338, 487–489. [7] Tonks W. B. and Melosh H. J. (1992) *Icarus, 100*, 326–346. [8] Ahrens T. J. et al. (1989) In *Origin and Evolution of Planetary and Satellite Atmospheres* (S. K. Atreya et al., eds.), 328–385, Univ. of Arizona. [9] Silver L. and Stolper E. (1989) *J. Petrol., 30*, 667–709. [10] Fukai Y. and Sugimoto H. (1983) *Trans. Jpn. Inst. Met.*, 733–740.

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BRINY LAKES ON EARLY MARS? TERRESTRIAL INTRACRATER PLAYAS AND MARTIAN CANDIDATES. P. Lee, Cornell University, Ithaca NY 14853, USA.

Recently, salt-rich aqueous solutions have been invoked in the preterrestrial alteration of the Nakhla [1] and Lafayette [2] SNC meteorites. The findings substantiate the long-standing suspicion that salts are abundant on Mars [3] and, more importantly, that brines have played a significant role in martian hydrogeological history. Adding to the growing body of evidence, I report here on the identification of several unusual intracrater high-albedo features in the ancient cratered highlands of Mars, which I interpret as possible saline playas, or salt pans.

The formations appear in Mariner 9 and Viking Orbiter images as relatively bright, low-relief, irregular or ring-shaped mottled patches on the floor of certain impact craters. Occasionally exhibiting a well-defined bright "core" usually 5–10 km in length, the features may stretch over several tens of kilometers as subdued, bathtub-ring-like formations. Most are located at equatorial to mid latitudes, with a distinct clustering of the core-bearing features in Terra Tyrrhena (e.g., at 11.5°S,290.5°W, 19.2°S,291.75°W, or 19.6°S,300.5°W). These features are unlikely to be merely eolian deposits because their albedo patterns and general outlines are unlike those of common martian or terrestrial eolian formations. Moreover, they often occur in portions of crater floors that would not be expected, based on the indications of nearby wind markers, to exhibit eolian deposits. The features are also unlikely to be CO_2 or H_2O frost cover because many of them lie at latitudes no higher than ±20 where such frosts would be thermodynamically unstable under present martian conditions. The features show no appreciable morphological change over time intervals spanning more than 2 martian years and, from preliminary cratering statistics, actually appear to be very ancient. On the basis of their distinct morphology, mode of occurrence, and stability through time, and also because there is strong, albeit indirect, evidence for the presence of salts [3] and for the past presence of ponding water on Mars [e.g., 4], I suggest instead that these features are plausibly evaporitic saline playas.

Geochemical measurements performed at the Viking Lander sites [5] and on SNC meteorites [1,2] indicate that salts are probably an important component of the martian regolith. Also, geomorphologic and climatic observations, in particular the identification of ancient aqueous sedimentary basins on Mars [4], suggest that saline playas may be expected to have formed. Until now, however, no large-scale salt pans have been identified on Mars, with the possible exception of the intracrater high-albedo, low-relief feature known as White Rock (8°S,335°W) [6]. While morphologically not identical to White Rock, the features reported here have similar attributes and may be of the same nature. All present many of the morphologic and setting characteristics that are associated with saline playas on Earth. (Note that none of these formations, including White Rock, are actually white, at least partly because of the ubiquitous presence of pigmented eolian fines that cover much of the martian surface.) These considerations prompted a reexamination of terrestrial examples of intracrater playas. Impact craters often constitute enclosed drainage basins that, when exposed to arid or semiarid environments, commonly develop playa units on their floors. Such playas are of particular value because their record of paleoenvironments was kept confined and is likely to have been well preserved. Examples of intracrater playas include those found within Meteor Crater (USA) and the Acraman, Connolly Basin, Henbury, and Wolf Creek Craters (Australia). At Wolf Creek, the center of the crater floor is occupied by a saline playa 450 m in diameter [7]. It is composed of porous gypsum and pitted with sink holes that expose underlying calcareous tuff. The origin of the gypsum in the crater's quartzitic setting is unclear. While Mason suggested eolian influx of Ca-rich feldspathic sands, McCall hypothesized intracrater hot spring activity [8]. A simpler explanation, however, common to many extracrater playas, might just involve discharges of briny groundwater accompanying secular variations in the level of the water table.

If the features reported here are indeed saline playas, implications for the evolution of the martian surface would be very important. They would, for instance, suggest that there were once relatively large intracrater briny lakes on Mars. It is not clear, however, whether the implied transient bodies of liquid water would have resulted from surface runoff, direct precipitation, and/or groundwater discharge. While the small-scale surface texture of terrestrial playas (at meter and submeter scales) are often diagnostic of their mode of formation and their subsequent history of modification, images of higher resolution than those provided by the Viking orbiters are needed before such information may be derived for the martian features. The possible existence of saline playas on Mars is tantalizing also because weathering by salts has been suggested as a significant process of geological alteration [9]. The preservation of secular ice in high-altitude Andean salars, under high-albedo, thermally insulating, and diffusion-inhibiting blankets of salts [10], further underscores the potential value of possible analogs on Mars. High-resolution images acquired by the Mars Observer Camera, along with targeted measurements by the Thermal Emission Spectrometer, offer a unique opportunity to test these ideas and to gain a better understanding of the intriguing features.

References: [1] Gooding J. L. et al. (1991) *Meteoritics, 26*, 135–143. [2] Treiman et al. (1993) *Meteoritics, 28*, 86–97. [3] Clark B. C. and Van Hart D. C. (1981) *Icarus, 45*, 370–378. [4] Goldspiel J. M. and Squyres S. W. (1991) *Icarus, 89*, 392–410. [5] Clark B. C. et al. (1976) *Science, 194*, 1283–1288. [6] Evans N. (1979) *NASA TM-80339*, 28–30. [7] Reeves F. and Chalmers R. O. (1949) *Aus. J. Sci., 11*, 154–156. [8] McCall G. J. H. (1965) *Ann. New York Acad. Sci., 123*, 970–993. [9] Malin M. C. (1974) *JGR, 79*, 3888–3894. [10] Hurlburt S. H. and Chang C. C. Y. (1984) *Science, 224*, 299–302.