

Observation of aerosol profiles using balloon separated Unmanned Aerial Vehicle at Syowa Station, East Antarctica

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Boundary regions in the upper atmosphere play important roles in the global budget of material and energy. It is difficult to perform in-situ observations and sample recovery in/from the regions. There are some platforms for them, airplane, balloon, rocket and so on. They require heavy loads and/or cost for observations.

Small Unmanned Aerial Vehicle (UAV) is one of the most cheap and mobile platforms. Recent developments of electronic devices, microcomputer, and navigation system have been drastic and it supports to develop many types of small UAV. On the other hand, a small rubber balloon is very cheap and useful to lift instruments to upper atmosphere. We started to develop new type of platform, combined a balloon and an UAV. In the first stage, an UAV is hanged and lifted by a rubber balloon to the stratosphere. Aerosol instruments borne in UAV observe aerosol concentration and collect sample during ascending. At the top altitude, planned to separate position, UAV cut hanging rope and return to ground base with instruments and sample by self-control with micro-computer system.

We performed aerosol observations upto 10 km a.s.l. at Syowa Station (69.0 oS, 39.6 oE) in January 2013, as one program of the 54th Japanese Antarctic Research Expedition. Five successful flight were carried out and observe vertical profiles of aerosol concentration ranging from 0.3 to 11.4 μm in diameter, and collect sample up to 8 km a.s.l.. Tropopause is locate around 8 to 10 km a.s.l over Syowa Station in summer season.

We are planning to develop more advanced platform, using balloon, parachute, and UAV, which can realize observation up to 30 km.

We will report details of the developed new type of platform and preliminary results of aerosol observations at Syowa Station.

Keywords: balloon seperated UAV, stratospheric aerosol, Antarctica