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NESL's Atmospheric Chemistry Division Seminar

Observational Constraints on the Global Methane Budget

Ed Dlugokencky,

NOAA ESRL Global Monitoring Division

Monday, May 13th, 3:30 p.m.

3:00 p.m. – Refreshments & Socializing

3:30 p.m. – Seminar

Foothills Lab 2, Room 1022

Abstract

The atmospheric burden of CH_4 has increased by a factor of 2.5 since 1750, contributing 0.5 W m^{-2} to total radiative forcing by long-lived greenhouse gases (2.84 W m^{-2} in 2011), while its atmospheric chemistry affects background air quality and contributes an additional ~0.2 W m^{-2} indirect forcing through production of tropospheric O_3 and stratospheric H_2O. Because atmospheric CH_4 has a relatively short life time, ~9 yr, reducing its emissions is considered a potential approach to slowing the rate of increasing radiative forcing. In fact, reductions in emissions from many anthropogenic sources would be cost-effective. But, the effectiveness of emissions mitigation may be over-estimated by bottom-up inventories, so emission reductions must be verified through atmospheric observations. Also, reductions in anthropogenic emissions may be canceled by increased emissions from natural sources such as Arctic wetlands as they respond to changing climate.

NOAA has been measuring the global distribution of atmospheric CH_4 since 1983. The data provide important constraints on methane's global budget and how it is changing with time. An observed decrease in CH_4 growth rate from 1983 to 2006 suggests that, if the CH_4 lifetime has been approximately constant, then atmospheric CH_4 is approaching steady state with no long-term trend in total global emissions through 2006. Super-imposed on this long-term picture is significant interannual variability in CH_4 growth rate, including an increasing atmospheric CH_4 burden since 2007. Inherent in the spatial patterns of this variability is information about processes that emit or destroy CH_4. In this presentation, I will review some key findings determined from NOAA CH_4 measurements with particular focus on the renewed increase in atmospheric CH_4 since 2007 and the potential contribution of climate feedbacks in the Arctic.