



Climate research by passenger aircraft: past, present & future

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Understanding the chemistry of our atmosphere and its reaction to human influences is vital in developing global solutions to tackle climate change. Passenger aircraft provide a unique platform for directly measuring atmospheric composition, particularly in the tropopause region. The MOZAIC programme, which was initiated in 1993 as a cooperation between European scientific institutions, avionics industry and five European airlines used five AIRBUS A340 aircraft operated by Lufthansa (2), Air France, Sabena and Austrian Airlines to monitor atmospheric gases day by day. Starting with measurements of O₃ and H₂O in 1994, instruments for CO and NO_y were added in 2001. After three phases of funding, MOZAIC has terminated in February 2004, having provided data from more than 100 million flight kilometres in the UTLS and 40000 vertical profiles in the troposphere. The data are open to researchers worldwide and have been used for the evaluation of satellite observations, the improvement of global models, and aircraft environmental impact assessment studies. The European Design Study for new Research Infrastructures IAGOS (Integration of Routine Aircraft measurements into a Global Observing System) prepares the transition from a scheme of individual research projects into a sustainable infrastructure with enhanced measurement capabilities and global coverage. This will be achieved by developing lighter, smaller and low maintenance instrument packages, based on the former MOZAIC instrumentation, as well as new instrumentation for carbon dioxide, aerosol, and clouds - key unknowns in climate modelling. Routine observations from passenger aircraft are a key component of IGACO, itself a key element of a new multi-governmental initiative on Global Earth Observations (GEO) with its secretariat at the World Meteorological Organization. IGACO will merge groundbased observations of atmospheric composition with routine aircraft and satellite measurements through model-based data assimilation.