

## ***Interactive comment on “Revisiting the DeepWater Horizon spill: High resolution model simulations of effects of oil droplet size distribution and river fronts” by Lars R. Hole et al.***

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We thank the reviewer for very thorough comments to our manuscript. We do agree that the initialization of droplet size distribution needs to be described better and we have now prepared an improved description. In the manus we already describe that we release oil particles in a polygon at the surface (from satellite observations) + a point source at the seafloor. The release rates are quantified on p5, but we now emphasize more details on how the model is initialized.

How droplet sizes for the surface release are described in OpenOil, is documented in a very recent paper in OS (Röhrs et al. 2018). For the bottom release, we have

unfortunately overseen to describe how particle distributions are initialized, and would like to thank the reviewer for spotting this shortcoming. We have now added the following paragraph to Section 3 to clarify how droplet sizes are given: “The oil elements released at the surface are assigned random droplet radii at each entrainment incident, according to the parameterisation of size distributions from respectively DS88 or Li17, see Röhrs et al. (2018) for details. For oil elements released at the seafloor (wallhead), we use a simplistic and pragmatic approach of prescribing random radii in the range 0.5mm to 5mm, as suggested by Johansen et al. (2000). Oil elements at the sea surface (slick) are not considered to have a radius.” We now also refer properly to North et al. (2011), Barker (2011) and Boufadel et al. (2014) in the introduction and discussion to compare our results with previous work.

Due to repeated surfacing and submersion from wave breaking, the particle distributions from both surface and bottom releases develop over time, and we show that the DS88 and Li17 formulations give similar size distributions after 24 hours with the same peak in the spectra. We believe that this is a new and interesting result that highlights the importance of the cycle of wave entrainment, vertical mixing and resurfacing in oil spill modeling, and we are now trying to state this even clearer..

We already have a quantitative description in the manuscript as the release rates at the surface and seafloor are described in section 3, and the time evolution of mass of oil at the surface and in the water column, at the surface, stranded and evaporated is shown in Fig 4. We focus now on a more quantitative presentation of the model results for the revised manuscript. At the same time, we think it is of interest to the reader to discuss fractions of oil stranded, at the surface etc.

Response to minor comments: **Page 1, line 9: in Abstract, “The oil droplet sizes are also relevant for the biological impact.”** Changed to “oil droplet size is”.

**Page 2, line 1: “significant quantities”** Not clear to us what is meant. We give two references with quantities of oil released.

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**Page 2, line 22, “all important factors”, I would use “major factors”** We agree.  
Corrected.

OSD

**Page 2, line 26, “significant effect”** Not clear what is meant here.

**Page 3, line 11, “Bleck (2002)” -> (Bleck, 2002)** Corrected.

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comment

**Page 3, line 15, “USG” -> “USGS”** Corrected

**Page 3, line 17, missing “)”** Corrected

**Page 4, line 16, “model physics”, be specific.** Much more details are now provided about the model physics.

**Page 5, line 14, “state-of-the-art”** Corrected.

**Page 6, line 4, “Fig. 7”?** Numbering of figures is made automatically in latex. The order of appearance has now been corrected.

**Page 6, line 5, “former”?** Corrected to Li17.

**Page 6, line 7, ms-3 -> ms-1** Corrected

**Page 6, line 7, define “super particles”** We now just write particles throughout.

**Page 6, line 10, “very similar volume distribution”. I do not agree.** Corrected to “similar volume distribution”. They do have the same peak in the volume distribution after 24 hrs.

**Page 6, line 11, “more particles”, particle numbers or volume?** Corrected to marginally more oil.

**Page 6, line 15, it will be interesting to check how different sizes of oils move with wind, especially those submerged in the water.** The horizontal distribution partly caused by the wind is shown in Fig. 6. The submerged particles are not moved by the wind.

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**Page 8, line 3, “realistic spill rate”, be quantitative.** We are quantitative and the spill rate is given in section 3. Not sure what is meant here.

**Page 8, line 11-14. Not sure what the authors wanted to deliver here. Discussion of the oil droplet sizes is not adequate. The discussion is very qualitative.** Much more detail on oil droplet size distribution is now provided with several new subsections.

**Page 8, line 30, “large surface” -> large surface area?** Corrected to “large surface area”.

**Page 9, line 3-5, a few hyperlinks seem not to work.** Not sure what is meant. We do not see any hyperlinks on line 3-5. Several new superlinks are now included in the text.

**Page 9, line 10-11, be accurate describing coordinate.** Not sure what is meant. Coordinates are given.

**I would delete the last paragraph.** We agree. This is done now.

**Without the information of how oil sizes were calculated and what oil fate and transport model was used, I think this manuscript is lack of fundamental information to justify the rationale of the simulation.** We have a long paragraph describing the oil transport model used, and several references are given. The ADIOS Oil library is also well described in references. We have added several new subsections describing how oil droplet size distribution is calculated.

Please also note the supplement to this comment:

<https://www.ocean-sci-discuss.net/os-2018-130/os-2018-130-AC1-supplement.pdf>

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