INTRODUCTION: NASA's New Horizons spacecraft revealed diverse landscapes on both Pluto and Charon during its July 2015 flyby, and we are undertaking geomorphologic mapping efforts [1,2] to better understand the different landforms, how they may have formed, and relative timing. The work herein focuses on Charon, and images from the spacecraft have revealed a variety of features [3,4] that include hundreds of tectonic manifestations [5] and vast but diverse plains [6]. We present progress in mapping the hemisphere that New Horizons best imaged during its flyby and will present a finished map, as submitted for peer-review, at the LPSC meeting.

AVAILABLE DATA: Data taken directly by New Horizons relevant for geomorphologic mapping come from LORRI (Long-Range Reconnaissance Imager) [7], MVIC (Multi-spectral Visible Imaging Camera) [8], and LEISA (Linear Etalon Imaging Spectral Array) [8]. LORRI is panchromatic and provided images of Charon at up to 160 m/px, MVIC 4-color images are up to 620 m/px, and LEISA spectral cubes are up to 5 km/px. Figure 1 shows the fractional coverage of Charon at panchromatic (LORRI and MVIC) wavelengths. Additional, derived data useful for mapping includes craters (useful for ages and as units if large enough) [9], reconstructed topography from stereo and photoclinometry [10], and mineralogy maps (produced by the team). Our primary dataset for geomorphologic mapping of Charon is the panchromatic map reconstructed from LORRI and MVIC data.

AREAS IDENTIFIED FOR NOMENCLATURE: For ease of communication, the New Horizons team developed informal names used herein. On Charon, these include two dark macula, 39 impact craters, seven chasmas, and three large montes. In addition, the very broad area north of a large tectonic belt has been termed "Oz Terra" and the smoother plains generally south of the belt are "Vulcan Planum."

TECTONIC FEATURES MAPPING: Initial geomorphologic mapping focused on tectonic features in support of Beyer et al. [5]. This map was originally made without topography input but is in the process of being finalized with the PDS-released topography. Beyer et al. [5] found the majority of tectonic features are aligned northeast-southwest; this parallels the massive tectonic belt implying these features are likely related.

Based on superposed, large impact craters, we estimate the majority of the larger tectonic features formed ~4 Ga. However, crater density maps [9] show a deficit of craters in some areas that are possibly due to disruption by tectonic features, indicating that some tectonic activity may be significantly younger.

VULCAN PLANUM MAPPING: Vulcan Planum is a region that is considered to be the majority of the large tectonic features. In topography, it shows a "moat" at its margins, possibly indicating a frozen viscous fluid flow [4,6]. We are in the process of studying this region [6] and the geomorphologic map has revealed only two primary types of landscape: smooth plains (Sm), and patterned ground (Pg1 and Pg2) which resembles an elephant skin-like texture. Near its southern margin, it also shows numerous broad warps that may represent upwelling.

PRIMARY ONGOING WORK: We are in the process of finalizing the map for submission to peer-review in a science journal. The primary work effort is currently focused on redrafting all line art with the final SPICE solution and basemap, for all original work is distorted on the latest maps. Additionally, we are focusing on the COMU (stratigraphy) of the units to piece together Charon's relative surface history.

FUNDING: This work was funded by the New Horizons mission within NASA's New Frontiers program.

Figure 1: Pixel scale and fractional global coverage of New Horizons panchromatic imaging of Charon.
Figure 2: Map of the main tectonic features on the encounter hemisphere of Charon [5], color-coded by type. Approximately 950 different linear, tectonic-related features have been identified (excludes craters).

Figure 3: Preliminary map of encounter hemisphere. There are three forms of background material we identified: Smooth Terrain in Vulcan Planum, Smooth Terrain in Oz Terra (no unit color, basemap shows through), and Rough Terrain.