

## Proposed mission to asteroid Phaethon

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3200 Phaethon is a B-type asteroid parent of the Geminid meteor shower. Phaethon does not show any cometary feature, unlike parent bodies (comets) for most of the meteor showers; therefore, it is either a dormant comet or an active asteroid. The observed sodium depletion in the Geminid meteoroid suggests that Phaethon/Geminid can consist of primitive cometary materials and locally melted differentiated materials. The nature of Phaethon remains an open question and currently highly debated. Thus, making Phaethon is a critical mission target to understand the chemical, physical and dynamic evolution of planetismals in the early solar system. Because of its scientific importance, Phaethon was a target candidate for NASA's Deep Impact mission and the OSIRIS-Rex mission.

Asteroids 2005UD and 1999YC are likely fragments originated from Phaethon due to their similar orbital properties, called PGC: Phaethon Geminid Complex. Also, a main-belt asteroid Pallas has been recently suggested to be genetically linked with Phaethon. A space mission to PGC can provide us with information on the physical and chemical characteristics of the PGC parent body. The data obtained with such mission is a key to understand the origins of Phaethon and PGC, and solve the fundamental issues in solar system sciences.

The working group of the mission is currently conducting a feasibility study on a possible mission to Phaethon and the PGC, such as a single flyby mission to Phaethon or a multiple flyby mission to PGC. The objective of the study is to design a (multiple) flyby mission based on impulsive and gravity assisted maneuvers performing an analysis that identifies the global minimum energy trajectory taking in account the system design requirements of the Epsilon rocket, Japan's latest launcher. We are also studying variable scientific instruments suitable for the mission. Scientific and technical discussion with domestic and international researchers for Phaethon and PGC are on-going, to support the mission. Here, we present the latest status of our mission plan to Phaethon (or PGC).

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