



CO₂ isotopic composition in the upper troposphere: the project CARIBIC

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The project CARIBIC (<http://caribic-atmospheric.com>), aims to study atmospheric chemistry and composition by measuring many compounds and species in the upper troposphere-lowermost stratosphere around the globe by using a commercial aircraft. CARIBIC has two phases, CARIBIC-1 and CARIBIC-2 (CARIBIC-LUFTHANSA). During CARIBIC-1 (flights from Germany to mainly India, South Africa and the Caribbean), large air samples of 250 l were taken. The CO₂ isotope composition was measured on cryogenic extracts from these samples. Despite of a scatter in d18O(CO₂) at the beginning (CO₂-water isotope exchange in the steel canisters) and the limited number of air samples (12 samples per flight), the approach to analyse CO₂ isotopes in the UTLS and free troposphere appears useful and measurements continued for CARIBIC-LUFTHANSA.

The new instrument container (15 experiments) of CARIBIC-LUFTHANSA operates onboard an A340-600 of Lufthansa (Frankfurt, Germany) absolving monthly flights from Frankfurt to China, South America, USA and Canada. 28 air samples are collected in glass containers (2.7 l volume, pressure ~3 bar), giving much better sampling resolution than for CARIBIC-1. A specially designed CO₂ extraction line was installed at IRMM (Geel, Belgium) and isotope measurements started in 2007. Particular focus is on the quality of d18O(CO₂) data which give important information about CO₂ exchange with oceans, soils and biosphere, being a long-term indicator of

global changes in the CO₂ cycle as well as oceans' feedback.

Preliminary data for some CARIBIC-2 flights demonstrate a correlation between d¹³C(CO₂) and inverse concentration of CO₂, indicating mixing of similar air masses into background air along a sampling route. Some correlations are extremely compact thus also confirming a high quality of sampling and measurement. Due to use of glass containers a preservation of d¹⁸O(CO₂) was expected and indeed a limited d¹⁸O(CO₂) scatter and a similarity of d¹⁸O(CO₂) for neighbouring samples basically confirms that. Data of the CARIBIC-2 record (the year 2007) will be presented at the meeting, aiming to assess d¹³C(CO₂) variations in the UT-LMS region and compare d¹⁸O(CO₂) with the reliable part of CARIBIC-1 record (October 2000-April 2002).