Response to reviewer's comments 9 February 2018

The authors would like to thank the reviewer for the comments and suggestions for the improvement of the manuscript.

Please see below is *our response (in italics)* and the *changes (in red)* following the **reviewer's comments (in bold).**

Athanasia Iona, on behalf of the authors' team.

Comments by Referee #1

General Comments. The paper is presenting a new climatological atlas of the Mediterranean Sea and discussing its quality. The authors are well presenting the problems related to different data collected with different technologies and to the uneven distribution of data. The methodology applied to calculate the climatologies is particularly useful in these cases. The Mediterranean is a semi-enclosed concentration basin with dense and deep water formation. The reduced Rossby radius and the high mesoscale variability should be discussed: how do they influence the data variability. The selection of the grid size is some sense is also filtering out some phenomena. A short discussion on a such effect would be beneficial for the future use of the climatologies.

Reply to the reviewer:

The climatological analysis of large historical data collections using the variational methodology is not very sensitive to the correlation length scales (Brankart J.M. and Brasseur P, 1997) since the spatial data coverage is such that the corresponding information is already contained in the data and the data variability is empirically taken into account when optimizing the correlation lengths.

The reviewer is of course right that mesoscale features are filtered out. However it is not primarily the spatial grid but the time averaging used to define the analysis periods which filter out those processes.

To clarify we will add the following text:

The climatologies provided cannot rely on sufficient high frequency and high resolution data to allow resolving mesoscale features which play an important role and modify the large scale flow fields (Robinson et al, 2001). We focus thus on the seasonal and decadal variations. This time filtering also results in a spatial filter as later shown by the spatial correlations found in the data. The spatial scales the data can capture are of the order of 300-350 km at the surface, much larger than the Rossby radius of deformation scale (10-15 km) associated with mesoscale motions (30-80 km, Robinson et al, 2001). These mesoscale features are thus filtered out from the analysis and hence the numerical grids we will use only needs to resolve the large scales. The same holds for the output files, where there is no reason to save at very high resolution (much smaller than the deformation radius) as in any case the analysis provides large scale fields.

Specific comments. In the abstract it is cited the original source of data (https://doi.org/10.12770/8c3bd19b-9687-429c-a232-48b10478581c) and not the climatologies produced by the authors: this should be changed. Furthermore, data source is accessible only through a password. Indications on how to access them must be provided.

Reply to the reviewer:

In the revised manuscript, at the abstract, next to the original data source citation the links for the access of the climatologies will be added, namely: "The climatologies in netCDF are available at:
Annual Climatology: https://doi.org/10.5281/zenodo.1146976;
Seasonal Climatology for 57 running decades: https://doi.org/10.5281/zenodo.1146938;
Seasonal Climatology: https://doi.org/10.5281/zenodo.1146953;
Annual Climatology for 57 running decades: https://doi.org/10.5281/zenodo.1146957;
Seasonal Climatology for six periods: https://doi.org/10.5281/zenodo.1146966;
Annual Climatology for six periods: https://doi.org/10.5281/zenodo.1146970;
Monthly Climatology: https://doi.org/10.5281/zenodo.1146974."

Concerning the indications on how to access the data source, in section 2.1, at the end of the first paragraph it will be added: "Users have to register in the Marine-ID (https://users.marine-id.org) to get an account for downloading the SeaDataNet V2 data collection. Registration is done only once and thereafter users can have access not only to SeaDataNet but all EMODnet and Copernicus marine data services."

In the abstract a sentence should have an additional information (lines 17-18): especially in critical areas of interest such as the Marine Strategy Framework Directive (MSFD) regions AND SUBREGIONS.

Reply to the reviewer:

In the revised manuscript it will be added the additional information "and subregions." as requested.

In the Introduction the physical characteristics of the Mediterranean water masses are presented: the authors should specify the unit of the salinity and, if it is in absolute salinity, how the old values have been transformed.

Reply to the reviewer:

The unit of the salinity is in ppt. In the revised version of the manuscript, the unit of the salinity (ppt) will be added where it is appropriate.

line 20, instead of Temperature and Salinity values, for the Cretean Sea waters the density has been provided: to be coherent, also in this case T and S should be provided.

Reply to the reviewer:

In the revised manuscript the mean density value there will be replaced by the mean temperature and salinity values namely "S~39 psu, T~14.8 ^{o}C"

line 33 it is mentioned a V1.1 version of the Simoncelli climatology: it is V2. Correct the value also in other places.

Reply to the reviewer:

We are sorry, there is an error at the link provided at line 33 of the manuscript while the mentioned version V1.1 is correct. The SeaDataNet climatology is based on V1.1 collection while this Atlas is using the newer version V2 which includes more data. The correct link to be included at line 33 of the revised manuscript is "http://doi.org/10.12770/cd552057-b604-4004-b838-a4f73cc98fcf"