Hydrocarbon Flux from Natural Deepwater Gulf of Mexico Vents

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ABSTRACT

We describe two vents in the northern Gulf of Mexico at lease blocks MC852/853 and GB425 that have high salinities and elevated temperatures. We use a steady-state multiphase-flow model to show that there is a unique water and hydrocarbon flux that simulates the observed salinity and temperature. We estimate the hydrocarbon flux to be 2.0-9.9x10^4 t yr^{-1} and 1.7-7.1x10^4 t yr^{-1} from two vents. These fluxes are ~1-3 orders of magnitude greater than previous estimates. Large natural seepage may inoculate marine basins such as the Gulf of Mexico from oil spills like the 2010 *Deepwater Horizon* blowout.

CLICK ON IMAGE FOR LARGER VIEW

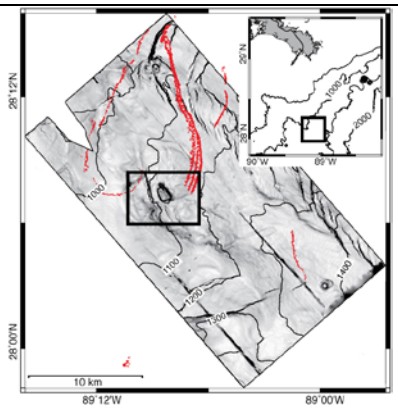

Fig. 1: Seismic map of the Ursa Basin in the Gulf of Mexico. Map is overlain with backscatter anomalies (red) detected from SAR images taken May 2006. Backscatter anomalies are interpreted as oil slicks on the ocean surface.

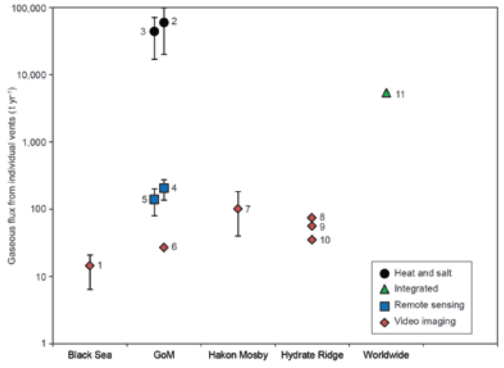

Fig. 2: Comparison of gaseous flux estimates from venting locations around the world.

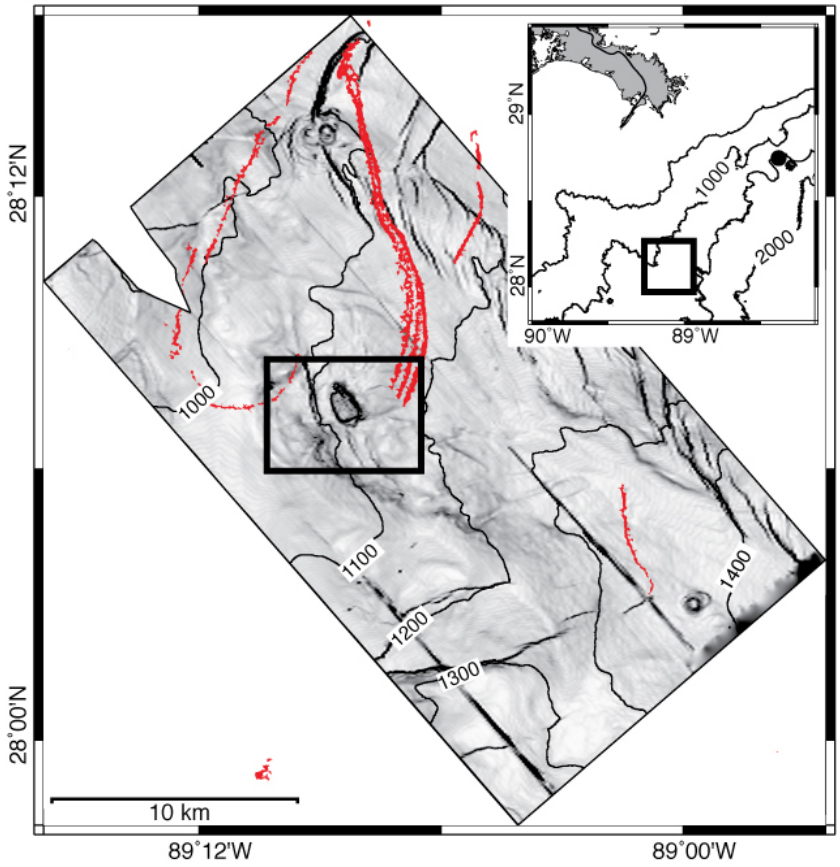

Fig. 1: Seismic dip map of the Ursa Basin in the Gulf of Mexico. Dip maps emphasize steeper gradients with darker colors. Contours are in meters below sea level (converted from time to depth assuming a 1.5 km s^{-1} acoustic velocity). Map is overlain with backscatter anomalies (red) detected from a SAR image taken May 24, 2006. Backscatter anomalies are interpreted as oil slicks on the ocean surface. The gas vent at lease blocks MC852/853 (black box, Fig. 2a) is ~220 km SSE of New Orleans and ~100 km from the *Deepwater Horizon* oil spill (black dot).

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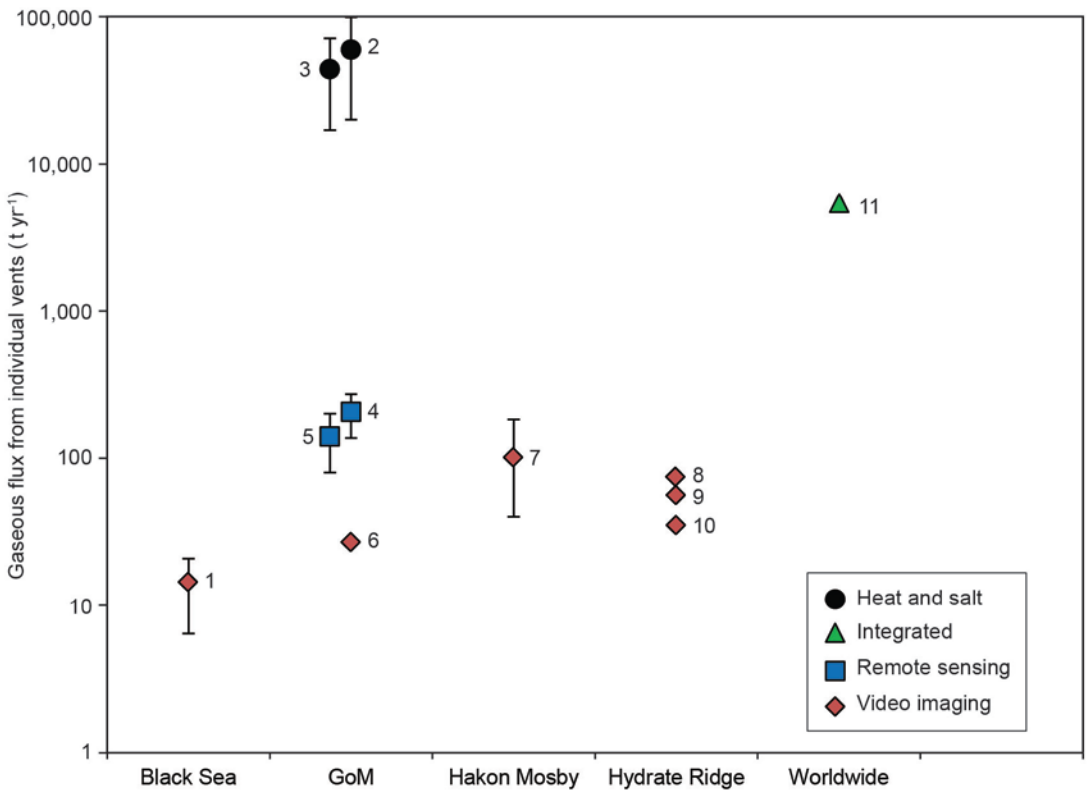

Fig. 2: Comparison of gaseous flux estimates from venting locations around the world. Black circles show hydrocarbon flux estimates from this study at MC852/853 (2) and GB425 (3). Blue squares, red diamonds, and green triangles plot gaseous fluxes determined from remote sensing of oil slicks, video-imaging techniques, and integrated studies, respectively. The fluxes determined using the temperature and salinity signature are ~1-3 orders of magnitude greater than other estimates. Future analysis of new heat-flow and geochemical data using our technique combined with calibration from other techniques will ultimately constrain global hydrocarbon flux estimates. Gas flux sources: 1) (Sahling et al., 2009), 2 and 3) this study, 4) (NRC, 2003) 5) (Joye, 2010), 6) (Leifer and Macdonald, 2003), 7) (Sauter et al., 2006), 8) (Heeschen et al., 2005), 9) (Heeschen et al., 2005), 10) (Torres et al., 2002), 11) (Milkov et al., 2003).

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