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Interactive comment on "Sources and transport of $\triangle^{14}$C on CO_2 within the Mexico City Basin and vicinity" *by* S. A. Vay et al.

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This paper presents an interesting set of $\Delta^{14}CO_2$ results from Mexico City and surrounds. Very few $\Delta^{14}CO_2$ measurements have been made in large cities, so these results represent an exciting new dataset. The results indicate that most of the samples from this region have $\Delta^{14}CO_2$ values higher than the Northern Hemisphere mid-latitude free troposphere "background" level, as represented by measurements from a North-South transect over the Pacific Ocean, from Hawaii (21°N) to Anchorage, Alaska (61°N), as well as independent measurements from Niwot Ridge, Colorado (40°N). This is contrary to initial expectations, whereby the addition of ^{14}C -free fossil fuel CO_2 should lead to lower $\Delta^{14}CO_2$ values close to the large Mexico City metropolitan area. The "above-background" data appear to fall into two groups: those with slightly (10‰

or less) elevated $\Delta^{14}CO_2$ levels; and those with more strongly elevated $\Delta^{14}CO_2$ levels. The authors propose differing explanations for the two datasets. For the first dataset, they suggest that addition of ^{14}C -elevated CO_2 from biosphere sources is the most likely explanation. For the second dataset, with strongly elevated $\Delta^{14}CO_2$, they propose nuclear industry and/or hazardous waste ^{14}C sources.

While it is difficult to imagine another explanation for the more strongly elevated $\Delta^{14}CO_2$ samples, for the slightly elevated (10‰ or less) samples, some other possible explanations should be considered. Firstly, the samples were collected in canisters, which are presumably metal. There is evidence that CO_2 mixing ratios measured in metal canisters can be elevated, and it follows that $\Delta^{14}CO_2$ values could also be altered, possibly by memory effects from previous samples. Secondly, and likely more importantly, the background values used represent, at least for the most part, mid-latitude (30-50°N) Northern Hemisphere background values. $\Delta^{14}CO_2$ measurements from several mid-latitude Northern Hemisphere free troposphere and mountain sites are in good agreement, indicating that these measurements likely represent a reasonable choice of background for mid-latitude Northern Hemisphere surface sites. However, the modeled global $\Delta^{14}CO_2$ distribution (e.g. Randerson et al., 2002) indicates that background $\Delta^{14}CO_2$ values in the tropics are 10-15‰ higher than Northern Hemisphere mid-latitude background values. Thus background values for Mexico City (latitude 19°N) may be somewhat higher than those for mid-latitude Northern Hemisphere sites, probably by at least a few permil, and possibly more. This suggests that the $\Delta^{14}CO_2$ values in the range of 57-68‰ observed by Vay et al. could be explained, at least in part, by the higher background value for this region, rather than requiring strong biosphere ^{14}C sources in the region (although it is worth noting that the higher modeled background $\Delta^{14}CO_2$ values in the tropics are in part due to biospheric respiration of relatively 14C-rich CO_2).

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