DEPARTMENT OF CHEMISTRY AND PHYSICS OF MATERIALS

ANNOUNCEMENT

PARIS LODRON UNIVERSITÄT SALZBURG

Vortragsankündigung

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"The JAXA/NASA sample return missions to Martian moon Phobos and to Asteroids Ryugu and Bennu"

Only recently, sample return missions to bodies of the Solar System became a reality. While a sample taken from Mars is still in the future, recent space missions to primitive asteroids (162173 Ryugu, by JAXA's Hayabusa 2 - and 101955 Bennu, by NASA's Osiris-ReX) did collect a significant amount (many grams) of extraterrestrial material and have returned it to Earth or will soon (September 24, 2023). The japanese MMX mission is due to be launched in 2024 and will land, in 2027, on Mars's tiny moon Phobos, to take samples. DLR and CNES provide a small (30 kg) rover, named Idefix, for MMX to scout the sampling region before the mothership lands. The Sample Return Capsule arrives back to Earth in July 2029.

Unlike meteorites, which come from an unknown parent body, samples returned by spacecraft come from a precisely known object and location and are free from alterations caused by entry in the Earth's atmosphere and by the horrors of weathering. It is already clear that the material from Ryugu consists of CI type carbonaceous chondrites, the most primitive material in the solar system; for Bennu and Phobos, we will see! Note that for Phobos (and its twin, Deimos) the main objective is to understand whether it is a captured asteroid or was formed after a giant impact on Mars.

There are large international teams to analyse the precious samples according to a meticulous protocol and to provide contamination-free curation. The author is

payload manager of the MMX rover and collaborator in the Osiris-ReX sample analysis team, with the focus there on physical properties measurement, like particle roughness, cohesion forces, and in particular, specific heat cp. The latter is one ingredient in a quantity called "thermal inertia", TI=sqrt(cp*k*rho), that can be measured remotely from space (by mid-IR radiometers). k is the effective thermal conductivity, rho the bulk density.

I will introduce the space missions mentioned, and the science objectives of analysing the minerals in the returned samples.