HEMERA Balloon Experiments - First Call for Proposals (CFP-1)

Deadline for proposals: October 15, 2018

HEMERA is a balloon infrastructure project offering balloon flights for research. It is funded by the European Commission within its programme Horizon 2020. The project is coordinated by the French space agency CNES and involves 13 partners from several European countries and Canada.

The **HEMERA** project will offer free of charge balloon flights to the user community. Six zero pressure balloon flight campaigns and several smaller sounding balloon flights are foreseen from mid-2019 to late 2021. This Call deals with flights in 2019 and 2020 only. The flights of the larger zero pressure balloons, each carrying around 150 kg of payload, are planned from Esrange (northern Sweden) and Timmins (Ontario, Canada). The French base in Aire sur l'Adour will be used for launches of the smaller sounding balloons with 3 kg payload. Launches will be operated by the Swedish company SSC and the French space agency CNES in collaboration with the Canadian Space Agency CSA. The HEMERA project will also cover travel and accommodation costs during the balloon campaigns (max 12 days Zero Pressure Balloons and 3 days for Sounding Balloons) for up to three team members from the selected teams.

The experiments (e.g. instruments) to be flown on HEMERA balloons must be funded by the users, e.g. institutes, universities, industry, national or other sources, outside the HEMERA budget*.

This call is open to all scientists and users, including industry, from the European Union member states, countries associated to Horizon 2020 and Canada. The deadline of the submission is October 15, 2018, 17.00 Central European Time. The responses should be submitted by e-mail to hemera@snsa.se as an attached pdf document(s) based on the **template for the Call for Proposals.** The proposers should be affiliated at a university/institute or company in the EU, associated country to Horizon 2020 or Canada.

Proposals received on time will be evaluated by a group of international experts. Selection of experiments for flight will be made in January 2019. The selection criteria are:

- Scientific quality (technical quality/relevance for the technology proposals)
- Feasibility and compliance with the balloon platform and schedule
- Maturity of the experiment and probability to succeed with the resources available (facilities, funding etc.)
- Expertise and adequacy of the team

Certain boundary conditions (e.g. gender, new users, early career scientists) can be applied at the selection for proposals of equal quality.

* The HEMERA consortium does not have detailed information about the national funding sources in various countries. The science teams are advised to get in touch with a suitable national funding body at early stage as well as to explore funding opportunities through e.g. ESA Prodex or PECS programmes.

Typical Zero Pressure Balloons from Esrange (Sweden) and Timmins (Canada)

Zero pressure balloon (ZPB) is a common balloon type, usually filled with helium gas and geometry of an inverted droplet of water. The balloon has an opening at the very bottom to exhaust excess gas which takes place at the ceiling altitude when the gas expands and the balloon is completely filled. At this point, the ascent stops, and the balloon will fly at a constant altitude. At sunset, the balloon will begin to naturally descend, due to the gas cooling and shrinking. The altitude of the balloon can be controlled by opening of a valve to exhaust gas (descent) and by dropping ballast (maintain altitude or ascent). The balloons considered for the HEMERA project will allow performing scientific measurements during a float at constant altitude for up to 40 hours and to have a slow descent until 15 km to allow atmospheric sounding.

The HEMERA zero pressure balloons will be able to carry several experiments with a total mass of around 150 kg to the altitude of ca 35 km. One of the HEMERA objectives is to address a wider user community, therefore the ambition is to fly up to five experiments in one gondola to allow more teams to participate. The envisaged mass of a single experiment is up to 30 kg but larger experiments will also be considered on a case by case basis (e.g. if some experiments are small, others can be bigger, larger mass can also be flown at lower flight altitudes). An on-board communication service is offered for instrument telemetry and remote-control. The gondolas with the experiments descend with a parachute and are then recovered.

For further details, please consult the Zero Pressure Balloon Manual, provided with this Call.

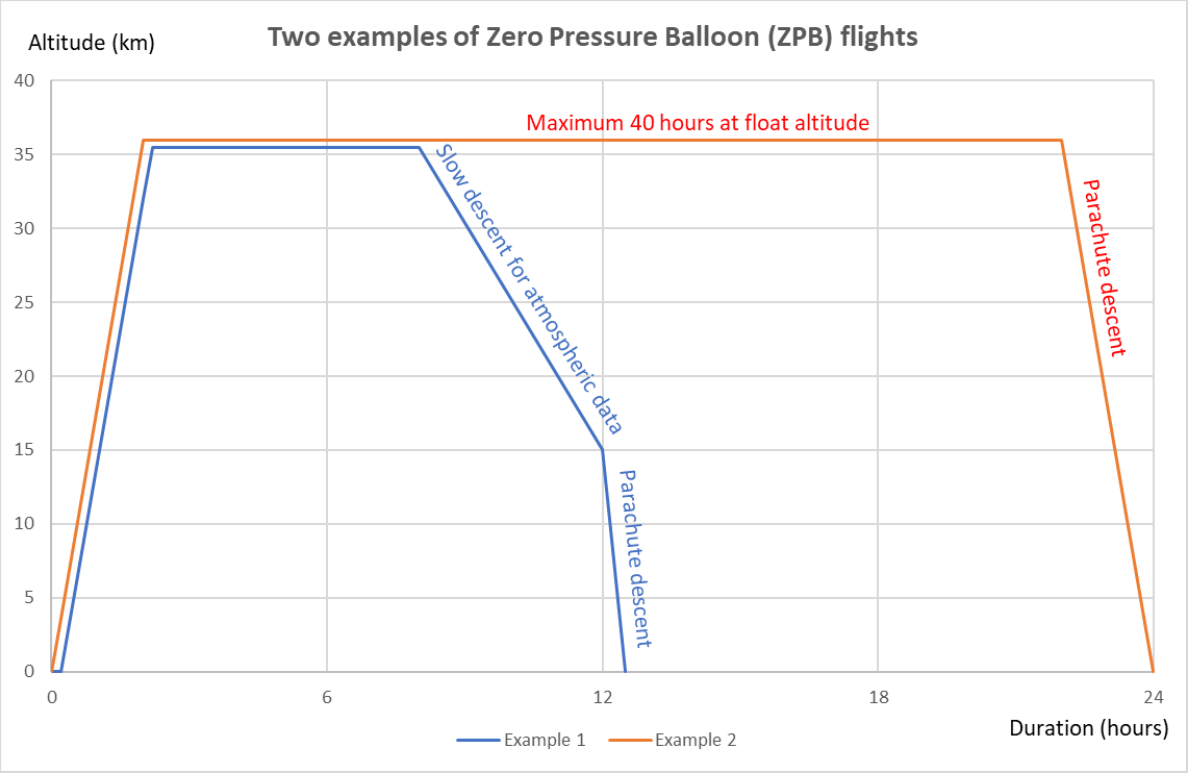

Fig. 1. Examples of zero pressure balloon (ZPB) flight altitude and duration.

Sounding Balloons from Aire sur l'Adour (France)

Sounding balloons (SB) are small expandable balloons, usually made of latex. The volume of these balloons expands during its ascent until the pressure is too high and the balloon bursts which also means termination of the flight. The ascent speed, of around 5 m/s, allows to reach altitudes of 30-35 km in 1.5 to 1.75 hours. After the balloon disintegration, the payload descents with a parachute, with a final speed of 5-6 m/s. The experiments are recovered and can be reused. The mass of the scientific payload is up to 3 kg. During the balloon flight and the parachute descent, wind and atmospheric pressure, temperature and humidity are recorded and transmitted in real time via a weather radiosonde. Experimental data must be recorded on-board, to be collected after the payload recovery. Typical characteristics of a flight is given in Annex 1 below.

For further details, please consult the Sounding Balloon Manual, provided with this Call.

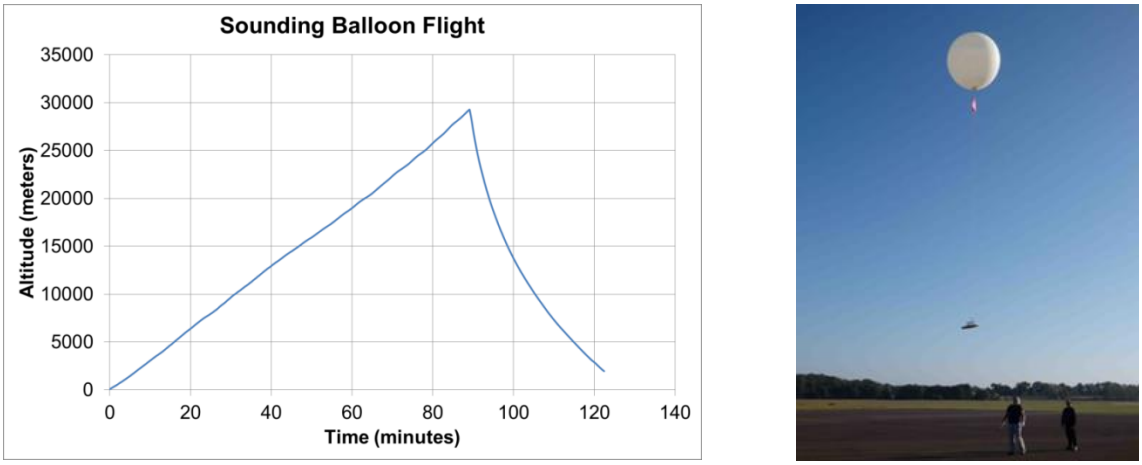

Fig. 2. Typical flight altitude and duration of a sounding balloon.

Contacts persons for the Call for Proposals

Programmatic questions: Kristine Dannenberg, SNSB, hemera@snsa.se
Technical questions: Stephane Louvel, CNES, stephane.louvel@cnes.fr
Maria Holmström, SSC, maria.holmstrom@sscspace.com

Annex 1

Typical characteristics of **Zero Pressure Balloons** and **Sounding Balloons** foreseen in the HEMERA project (more details are given in the ZPB and SB Manuals)

Parameter	**Zero Pressure Balloons (ZPB)**	**Sounding Balloons (SB)**
Launch site	Timmins, Canada and Esrange, Sweden	Aire sur l'Adour, France
Launch seasons	August-September from Timmins All seasons from Esrange	All seasons
HEMERA flights	6 flights during 2019-2021	Several flights, depending on user needs (max 20 flights)
Balloon volume	150 000 m^3	up to 5 m^3
Total experiment mass in one gondola	Up to 150 kg	Up to 3 kg
Typical altitude	15-35 km	30-35 km
Flight duration (excluding ascent and decent)	3 to 40 hours depending on launch site and season (maximum duration depends strongly on the meteorological conditions and can thus not be guaranteed)	3 hours
Ascent speed	5 m/s	5 m/s
Balloon slow descent speed	1-5 m/s	N/A
Speed at landing	5-7 m/s (landing with parachute, with shock absorbents on the gondola)	Around 5-6 m/s (landing with parachute)
Indicative mass of a single experiment	Up to 30 kg, including power source (larger experiments can also be considered on a case-by case basis)	Up to 3 kg, including power source
Indicative volume of each experiment	Depends on the choice of gondola and size of other experiments. Largest currently available gondola is 2.45 x 1.85 x 2.20 meters. Please consider that one gondola will carry up to 5 experiments and supporting equipment.	Indicative max dimensions should be calculated based on the area density, i.e. mass of the payload vs. smallest area of the payload. The area density should not exceed 13 g/cm^2.
Experiment data storage	On board storage and/or transmission by means of communication link	On board only
Speed of the communication link	Up- and downlink up to 2Mbit/s	N/A
Power source for the experiment	Can be provided by the operator or user; the mass of the power source is usually 10-20 % of the experiment	Provided by users
Other services	GPS location, azimuth control, real time flight trajectory, on board cameras.	GPS, pressure, temperature and humidity.