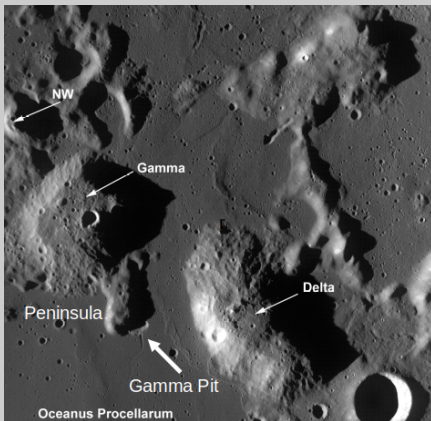


**The Geodesy of Lunar Active Regions**

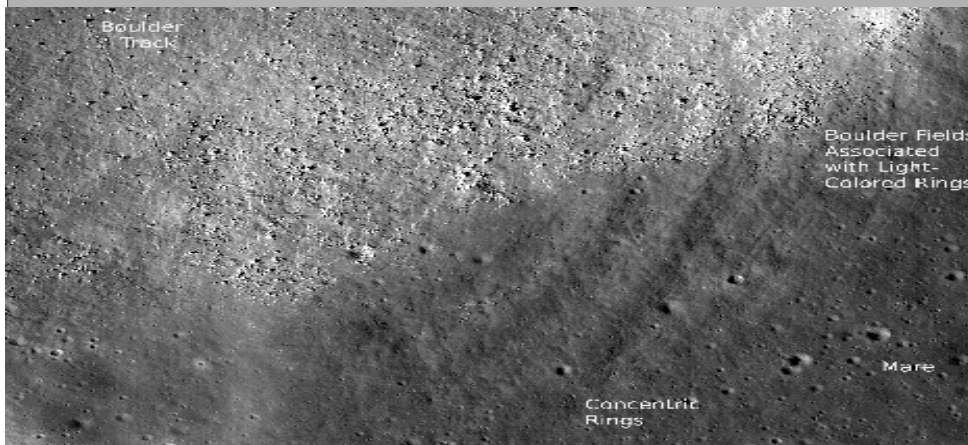
It is frequently assumed that the lunar surface is “dead,” with no motions except those caused by tides and meteorites. However, recent work shows that surface moonquakes are correlated with fresh lobate faults, and that these are likely still active, with surface motions detectable by geodetic instruments.

**The Gruithuisen “Gamma Pit”**

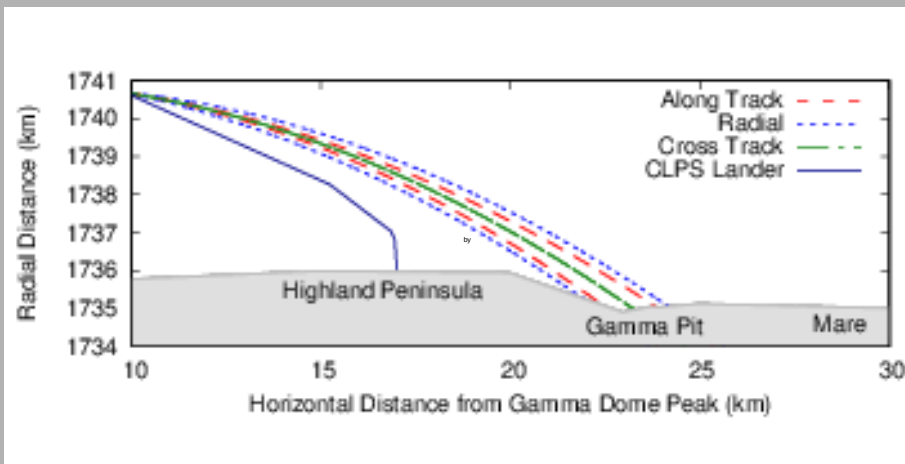


A search of the Gruithuisen Dome region reveals a candidate active tectonic region, the “Gamma Pit,” at the junction of mare and highland terrain. This, the “negative topographic feature” of Braden & Robinson (2011), descends roughly 250 m below the mare plane. The Pit appears to represent a recently active normal (not thrust) fault, possibly connected with isostatic adjustment of the weight of the Gamma Dome.

**Penetrator Deployment into the Gamma Pit**

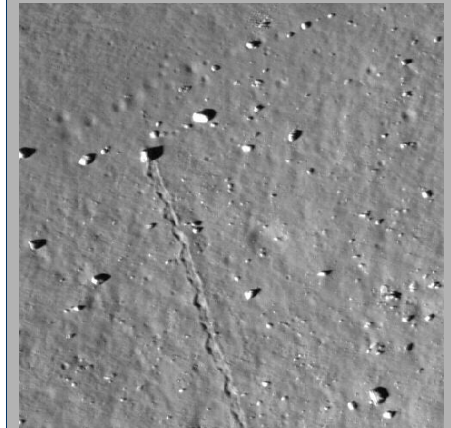


The Eastern Mare scarp of the Gamma Pit (North is at the top). There are a number of indications of recent activity in this area, including the sharp scarp littered with boulder and , boulders with tracks (see also to the right), both of which indicate recent ground movements. It is not clear if the light and dark “concentric rings” on the Mare surface are connected to the adjacent Rille (the Rille Head is just below the bottom left of this image).



Deployment of Mote Penetrators into the Gamma Pit region as part of a CLPS landing sequence. These ballistic penetrators could rapidly instrument the entire Gamma pit area.

**Moving Boulders**



Boulder tracks are a good sign of recent activity. This boulder, ~5 m diameter, has rolled almost to the fault itself, visible here as a line of small depressions.

**Conclusions**

Surface moonquakes apparently have meter level motions, which could be dangerous to astronauts operating nearby; based on terrestrial experience we expect cm to decimeter co-seismic motions in currently active regions. A combination of laser ranging, differential radio beacon VLBI, and local radio distance measurements will enable the direct observation of such motions, enabling a new means of study for lunar geology and selenodynamics.

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