Evaluation of Matthews-WLR-CH₄: A New Wetland, Lake, and Reservoir Methane Emissions Data Set

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Methane (CH₄) 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 CH4 emissions and other inland water sources, such as lakes and reservoirs, produce CH₄ but have received less attention. These emission sources are among the most uncertain components of the global CH₄ cycle. These uncertainties stem from numerous issues, including the vast variability in these ecosystems and the sensitivity of CH₄ emissions to interannual climate variations. Existing CH₄ emission models display large differences in wetland spatial extent and include simplified, or lack all together, wetland-type classifications. Furthermore, CH₄ 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, CH₄-centric classifications, and daily CH₄ emission rates (hereafter This project is unique in that it comprises source-independent Matthews-WLR-CH₄). emission data for WLR, the first spatially-explicit data set of lake and reservoir CH4 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 CH₄ emissions data from Matthews-WLR-CH₄. This evaluation will focus on the domain of North America and include: 1) estimates of the contribution of wetland and lake sources to total CH₄ emissions and atmospheric mixing ratios, 2) comparisons of wetland fraction and CH₄ emissions to a suite of existing models (e.g., Wetland and Wetland CH₄ Intercomparison of Models Project (WETCHIMP), Global Carbon Project (GCP)), and 3) an accuracy assessment with in situ airborne and tower-based atmospheric CH₄ observations when the Matthews-WLR-CH₄ emissions are implemented in forward and inverse CarbonTracker-Lagrange (CT-L) CH₄ model simulations. Here we will present the new Matthews-WLR-CH₄ wetland and lake CH₄ emissions data, the initial evaluation of these products, and the path forward for our project.