A NEW LOOK AT THE GEOMORPHOLOGICAL CLASSIFICATION OF IMPACT CRATERS ON THE DWARF PLANET CERES

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Over the last few years, knowledge about the Solar System has expanded due to the numerous space missions. NASA´s Dawn spacecraft was launched in September of 2007 to explore asteroid Vesta and dwarf planet Ceres (Russell and Raymond, 2011). After studying Vesta (between July 2011 and September 2012), Dawn then traveled to Ceres and entered into its orbit on March 6th, 2015 (Krohn et al., 2018). The mission studied in detail the largest body in the asteroid belt, the dwarf planet Ceres. In this study we revisited the current crater classification scheme that is used on other rocky planets, and has been applied to Ceres by Platz (2016). These authors separate craters into simple, modified simple, transitional complex, and complex (Platz et al., 2016). However, Ceres showed a variety of crater morphologies, mainly complex craters. Their central peaks cannot always be accurately depicted by the digital terrain models. To overcome this issue, we employed triangular irregular networks to build the DEMs. As a result, it was possible to observe a large variety of features associated with the craters, making it possible to develop a new classification scheme. For that, geomorphological mapping was carried out using the Arcmap software in order to identify the craters with a diameter greater than 20 km and related structures. From the analysis of the craters it was possible to produce a new spatial distribution map based on the new classes. The new classification scheme was developed using three of the currently existing crater types - simple, transitional complex and complex - and including their respective morphological features. This classification was obtained using only morphologies observed in Ceres, namely: the presence of a central peak, terraces, edges, aspect of the crater interior, condition and its profile in the digital terrain models. The simple craters are subdivided into two morphologies: SB, which in the current classification are simple craters with bowl-shaped morphology, and SH being simple modified craters that have a flat floor. For transitional complex craters, two classes were created, TD and TS. TD represents craters with smooth rims, interpreted as being the results of morphological degradation by different processes. Craters classified as TS are the classic transitional complex craters featuring scalloped rims and a flat crater floor. The complex craters were divided into four classes according to their morphology. The first one is the CP representing craters with the presence of a central peak and depressions in the floor, normally having a diameter smaller than 40 km which may, or may not, have scalloped edges. The most diagnostic features are in the CP, with no terraces or a flat crater floor. CT craters are those defined as complex in the current classification: they have a central peak, scalloped edges, flat floor and terraces. Terracing is strong to intermediate, with craters ranging from younger (fresh) to older ones that preserve all these characteristics. CS craters are also considered complex craters, only differing from CT because They have very weak or nonexistent terracing. The craters of the CD morphology are the only complex ones that do not have a central peak, but they usually have terraces. The main result was a new geographic distribution of the complex craters, using the new subdivision (Figure 1).

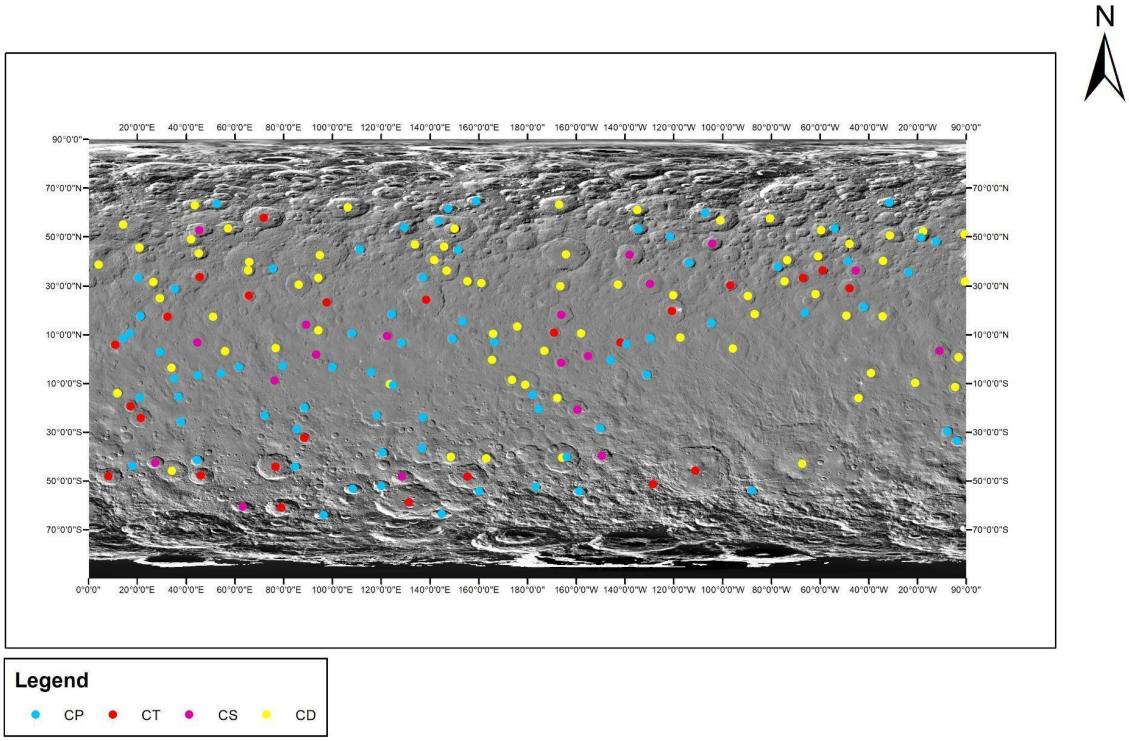

Figure 1. Spatial distribution of CP, CS, CT and CD type morphologies

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