resolution.

Acoustic tomography data from the Fram Strait showed high temperature variability on time scales associated with oceanic mesoscale processes. By analysing Seaglider data collected in the Fram Strait from 2008 to 2012 under the ACOBAR project we hope to characterize the mesoscale variability in the Fram Strait, and in combination with acoustic modelling describe its effect on the acoustic propagation conditions. Here we present preliminary results from our study using the four years of ACOBAR Seaglider data to investigate mesoscale eddies and meanders in the Fram Strait, with a view to improving the analysis of acoustic thermometry data. We compare hydrographic data from repeated quasi-zonal glider transects along ~79°N with other data from the integrated observational system, and invite discussion of the possibilities and challenges of using glider data to complement acoustic thermometry.

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Track classification : Glider networks, links with observing systems and data dissemination (synergies with other observing networks) ; High resolution 4D oceanic measurements by gliders and process studies(physical and biogeochemical coupling, sub-mesoscale features, air-sea interactions,...)

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Judgment :

Abstract ID : 37

In situ calibration procedure for Aanderaa optodes with a focus on glider oxygen measurements

Content :

Aanderaa optodes are installed on various platforms (e.g. gliders, moorings, floats) to measure the oceanic dissolved oxygen. Here, an in situ calibration procedure for these optodes is presented to acquire field data with high accuracy. The procedure is little time consuming and includes a calibration against oxygen measurements from regular CTD casts (by attaching the optode to the CTD rosette) that are conducted immediately prior to and after the field experiment. In addition, onboard laboratory calibrations are performed to define extreme conditions of dissolved oxygen that are not captured with the CTD casts. The procedure is presented with a particular focus on glider observations.

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Track classification : Developments on glider vehicles, sensors, and "gliderports" infrastructures (on-board capacities, ground-segment)

Contribution type : oral Presentation

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