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First Long term Record of the Mass Independent Isotopic Composition of Tropospheric Carbon Dioxide

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A major limitation in assessing global climate warming and carbon source strengths has been provision of a high definition accounting of the rate of transfer between reservoirs. In this context, stable isotopes have historically played a valuable role. The long term record of atmospheric carbon dioxide by Keeling has been a major factor in understanding global climate warming and isotopes have played a major role in that record.
It was first shown by Thiemens and collaborators that stratospheric carbon dioxide posseses a mass independent oxygen isotopic composition that it acquires from exchange with electronically excited atomic oxygen which is produced from ozone photolysis. Further measurements as well as sophisticated laboratory experiments by many groups have lead to a much greater undersatnding of stratospheric oxygen chemistry.
There have been models by suggesting that tropospheric carbon dioxide should have a mass indepednet isotopic composition and, if it does, would be a quantitative record of the transfer rates between the stratosphere and troposphere and troposphere-surface. There are however, no multi oxygen measurements of tropospheric carbon dioxide. In this presentation, a near decade of mass independent tropospheric carbon dioxide data, taken under carefully controleld conditions, without storage is reported and the trends and stratospheric influence in the troposphere examined.