

**BepiColombo – ESA's mission to explore Mercury.** J. Benkhoff<sup>1</sup>, <sup>1</sup>ESA-ESTEC, Science Support Office, Noordwijk, Netherlands (johannes.benkhoff@esa.int, FAX+31 71-5654697).

**Introduction:** BepiColombo is an interdisciplinary mission to explore Mercury. Bepi-Colombo is a joint project between ESA and the Japanese Aerospace Exploration Agency (JAXA). From dedicated orbits two spacecraft, the JAXA provided Mercury Magnetosphere Orbiter (MMO) and the European Mercury Planetary Orbiter (MPO), will be studying the planet and its environment. Both spacecraft of BepiColombo will be launched together in July 2016.

The BepiColombo mission will address a comprehensive set of scientific questions in order to study the planet, its evolution and its surrounding environment. A suite of state-of-art scientific instruments, flying on the two spacecraft, allow a wide range of scientific questions to be addressed that will provide clues on the origin and formation of terrestrial planets and help to answer fundamental questions like: "How do Earth-like planets form and evolve in the Universe?" The MPO will focus on a global characterization of the planet itself, while the second spacecraft, the MMO, will study the environment around the planet including the planet's exosphere and magnetosphere. Upon arrival in early 2024 after a cruise phase of about seven years, the Solar Electric Propulsion Module will be jettisoned and chemical propulsion will be used to inject both spacecraft into their dedicated polar orbits. The MMO will be released first, after which an additional thrust phase will insert the MPO into its final orbit. Both orbits are elliptical with eccentricity and inclination optimized for the study of Mercury (MPO orbit: 480×1,500 km) and its magnetosphere (MMO orbit: 590×11,640 km). The base-lined lifetime of the MPO and MMO in Mercury orbit is one Earth year (about four Mercury years, or two Mercury solar days). A mission extension by another Earth year is optional.

Mercury is small compared to the Earth, with a diameter of only 4,878 km. It orbits the Sun in an elliptic orbit between 0.3 and 0.47 AU from the Sun. Mercury is difficult to observe from the Earth, due to its close proximity to the very bright Sun. For an in-depth study of the planet and its environment, it is therefore necessary to operate a spacecraft equipped with scientific instrumentation around the planet. On the other hand the thermal and radiation environment close to the Sun and close to the hottest planet in the solar system is extremely aggressive, which makes this mission technically very challenging.

The mission has been named in honour of the Italian mathematician Giuseppe (Bepi) Colombo (1920–1984), who made many contributions to planetary

research, celestial mechanics, including the development of new space flight concepts. He is well known for explaining that Mercury rotates three times about its axis while it completes two orbits around the Sun.

The BepiColombo mission will provide a rare opportunity to collect multi-point measurements in a planetary environment. This will be particularly important at Mercury because of short temporal and spatial scales in the Mercury's environment. It is foreseen that the orbits of MPO and MMO are selected in a way to allow close encounters of the two spacecrafts throughout the mission. Such intervals are very important for the inter-calibration of similar instruments on the two spacecraft. They also provide scientifically valuable intervals to collect multi-point measurements in an environment where both spatial and temporal scales can be very short.

**Science Objectives:** The main scientific objectives of the BepiColombo mission are to study:

- Origin and evolution of a planet close to its parent star
- Mercury's figure, interior structure, and composition
- Interior dynamics and origin of its magnetic field
- Exo- and endogenic surface modifications, cratering, tectonics, volcanism
- Composition, origin and dynamics of Mercury's exosphere
- Composition, origin and dynamics and polar deposits
- Structure and dynamics of Mercury's magnetosphere

Test of Einstein's theory of general relativity.

It will be shown how BepiColombo can follow up on the new findings from MESSENGER. In addition the latest status of the BepiColombo mission will be given.