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Title:
P43K-3884 Characterizing Martian Crater Circulations with the NASA Ames Mars GCM

Abstract:
Observations made in Gale Crater by instruments on the MSL Curiosity Rover show that the diurnal amplitude of the surface pressure is increased and the depth of the Convective Boundary Layer (CBL) is decreased relative to other lander locations on flatter regions of Mars (Haberle et al., 2014; Moores et al., 2015). Mesoscale modeling studies of Gale Crater suggest that crater circulations produce these effects. Tyler & Barnes (2013) show that local upslope/downslope flows along the crater rim and Mt. Sharp amplify the diurnal pressure cycle. These same flows are thought to be at least partly responsible for the suppression of the CBL because upward air flow at the rim and in the center (due to Mt. Sharp) forces subsidence over the lowest regions of the crater during the day. Regional flows, largely due to the location of Gale near the dichotomy boundary, may also play a role in shaping the circulation internal to the crater. Whether the behavior of the CBL and the amplified diurnal pressure cycle are phenomena observed in craters morphologically different from Gale (i.e. bowl-shaped, irregular, degraded) is not yet understood. We will explore these questions by characterizing the behavior of these processes as they are shaped by the morphology of craters greater than 100 km in diameter. We use the NASA Ames Mars Global Circulation Model (GCM) that now utilizes the NOAA/GFDL cubed-sphere finite-volume dynamical core to examine ~100 craters of varying size and shape from a database of known Martian craters (Robbins & Hynek, 2014). Run at 7.5 km resolution, the GCM is capable of resolving surface winds, temperature, and pressure inside craters of this size allowing for the analysis of dozens of craters simulated at various seasons and within the context of synoptic and global-scale phenomena.

Key Words: Characterizing, Martian, Crater, Circulations