

Title: Airborne observations of carbon dioxide and methane emission ratios from the Yosemite Rim wildfire, California

Authors: Emma L. Yates, Laura T. Iraci, Tomoaki Tanaka, Matthew C. Roby, Patrick Hamill, Craig B. Clements, Neil Lareau, Jon Contezac, Max Loewenstein, Warren Gore

Abstract:

This paper presents airborne in situ measurements of carbon dioxide (CO₂) and methane (CH₄) downwind of an exceptionally large wildfire, the Rim Fire, near Yosemite, California, during two flights. Data analyses are discussed in terms of emission ratios (ER) and emission factors (EF) and are compared to previous studies. CH₄ ER's were 7.5-7.9 parts per billion (ppb) CH₄ for every 1 part per million (ppm) of CO₂ (ppb CH₄ (ppm CO₂)⁻¹) on 29 August 2013 and 14.2-16.7 ppb CH₄ (ppm CO₂)⁻¹ on 10 September 2013. This study measured only CO₂ and CH₄; however, estimated emission factors (EEF's) are used as rough estimates of EF's of CO₂ and CH₄ and are in close agreement with EF's reported in previous studies.

In the western US, wildfires dominate over prescribed fires, contributing to atmospheric trace gas budgets and regional and local air pollution. Limited sampling of emissions from wildfires means western US emission estimates rely largely on data from prescribed fires, which may not be a suitable proxy for wildfire emissions.

Given the magnitude of the Yosemite Rim wildfire, the impacts it had on regional air quality and the limited sampling of wildfire emissions in the western US to date, this study provides a valuable measurement dataset and may have important implications for forestry and regional air quality management.