We (authors) appreciate all the comments and suggestions provided by the reviewer. In response to the reviewer's comments, the manuscript has been revised. We have listed our answers and the changes made to the manuscript below. The reviewer's comments (in red) have been listed followed by our response (in black).

Interactive comment on "The Effects of Sea Spray and Atmosphere-Wave Coupling on Air-Sea Exchange during Tropical Cyclone" by Nikhil Garg et al.

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1. The model demonstrates strong sensitivity to the presence of waves. First, this fact needs explanation from the physical point of view

As described in Section 3.3, within the coupled model, the effects of ocean waves on the atmosphere model are included through the roughness length computed in the wave model. Due to the usage of wave model computed roughness length, the drag coefficient in atmosphere model includes the effects of the wave spectrum over a range of frequencies. This feedback between the atmosphere and wave model affects the dynamic structure of a TC by inducing non-linear interactions caused by the temporal and spatial variations in the roughness length (Katsafados et al., 2016), unlike the case of uncoupled model. In the case of coupled model, the roughness lengths are greater than those in uncoupled model, where this increase in roughness lengths increases both the sensible and latent heat flux in the atmosphere model (see Figure 13-15)

2. Second, investigation of sensitivity the wave model is strongly desirable, in particular sensitivity to the wind source term and wind dissipation term

As stated in the Section 1, this study focusses on the coupling between a wave model and an atmosphere model. Additionally, the effects of sea spray on the hurricane are also investigated. Therefore, the effects of different source terms used in the wave model are beyond the scope of this study. Furthermore, the wave model (DHI, 2012) used in this study provides only one formulation for the different source terms namely wind input and wave dissipation due to friction and whitecapping. We acknowledge that it is desirable to investigate the sensitivity of model results to the different formulations of source terms, however, due to the aforementioned reasons, it can't be carried out in the model setup used in this study.

3. Authors' estimations of the thermodynamic feedback coefficients ïA a¸ ïA c´ and ïA gˇ are in significant contract with another papers (eg., Andreas et al, 2008; Mueller, Veron, 2014). In this connection sensitivity study to the thermal feedback coefficients is needed.

The values of α, β and γ are obtained following the procedure described in (Andreas and DeCosmo, 1999), however, it should be noted that in the present study, sea spray generation function depends on the whitecap fraction computed from wave model, whereas in Andreas et al. (2008), the sea spray generation function is based on Fairall et al. (1994) with empirically obtained whitecap fraction. The sea spray generation function in Fairall et al. (1994) uses Miller (1988) for bubble droplet source function and Monahan and Muircheartaigh (1980) for spume droplet source function. It has been shown within the paper that our model produces 25% sea spray droplets as compared to some other studies. Additionally, previous studies have relied on parametrisations for wave heights or wave spectrum, whereas our study uses the output from the wave model instead.

4. Sensitivity study to spray generation function is also desirable.

Another valid point. As described in the study, if we use a different SSGF, it has to be a function which can account for wave model output, which is why, we used the sea spray generation function from Miller (1998). The sensitivity study of SSGF has been left for the future studies, as this study was intended to develop a coupled atmosphere-wave model and investigate the effects of sea spray fluxes on tropical cyclone. Furthermore, this study was designed to highlight various steps necessary to couple sea spray model within a atmosphere model (coupled or uncoupled).

5. Explanation of the effect of spray on momentum exchange is to brief. An equation for horizontal velocity of spray droplet before falling back in ocean in Eq.(13) is needed. Besides, the starting lines of paragraph 2.2.3 consists of qualitative discussion of the effect of spray on momentum exchange in atmospheric boundary layer, but no quantitative description is given. It definitely should be explained in some details.

The horizontal velocity of the spray droplet u_{sp} was given by

$$u_{sp}=\left(\frac{u_*}{\kappa}\right)\times\log\left(\frac{z_{sp}}{z_0}\right)$$

where height of spray droplet $z_{sp}=0.63H_s$, where significant wave height H_s was obtained from the wave model, while friction velocity was used after adjusting for neutral stratification. The effects of spray on momentum exchange are shown in Figure 1 and 2, where Figure 1 shows the spatial variation on momentum

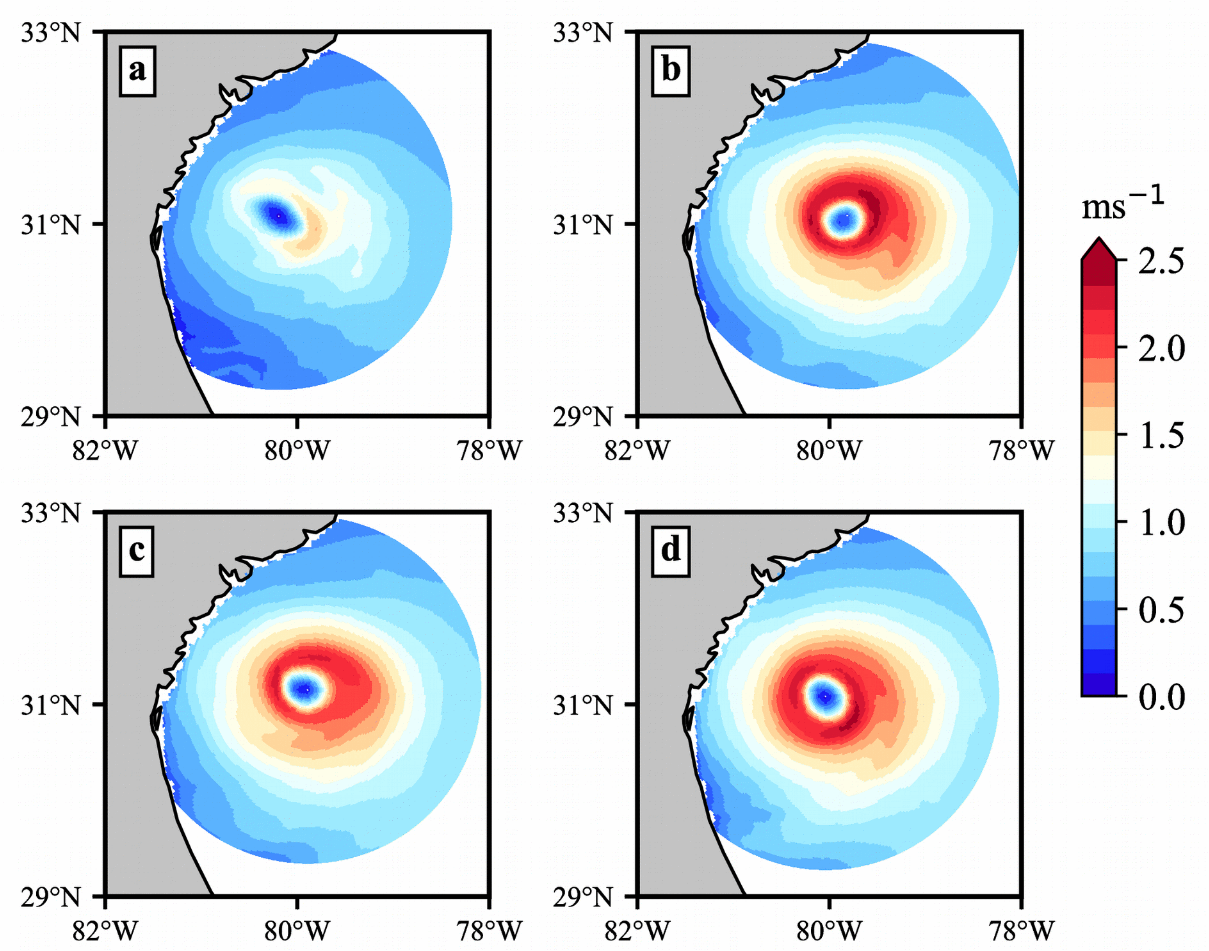

Figure 1. Plan views of surface momentum flux for (a) Expt. 1, (b) Expt. 2, (c) Expt. 3 and (d) Expt. 4 at 0000 UTC July 3, 2014.

flux in storm centric coordinates for the four numerical experiments whereas, Figure 2 shows the azimuthally averaged values of momentum flux to illustrate the radial variation of momentum fluxes.

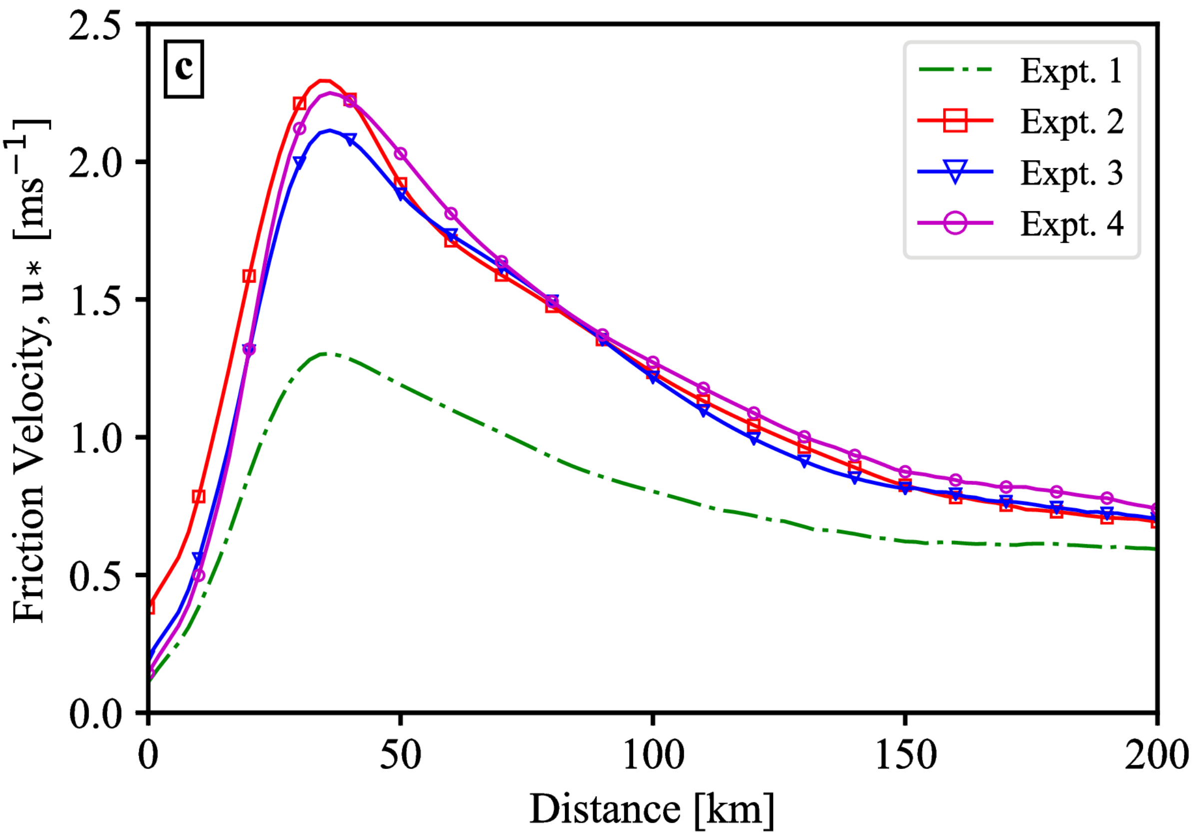

Figure 2. Radial distribution of azimuthal averaged total momentum flux at 0000 UTC July 3, 2014

From Figure 2, it is clear that the coupling of wave model doubles the momentum flux as compared to the uncoupled atmosphere model. Furthermore, it is noticed that the highest momentum flux is obtained in the case when both spray mediated heat and momentum flux are applied to the coupled atmosphere-wave model.

6. Possibly some related references should be added

Ans: Done. Thank you for the suggested references.

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