Atmospheric Measurement Techniques Discussions

Atmos. Meas. Tech. Discuss., referee comment RC2
https://doi.org/10.5194/amt-2021-234-RC2, 2021

Comment on amt-2021-234

Anonymous Referee #2

Referee comment on "The Antarctic Stratospheric Aerosol Observation and Sample-Return System Using Two-Stage Separation Method of a Balloon-Assisted Unmanned Aerial Vehicle" by Shin-Ichiro Higashino et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-234-RC2, 2021

The introduction is much too long, is hardly a review of previous aerosol measurements in Antarctica, it is limited only to Japanese references, and is not a basis to justify occasional aerosol samples in summer in Antarctica. There have been extensive aerosol measurements using balloons and aircraft over Antarctica covering a much broader range of time, altitude, and space, all of which were ignored.

But the paper is not focused on aerosol sampling, that just happens to be the scientific instrument deployed using the balloon/UAV system, which is the primary focus of the paper. The authors describe this system adequately, but it is a rather straight forward combination of two well-known platforms for in situ atmospheric sampling: balloons and UAVs. The somewhat novel application combines the UAV onto a sounding balloon, with the UAV doubling as an instrument gondola. Once the balloon flight is terminated, or the balloon bursts, the UAV/instrument gondola is parachuted down to an air density suitable for flight, somewhere near 10 km. The UAV then has a homing program installed such that the control surfaces are set for a return to base. Once over the release site the UAV spirals down to the surface, thus returning the instruments. This is a nice result to recover the instruments; however, the authors attempted two flights to stratospheric altitudes, yet only one returned to base. The authors offer no explanation of the fate of the other instrument, or why it might have failed. The reader only knows about this failure from the flight summary in Table 6. The authors also do not explain why more flights were not made with the instrument recovered. The beauty of recovering instruments in remote locations is that the instruments can be re-used, thus limiting the number of instruments required to be deployed to the remote site.

The authors also do not mention the fact that such a flight system can be used in Antarctica because the air space is not governed by a national air control organization, such as the FAA in the US, CASA in Australia, nor the ICAO standards for air traffic control. In locations where these rules apply, this system would not work since the UAV becomes a “piloted” aircraft above about 1000 meters, and thus would be subject to air traffic control. Once the air platform is so classified, a whole new set of requirements are faced beyond that for a free balloon.

In conclusion this paper is not really appropriate for the AMT journal. While the work is interesting, it merely builds on already established technologies, has very limited applications, and does not provide any measurements which could not be obtained by a sounding balloon, good prediction, and recovery vehicle. In addition, the predicted trajectories and the actual trajectories for the one flight recovered were significantly different with little explanation, and the one failure was not explained. From the one successful flight the authors conclude that possibly some aerosol from the Kelut eruption, in February 2014 near the equator, were sampled. The suggestion that Kelut aerosol were measured, nearly a year later over Syowa, raises many questions, none of which are discussed by the authors.