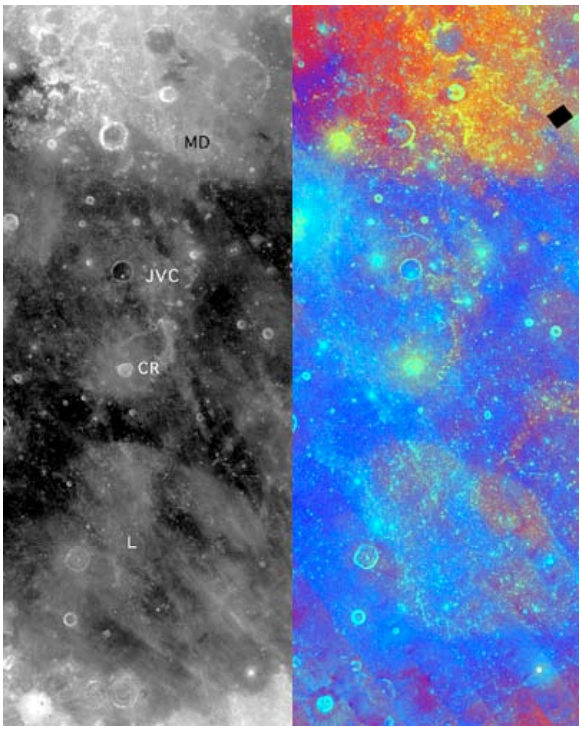
THE LAMONT - GARDNER MEGADOME ALIGNMENT: A LUNAR VOLCANO-TECTONIC STRUCTURE? Charles A. Wood[1], with images by Wes Higgins[2], KC Pau[3] and Giorgio Mengoli[4], [1]Managua Office, Planetary Science Institute, Tucson, AZ 85719. tychocrater@yahoo.com [2] starman2@flash.net , [3] kcpaulhk@yahoo.com.hk , [4] gmengoli@libero.it

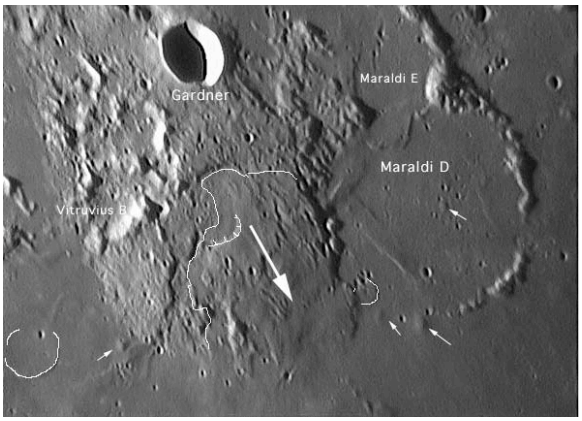
Introduction: Virtually all features of the Moon are directly related to impact basins and craters. However, the long and complex set of features that I [1] call the Lamont-Gardner Megadome Alignment (LGMDA) appears to have no obvious control by local impact structures and may be a rare example of a lunar volcano-tectonic feature.



Clementine images of LGMDA. Left – visible, right ratio image. Images generated with USGS Map-A-Planet [1].

The LGMDA extends about 500 km diagonally across the Tranquillitatis impact basin. The main components from north to south are:

(1) The **Gardner Megadome** is a rough textured, 70 km wide dome-like structure that rises 300-400 meter above the nearby northern end of Mare Tranquillitatis. Its summit seems to hold an irregular depression with what looks to be a channel running down slope to the south. Is this a giant pit crater on a giant dome? The 70 km wide structure seems to have two distinct personalities. On its west side the texture is rough and there are a number of small impact craters. The center and eastern sides look smoothed, as if a pasty coating of material was smeared onto the surface. We speculate that the summit volcanic crater was the source of lava flows that covered the eastern portion of the megadome. With this interpretation, the break in the southern rim of the summit crater appears to be a major drainage area, which carved a channel as lava flowed downhill (white arrow) to the mare. On a Clementine multi-spectral image (left) the megadome is not blue or light red like a mare, but orange.

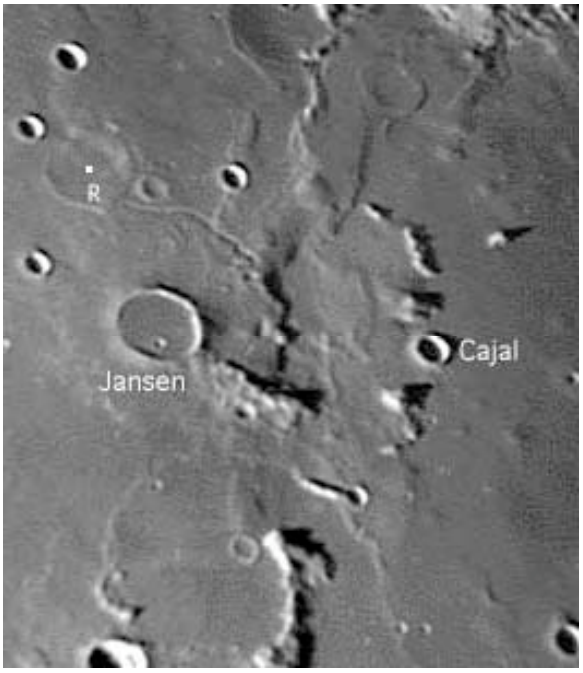


Gardner Megadome – image by Wes Higgins.

Certainly this is a volcanic area - there is a pitted dome immediately to the southeast of the megadome, and three small steep-sided domes or hills (small arrows). The nature of the megadome itself is unclear. Is it entirely a volcanic structure? Is it high because it's part of the ancient rim surrounding the Tranquillitatis and Serenitatis impact basins, or was it uplifted by magma from below?

(2) The **Jansen Volcanic Complex** is a locally high ridge composed of ghost craters and the remnants of flooded craters. Jansen is a presumed impact crater filled with lava that is darker and spectrally bluer than in the surrounding mare. A break in Jansen's west wall has allowed a small wedge of blue lava to escape. North of Jansen is a 75 km long sinuous rille whose vent is on the mare ridge high point of this part of the LGMDA. A rimless collapse pit also occurs on the ridge.

(3) The **Carrel Rise** is largely the eastern rim of a ruined crater sticking above the mare. Carrel is the crater previously known as Jansen B. In the Clementine color ratio image, the crater ruin and ejecta from Carrel have the same reddish color as the mare surrounding Jansen.



Jansen Volcanic Complex and Carrel Rise below – image by K.C. Pau

(4) **Lamont** is famous as a strange pair of concentric ghost rings with many radiating mare ridges. Lamont also is a moderate size mascon, leading to the conventional interpretation that it is a small, buried impact basin. The center of Lamont is blue, but its rings and radial ridges are reddish. Lamont is slightly elliptical, with its long axis paralleling the LGMDA trend.

Speculation: The LGMDA is a unique structure on the Moon. It is an elevated linear area extending across the floor of an impact basin. All four components of the KGMDA are associated with red (lo-Ti) basalts that are surrounded and embayed by blue (hi-Ti basalts. Crater counts [2] yield ages of 3.75 b.y. for the red lavas and 3.57 b.y. for the brighter blue ones. Mare ridge segments of the LGMDA near the Jansen Volcanic Complex are the source of a sinuous rille and a collapse pit. Accepting that the entire LGMDA is a single structure leads to a new interpretation of Lamont. It would no longer be considered a buried two ring basin, but perhaps is an igneous structure, with the mascon due not to a great depth of magma that ponded in a basin, but to a great depth of magma in a magma chamber. An alternative, basin-related, interpretation [1] for the LGMDA is provided by noting that the alignment follows a putative rim of the Gargantuam impact basin – thus the LGMDA is high because of a pre-existing large basin rim, but how could that rim survive the formation of the Tranquillitatis basin?

Carrel Rise to Lamont – image by Giorgio Mengoli.

References:

[1] Wood C. A. (2003) *The Modern Moon: A Personal View*. Sky Publishing Corp. [2] Hiesinger and others (2000) *JGR*, *105,* E12. pp 29,239-29,275.