Figure S1. Image of N_2O/CH_4/H_2O instrument in aircraft's luggage bay, which shows 1) electronics board, 2) detector pressure vessel, 3) detection cell, and 4) laser pressure vessel. Electronic cables were removed for clarity.
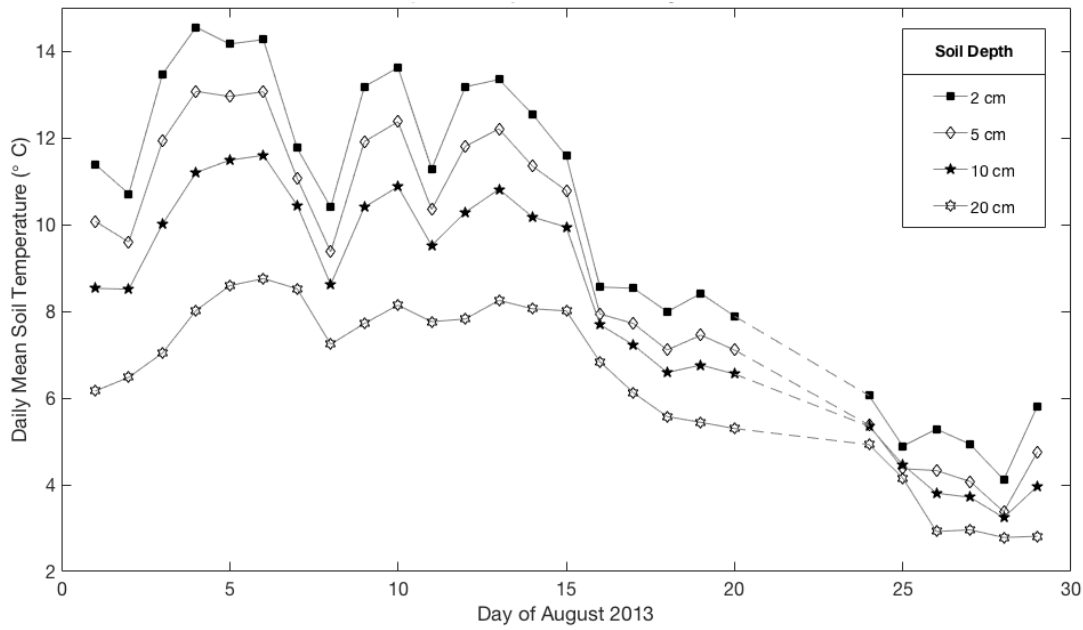
Figure S2. Daily mean soil temperatures at 2, 5, 10, and 20 cm depths. Each temperature shown is based on averaging 3 temperature probe sites located in the vicinity of the flux tower and then averaged for the full day. August 21-23 are missing because the flux tower platform was not being operated at that time.

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Table S1. In-flight precision and observed flux averages with 99% CI range. Second column lists flight-by-flight precision from in-flight calibration data. Spatially averaged fluxes are presented with bootstrap-derived 99% confidence intervals in parentheses.

Flight date DD.HH	σ_{N2O} (ppb Hz$^{-1/2}$)	Mean N$_2$O flux (μg N$_2$O m^{-2} s^{-1})
25.18	0.30	0.05 (0.016, 0.097)
27.11	0.53	-0.01 (-0.053, 0.045)
27.19	0.58	0.015 (-0.003, 0.040)
28.10	0.27	0.10 (0.049, 0.160)
28.15	0.44	0.04 (-0.002, 0.103)
All flights		0.043 (0.017, 0.063)