German Aerospace Center

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BEXUS 8: stratospheric balloon experiment launched successfully by Rostock University students

10 October 2009

Highlight of the second campaign in the German-Swedish BEXUS student programme

Start of BEXUS 8

At 14:00 on Saturday, 10 October, the BEXUS 8 research balloon was launched from the Esrange European rocket and balloon launch site near the Swedish town of Kiruna. Its gondola contained experimental equipment assembled by students at the University of Rostock for the measurement of atmospheric turbulence. BEXUS 8 is the first of two balloons in this year's BEXUS Student Campaign linking the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) and SNSB, the Swedish National Space Board, in collaboration with ESA, the European Space Agency. The launch of BEXUS 9 is also scheduled for 10 October.

These two balloon flights are the highpoints of the BEXUS (**B**alloon **EX**periments for **U**niversity **S**tudents) student research programme, towards which participating students have been working for almost a year. Following a flight lasting almost three and a half hours, BEXUS 8 landed 153 kilometres away in Finland, having reached an altitude of about 27 600 metres. BEXUS 9 is expected to achieve a similar flight profile.

Via telemetry, almost all the student teams were able to monitor their experiments during the flight, giving them instantaneous access to the initial data. After the parachute landing, the balloon gondolas containing the experiments were retrieved and brought back to the launch pad and the waiting students. Only then were they able to establish whether or not the devices and equipment they needed for evaluation purposes had been able to withstand the impact of landing.

Final adjustments to the MATI experiment

For this year's BEXUS research campaign, six teams of students from seven European universities made it through the qualifying rounds. They are investigating atmospheric phenomena or conducting technology tests. Throughout the entire project, they receive technical and organisational support from experts at the Swedish Space Corporation (SSC), DLR and ESA.

MATI: An experiment on BEXUS 8 conducted by the University of Rostock

Weighing 32 kilograms, MATI (**M**easurement of **A**tmospheric **T**urbulence with combined **I**nstruments), an experiment by the Leibniz-Institute of Atmospheric Physics at the University of Rostock (IAP), almost completely fills the BEXUS gondola. This experiment employs three different methods to examine minute levels of turbulence in the upper atmosphere during the balloon’s ascent. This involves continuous measurement of even the slightest differences in temperature and wind speed.

Turbulence is caused by wind shear, it occurs right up into the stratosphere and it influences the energy balance of Earth. The measuring fixture and its sensors are mounted on delicate structures on the outside surface of the gondola. The electronics for controlling the experiment and for recording data are located inside the gondola, safely insulated against the low exterior temperatures.

Alongside MATI, the balloon gondola, capable of carrying a total of about ninety pounds (40 kg), still had space for two of DLR's technology experiments; one for antenna development in the gigahertz range and another for examining the influence of high-energy radiation on the quality of optical fibres.

The balloon gains altitude

The reel.SMRT, COMPASS, CRIndIons, NAVIS and SO-hIgh experiments on BEXUS 9

The larger BEXUS-9 gondola is home to five experiments by students from Belgian, Czech, Danish, Italian and Swedish universities The most complex of these experiments is reel.SMRT (**S**pace **M**asters **R**obotic **T**eam). This tests the scope for conducting weightlessness experiments on balloon flights. It involves an experimental capsule attached to a reel and cable being dropped from the gondola. It examines the adverse influences on 'free fall' caused by air resistance and by cable friction.

COMPASS (**C**alculating and **O**bserving **M**agnetic **P**olar field intensities **A**t **S**trato**S**phere) measures the direction and strength of the Earth's magnetic field while the balloon is ascending. A comparison with the most familiar theoretical model enables conclusions to be drawn about the accuracy of altitude readings obtained from magnetic measurements. With the image-capable 3D detector of the CRIndIons (Cosmic Ray Induced Ionisation) experiment, the extent of ionisation caused by cosmic radiation can be measured as a function of altitude.

With NAVIS (**N**orth **A**tlantic **V**essel **I**dentification **S**ystem), a receiver developed in-house is being tested for use on tiny satellites for the automatic identification of ships. The SO-hIgh team (SOI: **S**ilicon **O**n **I**nsulator) is testing a miniature weather measuring system, also developed in-house, which can be used on balloons like BEXUS.

The gondola is suspended from the launch vehicle

REXUS/BEXUS - a programme for fresh scientific talent

In June 2007, DLR and SNSB inaugurated the REXUS/BEXUS programme. On an annual basis, this programme provides students with two research balloons and two research rockets, which they can use to conduct their own experiments. The students gain first-hand practical experience in the preparation and delivery of aerospace projects. Through collaboration between SNSB and ESA, students from all ESA member states are eligible to apply for this programme. EuroLaunch, a collaborative venture between DLR and SSC, performs the balloon and rocket launches.

This year's Ideas Competition for proposed experiments on the REXUS/BEXUS student programme has been running since September 2009. The final submission deadline is 16 November 2009 for proposed experiments in balloons in September 2010 and rockets in March 2011. Participants can find all the organisational and technical information and forms they require for their application on the DLR 'Information for participants in the REXUS/BEXUS programmes' page.
