

The BepiColombo mission to explore Mercury – Status update and first Results from Science Activities during Cruise. J. Benkhoff¹, ¹Affiliation: ESA/ESTEC, SCI-SC, Keplerlaan 1, 2201 AZ Noordwijk, Netherlands
E-mail: johannes.benkhoff@esa.int

Introduction: The BepiColombo mission was launched on 20 October 2018 the BepiColombo from the European spaceport in French Guyana and is now on route to Mercury. With its state of the art and very comprehensive payload BepiColombo will perform measurements to increase our knowledge on the fundamental questions about Mercury's evolution, composition, interior, magnetosphere, and exosphere. BepiColombo is a joint project between the European Space Agency (ESA) and the Japanese Aerospace Exploration Agency (JAXA) and consists of two orbiters, the Mercury Planetary Orbiter (MPO) and the Mercury Magnetospheric Orbiter (Mio).

During its 7-year long journey to the innermost terrestrial planet the Mio and the MPO spacecraft are connected to each other in a so-called 'stacked' configuration on-top of the Mercury Transfer Module (MTM). The MTM contains a solar electric propulsion engine and will bring the two spacecraft to Mercury. In late 2025, this 'stack' configuration is abandoned, the MTM will be jettisoned and the individual elements spacecraft are brought in to their final Mercury orbit: 480x1500km for MPO, and 590x11640km for Mio. The foreseen orbits of the MPO and Mio will also allow close encounters of the two spacecraft throughout the mission.

On its way BepiColombo has several opportunities for scientific observations - during the cruise into the inner solar system and during its nine planetary flybys (one at Earth, two at Venus and six at Mercury). However, since the spacecraft is in a stacked configuration not all of the instruments can be operated during the cruise phase.

Some of the instruments have been already operated regularly or partially during the flybys in their "scientific" observation mode: e.g. the magnetometer (MPO-MAG), the accelerometer (ISA), the environmental sensor (BERM), the gamma-ray and neutron spectrometer (MGNS), the solar intensity x-ray and particle spectrometer (SIXS), the radio science experiment (MORE), using the X-band and the Ka-band, the thermal infrared spectrometer (MERTIS), the UV spectrometer (PHEBUS) and some sensors of the SERENA suite. Also, instruments or some parts of the instruments of the Japanese Mio spacecraft like the dust monitor (MDM), the plasma wave instrument (PWI), the particle and plasma experiments of MPPE and the magnetometer (MGF) were already successfully operated in their science modes.

BepiColombo also took regular "selfie" images with their three monitoring cameras on the MTM. These cameras were also able to take a sequence of outreach images during the flybys at Earth and Venus in 2020. Other instruments such as cameras and NIR spectrometer (SIMBIO-SYS), the laser altimeter (BELA), the x-ray spectrometer (MIXS), and parts of the electron, neutron, and iron sensors of SERENA on MPO and MSASI and some dedicated sensors of PWI and MPPE are operational, but can only be used in their scientific modes after the Mercury in-orbit commissioning in early 2026 because their field of view is blocked by the underlying Transfer Module.

In April 2020 BepiColombo has passed Earth and on 15th October 2020 Venus. The next planetary flybys will be at Venus in August 2021 and at Mercury in October 2020.

A status of the mission and instruments and a summary of first results from measurements taken during the flybys and during the first two years in cruise will be given.