Examples of Accelerator Mass Spectrometry from Polar Regions.

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Accelerator Mass Spectrometry (AMS) determines the ratio of a rare isotope, normally radioactive and of intermediate half-life, to a stable isotope. AMS permits the detection of individual atoms in a sample and so is an inherently sensitive analytical technique. A well-known example is radiocarbon dating, where measurement of the $^{14}C/^{12}C$ ratio permits determination of the age of an artifact. Such AMS measurements can be performed rapidly (~ 20 min), at good precision (~ 0.3 ‰), with high sensitivity (< 10^{-15}) and on very small samples (as little a few µg of carbon). Radiometric measurements, by contrast, require much larger sample masses and much longer measurement times in order to obtain good precision.

The development of AMS has enabled unique studies in many different fields of research. Here I give examples of palaeoclimate research on samples from the ice sheets in Greenland and Antarctica: ^{14}C studies of atmospheric gases from firn air and ice core bubbles and studies of beryllium isotopes in snow and ice. AMS provides the unique key to unlock these important climate archives.