Geophysical Research Abstracts
Vol. 20, EGU2018-5870-1, 2018
EGU General Assembly 2018

A direct and simultaneous method for detecting atmospheric Ar, O_2, and N_2 by a gas chromatograph equipped with a thermal conductivity detector (GC-TCD)

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Carbon dioxide (CO_2) and oxygen (O_2) fluxes are inversely linked through the processes of fossil fuel combustion, terrestrial photosynthesis, and respiration, while with no correlation during air-sea exchange. This behavior of CO_2 and O_2 fluxes provides an insight into distinguishing the terrestrial and oceanic sinks for anthropogenic CO_2 by measuring atmospheric O_2 and concurrent CO_2 concentrations. In addition, atmospheric Ar/N_2 ratio is expected to undergo very slight variations due to exchanges of Ar and N_2 across the air–sea interface, driven by ocean solubility changes and thus observing such minute variations may provide useful constraints on large-scale fluxes of heat across the air–sea interface. In our study, we described a direct and simultaneous method for detecting atmospheric Ar, O_2, and N_2 by a gas chromatograph equipped with a thermal conductivity detector (GC-TCD) with the aid of a HP-PLOT molecule sieve capillary column and semiconductor cryogenic technology. Preliminary results showed this method could provide a good separation between Ar and O_2 in the atmosphere, but a litter difficulty to measuring such minute changes in the atmospheric Ar/N_2 and O_2/N_2 ratios.