

## ***Interactive comment on “VISIR-I.b: waves and ocean currents for energy efficient navigation” by Gianandrea Mannarini and Lorenzo Carelli***

### **Anonymous Referee #2**

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General assessment The paper is a through one. There are very few papers on ship weather routing covering so many aspects of this optimization problem and doing it with so much detail. I particularly appreciate:

- the time interpolation - I agree that it may bring significant benefits for drastically changes in the subsequent weather forecasts,
- using bathymetric database with detailed real data,
- detailed results and analysis of time savings attributed to exploitation of waves and currents.

My specific comments are few – I provide them below.

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## Specific comments

1. 'We use throughout this manuscript the words "track" or "trajectory" for indicating a set of waypoints joining two given endpoints or harbours, in relation to departure on a given date, and the words "route" or "crossing" when there is no reference to a specific departure date.'

While 'track' is perfectly acceptable here, I suggest replacing 'trajectory' with some other word (e.g. path). The word 'trajectory' is usually used in control and robotics with a different meaning: it involves greater accuracy (manoeuvrability and actuation issues), especially for obstacle avoidance or collision avoidance purposes. A "trajectory" between two harbours does not make sense.

2. Regarding section 2.3: an alternative approach would be to use varying resolution of a graph – the nodes can be placed with larger resolution in coastal areas and with lower resolution at open waters. I suggest commenting on the those two possible approaches to this problem and explaining why you choose the one with additional intersection check.

3. Regarding section 2.5.2: 'Edges which, for a given EOT, violate stability are pruned before the shortest path algorithm is run. This way, it is ensured that the optimal track preserves vessel intact stability.' Based on the above description, I am not sure if this approach is correct. In presence of coastline, shallows etc. the exact time at which an edge will be transited cannot be know exactly prior to running the algorithm. Even for open ocean, avoiding a cyclone may cause a delay resulting in reaching a certain graph node much later, thus making all prior assumptions inaccurate. Therefore, in my opinion the edges' weights should be verified dynamically during the algorithm run instead of pruning the edges before the run.

4. While I appreciate the computational complexity analysis based on RAM allocation data, I would also hope for assessing computational time and space based on the algorithm itself. I agree that it is a hard task for complex algorithms, but still some

analysis could be made, at least for the worst case. It would also be interesting to compare the computational time with that of a non-deterministic approach (there are multiple meta-heuristics available, including Evolutionary Multi-objective Optimization, Ant Colony Optimization etc.).

5. I agree with the authors that the paper would further benefit from a more realistic modeling of speed loss in waves and wind. I encourage them to include such modelling in their research.

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Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2018-292>, 2019.

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