Recent developments in using isotopic measurements for constraining methane sources and sinks

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Several recent studies have led to different conclusions regarding the utility of measurements of the isotopic composition of methane on diagnosing its budget and trends of sources and sinks. Some studies have found isotopic evidence of a largely microbial source causing the renewed growth in global atmospheric methane since 2007, and underestimated global fossil fuel methane emissions compared to most previous studies. However, other studies have challenged these conclusions by pointing out the substantial range in isotopic source signatures as well as open questions in atmospheric sinks and biomass burning trends. These differing interpretations and conclusions come despite substantial recent scientific contributions to this field including (i) careful comparisons and merging of atmospheric isotope measurement datasets to increase spatial coverage, (ii) in-depth analyses of observed isotopic spatial gradients and seasonal patterns, and (iii) improved datasets of isotopic source signatures. This presentation will provide an overview of the contrasting arguments by distinguishing among the different research objectives including (i) global methane budget source attribution in steady-state, (ii) source attribution of recent global methane trends, and (iii) identifying specific methane sources in individual plumes during field campaigns. We will also present preliminary results from a current modeling project that will combine and incorporate the most recent available global methane isotopic data (source signatures and atmospheric measurements).