Press release

Balloons will travel around the world to study weather phenomena

Neuchâtel, 10 February 2021 – A team of meteorologists will launch forty high-altitude balloons from the Indian Ocean starting this year to study poorly understood weather phenomena around the equator. The balloons will be equipped with measurement instruments and powered by custom-built, ultralight solar panels developed at CSEM.

Meteorologists know that the equator is home to the most powerful weather phenomena on Earth. These phenomena can be felt as far as the North and South Poles, yet they remain largely a mystery. So far, few studies have been conducted on how the troposphere and stratosphere interact along the equatorial belt.

That is set to change thanks to an international project called Strateole-2, launched under a French initiative (CNES and CNRS). The project team will collect data using pressurized, high-altitude balloons developed by CNES. Two strings of twenty balloons each will be sent up from the Indian Ocean three years apart; each string will make two or three trips around the world over a period of three months. The goal will be to obtain the information needed to better understand equatorial weather phenomena, test the researchers' models and validate computer simulations.

Harvesting data

The balloons consist of a transparent, helium-filled sphere either 11 or 13 meters in diameter, a basket that serves to control the balloon's flight and a second basket containing an array of measurement instruments. The instruments were designed to withstand the low air pressure and temperature (–85°C) that they will encounter so high up. The balloons will collect a wealth of data on air humidity, ozone and CO_2 concentrations, the presence of ice particles, ambient temperatures and pressures, and so on. Some data – like air temperature, pressure and wind speed – will be sent in close to real time to the World Meteorological Organization (WMO) in order to improve its tropical weather forecasts.

Custom-built solar panels

To power the balloons and onboard instruments, engineers at CSEM developed special solar panels made out of proprietary ultralight composites. Each basket will hold four to six solar panels in the shape of a square or a trapezoid, and each panel will have nine to twelve solar cells. The biggest panels will have a capacity of 40 W and the smallest 30 W. The panels are currently being fabricated at CSEM's labs in Innoparc, located in Hauterive in the Canton of Neuchâtel.

"We successfully tested the panels in a pilot run of eight flights in the winter of 2019–2020," says Stéphanie Venel, head of the Strateole-2 project at CNES, in Toulouse. "And so now we've begun

manufacturing the panels that will be used in the instrument-containing baskets for the twenty balloons that will be launched in October 2021."

"The solar panels are subject to really demanding technical specifications. Not only do they have to be small and lightweight – around a few kg/m², or nearly 10 times lighter than standard models – they must also be able to withstand the stratosphere's extreme conditions, such as very low temperatures, extreme heat cycles and significant UV radiation," says Xavier Bulliard, the engineer who heads the Strateole-2 project at CSEM. Pierrick Duvoisin, a design expert at CSEM who is working on the project, adds: "It was a real technical challenge to develop a lightweight system that delivers high performance and reliability in an environment as hostile as the stratosphere. Most vessels just pass through the stratosphere, like when rockets are launched, but these balloons will stay there a few months."

Press kit (pictures) : HERE

Contact

CSEM
Pierrick Duvoisin
spécialiste en design de module
Tel : +41 32 720 53 02
pierrick.duvoisin@csem.ch

Contact presse

CSEM
Laure-Anne Pessina
Strategic Communication Manager
Tel. +41 79 360 25 38
laure-anne.pessina@csem.ch

About CSEM

CSEM—technologies that make the difference

CSEM, founded in 1984, is a Swiss research and development center (public-private partnership) specializing in microtechnology, nanotechnology, microelectronics, system engineering, photovoltaics and communications technologies. More than 500 highly qualified specialists from various scientific and technical disciplines work for CSEM in Neuchâtel, Zurich, Muttenz, Alpnach, and Landquart.

CSEM'S PV & Energy Center
CSEM's PV & Energy Center, founded in 2013, is the largest deeptech research center in Switzerland working specifically in the field of renewable energy. It comprises over 2000 m² of research space in Neuchâtel, including some facilities run jointly with EPFL. The Center operates pilot production lines for next-generation PV cells and modules (made of silicon and perovskite), for the advanced manufacture of packaging materials (such as through the extrusion of polymer foils), and for small-scale energy scavengers. It also houses equipment for testing and modelling batteries and various power-electronics components. The Center plays an active role in developing general energy-management systems and digital technology for energy applications.

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