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Measurements of atmospheric halogenated greenhouse gases at Lampedusa island in the Mediterranean

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The atmospheric concentration of many halogenated gases, such as hydrochlorofluorocarbons (HCFCs), hydrofluorocarbons (HFCs) and sulfur hexafluoride (SF_6), is rapidly increasing. The production of several of these halogenated species was started in the 1990's to replace the ozone depleting chlorofluorocarbons. Although these species have a small or null ozone depletion potential, they are powerful greenhouse gases and their measurement in the atmosphere is an important task to understand climate change. According to the 1996 IPCC report, the 100-year global warming potentials of HCFC-22 and HFC-134a are 1700 and 1300, respectively. Due to their extremely low atmospheric concentrations (few parts per trillion), these compounds are difficult to measure.

Several halogenated greenhouse gases (HCFC-22, HFC-134a, HCFC-141b, HCFC-142b and SF_6) are monitored at the island of Lampedusa, in the Mediterranean, since December 2003, as a complement to a large set of measured climatic parameters (among which concentrations of CO_2, CH_4, N_2O, CFC-11, CFC-12). Lampedusa (35.5˚N, 12.6˚E) is particularly suitable for background greenhouse gas measurements because is poor of vegetation, far from pollutant sources and from continental areas. The air samples are collected weekly in 6L stainless steel canisters. The canisters are shipped to the ENEA Casaccia Laboratory (Rome), where a dedicated measurement line has been set up. The measurement line is equipped with a preconcentration system, containing a cold trap (-15˚C) that retains the trace gases to be analysed. After trap heating (300˚C), the released analytes pass into a gas chromatograph for the separation, and are finally detected by a mass spectrometer. Concentration standards

are prepared by the NOAA HAlocarbons and other Trace Species (HATS) laboratory. Four measurements are performed on each sample and means and standard deviations are calculated. Typical results for SF_6, HCFC-22, HFC-134a, HCFC-142b and HCFC-141b are 5.5$\pm$0.4, 181.6$\pm$1.5, 41.7$\pm$0.6, 16.7$\pm$0.3 and 19.4$\pm$0.2 respectively. The data are in line with the ones reported by other global monitoring stations of greenhouse gases. In order to test the reliability of these data, ENEA is participating to international intercomparison experiments. The 2-year time series have been submitted to the World Data Center for Greenhouse Gases (WDCGG) established under the WMO Global Atmosphere Watch (GAW) programme.