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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Revealing the sulfur dioxide emission reductions in China by assimilating surface observations in WRF-Chem" *by* Tie Dai et al.

Anonymous Referee #3

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The manuscript used the Four-Dimensional Local Ensemble Transform Kalman Filter (4D-LETKF) and WRF-Chem to dynamically update the SO2 emission grid by grid over China by assimilating the ground-based hourly SO2 observations. The topic is relevant and useful, and the results help reduce the uncertainty of emission inventory and improving the forecasting of SO2. I recommend this paper for publication after the following points are addressed. 1.Since the implementation of strict emission mitigation strategies in 2013, there is a large reduction of SO2. These reductions are primarily caused by the relocation and/or phased out of power plants and high-emitting industrial factories. In Fig. 6, the SO2 both with MIX and the inverted emissions were underestimated around Gansu. It is not clear that the system works well when the

prior emissions were underestimated. And if the locations of emission sources have been relocated, such as the factories or power plants are built/abandoned, does the assimilation method works well? 2.In fig. 10, FR_CM with inverted emission and H50kmT1h10Ps recalculation were similar. And the results show that the simulated SO2 with inverted emission were always less than observation for all sites. Cloud that be explained? 3.Please add a) b) c) . . . etc. in figure 5, 8 and 10. And the legend of Fig.11 NCP (red line) was an error. 4.P9L265 Please add the last access date.

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