

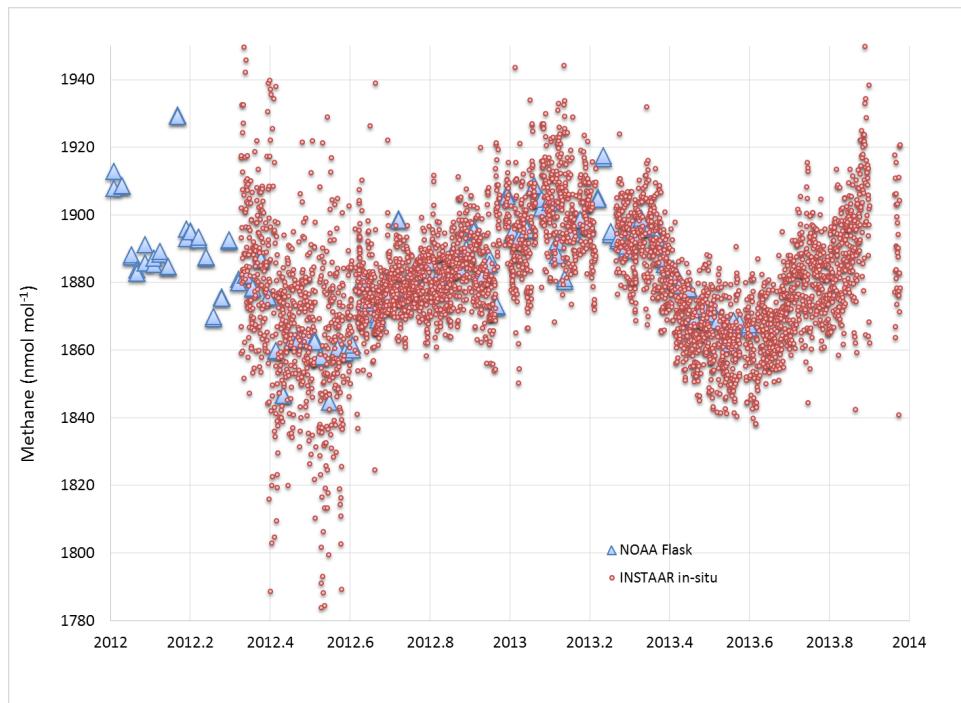
## Comparison of *In Situ* and Discrete Sample Methane Monitoring at Summit, Greenland

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Observations of atmospheric methane mole fractions in the Arctic serve as an important benchmark for the study of global trends and levels. Due to the isolation from most anthropogenic sources, methane measurements in the Arctic are also a sensitive tool for investigating climate feedbacks and the potential methane release from permafrost and hydrates. In this study, two methods for observing atmospheric methane at the GEO Summit Facility in Greenland are compared for the purpose of evaluating the two distinct sets of data. The two methods are: 1) High resolution *in situ* sampling with analysis by Gas Chromatography-Flame Ionization Detection (GC-FID) with 2-3 hour time resolution in the Temporary Atmospheric Watch Observatory facility at the site, and 2) Bi-weekly whole air sample collection with GC-FID analysis at NOAA Global Monitoring Division after shipment of the discrete air samples to Boulder. Averaging all data from the period of overlapping discrete and *in situ* measurements gave a mean value of 1880.7 nmol mol<sup>-1</sup> for the *in situ*, and 1881.8 nmol mol<sup>-1</sup> for the discrete measurements, respectively, demonstrating good agreement with a relative difference of 0.06%. These data were aligned on common scales to further investigate their agreement. The discrete samples gave higher values for 33 comparisons, and lower values 32. The paired discrete samples showed an absolute standard deviation of 0.4 nmol mol<sup>-1</sup>. Comparison of the two *in situ* measurements taken before and after the discrete sample yielded a mean standard deviation of 2.7 nmol mol<sup>-1</sup>. Both data sets agree very well in defining the methane seasonal trends. In addition, the fine scale temporal changes in the *in situ* data allow for deciphering atmospheric transport events for studies of upwind methane source regions.



**Figure 1.** Results of graphing NOAA's flask methane mole fraction data against INSTAAR's *in situ* methane data. The two sets can be seen to agree on seasonal trends and levels very closely. The significantly larger amount of samples gathered by INSTAAR's *in situ* sampling process is also made apparent.