Atmos. Chem. Phys. Discuss., 2, S180–S181, 2002
www.atmos-chem-phys.org/acpd/2/S180/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Using ^{14}C, ^{13}C, ^{18}O and ^{17}O isotopic variations to provide insights into the high northern latitude surface CO inventory" *by* T. Röckmann et al.

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Received and published: 14 June 2002

Referee 2 points out that there are still some "unanswered questions". Indeed, we agree that modeling is useful to quantitatively assess the issues brought up in the comment, and a recent inverse modeling study (Bergamaschi et al., J. Geophys. Res., 105, 1929-1945, 2000) shows first promising results. Nevertheless, we feel that the qualitative and semi-quantitative approach we take in this paper is in many respects sufficient to reach a good understanding of the seasonal isotope variations. In particular, the fact that only d(δ^{13}C)/dt changes sign in late spring is a clear isotopic fingerprint of the increasing relative contribution from the methane oxidation source, which is very strongly depleted in ^{13}C. For all other isotope signatures, CO from methane oxidation has a signature much closer to ambient levels, so this source effect is not visible in the

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other isotopes. The above mentioned modeling paper actually does capture the seasonal isotope cycles at various stations well. It also confirms that the relative contribution of the methane oxidation source is a major factor in influencing the seasonality of δ^{13}C also at other latitudes. Thus, the reason why one sees interlatitudinal variations in the seasonality of δ^{13}C seems to be to a large degree determined by the relative contribution of the methane oxidation source. The quantitative investigation of these questions does indeed require further model studies, and therefore was not pursued in the present paper. We want to point out here that the points we examine in more detail in the paper are those we feel can be adequately addressed with our semi-quantitative approach. The general understanding we achieve this way is also supported by a more rigorous past model study.

Interactive comment on Atmos. Chem. Phys. Discuss., 2, 213, 2002.