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The chaotic terrains on Mars: evidence for collapses

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Chaotic terrains are large zones of irregular mesas and knobs of varying sizes which lay as much as 1 or 2 km below the surrounding plateau. They principally occur in an equatorial area of Mars (extending from 20˚S to 15˚N, and 305˚E to 350˚E), in and near the sources of the outflow channels shaped by catastrophic floods. The chaos are an erosional landform and numerous geologic scenarios for their formation have been proposed including: (1) magma-ice interactions during intrusive events, (2) catastrophic release of groundwater from confined aquifers and (3) release of water and gas associated with the decomposition of gas hydrate. We investigate these terrains using HRSC (High Resolution Stereo Camera) and MOLA (Mars Orbiter Laser Altimeter) data. The MOLA altimetric data gave us the detailed topography of the chaotic terrains and allowed a morphometric analysis of the regional slopes. Preliminary results, made with the MOLA transects, show that a subsidence tends to happen in the centre of chaos. Moreover many faults and graben zones have been observed on the plateau regions. These faults make the margins unstable and have broken it up into mesas. The slopes on top of the mesas mostly tilted toward the lowest part of the chaos. Thus, whatever the mechanism implicated, we have found evidence of collapse features in the chaos and on the plateau margins.

Further studies of HRSC (High Resolution Stereo Camera) images and MOLA data will give more information about the transitional zone between the plateau and the chaos. This will help us to resolve the origins of chaos and their possible relation with the outflow channels.