

Spatial and Temporal Variations of Atmospheric Methane and Carbon Dioxide Observed in Environment Canada's Greenhouse Gas (GHG) Measurement Network

E. Chan, D.E.J. Worthy, M. Ishizawa and D. Chan

Environment Canada, Toronto, Ontario M3H 5T4, Canada; 416-739-4414, E-mail: elton.chan@ec.gc.ca

Environment Canada conducts high quality ground-based atmospheric measurements of GHGs from coastal, interior and Arctic regions in Canada. The current network of 12 stations is strategically located to catch the regional atmospheric signals of carbon fluxes from major ecosystems over Canada and reflect the long-range transport of GHGs into and out of Canada. These measurements document the spatial and temporal distributions of GHGs in Canada, providing essential constraints to our understanding of Canada's natural and anthropogenic sources and sinks of GHGs. An analysis of the spatial distribution of atmospheric CO₂ and CH₄ extent utilizing backward trajectory calculations is demonstrated. The results show that methane and carbon dioxide sources have the potential to affect regions covering several hundred kilometers. Temporally (synoptic, seasonal and inter-annual variations), atmospheric observations of CO₂ and CH₄ clearly provide information on controlling processes in important ecosystems such as the boreal forest and wetland regions in Canada and their possible response to changes in climate.

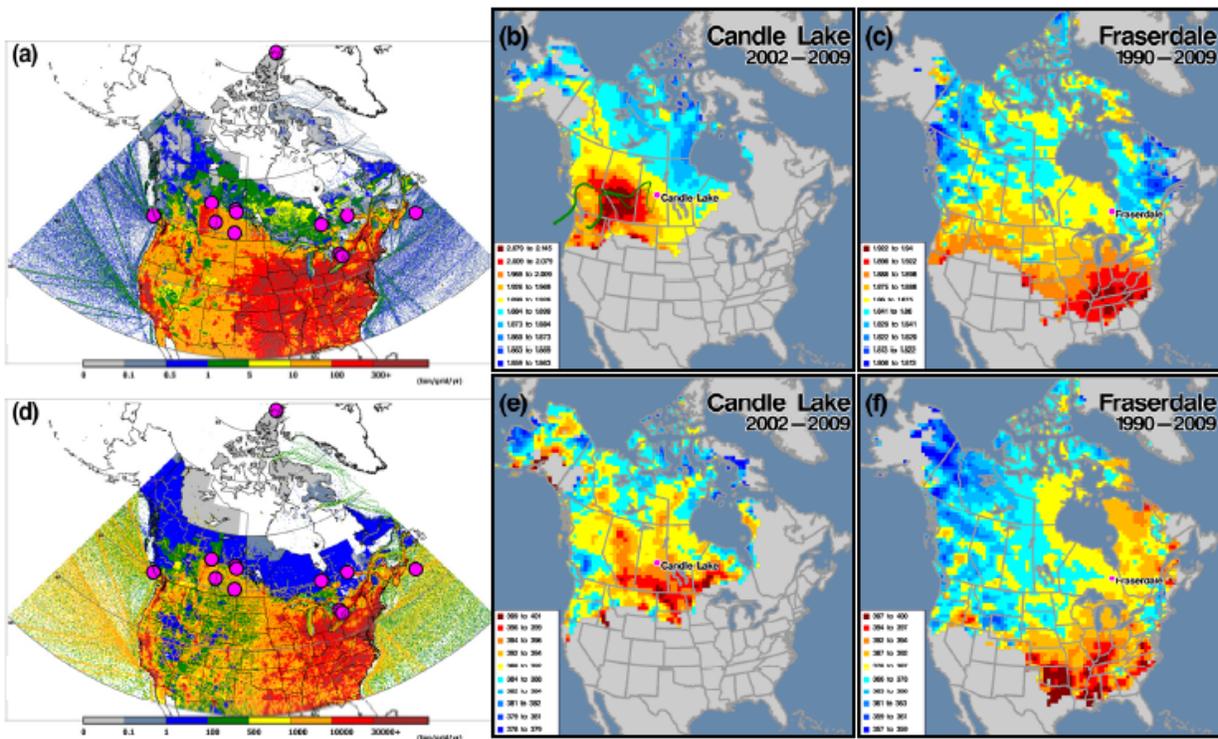


Figure 1. Receptor analysis (Seibert et al., 1994) using measurements of surface GHGs (CH₄ and CO₂) mixing ratios during Nov-Feb from Environment Canada, Climate Chemistry Research Section. Figures 1a and 1d show the year 2005 annual total emissions of CH₄ and CO₂ respectively, from Edgar v4.0 (0.1 x 0.1 degree). The circles show the current site locations. Figure 1b, 1c, 1e, 1f show the receptor modeling results using 5-day backward trajectories for CH₄ at Candle Lake, CH₄ at Fraserdale, CO₂ at Candle Lake, and CO₂ at Fraserdale respectively. NOTE: The scales are independent. Reference: Seibert, P., Kromp-Kolb, H., Baltensperger, U. et al. (1994), Academic Publishing, 689–693.