Semi-Automated Extraction of Morphometric Parameters of Impact Craters on Pluto’s Surface. C. V. N. Villaça¹ and A. P. Crósta¹, ¹University of Campinas, R. Carlos Gomes, 250, Campinas, SP, Brazil. (caiovillaca@yahoo.com.br)

Introduction: In July 2015, the New Horizons mission obtained high-quality images of approximately 35% of Pluto’s surface varying in resolution from 76 to 850 m/px [1], making possible to create of a digital elevation model (DEM) of most of its imaged area. Since then, few studies were performed to obtain data concerning the morphometry of impact craters on Pluto [1, 2]. This project aims to contribute in establishing the morphometry of impact craters on this dwarf planet. Impact crater morphometry can be used to gain insight into the properties of the target’s crust and the endogenous and exogenous processes that could modify impact craters.

Objectives: The goal of this project is to elaborate a semi-automated method to delineate the crater’s rim (Fig. 1A) and collect detailed morphometric data of impact craters from Pluto’s different geomorphological provinces. The morphometric data are being compared between the different terrains, in order to check eventual links between crater morphometry and the composition and age of the target. For mapping purposes we need to take into account the different ranges of resolution from the New Horizon data, that causes different levels of noise depending on the region. Our work was based on [3] that divided Pluto into geomorphological and topological domains (Fig. 1B). The map of Sputnik Planitia [4] is used as a reference basis, as well as the upcoming new geological maps of Pluto [5]. The advantages of using a semi-automated method is to reduce the human abstraction of data analysis, as well as to accelerate the analyses of impact crater morphometry in any kind of terrain.

Method: The topological data are being extracted from a DEM with resolution of 300m/px [6]. The code of the semi-automated method allows the user to draw a simplified circle around the crater’s rim as an initial input. Then, the script follows a concept similar to the one employed by [7]. In order to delineate the crater as close as possible to reality, the script creates several profile lines starting from the outside of the crater and passing through the crater center to find three points of reference: slope break (S.B.), maximum elevation (M.E.) and local maxima (L.M.). The script then connects the points of reference, thus delineating the crater’s rim. With the crater boundary delimited, it then extracts the diameter, depth, medium slope of the wall and rim height (and how it varies along the rim).

Preliminary results: So far, we developed a script that can, with minor errors, delineate and extract basic morphometric data from the impact craters distributed on many varieties of Pluto’s terrains. We have yet to further improve the code in order to be able to collect reliable data, especially on the chaotic terrains, such as Cthulhu Macula, and then gather a significant amount of morphometric measurements to create a database to be used in a statistical comparison between Pluto’s different terrains.

Figure 1: A) Impact crater delineated automatically using the code here developed, with approximately 30 km of diameter located on 130°E 20°N. B) Map showing major topographic and morphological provinces mapped by [4].

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