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## ***Interactive comment on “Change of the Asian dust source region deduced from the relationship between anthropogenic radionuclides in surface soil and precipitation in Mongolia” by Y. Igarashi et al.***

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To the referee No. 3

General comments: The raw data in the manuscript are great valuable, and one of useful approaches using the anthropogenic radionuclides is proposed to study on Asian dust sources. Asian dust researchers must take interest in this manuscript. I have also interest that the ( $^{137}\text{Cs}/^{90}\text{Sr}$  vs.  $^{137}\text{Cs}$ ) slope of Takalimakan desert soil, China is very close to the slope of Mongolian soil, whereas the slope of Tsukuba soil, Japan is clearly

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distinguished. However, I have hard to understand that authors describe the relationship between annual precipitation and  $^{90}\text{Sr}$ ,  $^{137}\text{Cs}$  composition and ( $^{137}\text{Cs}/^{90}\text{Sr}$ ) at the each site, as I would like express the following my opinions.

Ans: Thank you very much for your interest in our manuscript.

Specific Comments: 1) On the basis that the elution of  $^{90}\text{Sr}$  is faster than that of  $^{137}\text{Cs}$ , authors explain the difference of the anthropogenic radionuclides ( $^{137}\text{Cs}$  and  $^{90}\text{Sr}$ ) composition as well as the ratio could be elucidated from annual average amounts of precipitation (section 3.1 and 3.2). Is it reasonable to use annual average precipitation to explain for the weathering process concerning with  $^{90}\text{Sr}$  mobility? As far as see in figure 3 and 4, I cannot agree with the authors conclusion that the level of  $^{90}\text{Sr}$  and  $^{137}\text{Cs}$  in the surface soil had a notable straightforward correlation with precipitation. I suggest that the title may be consequently modified.

The composition of anthropogenic radionuclides in the surface soil is determined by a combination of processes. We believe that precipitation is the major controlling factor for the atmospheric deposition of  $^{90}\text{Sr}$  and  $^{137}\text{Cs}$  onto the ground, but the elution of the deposited  $^{90}\text{Sr}$  and  $^{137}\text{Cs}$  in the soil column is controlled not only by precipitation but also by soil characteristics. Biological processes may also be involved. Nevertheless, in the Asian continental grassland region in areas without anthropogenic perturbation, a simpler overall relationship can be found than in cultivated regions between anthropogenic radionuclides in the surface soil and precipitation. We used annual precipitation as the best index for the precipitation at individual sampling points.

Ans: In response to your suggestion, we slightly changed the discussion (removing the term “straightforward”) and also modified the title.

2) Figure 4 is cross plotted various soil data (Tsukuba soil, Japan; Taklimakan soil, China; Mongolian soil) and each wet event deposition, monthly total deposition. As authors mentioned that the Taklimalan soil samples also exhibit a linear curve with same slope as the Mongolian curve plus a positive intercept, I also recognize one of

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good information that the same slope is important to explain the long-range transport of Asian dust. Then, I checked/examined the plotted raw data and each event, taken from the references (Igarashi et al., 2005 and 2009). Each wet event, 2007, plotted by triangular mark (( $^{137}\text{Cs}/^{90}\text{Sr}$ ) : ( $^{137}\text{Sr}$ )) and my examination of Asian dust event observed in Japan, 2007 are arranged: a) Obvious Asian dust were observed in Japan, just before/during each wet event: 2-4April(3.9:30.6), 4-5April (5.4: 80.1), 10-11May (2.2 : 8.58) b) Asian dust was not observed in Japan, just before/during each wet event: 13-14April(>8.1: 24.3) c) Other: Monthly deposition, April (5.9:21.5) Three events in the (a) are plotted near the linear curves of Taklimakan and Mongolia soil, others in (b) and (c) are plotted far apart from these linear curves in Figure 4. Although the number of each event data of anthropogenic radionuclides correlation with obvious Asian dust events is not sufficient, I think this is important to consider the change of the wet deposition of anthropogenic radionuclides, as authors exhibited the monitoring data of monthly deposition in Tsukuba, Japan. And, I also conclude that the difference between Taklimakan and Mongolian soils data of the anthropogenic radionuclides is not significant.

Ans: Thank you very much for your kind independent analysis of the data. The Asian dust source has been spreading eastward and northward from the conventional source as a result of the degradation of the relatively moist zone (grasslands) in years that have experienced frequent Asian dust events (during the 2000s).

Please also note the supplement to this comment:

<http://www.atmos-chem-phys-discuss.net/11/C5769/2011/acpd-11-C5769-2011-supplement.pdf>

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