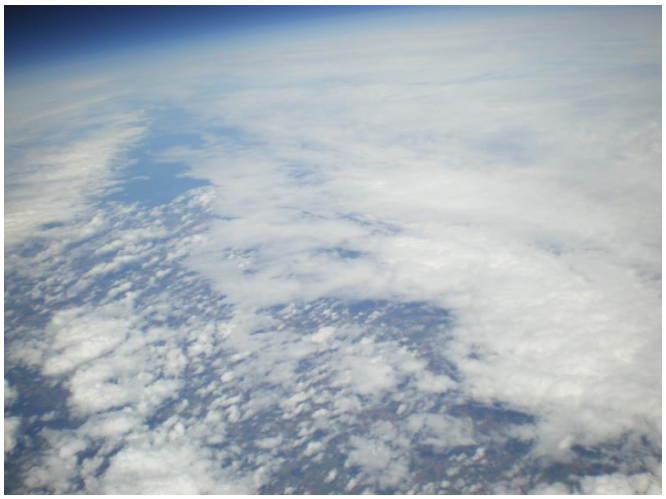
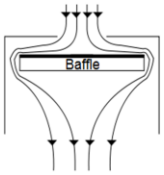


A TEAM OF UNIVERSITY OF BRISTOL PHYSICS STUDENTS HAS COMPLETED A HIGH ALTITUDE BALLOON MISSION, COLLECTING AEROSOL FROM THE UPPER TROPOSPHERE.

The mission, run as part of the Bristol student physics society CHAOS, took almost a year to complete, with team members participating alongside their undergraduate and postgraduate studies. The group aimed to make preliminary investigations into the presence and composition of upper-tropospheric aerosol, of particular topical interest due to their impact on ice nucleation in this region, where cloud formation is poorly understood and has a strong impact on climate. As part of the same mission the standard atmosphere model would be tested and photographs taken throughout the balloon flight.

A GPS module, radio, digital camera and microprocessor, kindly contributed by mbed, were programmed and contained within a polystyrene chilled foods box.

Aerosol collector

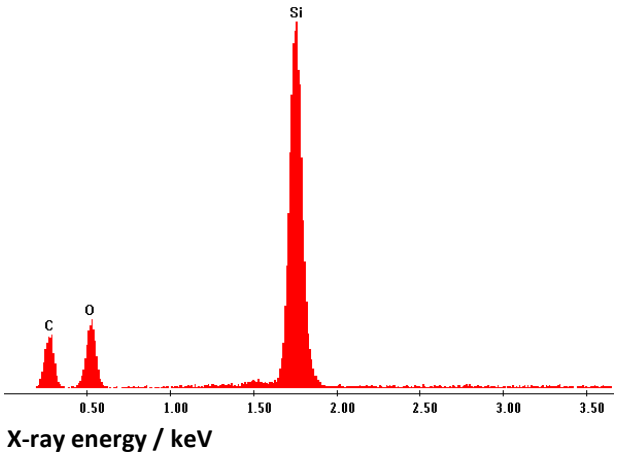


- Based around the same physics as centrifugal vacuum cleaners
- Upward motion of balloon forces air through window and into flow tube, around flat baffle with sticky carbon pad attached
- Exit of the pipe is unrestricted to allow flow to exit freely
- Air turns rapidly through 90° to circum-navigate the baffle
- Particulate present in air forced to hit the baffle due to centrifugal separation
- Carbon pad is extracted for SEM viewing
- Control carbon pad is exposed during the flight but protected from airflow – particulate collected can be solely assigned to altitude of interest
- Entry to tube protected by rotating window controlled by mbed blocking airflow into tube until desired altitude range.

Temperature, humidity and pressure probes were connected, and an aerosol collection device (see inlay) attached to the outside.

In August the team travelled to Cambridgeshire to launch the balloon. Using three cubic metres of helium, the 1.6kg payload was lifted to an altitude of 20.6km before the balloon burst as the planned means of achieving descent. During the flight, the location of the balloon was tracked and the payload was safely recovered 93km away from the launch site.

Almost nine hundred photographs were recovered, along with data from the sensors and the carbon pads bearing aerosols. The collected aerosols were examined using scanning electron microscopy and energy-dispersive X-ray spectroscopy (EDX). It was unfortunately not possible to obtain quantitative results in the available time but a successful initial investigation showed that it would be possible to identify the chemical composition of microscopic particles collected on the carbon pads.



Example of EDX data showing spectra for a particle, likely to be silica.

Future missions by the Bristol team are planned, with aims to investigate the possibility of sustaining a balloon at a given altitude whilst experiments are performed.

The team gratefully acknowledge funding provided by Nexus, the Aerosol Society and the Royal Meteorological Society; as well as support and advice from Steve Randall of Aerospace Engineering; UKHAS; Dr Stuart Kearns, University of Bristol School of Earth Sciences; Professor John Hannay, Bristol School of Physics; Dr Tom Richardson, Bristol Department of Aerospace Engineering; and Dr Ben Murray, University of Leeds School of Earth and Environment.

Hannah Price