

Interactive comment on “Long-term monitoring programme of the hydrological variability in the Mediterranean Sea: a first overview of the HYDROCHANGES network” by K. Schroeder et al.

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In the following we have copied the referee's comments and our answers are in quotes.

Referee #2

«We thank the referee for his detailed comments, and hope to have modified the manuscript satisfactorily»

This manuscript describes the HYDROCHANGES (HC) network for the study of long term variability of Mediterranean water masses. HC is an initiative proposed during a CIESM workshop almost 10 years ago. In the manuscript, the authors present the HC

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programme, list the contributing institutions and describe the main achievements by reviewing the papers published during the last years and by presenting some figures.

The article is well written and the language is fluent and precise. The overall organization is correct although:

(1) the objectives of the manuscript are not clear enough

«We have now clarified the objective at the very beginning of the paper (in the first part of the introduction, right before section 1.1) with this sentences: “This paper aims at presenting a review of the Mediterranean Sea variability by analyzing hydrological time series collected within different water masses all around the Mediterranean in the framework of the CIESM HYDROCHANGES network (HC hereafter, <http://www.ciesm.org/marine/programs/hydrochanges.htm>). Some of these time series have already been studied, entirely or partially, in a number of scientific papers, while others are presented and discussed here for the first time. For sure it is a novelty that all partners have concurred to provide an overall presentation of all series together, giving a significant contribution to the understanding of the degree of variability, in space and in time, of hydrological properties on the long term in the Mediterranean. In this introductory section a review of the Mediterranean Sea functioning and its variability is given, and some issues related to the monitoring of long-term hydrological variability are discussed. In the remainder of the paper, we review the rationale behind the HC programme, as well as the history and the present status of the network (Section 2). Sections 3 and 4 are dedicated to the presentation and the discussion of the observations collected so far in the HC framework. Section 5 points out improvements that are envisaged and provides some concluding remarks.”»

(2) section 1 and section 2 do not follow a logical structure and are excessively long (see details below).

«See details below (merging of section 1.3. and 2.1, and shortening)»

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In my opinion this article is suitable for publication in its present form as a Discussion paper in Ocean Science Discussions but not as a research paper in Ocean Science, since there are certain important issues that need to be addressed. First, I think that the manuscript should be resubmitted as a review paper that would synthesize the results obtained by previous authors on changes of deep-water masses in the Mediterranean Sea and discussing the implications and links at a basin scale, which are indeed very relevant for climate change studies.

«We have put all our effort to address these issues, trying to satisfy both referees, and are going to resubmit an amended version that would hopefully be suitable for publication in OS. As stated also in our response to the first point raised by the referee, one point of interest, clarifying that this is a research paper, is the novelty of most data presented and the fact that these are presented for the first time together, so as to draw a composite image. This is now put in emphasis at the very beginning of the paper (see before).»

Second, in the present version of the manuscript, too much emphasis to the HC initiative (which is already dating about 10 years) is given. As far as I understand, each of the monitoring sites has been funded by different sources and projects and not only by HC.

«It is true that the HC workshop was held in 2002, i.e. 10 years ago. But it is important to clarify that HC is mainly aimed (even if not only) at addressing long-term variability. We thus have to deal with space (the whole sea, or at least a whole basin) and time scales (season/year) that need, to correctly appreciate the interannual variability, to have time series at least a few-years long, in order to have results to show and discuss. Also, as is discussed in section 2.2 ("Present status and monitored sites") it took some time to build up a network of sites (the moorings were not all deployed in the same year at the beginning of HC). We believe the emphasis to the initiative is adequate and deserved. The time scale of the processes we are interested in is long, so it is the time scales for dissemination of results. Unfortunately this is the "fate" of long term

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observations: immediate results are not expected, and, as stated also in the paper (see section 5), this is why it is often difficult to get proper and sustained funding, even though sustained long term observations have been described as the most powerful tool for the identification of climate change effects*. One aim of our paper is thus also to show the HC potentiality and try to encourage other potential partners to get additional funds to elaborate a sustainable monitoring network of the sea, which is the only way to provide a sound counterpart to the meteorological network and to provide reliable information about how climatic changes are occurring in the sea. For these reasons we do not agree with the referee on this point that it is of no interest 10 years later to write a paper under the HC umbrella.

* See Send, U., Weller, R.A., Wallace, D., Chavez, F., Lampitt, R.L., Dickey, T., Honda, M., Nittis, K., Lukas, R., McPhaden, M., and Feely, R.: OceanSITES, in: Proceedings of OceanObs'09: Sustained Ocean Observations and Information for Society (Vol. 2), Venice, Italy, 21-25 September 2009, Hall, J., Harrison, D.E. & Stammer, D., Eds., ESA Publication WPP-306, doi:10.5270/OceanObs09.cwp.79, 2010.»

Further, there is neither a common web portal to distribute the data nor common QC protocols. Thus, I cannot see the interest of writing an article under the umbrella of this initiative, given the fact that a well-defined interaction between the different partners is missing.

«(see also comment above) There is a common webpage, which is continuously updated with relevant information and news. Even though the webpage does not indeed distribute data, it contains the necessary metadata and the potential user can easily find contact information to obtain data from a specific site. In our opinion, considering the scarcity of funds, these results are much more than one could have expected at the beginning of the programme. Concerning partner interaction, we believe there is a high degree of interactions, as you can see considering that several moorings are co-managed by multiple partners (this is periodically highlighted also in the News section of the webpage, see also section 2.2). In addition, during the CIESM congresses,

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specific meetings between HC partners are held, focused both on technological aspects, sharing of instruments, and research themes (see paragraph 2.1). All these facts, among others, denotes that there is indeed interaction between partners.»

Third, I suggest reorganizing Section 1 and Section 2 in Introduction and Data and Methods (more details are given below) and also reducing the information related to HC by referring to the website and/or to the documents already published as a CIESM monograph.

«See details below (merging of section 1.3. and 2.1, and shortening)»

SPECIFIC comments: 1) Title and throughout the text: it is not clear if the focus of the article and HC is only deep waters or if covers the entire water column, in which case the inclusion of other data (e.g. satellite data, gliders,. . .) should be explicitly mentioned in the text.

«HC is dedicated to the monitoring of the water masses in key points for studying the functioning and long term evolution of the Mediterranean. In the paper we don't say that we focus only on deep waters, and the title correctly says only "long-term monitoring of hydrological variability". Indeed the Gibraltar, Sicily, Corsica moorings are not at all deep but focus on intermediate and even surface water. The referee is right that in this case also other data have to be mentioned, and this has now been done in paragraph 2.1 »

2) Section 1.1, L 19: references on mesoscale variability in the Mediterranean Sea are missing.

«Ok, here we have added a reference to this paper,

Pascual, A., Pujol, M.-I., Larnicol, G., Le Traon, P.-Y., Rio, M.-H., 2007. Mesoscale mapping capabilities of multisatellite altimeter missions: first results with real data in the Mediterranean Sea. *J. Mar. Syst.* 65 (1–4), 190–211.

Actually also the subsequent reference to the book chapter Schroeder et al. , 2012, C1182

contains the circulation scheme including mesoscale features (in the chapter itself there is a section dedicated to the mesoscale circulation variability)»

3) Section 1.3, as stated above, this section should be summarized and merged with the rest of the introduction. The title does not correspond with the contents as many of the other initiatives mentioned such as MFSP, DYFAMED, RADMED,. . . are not part of CIESM. Further, the list of initiatives should be completed adding Argo, coastal observatories(JERICO), HYMEX, ENACT-ENSEMBLES, SeaDataNet. . .

«We have merged the paragraph 1.3 (which no longer exists) with part of the introduction, and with the following section 2.1 (which now is called "history and rationale of the CIESM initiative"). It has also been reduced, since some information were actually repeated in 2.1. We hope that this has been done in a satisfactory way to the referee, and we thank for this advice, since it made the text quite easier to read. Overall the section 2 has been called "data and methods", as suggested by the referee. Also the list of initiatives has been complemented: ARGO has been cited, as well as Hymex, and for coastal observatories we cite the I3 project JERICO. However, since we were listing complementary observing systems / programs, we did not add ENACT and Seadatanet.»

4) Section 2.1-2.3: idem as point 3). I suggest explaining only very briefly the initial objectives of HC (L 15-20).

«Section 2.1 has been rewritten, since it has been merged with the no longer existing section 1.3, and some repetitions were eliminated in this way. The other two sections were shortened only slightly, since our objective was also to describe the network, along with the data it collected over the years. »

5) Section 2.2-2.3: these two sections could be merged to a single section entitled something like 'Data and methods'. Please indicate if common QC protocols and data formats among the HC network have been established.

«The whole section 2 has been called “Data and Methods” as suggested by the referee. 1.3. has been merged with 2.1, but in our opinion it was better to keep 2.2 and 2.3 separated, since they are dealing with different aspects, one is the timeline of the implementation of the program (from which the referee can see that actually the program is not really 10 years old, indeed the last moorings were added to the network in 2010) and the other explains the common QC protocols and HC requirements as requested by the referee. »

6) Figure 1: please add the name of the different areas described in Section 3.

«OK, we have added the names of the sections also in the figure»

7) Section 3: Northern WMED: the importance of WIW should be mentioned (in case the focus of the paper also includes intermediate waters).

«Done, with the sentence “The mooring installed at the head of the CCC (at 315 m depth), at a level generally occupied by WIW/LIW “

WIW has now also been mentioned in the Introduction with this sentence:

“In addition during milder winters the DWF areas see the formation of other intermediate water masses (e.g. the Western Intermediate Water, WIW, and the Cretan Intermediate Water, CIW, see Millot, 2012).”»

8) Concluding remarks: the links with other initiatives (e.g. HYMEX, SeaDataNet, coastal observatories JERICO, . . .) could be mentioned as well as the future plans of HC. Is it envisaged to expand the network by including other institutions?

«This link has been added (see previous comment), including Argo, hymex, coastal observatories. The future plans of HC are detailed in this section as well: “Future commitments to improve the HC network comprise the inclusion of moorings in other key regions which are not currently monitored, possibly including additional institutes and favouring the participation of partners from the southern Mediterranean shore. The joining of a new partner to the network is done on a volunteer basis, and interested new

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mooring managers just need to contact the coordinators.” and following sentences detailing where the missing key sites are, that should be included in the future, the plans for a higher homogeneity of procedures among partners, the plans for setting up data and meta-databases for HC partners, the plans for favoring combined analysis of simultaneous time series in different places by more partners .»

Interactive comment on Ocean Sci. Discuss., 9, 1741, 2012.

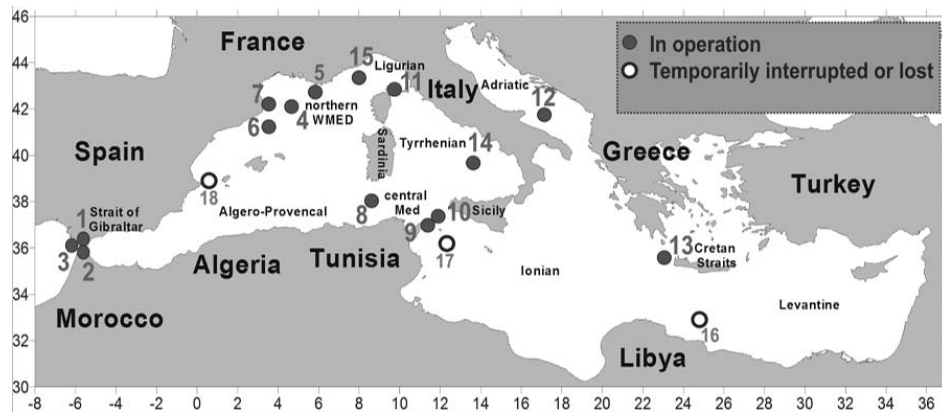


Fig. 1. Revised version of figure1