(19-220414-B) **Progress Towards Diagnosis of North American CO_2 and CH_4 Fluxes with the Expanded *In Situ* Measurement Network**

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North American biogenic carbon dioxide (CO_2) fluxes and total methane (CH_4) emissions remain poorly diagnosed at regional scales. Regional scales (areas smaller than the entire continent - e.g. the MidWest corn belt, oil and gas production basins) are critically important because they are the scales (biomes, geopolitical units) over which management activities take place, and over which climate and ecological processes drive terrestrial fluxes. As shown in the figure below, the rapid expansion in North American, tower-based greenhouse gas (GHG) measurements over the last decade, and substantial advances in atmospheric inversion methodology provide an excellent opportunity for improving our understanding of regional CO_2 and CH_4 fluxes. Here we discuss progress towards taking advantage of the extensive continental GHG measurement network (over 80 continuous, tower-based measurements, and over 20 flask measurement and aircraft profiling sites) and the newly operational continental-scale flux inversion system, CarbonTracker - Lagrange, to diagnose North American GHG fluxes at regional spatial and sub-seasonal temporal resolution from 2007-2018. These inverse flux estimates will eventually be cross-evaluated with comparisons of posterior mole fractions to independent atmospheric GHG mole fraction observations from the Atmospheric Carbon and Transport (ACT) - America Earth Venture Suborbital (EVS) flight campaigns, and with comparisons of posterior fluxes to regional clusters of flux towers. Also, a range of data removal experiments is planned, with the goal of illustrating the value of currently available tower and aircraft data in resolving both spatial structure and temporal patterns in GHG fluxes.

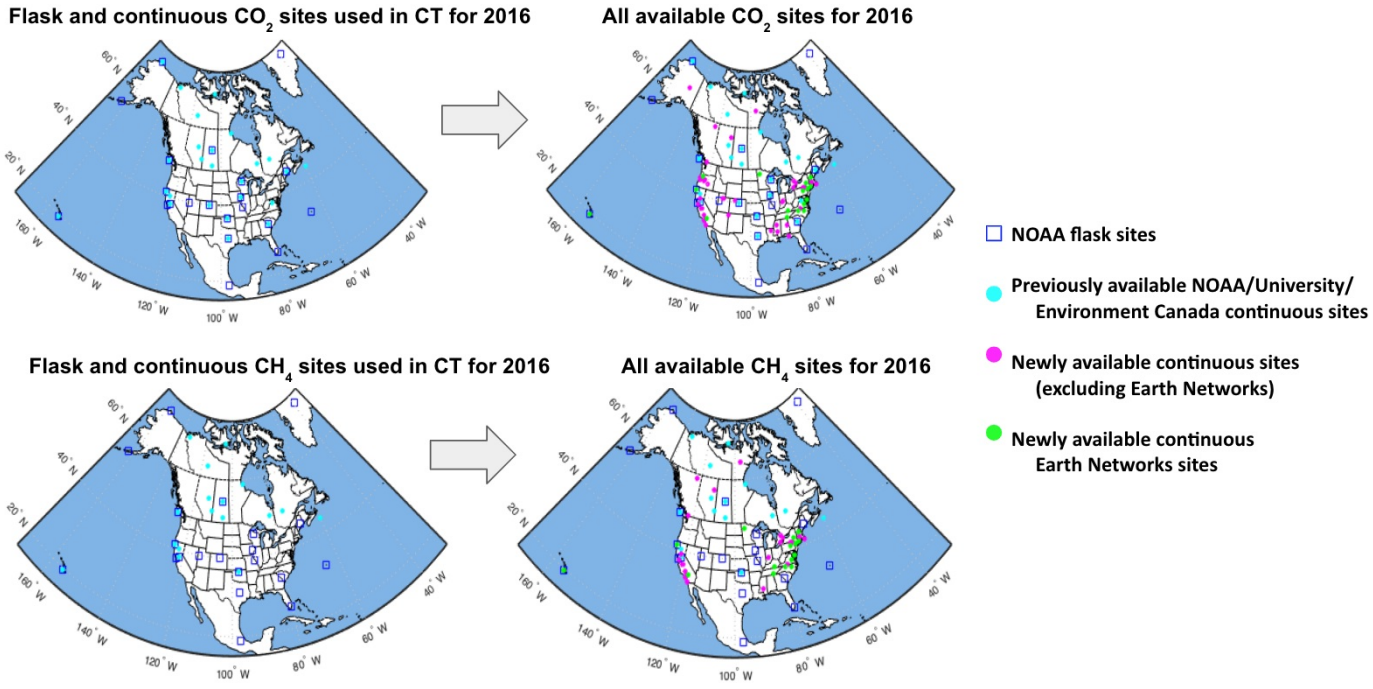

Figure 1. [a] In-situ CO_2 flask and continuous measurement sites used in the Hu et al. (2019) CT-Lagrange study and CT2016 (not including ship-based measurements). [b] All CO_2 sites available in 2016. [c] In-situ CH_4 flask and continuous measurement sites used in the Bruhweiler et al. (2014) study. [d] All CH_4 sites available in 2016. Blue squares are NOAA flask sites, pink points are NOAA/University/Environment Canada continuous sites and green points are continuous sites operated by Earth Networks.