

Comments on the manuscript entitled « Wind, waves, and surface currents in the Southern Ocean: Observations from the Antarctic Circumnavigation Expedition », submitted by Derkani et al, to Earth System Science Data, oct 2020.

General comments

This manuscript presents an observation data set of surface wind, surface waves and surface currents obtained during a 3-month oceanographic expedition in the Southern Ocean. The most original part of this data set was obtained by analyzing marine radar observations (radar WAMOS_II) carried out from the research vessel.

It is a very good initiative to publish the details on this data set. Indeed, first, the number of local observations in this part of the oceans is very scarce, and there are not so many oceanographic research cruises. This hampers many scientific studies focused on this region and more generally studies in conditions of high wind and high sea-states. More generally, field observations of surface wind, waves and surface current remain very important to progress on several topics related to the air/sea interface as :

- better understanding or quantifying physical processes related to surface ocean waves (wave/wave interactions, wave/current interactions, wave/ice interactions, impact of wave on turbulence and ocean/atmosphere fluxes,
- improving numerical modelling (wave models and/or coupled atmospheric/wave/oceanographic models),
- validating and improving satellite products on wind, waves and current, particularly in extreme wind and wave conditions.

So it is very likely that the data will be used in future by scientist not involved themselves in this field campaign.

The manuscript is well organized and provides the main information to future users of the data set. Maybe, as suggested by the topic editor, more information could be given in the abstract and conclusion on the questions already addressed by the PIs of these measurements, and those that could be addressed in the future by external users.

In general, the methods and materials are well described. Some details are lacking but can be easily added (see below specific comments). References to instrumental design and processing methods are also pertinent (except some, see, below specific comments).

I checked, on some examples, that the data files are accessible and well documented. There are two documentation pages associated to the DOIs and an easy access to the data files through a structure in directory /sub_directory/files organized by dates. Maybe a general calendar could be added so that a user can see immediately if data sets exist on their dates of interest. Also, one information which I could not find is: do you include somewhere in your data sets, the information on the sea-ice cover? (could be interesting if available)

A validation of the data set is presented in the manuscript, at least for what concerns the wave height (comparison with satellite data). For the other parameters, due to the lack of concomitant independent observations, I do understand that the validation remains limited. However, I suggest to add here some references to previous publications on WAMOS –II data sets to let the reader know what are the expected performances or known limitations on other parameters of the data set such as dominant wave direction, dominant frequency, directional spread, surface current.

Overall, my recommendation, taking into account the specificity of the ESSD Journal and its focus on original research data sets furthering the reuse of high-quality data, is to accept this manuscript , provided that some minor revisions are carried out, to answer my specific comments below.

Specific comments

- section 3.1, line 97: more details should be added on the type of wind sensor, its position on the vessel, the height measurement, the calibration procedure
- line 120: please give more details on how the shadowing effects and tilting effects are removed. Is it a correction of a filter based on data quality control? How many data sets are eliminated by this procedure?
- line 124 and following: the method for rescaling the wave spectrum deserves more details. Indeed, I could not find details on this rescaling in the Young et al, 1985 publication. Furthermore, other publications on WAMOS, like the one of Nieto Borge et al, 2004 mention that this type of rescaling may not be fully appropriate, as the Transfer Function between image intensity and wave heights depends on the wave number of the ocean waves. Could you comment on that in the manuscript?
- line 132-133: please give details or references on how the partitions were estimated (method of partitioning, external data used in the partitioning if any - like wind speed and wind direction,...)
- section 3.4: I am surprised that only ship data are used to build reference values of significant wave height H_s . You do not have any possible comparison with buoy data when the ship was in coastal regions? Using ship IMU data as reference to obtain H_s does not seem so trivial as shown for example by Nielsen and Dietz (see e.g. "Estimation of sea-state parameters by the wave buoy analogy with comparisons spectral wave models », Ocean Engineering 2020) . In the ship to wave spectral transformation, do you take into account the possible non-linearities of the ship response, the effects of ship speed, of direction of waves with respect to the ship heading,....? More details should be added in this section. On the other hand, I must admit that the a posterior validation using satellite significant wave heights, as presented in Fig.7, is convincing
- Section 4.1 comments about the statistics on current: You have omitted to mention that the current from satellite altimeters are not surface currents but geostrophic currents.
- section 4.2? lines 204-207: please , indicate how the raw wind measurements were converted into ten meter-height winds (U_{10}), and what is the duration of integration of the raw data.
- line 223-224: it is strange that the only references that you give to mention the oceanic directional distribution of waves come from wave tank measurements. Could you add some references on field measurements?
- line 240: here again , mention that the current measurements from WAMOS-II and the climatological currents estimated from altimeter data do not represent exactly the same geophysical quantity.
- lines 270-273: you could mention that on these examples, SAR does not detect the wind sea, in opposite to WAMOS-II data.

Technical corrections

- Figure 5: you could mention in the legend that the circles in dashed light lines (hardly visible) are plotted every 15° in latitude
- Line 201: "pattern" (instead of "patter")

- Figure 8 i) the marks for the scales are not visible (circles in wave number or frequency) ii) Also could you add the wind direction on these polar plots