GEOGRAPHIC SURVEY OF MARTIAN CHAOTIC TERRAIN. M.B. Stoddard Crile[1] and D.A. Howard[2], [1]Geography & Geoinformtion Science, George Mason University, 230 Research Hall, 4400 University Drive, MS 6C3, Fairfax VA 22030, mcrile@masonlive.gmu.edu, [2]Science, Technology, and International Affairs Program, School of Foreign Service, Georgetown University, ICC 301, 37th and O St., NW, Washington, DC, 20057, dah90@georgetown.edu).

Introduction: The purpose of this research is to provide a comprehensive statistical geographic information survey of chaotic terrain locations on Mars. The GIS analysis evaluates possible spatial correlations between chaos sites and their associated occurrence properties. Chaotic terrain are typically hundreds of km wide and comprised of irregular surfaces with elevated flat topped mesas, knobs of various sizes and deep depressions [1]. The morphology of chaotic terrain is typically associated with either structural and tectonic influences or surface fractures and fissures propagating from depth [2].

Method: Chaotic terrains are spatially correlated to physiographic regions and geomorphology. Additionally, chaos sites are proximally evaluated based on physical characteristics including the most common rock and mineral compositions, indicators of rock strength, and thermal emissive properties. Geologic, geomorphologic, and physiographic characterization of various locations of chaotic terrain provide a quantitative analysis related to its genesis. A GIS database is utilized to organize chaotic terrain attributes (Table 1).

Table 1. Sample attribute table for chaotic terrain GIS feature classes.

ID	NAME	PROXIMITY	ROCK_TYPE	THERMAL_INERTIA	SOLAR_ZONE
1	Aram Chaos	Crater	Sedimentary	High	Equatorial
2	Iani Chaos	Channel	Sedimentary	Low	Equatorial
3	Chryse Chaos	Channel	Sedimentary	High	Equatorial
4	Aurorae Chaos	Channel	Sedimentary	High	Equatorial
5	Hydraotes Chaos	Channel	Sedimentary	High	Equatorial
6	Aureum Chaos	Channel	Sedimentary	High	Equatorial

Furthermore, these sites are examined from a broad perspective, to determine if there are global trends in the occurrences of chaotic terrain (Figure 1). For example, Aram Chaos is located within an ancient impact crater and those sites identified through this research are categorized based on various remote sensing datasets to determine what similarities exist (i.e., craters, flow channels, volcanics, rock types, areas of high/low solar radiation, and high/low thermal inertia).

Chaotic terrain feature class attributes are derived from analysis of thermal emission spectra (TES and THEMIS), visual image interpretation, Mars Orbiter Laser Altimeter (MOLA) data, and solar insolation map interpretation.

Sites exhibiting chaotic terrain are also analyzed for spatial correlation patterns. Spatial correlation using multiple spatial tests and quadrat analyses are performed examining different aspects of spatial patterns. Statistical evaluations are conducted based on both intrinsic, site specific terrain features and regional geomorphological parameters.

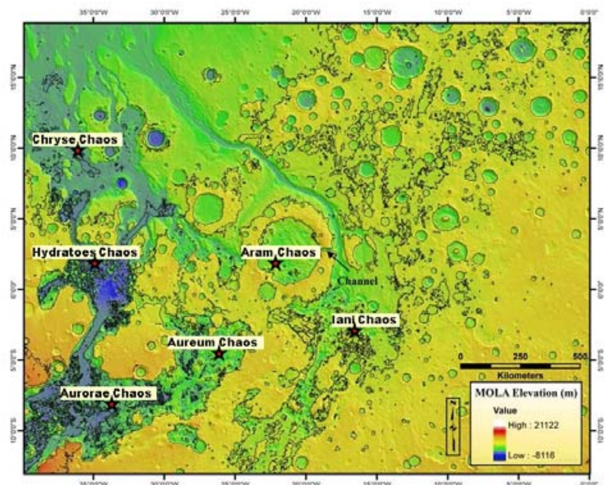

Figure 1. Six representative chaotic terrain locations in the Xanthe and Margaritifer Terra regions. Base map is a MOLA digital elevation model, after [3].

Discussion: Many studies that examine chaotic terrain formation focus on a particular mechanism or chaos region [4][5][6][7]. The intent of this study is to provide insight to identification of potential Earth analogues in order to observe these characteristics *in situ*. Although this research does not attempt to represent a comprehensive list of all chaotic terrains on Mars, it does intend to expand the current knowledge base of the Martian surface which will assistance in further understanding Mars' morphological history.

References: [1] Meresse S. et al. (2007) *Icarus*, 194, 487-500. [[2] Andrews-Hanna J. C., and Phillips R. J. (2007) *JGR*, 112, EO8001. [3] Howard D.A. (2009) *LPS*, XXXX, Abstract #2179. [4] Noe Dobrea, E.Z. et al. (2008) *Icarus*, 193, 516-534. [5] Rodriguez J.A. et al. (2011) *Icarus*, 213, 150-194. [6] Sharp R.P. (1973) *JGR*, 78, 4073-4083. [7] Zegers T.E. et al. (2010) *Earth & Planetary Sci. Letters*, 297, 496-504.