

We would like to thank reviewer#1 for the positive feedback on our paper.

1. *Lines 1-7, p.12333: The reference about the characteristics and health effects of I-131 and Cs-137 would be helpful for readers' understanding.*

We added three references: Balter (1996), Bleuer et al. (1997) and EPA (2012).

2. *Lines 7-8, p.12333, "¹³⁷Cs determines the long-term effect of a nuclear accident": Is it because of its long half-life period?*

Yes, we changed the sentence to read:

"While ¹³¹I, with a half-life period of 8.02 days, is important for the short-term exposure of the population, ¹³⁷Cs determines the long-term effect of a nuclear accident due to its longer half-life period (30 years)."

3. *Lines 9-11, p.12333, "These radionuclides attach mainly to the ambient accumulation mode (AM) aerosols": this is not correct because I-131 also exists as gaseous phase as the authors mentioned.*

Yes, this is true and this is explained in detail later on. Here we use the phrase "..attach mainly..**" to reflect that this is the main mechanism but that other things may play a role as well (which is elaborated later). We think that this is sufficient description in this very first paragraph of the introduction.**

4. *Lines 28, p.12333, "The gaseous release fraction is typically as high as the particulate fraction": please add the reference, otherwise show observed data on gaseous and particulate fraction during the accident.*

We added the following sentence: "For the FD-NPP emissions about 70% of the released ¹³¹I was gaseous (Masson et al., 2011)." We also included a sentence about the time scale of the conversion: "The gas-to-particle conversion for ¹³¹I typically occurs on time scales of 2-3 weeks (Masson et al., 2011; Uematsu et al., 1988)."

5. *Section 2, p.12337-12338: is the method to estimate removal times firstly used in this paper, or does it rely on many published papers introduced in p.12345? If it is a commonly used method, add the references here.*

The idea of using radionuclide measurements to estimate aerosol lifetimes is nothing new but goes back several decades. For example the references Moore et al. (1973), Papastefanou, (2006), and in particular the compilation of observation based aerosol residence times from Giorgi and Chameides (1986) (their table 2) show that different methods are applied in the previous estimations. The exact method used here to estimate

the lifetime from the measurements is not directly based on any other methods previously published.

6. *Lines 14-15, p.12336: I think half-life should be inserted in Section 1 instead of here.*

We now mention the half-lives of all three species in Section 1 and repeat them here for convenience.

7. *Lines 26, and 29, p.12336: please address temporal behavior of I-131 and Cs-137 from the recent paper of Katata et al. (2012a) which re-estimated the release rate from March 12 to 14 on 2011.*

Thank you for this reference which we also now added.

8. *Lines 5-6, p.12340, "affected by strong wet scavenging due to tropical precipitation": the readers could easily imagine the sentence if the authors show, for example, the distribution map of total precipitation as Fig. 1.*

We included a reference to two figures in Stohl et al 2012 which shows the precipitation patterns during the period.

9. *Lines 1-11, p.12342: regarding gas-particle conversion of I-131, there are comprehensive dataset in Europe provided from Masson et al. (2011) and past study related to gas/particle separation of Uematsu et al. (1988). Both studies may support the authors' presumption.*

We have re-written this paragraph including the references.

We also added a paragraph comparing the ^{131}I removal times with a newly published paper (Yang and Guo).

10. *Lines 12-24, p.12342: The recent study of Terada et al. (2012) summarizing source term revised from Chino et al. (2011) may change the authors' results to some extent.*

From Figure 2 of Terada et al. there are only minor changes in the source term from that of Chino et al. Also the total amount of ^{131}I and ^{137}Cs released is not explicitly given.

However, we included the reference since it is an update from the Chino et al. source term.

11. *Lines 3-4, p.12343, "Unfortunately, the initial phase of plume dispersion was not sampled by the CTBTO network and it is therefore not possible to derive removal rates or lifetimes for the first few days after emission": The report of Ohkura et al. (2012) that shows the temporal data in gaseous and particulate I-131 concentration in Japan may enable your discussion.*

Data on aerosol-gas partitioning of I-131 will certainly be useful, but data from a few sites may not be fully representative of the overall partitioning. A more detailed analysis would be needed, which is outside the scope of this study. This study focuses mainly on aerosol removal time scales, and less on the removal time scales for I-131, which is semi-volatile. The results for I-131 cannot be generalized to other semi-volatile species, which would exhibit different partitioning behaviour, depending on their chemical properties. Also the fact that local measurements can be strongly affected by resuspended aerosols which we discuss in the next paragraph, make it difficult to interpret the local measurements in relation to the early phase after the emissions.

12. Lines 8, p.12343, *"thus facilitating effective dry deposition": the fact should be supported by the related paper of Katata et al. (2012b).*

Thank you for this reference which we included and was very helpful.

13. Lines 5, p.12344, *"which received 90% of the FD-NPP fall-out over 5 land": has it been estimated by numerical simulation?*

Yes. We added "as estimated by numerical simulations" to the sentence.

14. Lines 28, p.12344, *"distributed": mixed?*

We changed the word to "mixed".

15. Lines 10, 17, p.12347: *please add a period to the end of sentences.*

Done.