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Area-Age Estimates and Physical-Compositional Properties of the Circum-Hellas Volcanic Province, Mars.

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We constructed THEMIS daytime-infrared mosaics (spatial resolution 100 m/pixel) of several regions of wrinkle-ridged plains bounding the Circum-Hellas Volcanic Province (CHVP), and performed crater counts to assess whether these plains were associated with volcanism in the CHVP. We determined cratering model formation ages of 3.4-3.7 Ga for SE Malea Planum, 3.6-3.7 Ga for W Promethei Terra, 3.5-3.7 Ga for Hesperia Planum, and 3.6-3.8 Ga for the eastern Hellas basin floor, all of which are consistent with the formation of the major volcanic edifices (3.6-3.8 Ga) in the CHVP. The inclusion of these regions brings the size of the CHVP to $>$4.86 x 10^6 km^2, comparable in size to the Elysium Volcanic Province. Additionally, we used TES, THEMIS, HRSC, and OMEGA data to assess the physical and compositional properties of the Malea Planum (MP) portion of the CHVP. Our analysis of surface materials shows that the thermal inertia decreases from north to south, suggesting that the surface is composed of coarse silt to very coarse sand, and that there is greater dust cover on the flanks of the CHVP volcanoes than in their putative calderas. Local variations in thermal inertia in MP are likely due to variations in surface material caused by aeolian and periglacial/permafrost processes, whereas regional variations are likely due to seasonal deposition and sublimation of ice at higher latitudes. A new HRSC color mosaic reveals the extent of dark material in MP. Spectral analysis of OMEGA data indicates the widespread presence of pyroxenes $\pm$ olivine, particularly exposed in crater rims indicative of excavation of underlying volcanic materials. Dark materials occur throughout the CHVP, but are concentrated in topographic lows such as crater and caldera floors. Derivation of modal mineralogies from OMEGA data show a variation in composition of dark materials across MP: eastern dark deposits have higher olivine and low-calcium pyroxene contents, lower high-calcium pyroxene contents, and higher ratios of low-calcium to total pyroxene, relative to western dark deposits. Correlation with cratering model age estimates suggests that the western deposits are associated with older features (3.8 Ga) than the eastern deposits (3.6 Ga), but these ages differences are within uncertainties. Nevertheless, our results indicate a potential change in composition of volcanic materials in the Malea Planum portion of the CHVP with space, and possibly time.