South African Weather Service

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WEATHER BALLOONS OVER THE KAROO – MEASURING IMPORTANT POLLUTANTS AND GREENHOUSE IN THE ATMOSPHERE - A FIRST OF ITS KIND FOR AFRICA AND SOUTH AFRICA

Scientists from the South African Weather Service and the German Research Centre Juelich are working together near Beaufort West, Western Cape, on launching high-altitude balloons (Figure 1) to measure the chemistry of the atmosphere, including pollutants. These balloons can carry small measuring instruments up to an altitude of approximately 35 km, well above the range of aircraft, to investigate the atmosphere from the ground up to those otherwise inaccessible altitudes.

Figure 1: A high-altitude balloon being launched near Beaufort West by Thumeka Mkololo, Pieter Labuschagne (both from the South African Weather Service) and Kiriyaki Blazaki (German Research Centre Juelich)

The challenges of such balloon launches are multifold. Just imagine filling a latex balloon with enough helium to lift a 4 kg instrument with a GPS tracker. This balloon ascends to an altitude of 35 km, while recording temperature, pressure, water content, methane, carbon dioxide, ozone etc. during the flight. After bursting we predict where the parachute will drift to – finding out on which farmer's land it has landed and trying to locate it on the farm. Very much a needle-and-haystack scenario. Other challenges that have been experienced are sudden wind gusts breaking a balloon before it could even take off, and recovering the sensors after a particularly hard landing (all of which are time-critical) during a thunderstorm. Despite this, the first four launches have already provided valuable and precise information on the vertical distribution of the concentrations of water vapour, ozone, carbon dioxide, carbon monoxide, methane and many other trace gases (gases in the atmosphere which have a small concentration with respect to oxygen and nitrogen).

The purpose of this project is to collect data about important pollutants and greenhouse gases in the atmosphere, which are extremely scarce in the southern hemisphere, especially at higher altitudes. Normally, one has to rely on remote sensing instruments such as satellites, but even this sophisticated equipment requires independent verification, which is one of this project's objectives. The gases in question are of importance as they can absorb sun energy at these high altitudes, which influences surface weather.

This is a new and exciting collaboration between the South African Weather Service and the German Research Centre Juelich. Some of the benefits of this collaboration include to further our understanding of atmospheric processes; to improve satellite products by providing an independent point of comparison; and, in the longer term, to help improve long-term weather forecasts as well as projections of future climate change.

The South African Weather Service looks forward to further collaboration in this regard and the incorporation of this crucial information in its climate database.

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