AIRCORE as a new tool to study stratospheric age of air

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Mean age of air is a fundamental parameter describing the tracer-transport in the stratosphere. It can be determined from long lived tracers without sinks or sources in the region of interest, which show steady and monotonous trends in the atmosphere.

Observations of the most common mean age tracers, SF6 and CO2, so far required heavy and difficult to launch instrumentation. The instrumentation needs to be mounted on stratospheric balloons allowing to carry the payload to altitudes of 30 km and more. So far large and very expensive balloons were needed for this. A new method for collecting stratospheric air has been described by Karion et al. (2010), and has been named AIRCORE. This method relies on collecting stratospheric air in a long and thin-walled tube during the descent of a balloon. Due to the weight of the tube, which can be below 2.5 kg, a launch on small and inexpensive radio sonde balloons is possible. Due to the length of the tube the information on the chemical composition of the air is conserved for some time in a similar way as in an ice core. However, the information is lost due to diffusion after some time.

We present first observations of CO2, CH4 and CO based on this method during balloon flights in Timmins, Canada in August 2014 and 2015. We discuss the applicability of the method for mean age determination and the altitude range for which results can be obtained. Finally we present the new mean age results in context with previous observations of mean age.