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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The atmospheric cycling of radiomethane and the "fossil fraction" of the methane source" *by* K. R. Lassey et al.

Anonymous Referee #2

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This paper will be of interest to readers of Atmos. Chem. Phys. and should be published with very little revision. The authors are to be commended for offering a new approach to differentiating between biosphere radiomethane and fossil fuel radiomethane sources and in particular de-coupling the nuclear power 14CH4 source from other global methane sources.

The result of 28.6±ś1.9% is a little surprising, but probably only because we have become so used to thinking that the fossil fuel fraction of CH4 sources is only about 20 per cent or so based on earlier determinations. This is a legitimate result and may prove to necessitate re-thinking some of the terms in the CH4 budget.

Specific Comments:

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On p. 3 the authors may want to acknowledge the pioneering work of Ehhalt (1974) and Ehhalt and Schmidt (1978) who first described apportioning radiocarbon dead and radiocarbon live sources of CH4 on the basis of their inferred 14C content and available data on CH4 source strengths at the time. Later studies beginning with Lowe et al. [1988] used actual measurement data of 14CH4 to attempt the same result.

On p. 4 at the bottom, the authors refer to "relatively isolated and small tests" by France and China after 1963. This is a somewhat subjective and I wonder if the continued tests by these nations and others which occurred over many years after 1963 aren't at least significant. Is there any qualifying data that would put this in perspective?

On p. 5, top paragraph, I'd say the "The bomb pulse 14C therefore has become a valuable..."

On p. 8, the assumption made that sources of methane are largely unvarying since the mid-1980's may not be true. It's probably a mistake to rely on only one group's research [Dlugokencky et al., 1998 and 2003] for this information. Several researchers have deduced varying contributions of both biomass burning (often related to El Nino events) and changes in wetland emissions over the time frame 1980 to present. For instance, a very recent paper, which I would not necessarily expect the authors to know about, epitomizes the combined flux measurements, process studies, satellite measurements, and modeling efforts used to investigate the variability of CH4 sources [Bousquet et al., Nature, 2006]. In it, Bousquet et al., determined that varying wetland emissions played the major role in CH4 growth rate changes between 1984-2003, with fossil fuel emissions declining since 1991 and biomass burning events playing a minor role except for a spike during the 1997-98 El Nino. Several other papers on this subject have reached conclusions indicating a lot of CH4 source variability.

The authors may want to address these types of studies more thoroughly but in the end, may still prove to be justified in their assumption with respect to their regression analysis calculation because their source term value S (= 560±ś40 Tg/yr) has an

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uncertainty large enough to account for individual source variations over the period 1986-2000.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 5039, 2006.