Quantifying Canada's Natural and Anthropogenic Methane Budgets Using Atmospheric Observations & Modeling: Progress and Limitations

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The long lifetime and rapid mixing of CH_4 in the atmosphere provides a large scale integration of surface fluxes. With sufficient measurement precision and surface coverage (measurement sites), a signature of individual surface source or sink regions can be detected and quantified. For example, below are preliminary results from a study to quantify Canada's wetland CH_4 budget using atmospheric CH_4 measurements and Four-Dimensional Variational Analysis modelling [applying prior gridded source patterns, an atmospheric transport model (TM5) and analyzed wind fields (The European Center for Medium-Range Weather Forecasts)] . The global analysis was done using CH_4 data from the NOAA ESRL's global air sampling network in addition to continuous CH_4 measurements from 4 of Environment Canada's observational sites. The figures show gridded wetland fluxes for 2004 (~ 7.5 Tg) and 2006 (~12Tg). Anthropogenic emission estimates for these same years will be reported as well. The poster demonstrates the potential of using atmospheric methane observations along with modelling to track and estimate methane emissions for Canada. Limitations in the analyses will be addressed as well.

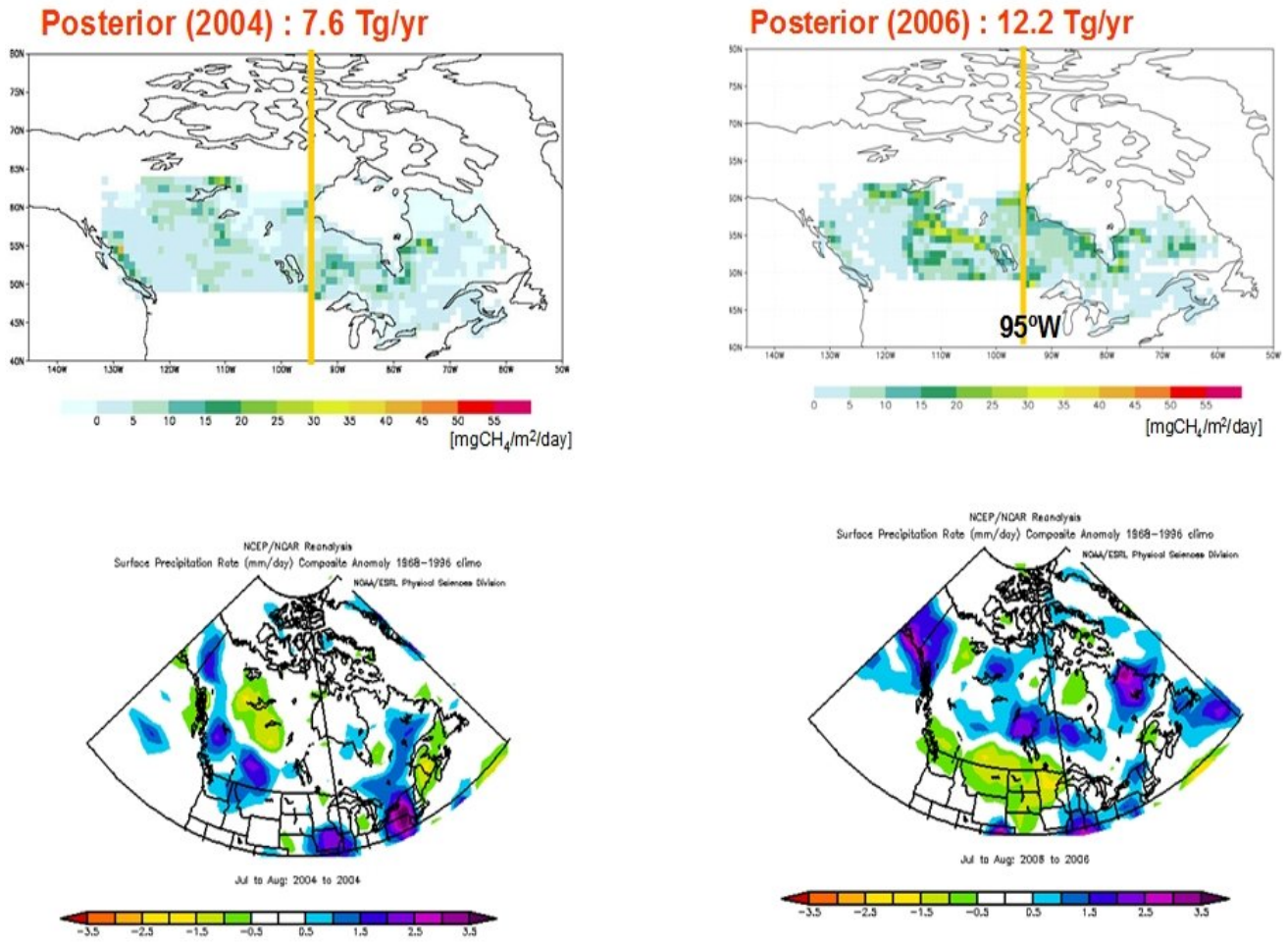

Figure 1. Annual gridded modelled wetland methane fluxes for 2004 and 2006 (top 2 figures) shown along with observed summer precipitation anomalies for the same 2 years. The lower flux estimated for western Canada in 2004 appears to be correlated with an unusual dry summer period.