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Cluster Analysis of the Circum-Chryse Region, Mars: Evidence for Carbonate Minerals

G. A. MARZO[1], T. L. ROUSH[2], S. FONTI[1], R. POLITI[1]

[1]*Astrophysics Laboratory, University of Lecce, via Arnesano, I-73100, Lecce, Italy*

[2]*NASA AMES Research Center, Moffett Field, CA, USA*

The largest channel systems on Mars are located in the Circum-Chryse region. TES/MGS spectral data of this area have been investigated using cluster analysis, focusing on surface materials, in particular those connected with past aqueous environment, such as carbonates. The cluster analysis technique used in this work is an unsupervised statistical multivariate approach able to reduce and explore the large amount of data collected during planetary missions. It divides the data set into classes, named clusters, based on the natural distribution of the data in multivariate space. Scientific meaning is defined by fitting the representative spectra of the clusters using an appropriate Martian radiative transfer model. Results of the modelling suggest that some clusters present the spectral features of the carbonate minerals that have small grain diameters and a narrow particle size distribution. In this work, the cluster analysis technique applied to TES/MGS data set and the scientific results for the Circum-Chryse region will be discussed.