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Discussions

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Interactive comment on "The Coastal Observing System for Northern and Arctic Seas (COSYNA)" *by* B. Baschek et al.

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Interactive comment on "The Coastal Observing System for Northern and Arctic Seas (COSYNA)" by B. Baschek et al.

Anonymous Referee #2 Received and published: 28 September 2016

AUTHORS: Many thanks for your time and very valuable comments. We have addressed them all in the revised version as explained in detail below.

REVIEWER: *** General comments This paper comes as an introduction about the COSYNA observing system deployed in the Northern and Adriatic Seas by a large consortium, prior to more focused scientific papers in the special issue. COSYNA is presented as an integrated and complete flexible observation system, including remote

observation (satellite, radar) and in situ observations, as well as modelling tools and data assimilation techniques. First, a long description of the areas (Northern Sea and Artic Sea) and of their circulation and hydrological patterns is given. Then, the objectives and the international context are explained, showing the diversity of potential data users (from the scientific community to operational users) and the links with various initiatives at European and international levels. Third, the different components of the system are described in a very detailed way (stations at fixed locations, mobile platforms such as gliders or ferryboxes, satellite products, HF radar data, GPS bird tracking system, models and assimilation tools, oceanographic cruises: : :). In this section, the authors refer to interesting scientific results of previous papers or papers of this special issue. In the following section, a description of the development of new sensors (Alkalinity sensor, nutrient sensor, molecular observatory,: : :) performed in the framework of COSYNA is given. Then, data management and data products are described, as well as outreach activities and stakeholder interaction, insisting on the public and free access to data collected by COSYNA. The last section deals with the future of COSYNA, in particular its spreading toward new areas, new partners and new scientific products and research associated subjects. Overall, this paper gives a lot of details on the system and on the observed areas. The spatial and temporal coverage, the technical developments, as well as the diversity of the systems that are used, make COSYNA an impressive observing system that a lot of scientists would love to have in their research geographical area. However, the paper claims to be exhaustive, which sometimes results in long descriptions that make parts of the paper cumbersome to read. My main concern is thus on the form of the document that requires revision. I would recommend to shorten some sections and remove some figures. Reference to other papers of the special issue should also be emphasized. A few suggestions are provided in the following comments below which may help to address this issue. Reference to other papers of the special issue could also be emphasized.

AUTHORS: The document has been shortened, in particular in the introduction and description of the focus regions. Several figures have been removed.

C2

Interactive
comment

****************** REVIEWER: *** Specific comments: * Section 1 : The lists of COSYNA's partners sprays over 12 lines, which interrupts the reading. Could this information be shortened and details put in another section or in the ac- knowledgments?

AUTHORS: Information has been moved to Table 1

REVIEWER: More could be said about the originality of this system compared to other existing observation systems, and about the research questions underpinning the system. This last point is only approached in Section 3.

AUTHORS: We have tried to highlight this more at the beginning of the paper * Section 2: This section is dedicated to the presentation of the area of observation. A general map containing the two areas, both the North Sea and the Arctic coast, is required. It would also be good to have an idea of the bathymetry in the different areas. Figure 3 is a zoom on a particular area, it would be better to have the location of the station on a larger map.

AUTHORS: Figure 1, showing a map has been completely redone.

REVIEWER: On Section 2.2 the reader has to wait until l.24 of p.7 for a figure of the area, although the same area is mentioned before at l.9. Also, the description of the two areas is too long. This section of the paper should be shortened. For example on p.5, at l.31, are the residual currents useful to the purpose of the paper? (and isn't there any tidal current residual?)

AUTHORS: We have shortened the whole chapter. The residual coastal current paragraph is not included in the new version. The figure is mentioned earlier.

REVIEWER:p. 5 l.14 Currents are not directly dominated by a tide (replace "M2 lunar tide" by "M2 lunar tidal component").

AUTHORS: done

REVIEWER: * Section 5 "Observations" : The idea of this paper is to link previous works with the results presented in this special issue However, more could be made in order to emphasize the new results of the special issue.

AUTHORS: Since this paper is meant to be an overview paper that comprises the various aspects of the observing system ranging from operational observations, to sensor development and data management, outreach, etc. it would be a misbalance to emphasize the new (scientific) results more than addressed in the single sections and associated publications. The location of the stations are often difficult to assess (for example at l.22 p.10 or l.18 p.10) or repeated ships/gliders routes, as Figures 1 and 2 are not sufficient to locate them. Please add a figure with all the fixed platforms of table 2, and refer the reader to the figure in the text.

AUTHORS: Figure 1, showing a map has been completely redone.

REVIEWER: P.10 l.24: explain the link between tidal dynamics and matter budgets.

AUTHORS: This has been clarified: Starting from the Wadden Sea coast line, four stationary systems were installed on poles placed in three tidal basins of the East Frisian and one in the North Frisian Wadden Sea. They provide highly resolved measurements of the tidal dynamics for the COSYNA standard parameters (s. Table 2) and allow the integration of energy and matter budgets over the sampled catchment areas.

REVIEWER: p.11 l. 8-9: Please clarify, as one could understand that it is the viewing angle of one radar that enables getting the surface current vectors from that sentence.

AUTHORS: This has been clarified: Two HF radar arrays are installed at the North Frisian and one at the East Frisian coast with nearly rectangular viewing angle to the other two systems.

REVIEWER: p.12 l.5: add "or trends" after "long term records"

AUTHORS: done

REVIEWER: p.14 l. 16: please give examples of research questions

AUTHORS: Several examples have been provided

REVIEWER: p.15 l. 9-10: The oceanographic sensors described in Section 5.4 are O2, pH, pCO2,: : :.are they really standard sensors?

AUTHORS: the word "standard" was removed.

REVIEWER: p.17 l.15: "subsurface variables"

AUTHORS: changed to near-surface variables

REVIEWER: p.17 l.22-24: the authors list the measured variables, however among the list some are not directly measured by derived from the measure (it is the case for salinity and especially for Chlorophyll-a with the measure of fluorescence).

AUTHORS: We agree and have modified the sentence accordingly: "The recorded variables include temperature, conductivity, salinity (derived from temperature and conductivity), chlorophyll-a fluorescence, turbidity, dissolved oxygen (DO), the partial pressure of CO2 (pCO2), pH, alkalinity, nutrients, and algal groups (derived from patterns of algal fluorescence by excitation at different wavelengths)."

REVIEWER: p.17 l.27-30: the ferrybox is a very nice system, but the maintenance constrains could be mentioned.

AUTHORS: A sentence has been added: "Due to a self-cleaning mechanism, the system maintenance intervals can be extended up to several months."

REVIEWER: Subsection 5.6.3: is there any result obtained yet with the FLUXSO lander?

AUTHORS: The Lander is a recent development. First results can be found in (Figure 16; Friedrich et al., 2016; Neumann et al 2016; Ahmerkamp under review as now specified in the paper.

REVIEWER: p.25 l.4: what about glider surveys?

AUTHORS: this has been added

REVIEWER: p.25 l.6: if the surveys observations are also used for model and remote sensing systems calibration this could be added.

AUTHORS: The in-situ values measured continuously by COSYNA are qualitative not yet usable for remote sensing validation. High precision measurements of Chl-a and TSM were performed for that purpose on selected cruises that are not part of COSYNA yet. A sentence and reference for the modelling has been added.

REVIEWER: * Section 6: p.26 l.26: the reviewer does not agree that the pH is a proxy for phytoplankton and primary production, it has a strong impact on them but it is not directly linked to that quantities.

AUTHORS: This statement has been changed to "pH can be used to estimate a system's state in terms of phytoplankton and primary production in regions of high biological activity, one of four parameters characterizing the oceanic inorganic carbon system, and an indicator for the increasing acidification of sea water."

REVIWER: Subsection 6.7 (p.30): with this passive sampling method, how do you get rid of the influence of the vessel on the measure of metals concentration?

AUTHORS: This is now described in the manuscript "Normaly, the pumped water intake systems is installed at the bow of the ship hull several meters below the sea level thus ensuring that the sampled water body is continuously exchanged due to the movement of the ship and the water is not contaminated by the metal construction of the ship. Alternatively, a metal free pump system can be deployed on a crane several meters away from the ship hull."

REVIEWER: p.35 l.13: "many modelling studies" : please add references.

AUTHORS: References have been added: To include these vertical patterns into

modeling studies requires sophisticated formulations like those by Behrenfeld and Falkowski (1997) or Behrenfeld et al. (2005).

REVIEWER: Figures 7 and 20 (glider and Scanfish pictures) do not have any additional value, I would therefore suggest to remove them.

AUTHORS: Both figure have been removed

REVIEWER: I also suggest to remove Figure 13 (may this figure or the information it contains be found in another paper?)

AUTHORS: Figure has been removed

REVIEWER:*** Technical comments: The figures quality should be improved. Replace "publically" by "publicly" wherever you mention the availability of the data (p.2 l.9, p.3 l.20, p.36 l. 13 and 17, p.37 l. 24) There is an abusive reference to Chlorophyll-a when only fluorescence is measured, please modify. p.12, Title of subsection 5.1: I suggest to replace "fixed-point" by "fixed station" p.10, l. 24: "dynamics is" p. 10 l. 30 : remove comma after "located" p.11 l. 7: "HF radar arrays are" p. 13 l. 10 : "and operated for more than a year" p.13 l. 21 : "at frequency M4" p14 l.23: "analysis of" p.18 l.25 : typo, replace "und" by "and" p.20 l.6-7: "both CTD and ADCP sensors, and with" p.22 l. 14-15: "The aim was to" p.22 l.16: remove comma after "and" p.23 l.1: "The goal is" p.24 l. 4: "adaptation" p.25 l.32: "gliders were" p.27 l. 9: "was achieved" p.28 l.4: "analyzed" or "analysed" p.25 l.16: "depends on factors such as" p.35 l.2: "accounting for" p.39 l.32: "partners" AUTHORS: All of these technical corrections have been made. Thank you!

REVIEWER: Figure 4: please describe what the underwater unit is.

AUTHORS: Description has been improved in text and is referred to in the caption.

REVIEWER: Figure 5: the labels cannot be read, this figure should be improved.

AUTHORS: The Figure has been improved

REVIEWER: Figure 8: stratification in the y label should be the same as in the legend ("_"). The time axis on Figure 8.a mentions the month, however it is said in the figure caption that it is for years 2012 and 2014, please explain. Also, what is the legend at the bottom left of the figure about? What is "b"? The figure caption has been clarified.

AUTHORS: Figure 12: Improve image resolution.

REVIEWER: Figure 14, lower panel: the colorbar labels range from 32 to 36, which is very dubious for the temperature: : :please check if this is not salinity instead: : :moreover, what is the purpose of this lower panel figure? The text does not mention it so it could be removed.

AUTHORS: Caption has been redone: Upper panel: The temporal abundances of the main biota groups assessed with a stereo-optic sensor attached to the Underwater-Node System in Spitsbergen from January 2014 to March 2014. CPUE (catch per unit effort) refer to total number of organisms per group counted per week. Lower panel: The temporal and spatial pattern of salinity in the depth range between 0 to 10 m assessed with one remote controlled vertical CTD profile per day during the same time period when the biota measurements (upper panel) were done.

Please also note the supplement to this comment:
http://www.ocean-sci-discuss.net/os-2016-31/os-2016-31-AC2-supplement.pdf

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