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Balloon Science: Italy flies from the North Pole!

Reportage from the Sweden stratospheric balloon launching site in Esrange, at 200 km from the Polar Artic circle. Giulia Mantovani follows her colleagues – researchers from the Italian National Institute for astrophysics of Roma (INAF/IAPS) – involved in the preparation of the launch of the GRASS and DUSTER instruments, programmed for the next days.
This reportage has been done during the HEMERA flight campaign 2020 postponed to Summer 2021, due to the COVID pandemic situation. Two flights have been successfully performed in August 2021 from Kiruna with CNES ZP balloons. On 11th September, the SSC ZB balloon has been lunched from the Esrange Space Center, with onboard six instruments from 3 different countries: GRASS (ASI-INAF), DUSTER (INAF), STRAINS (ASI-SAPIENZA), BAMARA (DLR), B-TRUE (University of OULO) and STRATOBUS (Thales-Alenia). After a 9 hours flight, the instruments were recovered from the SSC team, thanks to a track and a helicopter. The collected data will be analyzed by the teams and published on the HEMERA data center website.
Finally, the HEMERA users will have the opportunity to share, with the community, the scientific results of those flights during the first HEMERA workshop. This will be held in Rome from 4th to 7th July 2022. More information on the workshop will be published on the dedicated HEMERA website.

I am in Esrange, in the north part of Sweden, in the launch base of the Swedish Space Corporation, the “Esrange Space Center”. In the next days, we will launch 6 different scientific instruments. Among those, two are developed by INAF with the ASI (Italian Space Agency) support: DUSTER (Dust in the Upper Stratosphere Tracking Experiment and Retrieval) and GRASS (Gamma-Ray Astronomical Small Sensor), both developed by Italian researchers of the INAF/IAPS institute in Rome. These experiments will fly in the atmosphere thanks to a stratospheric balloon, which will carry a structure – the gondola – where the instruments are placed. This launch is part of the HEMERA campaign, a European program funded by the European Commission under the Horizon H2020 program.

The Esrange Space Center is 40 km from Kiruna, the closest city, and at 200 km from the Polar Artic Circle. The center is isolated and far from towns and airports, because of the possible interferences with the balloon launches and the recovery of the instruments. The entrance is restricted to the employees and to authorized people participating to the flight campaign. In the center there is a hotel, a dining hall offering typical Swedish food and different buildings where the instruments are installed on the gondola. These are the buildings where researchers spend most of the time, working on their instruments and taking advance of all the time they have left before the launch in order to set up the instruments. The space center is surrounded by the silent Swedish nature, with forests where, hopefully, it is possible to meet a fox looking for food…like I did when I arrived at the hotel!

Usually, the teams meet in Esrange one week before the expecting launch date, to perform tests on the instruments. “In these days, we are testing the performance of GRASS and preparing the data collection during the launch”, says Lorenzo Natalucci, researcher at INAF/IAPS in Rome and PI of the GRASS instrument. With him, Angela Bazzano, Alessandra Parmentier, Nello Vertolli and Pietro Ubertini partecipate to the campaign. “GRASS is a small detector of 20x15 cm, with a new generation scintillator coupled with a sensor which allows to detect the energy and the interaction position of Gamma Rays”, Natalucci says, “During the flight, we will measure the cosmic and atmospheric background at the stratosphere level, in order to monitor these parameters close to the North Pole and, in the future, develop and upgrade the instruments to improve its technology. In fact, those type of detector, with multiple modules, allows to detect and placed transient event in the sky, like the Gamma-ray bursts and located the counterpart for the gravitational waves.”

DUSTER is the second Italian Instrument flying with GRASS. “We are almost ready to integrate DUSTER in the gondola”, says Vincenzo Della Corte, researcher of INAF/IAPS and DUSTER PI. “During the flight, DUSTER will collect and recover solid particles present in the aerosol in the stratosphere, which will be analyzed in our laboratories. Those particles come from the Earth, for example from volcanos, but also from extraterrestrial sources, like meteorites. Our experiments allows to analyzed the chemical and mineralogic properties of these particles in order to study the origin of the Solar System.”

Then, we all have to wait when the forecast will be optimal for the launch of the stratospheric balloon, expected between Thursday and Friday morning. Stay tuned!