

Atmos. Chem. Phys. Discuss., referee comment RC1  
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## Comment on acp-2022-383

Anonymous Referee #1

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Referee comment on "Spatiotemporal variation of radionuclide dispersion from nuclear power plant accidents using FLEXPART mini-ensemble modeling" by Seyed Omid Nabavi et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-383-RC1>, 2022

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The paper describes a hypothetical scenario of an accident at the Barakah nuclear power plant in UAE and the atmospheric transport to Qatar using standard FLEXPART with different meteorological datasets and FLEXPART-WRF. While the manuscript is well-written and plots very comprehensible for the average reader, I do not see any novelty neither in methods nor in results or discussion. I do not mean to degrade authors' great work, but I do not see this manuscript of relevance for publication in ACP. I would encourage them to submit it elsewhere. A few arguments are listed below:

- The authors write "Using an ensemble of meteorological inputs, this study primarily aims to investigate the seasonal and diurnal changes in the transport and surface concentration and deposition magnitude of radionuclides in the event of a potentially possible nuclear accident". I am very sensitive with radiological issues and I think they should be handled very carefully, because then can have a negative psychological impact to the public. What is "potentially possible nuclear accident" supposed to mean? There is no explanation that could justify this. Why did the authors study this particular hypothetical release? Why did they not study, for example, a hypothetical release from an older reactor? For instance, several Balkan reactors (which I do not want to name, but one can easily google) from the Soviet-era have shown functionality problems during the last 10 years and could affect a more significant area (central Europe) where a larger population lives and reproduces.

- Usually, for the assessment of transport of radionuclides and the impact of meteorological fields in transport modelling, more sophisticated state-of-the-art databases are used. I would encourage the authors to use the ETEX (Nodop, K., Connolly, R., and Girardi, F.: The field campaigns of the European Tracer Experiment (ETEX): Overview and results, Atmos. Environ., 32, 4095–4108, 1998) and ETEX-2 (<https://doi.org/10.1016/j.atmosenv.2008.07.027>) experiments and repeat their assessment rather than a hypothetical release that may never happen or cause the aforementioned problems (see previous comment).

- An alternative solution for publication might be to focus on the model developments they have done, correct the manuscript and submit to GMD. This would require a detailed validation of the results, which lacks here.

- In line 175, the authors are talking about a nuclear accident, but then release particles for only 24h? During the 2 worst nuclear accidents (Chernobyl and Fukushima), emissions lasted much longer, which makes the study completely unrealistic.

- Same paragraph later mentions that "... particles are initially distributed at height levels between 100 and 300 m above the ground level over the emission point". Since we have a nuclear accident and given our previous experience with nuclear accidents, one may expect emissions at higher altitudes (see paper from Stohl's group) depending of course if there was a thermal explosion (such as in Chernobyl) or a hydrogen explosion (such as in Fukushima). Hence, one understands that a sensitivity study is also required to examine what the impact of injection altitude would be on transport. I would expect large differences on transport between emissions that occurred at 300 m and at 3 km (such as those that were calculated for the 2 major nuclear accidents in 1986 and 2011).

- Line 281: "Using conversion factors from Spiegelberg-Planer (2013),  $^{131}\text{I}$  conc<sub>seas\_max</sub> (in a unit of Bq m<sup>-3</sup>) are converted to the maximum hourly doses from inhalation (in a unit of  $\mu\text{Sv}$ )". This is not a proper dose-rate calculation. I would encourage the authors to calculate inhalation doses using the models presented in the WHO report for Fukushima that is the most recently updated:  
<https://www.who.int/publications/i/item/9789241503662>