Methane Fluxes to the Atmosphere from Deepwater Hydrocarbon Sources

L. Hu[1], S.A. Yvon-Lewis[1], J.D. Kessler[1] and I.R. MacDonald[2]

[1]Texas A&M University, Rudder Tower, 401 Joe Routt Blvd, College Station, TX 77843; 979-845-6939, E-mail: leihutx@gmail.com
[2]Florida State University, Tallahassee, FL 32306

Methane, one of the most potent greenhouse gases, has a warming potential 72 times that of carbon dioxide over a 20-year time horizon. It is also actively involved in atmospheric chemistry. Gas hydrates, ice-like mixtures of gas and water, are the largest methane reservoir. The total abundance of marine gas hydrates is equivalent to 400 times the total atmospheric methane. Whether the marine gas hydrates, especially the deepwater gas hydrates, contribute significantly to the atmospheric methane is under debate. To investigate this question, two studies (HYFLUX and PLUMES) were conducted over deepwater hydrocarbon plume areas in the Northern Gulf of Mexico. Continuous air-sea measurements were made with high spatial and temporal resolution during both studies using a "Weiss-type" equilibrator coupled with a Gas Chromatography-Flame Ionization Detector (during HYFLUX) or a Cavity Ring-Down Spectroscopy (during PLUMES). Results from both studies indicate that methane fluxes to the atmosphere from deepwater hydrocarbon sources are small (Figure 1) and deepwater hydrocarbon sources are not likely to play a significant role in contemporary climate change.

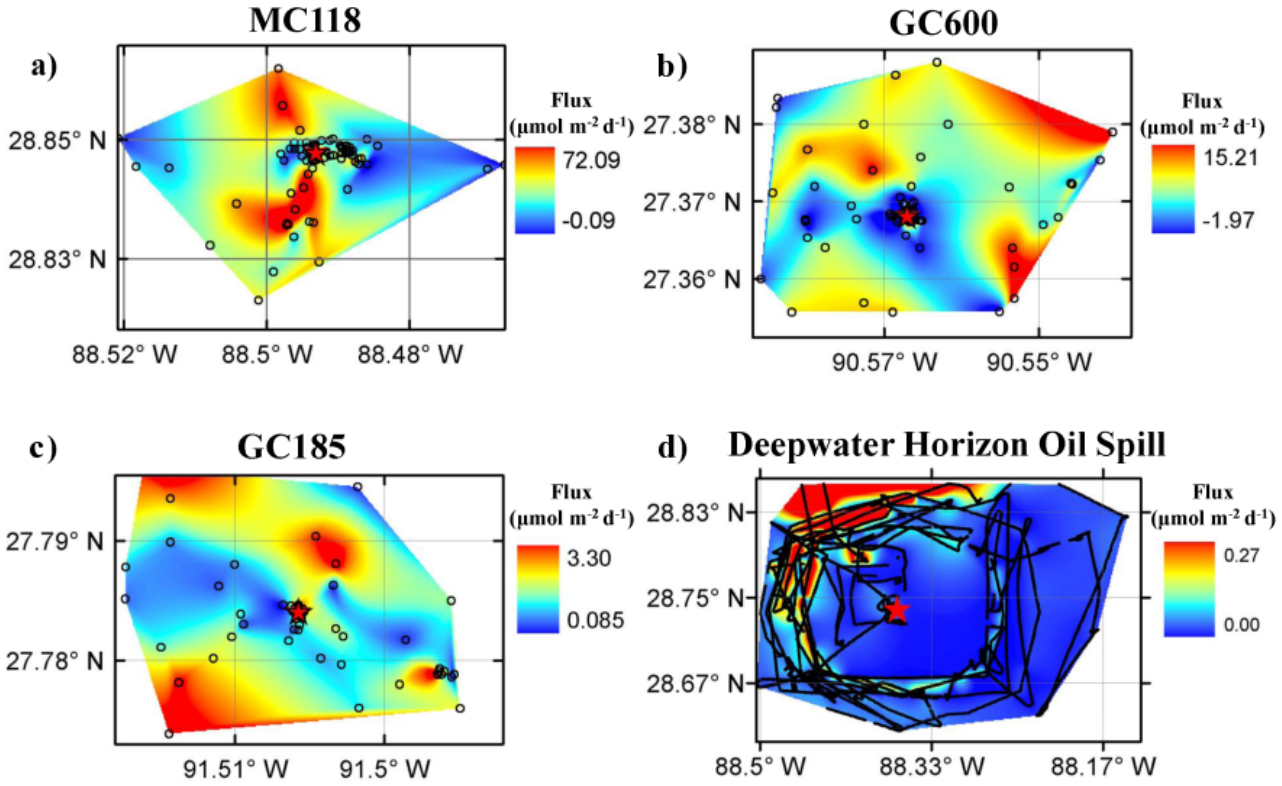

Figure 1. (a – c) Methane fluxes to the atmosphere from deepwater hydrocarbon seeps during HYFLUX (4 – 19 Jul, 2009). (d) Methane fluxes to the atmosphere from Deepwater Horizon oil spill during PLUMES (12 – 20 Jun, 2010). Black circles indicate sampling locations.