Evaluation of Matthews-WLR-CH_4: A New Wetland, Lake, and Reservoir Methane Emissions Data Set

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Methane (CH_4) is emitted from a variety of sources, both natural and anthropogenic, and is the second most important greenhouse gas contributing to climate change. Natural wetlands are the largest single contributor to annual global CH_4 emissions and other inland water sources, such as lakes and reservoirs, produce CH_4 but have received less attention. These emission sources are among the most uncertain components of the global CH_4 cycle. These uncertainties stem from numerous issues, including the vast variability in these ecosystems and the sensitivity of CH_4 emissions to interannual climate variations. Existing CH_4 emission models display large differences in wetland spatial extent and include simplified, or lack all together, wetland-type classifications. Furthermore, CH_4 emissions from lakes and reservoirs are typically combined with wetlands, or ignored, on a regional and global scale. Our NASA Interdisciplinary Research in Earth Science (IDS) study is focused on developing a suite of data sets on wetlands, lakes, and reservoirs (WLR) including global distributions of types, CH_4-centric classifications, and daily CH_4 emission rates (hereafter Matthews-WLR-CH_4). This project is unique in that it comprises source-independent emission data for WLR, the first spatially-explicit data set of lake and reservoir CH_4 emissions, and wetland emissions comprising numerous different wetland-type classifications.

The focus of this study is to perform the initial evaluation of the wetland and lake CH_4 emissions data from Matthews-WLR-CH_4. This evaluation will focus on the domain of North America and include: 1) estimates of the contribution of wetland and lake sources to total CH_4 emissions and atmospheric mixing ratios, 2) comparisons of wetland fraction and CH_4 emissions to a suite of existing models (e.g., Wetland and Wetland CH_4 Inter-comparison of Models Project (WETCHIMP), Global Carbon Project (GCP)), and 3) an accuracy assessment with in situ airborne and tower-based atmospheric CH_4 observations when the Matthews-WLR-CH_4 emissions are implemented in forward and inverse CarbonTracker-Lagrange (CT-L) CH_4 model simulations. Here we will present the new Matthews-WLR-CH_4 wetland and lake CH_4 emissions data, the initial evaluation of these products, and the path forward for our project.