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Analysis and Monitoring Atmospheric Gases in a High-Performing and Versatile Isotope Ratio Instrument

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Biogenic gases carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O) are regularly analysed in many environments to understand elemental cycling and processes through the ecosphere. They are also of interest to atmospheric chemists for their role in climate change. The Elementar Isoprime TraceGas, coupled with Elementar isotope ratio mass spectrometer (IRMS), has been a key to a significant number of studies providing data on the isotopes of these key dynamic molecules. We shall review some of the notable publications and modifications in the field of atmospheric gas monitoring.

The development of the recently launched isoprime precisION IRMS has permitted a new generation of control and automation of the mass spectrometer and integrated peripherals. This has greatly improved the accessibility and versatility of the instruments as a whole. Taking advantage of the inherent benefits of the isoprime precisION, the iso FLOW GHG has been developed for high performance analysis of CO₂, N₂O and CH₄ as a successor to the isoprime TraceGas, and has the capacity to be rapidly customised for specific needs with options for N₂ and N₂O analysis, analysis of hydrogen isotopes in CH₄, and high precision and sensitivity measurement of nitrate-derived N₂O as generated from denitrifier techniques. We present an outline of the latest generation hardware available to the gas researcher and explain how its standard modes and configurations take biogenic gas analysis further than before.