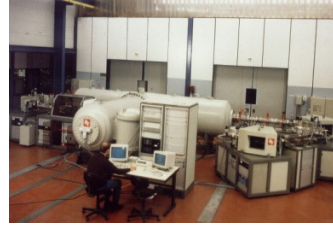


Radiocarbon (^{14}C) measurements to distinguish biogenic and fossil carbon fractions



In our research we use the measurement of the radioactive carbon isotope ^{14}C (radiocarbon) to quantify biogenic CO_2 fractions in fuels and flue gas CO_2 emissions and to determine trends in atmospheric regional fossil fuel CO_2 emissions.

^{14}C has been used since the 1950s for many different applications. A well-known application of ^{14}C measurements is dating organic material: the less ^{14}C is measured the older the sample.

Another application, which we use here, is to determine the rate of mixing of biogenic and fossil organic materials. Since fossil organic materials are very old (> 50.000 years) almost all ^{14}C has decayed and these materials contain no measurable amount of ^{14}C anymore. Biogenic organic materials, on the contrary, are formed recently (< 200 years) and contain ^{14}C abundances (relative to total C) comparable to atmospheric values. If recent biogenic carbon material or atmospheric air is mixed with fossil carbon, the relative ^{14}C abundance in this material/compartement decreases in comparison to a sample with 100% biogenic carbon or, in the case of atmospheric air, to a sample with no addition of fossil fuels. This decrease in ^{14}C is proportional to the fraction of fossil carbon in the sample and can therefore be used to determine the biogenic and fossil carbon fractions in a sample.