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Interactive comment on "PROTEVS-MED field experiments: Very High-Resolution Hydrographic Surveys in the Western Mediterranean Sea" *by* Pierre Garreau et al.

Anonymous Referee #2

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This paper describes a unique dataset from towed instruments aiming at resolving the sub-mesoscale during several cruises in key areas of the western Mediterranean. The originality of the approach consist in the higher degree of synopticity compared to autonomous gliders, or ship measurements. The dataset resolves the upper 400m of the water column and covers a broad range of processes (eddy, front, convection...), which makes it very relevant for the community.

In a general manner, the paper is well organized and provide most of the requirements to be published in ESSD. However, I have some minor comments, mostly related to style and references, to make it clearer, consistent and easier to read.

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Discussion paper

L25 missing ,

L29 "peculiar objects" prefer particular processes ; a MVP

L30-32 ... to access even higher resolution the ocean physics (temperature, salinity, currents). Biological sensors were opportunistically used to provide ...

Throughout the paper : opportunely -> opportunistically

L33 the fine-scale processes

L35 properly résolve

L43 connecting ... to ; energy cascades to small scales and reversely

L44 For instance in the northwestern Mediterranean ; chlorrophyll-a

L46 vortices

L50-55 partly fill these gaps between the large and finer scale dynamics. Since many years, remotely ... observe a large ... soon by the future Surface Water and Ocean ... mission (SWOT), expecting to provide ... small-scale processes ...

L59 in a context of ocean physics I would use km instead of nautical miles.

L63 looks at ; are described

L66 Oceanic context of the

L68 is sometimes referred as a "lab-ocean"

L70 "nearby" did you mean close to Land? Accessible?

2.1 General circulation : you aren't describing the thermohaline circulation very much...

L74 sub-basin circulation ; what to you mean about dominated? Please rephrase.

L75 basin or sea, not both ; Light (fresh) Atlantic Water

L76 generally circulates along the continental slope ... western and eastern basins

L77 The slope ... Algerian coast

L79 and throughout the paper, no caps for western basin etc

L77-79 These lines fit better to 2.2

L79 northern part

L80 Ligurian Sea ; Northern Current is more often found (please modify consistently throughout the paper).

L83 (sounds more logic in this order) The generally accepted concept of the Northern Gyre flowing cyclonically around the doming of isopycnals of the deep convection area of the northwestern Mediterranean (please cite a ref about the general circulation). The existence, position and strenght of the return flow of this gyre ...

L84 (LIW), a mode water ...basin entering the western ... , follows pattern (again please provide ref)

L87 This important water mass is marked by a relative ...

L93 indicator of ; because the scale of surface-intensified eddies in geostrophic balance ranges a few ...

L95-96 topography ; whose size is close to the local ; observed in the Western Mediterranean (also cite Testor and Gascard 2003, 2006; Bosse et al 2015, 2016)

L97 contrasted in terms of what? What's the point of reference? Subtropical regions might not be comparable, while polar regions would tend to exhibit similar characteristics with density compensated contrasts.

L99 Submesoscale (tends to be found in one word in the litterature, please correct throughout the paper)

L101 marked by frequent strong wind évents ... northwestern basin ... with the NC and

mesoscale structures and generate ... (No need for PV acronym if not used afterward) ... please the relevant litterature : Bosse 2015, Estournel et al 2016, Giordani et al 2017, Testor et al 2018

L104 a place ; for a long time (cite for instance MEDOC group et al 1979, Schott et al 1996, Houpert et al 2016, Testor 2018)

L106 both models ... and observations ... show

L108 due to the deepening of the mixed layer

L111-115 ... are only partially resolved by usual ... ; repeated glider lines (instead of glider fleet) ... in the Western Mediterranean, in particular as part of the multi-platform ... MOOSE (rather cite Coppola et al 2019). Intensive targeted ... the dynamics of the deep convection area in the northwestern Mediterranean Sea (Estournel et al 2016).

L116 glider lines

L117 opportunely

L121-122 please sort references in chronological order

L126 prefer 15-30 km/day than nautical miles

L130 sampling of

Proposition of section/subsection titles: 3 The PROTEVS-MED field experiments 3.1 Objectives 3.2 Cruises

L146 key regions of the basin ; North Balearic Front

L147 "assessments of numerical simulation" is not very clear... What kind of simulation? How?

L148 please avoid modal weddies which is not defined earlier ; surface and subsurface mode water eddies (including SCV)

L149 meanders and filaments

L151 observe and characterize

L155 prefer platform to vectors... Also in other occurrences in the paper

L158 across strong thermocline ; shipborne CTD casts.

L161 SHOM?

L164 ship CTD

L166))

L168 dataset of all

L171 to detect and track mesoscale structures during the cruises.

L178 paid to cross-slope transects

L180 please refer to table 2. Apparently surface drifters were deployed during every cruise. Since it is not only the case for the first one, it feels odd to mention it here and not for the others.

L183 Balearic Sea (please check capital letters for the rest for the rest of the paper).

L185 therefore led ; mostly carry out ship CTD casts

L188 with caution, as they caused an excessive ...

L193 origin of the NC where the flow through the Corsica Channel and the WCC join.

L194-195 This latter ... current. I am not sure about what the authors are trying to say here.

L195 in early spring

L196 to capture an Algerian Eddy

L198 also provides insights about ; Northern Current

L203 eddy tracking tool

L204 consecutive to a strong Mistral gust, ...

L206 (WIW) formation were ... ; A SCV was

L212 release

L213 what is the acronym of SPASSO?

L215 mushrooms-like structures -> do you mean dipolar structures ? ; fronts ; focus was given to the area south of Mallorca where

L216 a front was detected ; Lagrangian diagnosis

L218 "A Lagrangian round-trip strategy" I dont know what this is...

L230 a RDI 150khz ... Was the LADCP profiles acquired by a pair of those instruments?

L232 LADCP data were processes following thé inversion mehod of Visbeck (2002).

L236 The main instrument used was a SeaSoar ...

L238 a WET Labs WetStar chlorophyll-a fluorometer

L239 attached to ; profiled cable ?

L240 give scale in km

L242 range of sampling ; real-time

L244 please provide km too ; crossing numerous and various structures ... (see section 5), ... fine-scale patterns

L248 Avoid the use of underscore while refering to cruise name in the text and be consistent throughout the paper ; During the PROTEVS-MED 2017 cruise, a ...

L250 half a

L251 when the instrument is surfacing

L253 what is the conclusion of the comparison?

L258 allowed for real-time

L259 what is the horizontal resolution in km?

L263 what do you mean by "induct"? ; contributed

L271 on R/Vs Pourquoi pas ?, Atalante, Beautemps Beaupré ; are 150kHz and 38kHz Ocean Surveyor by RDI Teledyne

L291-292 ship CTD and SeaSoar ; SHOM? (please be consistent with capital letters) ; bath, whose temperature can ...

L298 with SBE 35's : do you mean by several SBE 35? In that case how many?

L304 tested against Autosal and Portasal salinometers.

L310 the provider ? You mean collaborators who provided the instruments ? An easy process would be to compare in the TS space the data from MVP and RapidScan with calibrated ship CTD casts...

L320 Level 0 (L0) consisting in ... Level 1 (L1) displaying ... standards units and corrected from eventual drift of sensors ... Level 2 (L2) proposed as ...

L334 and the corresponding author? Or provide an adresse/url to get the data. It would be nice to have a contact point without having to look for it.

L338 also 100m

L339 Lagrangian

L340 deployed with dedicated sampling rate. Please specify the range of temporal sampling, of the parking depth, and for how long.

L344 (see table 2)

L356 provided ... It was also possible to simultaneously observe.

L357 "showing the predominance ... (few kilomètres)." Without further demonstration, I would remove that strong and general assessment. (In general, please use past tense for data description and present for interpretation.)

L358 were patchier

L360 appeared ... described and are actually made of

L362 dual-core anticyclonic eddy was observed

L363 three-core eddy was also

L364 remains to be investigated

L365 pre-existing eddies

L366 reveal filaments and layered structures due to submesoscale (ageostrophic) dynamics

L367 symmetric instabilties -> what about stirring by the mesoscale eddy field, frontogenesis ...? There is no evidence here of one prevalent process... Please draw instead a list of relevant potential mechanisms.

L369 Northern ; a SCV of LIW was observed south of Toulon. Do you have evidence of swirling currents by VMADCP?

L371 was paid to the NC

L372 SCVs generated in the deep convection area.

L375 of the deep convection area

L376 showed small-scale structures likely formed by convection ; the north to the south

L378 convection chimney

L380 double-diffusive processes ; please cite existing references related to double-diffusion in the Western Mediterranean.

L382 Cap Creus

L384 cold water originating from the Gulf of Lion's shelf (please correct Gulf of Lion in future 1 too) ; The WIW was progressively entrained and mixed with the AW and LIW while flowing south ; Please add a word and a reference to dense shelf water cascading (e.g. Durrieu de Madron et al, 2013).

L397 the fine-scale dynamics

L401 It also complements the repeated glider lines maintained in the framework of the MOOSE observatory (Coppola et al, 2019) and is usefull to design future combined multi-plarform experiments.

L403 different instruments to obtain high-resolution

L404 transects have been

L405 has only been tested and used as ...

L409 perfect tool to identify mesoscale structures ...

L410 down to

L411 describe important surface and subsurface dynamical features.

L413 free-fall instrument, its setting is lighter

L415 equation and hydrography.

L417 of the sensors ... , this experiment of fast and ... revealed ... (Garreau et al, 2018)

L429-430 and the back and forth ... fruitfull. Not clear, please rephrase.

L421 knowledge of the mesoscale and smaller, filling some ...

L422 gains ; meters), sub-mesoscale ... starts to be resolved ... This dataset of observations at similar resolution ... simulated secondary circulations.

Figure 1 : you could consider putting names of main currents on the map for the reader who won't necessarily be familiar with the region.

Figure 2 : are there all the sensors used during the campaigns?

Table 2 : Argo floats ... deployed

Figure 3 : Dual-core observe in the NBF during XXX (name of cruise and year) ... Three-layer Eddy ... (Name of cruise instead of year) ... Front of XX -> observed off XX ... NC position and intensity (from which instruments and depth?) cross-front transect of the NBF ... double-diffusive staircases ... patch of cold ... Catalan Shelf ... in the data repository. Please also consider redrawing the figure, axis labels are lying ontop of each others.

Reference :

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Coppola, L., P. Raimbault, L. Mortier, and P. Testor (2019), Monitoring the environment in the northwestern Mediterranean Sea,ÂăEos, 100,Âăhttps://doi.org/10.1029/2019EO125951

Durrieu de Madron et al, Interaction of dense shelf water cascading and openâĂŘsea convection in the northwestern Mediterranean during winter 2012, GRL 2013

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