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GLOBAL INFRARED MOSAICS OF ENCELADUS BASED ON NEW NAVIGATION AND PHOTOMETRIC CORRECTION FUNCTION.

Abstract

The main objective of this research project is to develop super-resolution mapping methods to increase the spatial resolution of surface maps of icy moons of the Solar System by combining all the overlapping observations acquired during a given planetary mission. Cassini-Huygens was the first dedicated mission to Saturn, where it spent 13 years studying the gas giant and its system of moons and rings creating a treasure-trove of data. The focus of this study is to create global surface cartographic products in the infrared by evaluating the Cassini's Visual and Infrared Mapping Spectrometer (VIMS) hyperspectral dataset in its entirety. We will first focus our efforts on developing, testing and validating the methods on Enceladus, a prime astrobiological candidate, which, in contrast to Titan, does not require any atmospheric corrections. We offer a new module in Python for creating the navigation cubes necessary in merging individual cubes into global mosaics, increasing the accuracy of the covered area and maximising the number of pixels used (e.g. limb-crossing pixels). We then determine a surface photometric function which mitigates variations in the brightness due to the changing geometric conditions of the flybys. With a precise and comprehensive navigation and an accurate surface photometric correction, we will be ready for the application of the super-resolution method to enhance both the spatial resolution and the signal-to-noise ratio of our maps.