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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Comment on "Global risk of radioactive fallout after major nuclear reactor accidents" by J. Lelieveld et al. (2012)" *by* J. Lelieveld et al.

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We thank Dr. Wotawa for his constructive and helpful comments.

Replies to the specific comments:

-Chernobyl emissions. The following text will be added to the answer to Q1: "The emissions by Chernobyl have been adopted in many previous publications and were presented as "revised estimates" by IAEA (2006). Furthermore, Davoine and Bocqet (2007) re-assessed the Chernobyl source term by inverse modeling and found that their results are in good agreement with the latest reported emission estimates with only a minor difference in their temporal representation. Nevertheless, it may be assumed

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that substantial uncertainties remain."

-Fukushima emissions. We agree that the order of magnitude of the Fukushima is meanwhile relatively well known. The following text will be added to the answer of Q2: "The emissions from Fukushima are associated with a significant degree of uncertainty, and are subject of scientific debate. Nevertheless, the order of magnitude of the Fukushima emissions is meanwhile reasonably well known, at least for certain species, indicating that they are generally lower than from Chernobyl."

-The INES scale is recommended and defined by the IAEA, and was introduced after the Chernobyl accident. The earlier accidents have been assessed according to INES in retrospect (see Table 1 of our original article) which introduces additional uncertainty, though it is generally accepted that only Chernobyl and Fukushima qualify as INES 7.

-Averaging period: We agree that applying the contamination threshold to individual accidents or individual scenarios for NPPs could give very different results in terms of the detailed geographical distribution of the deposition compared to applying this threshold to average releases (and also averaging over longer periods with naturally varying meteorology). However, we need to distinguish between "deposition calculations" and "deposition risk calculations". We have applied the following definition: Risk = Average deposition x probability of INES 7 : contamination threshold.

-Emission height: We performed sensitivity studies regarding the emission height (see also Kunkel et al., 2012). Instead of introducing the emissions in the lowest model layer, we added them to the 2nd, 3rd, 4th or 5th layer and thus had in total 5 different emission heights within the first kilometer from the surface. The only change we find is that the remote deposition slightly increases and there is a small slight shift to more wet deposition when the emissions are released at higher altitudes. However, larger changes would probably occur when the effective emission altitude would be in the free troposphere.

Although each of these aspects have been transparently defined and calculated in our

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original article, we would agree that the values adopted, e.g., for the probability, the threshold and emissions (which determine the deposition) can be discussed. We are open for this and hope that our article has contributed to providing further grounds for intensifying this discussion within the scientific community.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 19303, 2012.