Interactive comment on "Data-driven versus self-similar parameterizations for Stochastic Advection by Lie Transport and Location Uncertainty" *by* Valentin Resseguier et al.

Anonymous Referee #2

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General: This paper introduced the stochastic subgrid parameterizations which express the unresolved velocity from the large-scale velocity. Self-similar schemes with SALT and LU frameworks are proposed with details and compared with the data-driven models in the Surface Quasi-Geostrophic (SQG) model. The authors focus on their common challenge: the parameterization choice. The results show that both parameterizations lead to high quality ensemble forecasts. This paper is well organized, and also contains some interesting components. I think it is suitable for publication in NPG, however, there are some issues to be addressed.

1.Page 6, the authors compared figures 2 and 3 in line 171, indicated some features

of the homogeneous parameterization in line 174. Actually, only the first row of figure 3 was referred here. In Page 8 line 205, they state 'Figure 3 confirms that this modulation enables a more accurate spatial distribution of the stochastic foldings', it is more convincing if the reference distribution is in the same figure. I suggest to merge figure 2 and 3.

2.Page 19, line 370 and line 378, it is not recommended to say SALT-LU SQG dynamics. Although the slight difference between the SQG SALT and the SQG LU models are not considered in this section (indicated in line 318), they are not combined. So, please use an other abbreviate.

3.Page 16, the caption of figure 4 is not correct.

4.A legend is required for the right plot of figure 6. Also the colors for different number of EOFs are difficult to distinguish in that plot.

5.Figure 7, although the SLAT/LU dynamics is not worse than a low-resolution deterministic simulation, it did not show many advantages as figures 2&3 shown. The scenarios of figure 7 and figure2&3 have different resolutions (128ˆ2 and 64ˆ2) and different integration days(day 15 and day 110). Give reasons why both data-driven and self-similar parameterizations have very weak improvements in figure 7.

6.Page 22, line 393, why the error estimation is 1.96 times the point-wise std?

7.Mark the grid points chosen for figures 10 and 11 in figure 9.

8.The authors have shown the predictability time for one realization is about 2 weeks. They also showed that the ensemble forecast can capture well the reference dynamics of the center of the ensemble distribution for longer period in figures 10 and 11. It is hard to tell the predictability time for ensemble forecast from the first column of figure 9. The authors should plot the ensemble mean of each SQG dynamics analogs to figures 7 and 8, and make a statement about the predictability time of ensemble forecast.

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