**DTM generation from STC-SIMBIO-SYS images**

The development of advanced techniques in data acquisition and processing for the mapping of Solar Systems bodies are becoming more and more important and interesting for the scientific community. In this context the research group with the responsibility of the STereo Camera (STC) for the ESA BepiColombo mission to Mercury, realized an innovative and compact camera design in which the light collected independently by two optical channels at ±20° with respect to the nadir direction converges on the same off-axis portion of a modified Schmidt design and on unique bidimensional detector. Moreover, STC adopts a novel stereo acquisition mode, based on the push-frame concept, never used before on a space mission.

STC, integrated in the SIMBIO-SYS suite, will provide a three-dimensional reconstruction of Mercury surface, acquiring images from two different perspectives. The new stereo push-frame concept, due to the low resources allocated to support the mission instruments design, needs a pre-flight verification of the actual accuracies in obtaining elevation information from stereo couples. To this aim, a stereo validation setup, based on the used of two rotational stages, to get an indoor reproduction of the flight observing condition of the instrument has been developed in order to give a much greater confidence to the novel instrument design. Since in-flight STC will have to deal with source/target placed at infinity, an auxiliary optical system (collimator lens) that collimates the light rays coming from the target, has been necessary to realize the indoor acquisition of the images. In doing so, a target projected at infinity by about 1-m focal length collimator, corresponds to a representation of the Mercury surface at 400 km distance.

The stereo-pairs of a series of rock samples (anorthosite and basalt stones have been specifically collected as they represent a good analogue of the hermean surface) and of a modelled piece of concrete, acquired in laboratory, have been introduced in the photogrammetric pipeline that consider the Dense Matcher as image correlator for the final 3D model generation. Once run the program, the stereo validation has been performed by comparing the STC DTMs (Digital Terrain Models) produced by Dense Matcher software and the DTM produced by an high resolution laser scanning system as reference data. The latter has a much higher precision (ca. 20 m) of the expected in-lab STC photogrammetric image network (190 m).

A series of different parameters and conditions have been changed in order to test their influence on the accuracy of the DTMs produced by the STC-stereo images as different illumination angles (in order to reproduce the acquisition conditions according to the Sun position) and different image compression rates. The main aim is to define the best stereo-pairs and acquisition configurations in order to obtain the best DTMs in terms of accuracy, considering the compromises between the mission constraints and the specific matching aspects that could affect the mapping process.