

Thank you very much for your very relevant comments. In the following text we present your comments followed by our answers and the modification that we propose following your comments to the final variant of the manuscript.

#### **Referee's Comment 1**

Font Size: Sections and Figure captions should have larger font sizes.

#### **Authors' answer**

Now corrected in the final version.

#### **Referee's Comment 2**

page 1, Line 5-10, authors' superscripts (1-5) don't match notes: 1,5,3,4,4 of authors' institutions.

#### **Authors' answer**

Now corrected in the final version

#### **Referee's Comment 3**

page 4, lines 15-20; The discussion of the ocean currents, is a bit confusing, as to exactly which ocean currents are used by the OCEAN-SAR. I assume that is due to the production cycle of the model (see <http://medforecast.bo.ingv.it/>), which rotates throughout the week. Also, used of the term 'employed', is unclear, suggest 'used by' or 'accessed by OCEAN-SAR'

#### **Authors' answer**

We agreed with the Referee's comment and we have corrected the paragraph as following:

'Advances in high-resolution ocean operational forecast (Pinardi et al. 2003; Oddo et al. 2006; Tonani et al. 2008) for the Mediterranean Sea, nowadays delivered by the Copernicus Marine Environmental Monitoring Service (CMEMS) Mediterranean Monitoring and Forecasting Centre (MED-MFC), are available providing each day accurate hourly frequency forecasts for the next five days and every week analysis of the last week. Analyses are produced thanks to the data assimilation system (Dobricic et al. 2004; Dobricic and Pinardi 2008) which is correcting the model results with observations (e.g. Sea Level Anomaly, Temperature and salinity profiles). The MED-MFC analysis and forecasts can be used by SAR models.'

The term 'employed' has been substituted by the term 'used by' in all the paper.

#### **Referee's Comment 4**

Page 6, lines 18- 20; this discussion on SeaOverLand and lwseed should be a higher level, instead of referring to these routines or sub modules, state what is accomplished with these routines. SeaOverLand extrapolates data near the coast. What data? sea currents, particles, wind? 'lwseed' is mentioned here and only here, no real need for it at all. Perhaps something along the lines of "The initial positions are randomly generated for LKP before passing to the drift trajectory module of OCEAN-SAR"

#### **Authors' answer**

We have better specified the actions performed by the routine SeaOverLand, we would prefer to keep the name of the routine since it synthetically presents the concept of the procedure that optimally extrapolates the wind and ocean from the ocean point into the grid points closer to land. We have added the following text to the paragraph:

"The wind and current data at sea are extrapolated the ocean data towards the coast using a procedure called SeaOverLand (De Dominicis et al, 2013; Mannarini et al, 2016), which performs an extrapolation of the original data considering for each cell grid point an average of the 8 nearest values and then doing different iterations. This procedure optimally fills, for the currents, the gaps



that remain between the ocean model domain and the high-resolution coastline. Moreover also the wind data over the ocean model domain are extrapolated over the land point to ensure that the simulation is performed with data of wind over the ocean and is not affected by wind over land. Then a high-resolution mask is applied to remove the part of the extrapolated ocean data on land.”

As mentioned in the text above we have added the following references:

De Dominicis, M., Pinardi, N., Zodiatis, G., and Lardner, R.: MEDSLIK-II, a Lagrangian marine surface oil spill model for short-term forecasting – Part 1: Theory, *Geosci. Model Dev.*, 6, 1851-1869, 2013.

Mannarini, G., Pinardi, N., Coppini, G., Oddo, P., and Iafra, A.: VISIR-I: small vessels – least-time nautical routes using wave forecasts, *Geosci. Model Dev.*, 9, 1597-1625, doi:10.5194/gmd-9-1597-2016, 2016.

In addition we agreed with the Referee’s comment on the “lwseed” and we have corrected the paragraph as following:

‘The initial positions are randomly generated for LKP in a circle which radius is set-up by the user before passing to the drift trajectory module of OCEAN-SAR. For every step an error management procedure is implemented that for the moment being will kill the job and give the message to the UI.’

#### **Referee’s Comment 5**

page 6 lines 21-22: suggest the following: ‘For every step an error management procedure is implemented that may cause the processing to stop, killing the job, and will post an error message with details to the UI.’

#### **Authors’ answer**

We agreed with the Referee’s comment and we have corrected the paragraph as suggested.

#### **Referee’s Comment 6**

page 8, line 9, “LKP (start position, end position, start date, end date)” in the present online version of OCEAN-SAR only LKP (start position and start time) are available. Do the authors have a different version of OCEAN-SAR? If so, perhaps, the paper should include a reference to the version (or date) of OCEAN-SAR they used.

#### **Authors’ answer**

The Referee is correct and he has identified an inconsistency in the text. The Authors have only one operational version of the OCEAN-SAR and others for the research and development activities. The Authors, following the referee comment, propose to name the version of OCEAN-SAR as OCEAN-SAR ver 1.1 and date it May 2016. In this way when we will include new improvements in the code we will release a new version with progressive numbers and date.

We propose to add the following text in line 6 of page 8:

‘The version of the UI presented in this paper is referenced as OCEAN-SAR ver 1.1 and dated May 2016.’

We have also corrected the text at page 8, line 9 as following:

‘Last known position (start position and start date);

since we are not using the end position and end-date in the OCEAN-SAR ver 1.1

#### **Referee’s Comment 7**



Section 5 Real Case Scenarios Figures or photos of any of the search objects used in the case studies would be useful.

**Authors' answer**

Italian Coast Guard has provided the photos of the exercise Calabria#1 and Calabria #2. The rest of the photos related to Migrants were not available for.

**Referee's Comment 8**

Table 1: Calabria#1 (SAR dummy) is Class 7, when this should have been Class 1, or my recommendation Class 6 PIW deceased. Calabria#2 (raft), switched Class1 with Calabria#1. Should be Class 7. Why is there a Seeding End Time and Position for this? Where both the SAR dummy and the raft deployed at the same time and location?

**Authors' answer**

We have noticed that there is a mistake in the text, the table is correct. Calabria 1 is the raft and Calabria 2 is the dummy. The text has been corrected. We have done a new simulation as suggested using object class 6 for Calabria 2. The difference is small. Figure 10 has been substituted with the new result of the simulation (Calabria 2 object 6). Both the SAR dummy and the raft were deployed at the same time and location as it is presented in table 1.

The seeding end time is not from the case Calabria#2, it is an error in the table. The seeding end time is for the Ferry test case.

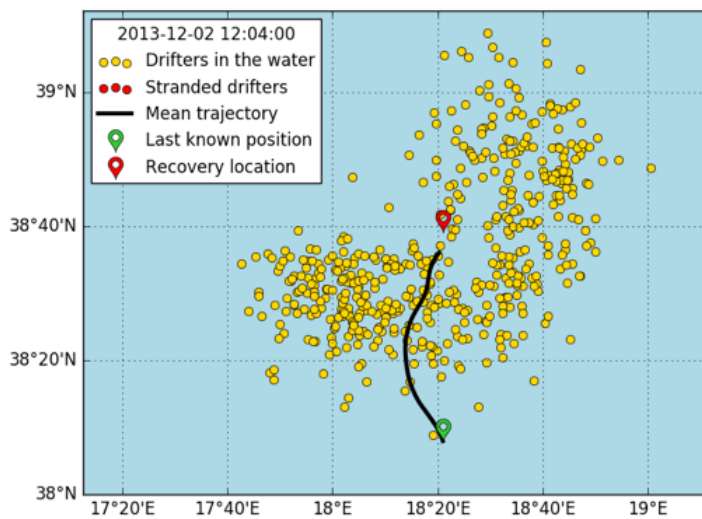
**Referee's Comment 9**

MigrantShip#1, FV Japanese side-stern trawler (#45) (from Suzuki and Sato (1977), was a 62 m vessel, similar in length to Migrant#2 at 60m.

**Authors' answer**

The object parameters are quite similar, but the uncertainties on the Japanese side-stern trawler are smaller. This makes the spread a bit smaller and the left/right drifting behaviour more pronounced. Figure below present the results of Migrants#1 simulated with object class #45. We propose to keep the present results for Migrants#1 simulated using the type of object "Commercial fishing vessel (14-30m) Troller" which was the correspondent object in the IAMSAR manual (Object call #43).





### Referee's Comment 10

In general, using actual SAR cases are of limited value in validating a SAR trajectory model. Either we have good agreement, or not. If not, then the question are: was LKP correct? Was the correct or most appropriate search object used (are the leeway equations right)? What are the uncertainties in the winds? What are the uncertainties in the currents? The authors should at least recognize that these uncertainties exist.

### Authors' answer

Thanks for the suggestions, we have included the following paragraph in the chapter related to Conclusion.

Validation of SAR trajectory model using actual SAR cases as done in this paper is important especially from the users point of view but have some limitations: 1) In some cases there is large uncertainty on the LKP; 2) In some cases we cannot be sure that the correct or most appropriate search object are selected and used; 3) Since there would not be any measurement of currents and wind at the time and location of the event modelers need to consider that there might be large uncertainties in the winds and currents estimated by the model.