Tracking Variability in Methane Source Signatures in the NOAA Global Cooperative Air Sampling Network

S.E. Michel[1], J. Winokur[1], B.H. Vaughn[1], E. Dlugokencky[2] and J.W.C. White[1]

[1]Institute of Arctic and Alpine Research (INSTAAR), University of Colorado, Boulder, CO 80309; 303-492-5495, E-mail: sylvia.englund@colorado.edu
[2]NOAA Earth System Research Laboratory, Boulder, CO 80305

The INSTAAR Stable Isotope Laboratory has measured $\delta^{13}C$ of methane from air at a subset of sites in the NOAA Global cooperative air-sampling network since 1998. In this poster we examine what isotopes can add to our understanding of global methane, especially over the last few years. Time series of isotopic data reveal changes in sources and sinks of atmospheric methane over time and indicate that polar regions are not yet a major source of methane to the atmosphere from processes such as permafrost decay and clathrate release. We have examined Keeling plots (in which the isotopic data are plotted against the inverse of the mole fraction of methane) and present the results in a number of ways. Correlation coefficients are used to determine if there are dominant single sources; for instance, Lac la Biche, Canada is notable in that it is clearly dominated by a strong, single source of methane. Even when the Keeling plots do not explain as much of the variance in the methane isotope signal, all sites have statistically significant linear relationships, driven by the general dominance of anaerobic sources of methane. Seasonal Keeling plots reveal trends in the seasonality of sources and sinks, and when plotted by latitude, reveal a sharp, unusual shift in intercept at 40°N (see plot below). This finding is investigated further by examining the intercepts as a function of time, as well as season.

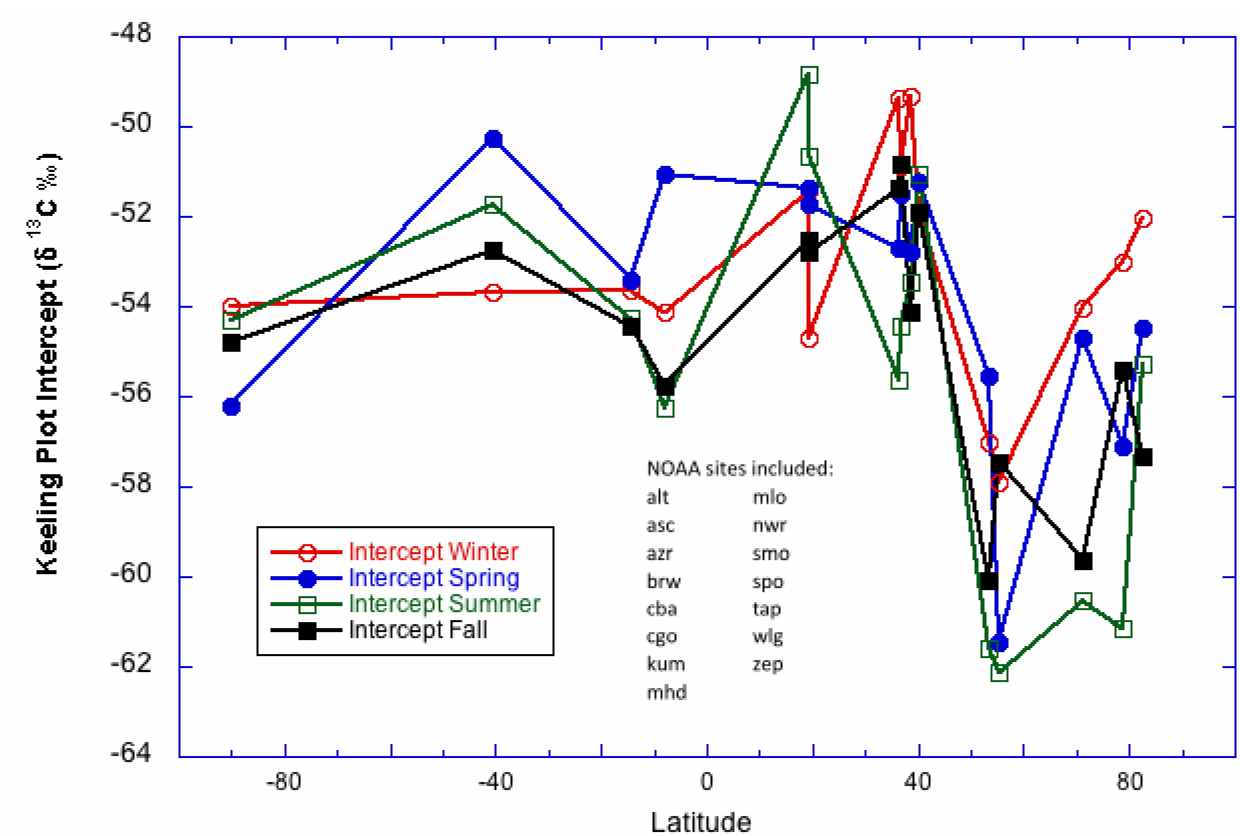

Figure 1. Isotopic signatures of 15 different NOAA flask-sampling sites calculated using Keeling plots by season. A sharp transition occurs at 40°N. The cause of this shift is still unclear.