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PRESS RELEASE

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ESA adopts Comet Interceptor space exploration mission

The European Space Agency (ESA) has adopted the Comet Interceptor space exploration mission for a planned launch in 2029. The science goal of this fast F-class mission—taking about eight years from selection to launch and weighing less than 1,000 kilograms—is to characterize a pristine comet or interstellar object for the first time. The original feature of the mission is that its target comet is yet to be discovered and will only be identified after the three spacecraft composing it have been launched. Developed in partnership with the Japan Aerospace Exploration Agency (JAXA), several national space agencies and research centres in Europe, including CNES and CNRS, Comet Interceptor will be the first mission to encounter a comet from the outskirts of the solar system or even beyond.

While Comet Interceptor descends from ESA's pioneering Giotto and Rosetta comet missions, it is nevertheless different because it will acquire the first simultaneous observations from three different points of an object outside the near-Earth environment, and because it will target a comet visiting the inner solar system for the first time, probably from the vast Oort Cloud surrounding the outer reaches of the Sun's realm. This type of comet can only be observed for a few years before it enters the inner solar system, which is why Comet Interceptor's target is as yet undiscovered, even if it is already on its way towards Earth.

Comet Interceptor will comprise three spacecraft forming a composite that will wait at the L2 Lagrange point for a suitable target. The three modules will then travel together before separating a few weeks prior to intercepting the comet, where they will conduct simultaneous observations. Each module will be equipped with a complementary science payload, providing different perspectives of the comet's nucleus and its gas, dust and plasma environment to understand the dynamic nature of a pristine comet interacting with the constantly changing solar wind environment. They will thus obtain the first 3D profile of a comet from the Oort Cloud containing materials that have survived unchanged since the Sun and planets first formed.

CNRS and CNES are closely involved in the Comet Interceptor mission through contributions to four instruments, two of which are directly under France's responsibility. CNRS is also coordinating scientific modelling, crucial for selecting the target comet.

Scientists from ten French research laboratories[1] are working on the mission. CNES is overseeing the French contribution to Comet Interceptor. LPC2E is responsible for the COMPLIMENT instrument. Operating like a small weather station, this instrument will measure plasma (ionized gas) density and temperature, as well as the electric field around the comet, and will count the fine dust particles from its nucleus. These measurements will yield new insights into how the Sun and comets interact. IRAP is in charge of the LEES instrument and contributing to the MANIAC instrument. LEES (Low-Energy Electron Spectrometer) will study and characterize electron populations in the solar wind and in the comet's vicinity. MANIAC (Mass Analyzer for Neutrals in a Coma), developed by the University of Bern, Switzerland, will measure the detailed composition of populations of neutral gases in the comet's coma. These combined measurements will advance understanding of interactions between plasmas, neutral gases and dusts of cometary origin. LAM is supplying the primary mirror for the CoCa camera developed by the University of

Bern to acquire colour imagery of the nucleus and its near environment during the approach and flyby phases of the mission. These images will tell us more about the comet's origin and how it has evolved. LAB is involved in defining and building mechanical and electronic systems for the LEES instrument. LGL-TPE is tasked with coordinating and developing models—of the comet's nucleus, tail, etc.—for the mission, from the engineering phases required to design instruments for an as-yet unknown target through to the operational phases. LGL-TPE will also be involved in selecting the future target, modelling how the comet's activity is likely to evolve on the basis of the first observations from the ground. The Lagrange laboratory is coordinating French activities for the mission and is sharing responsibility for the COMPLIMENT instrument.

The French contributions to Comet Interceptor bear testament to the strong science and engineering heritage built up by the French scientific community over the course of the successful Rosetta comet mission. They are turning the spotlight on France's prowess in space science, particularly in the fields of planetology and the solar wind.

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1 LPC2E environmental and space physics and chemistry laboratory (CNES/CNRS/University of Orléans); IRAP astrophysics and planetology research institute (CNES/CNRS/Toulouse III – Paul Sabatier University); LAPLACE plasma and energy conversion laboratory (CNRS/INP Toulouse/Toulouse III – Paul Sabatier University); LAM astrophysics laboratory in Marseille (AMU/CNES/CNRS); LAB astrophysics laboratory in Bordeaux (CNRS/University of Bordeaux); LGL-TPE Earth, planets and environment geology laboratory (CNRS/ENS Lyon/Claude Bernard Lyon 1 University); J-L Lagrange laboratory (CNRS/Côte d'Azur Observatory); IMCCE institute of celestial mechanics and computation of ephemerides (CNRS/Paris Observatory - PSL); LESIA space and astrophysics instrumentation research laboratory (CNRS/Paris Observatory – PSL/Sorbonne University/Paris-Cité University); LATMOS atmospheres, environments and space observations laboratory in Paris (CNRS/Sorbonne University/UVSQ).