

LUNAR INA-LIKE FEATURES: MAPS AND MORPHOMETRY. N. W. Chan¹, W. M. Vaughan¹, and J. W. Head¹. ¹Department of Geological Sciences, Brown University, Providence, RI, USA, Nicholas_Chan@brown.edu.

Introduction: What process formed the enigmatic lunar feature Ina, an approximately rectangular (D-shaped) 2 km by 3 km pit about 50 m deep with low mounds rising from its bright, bouldery floor? Perhaps the floor of Ina represents a collapsed caldera [1], a field of inflated lava flows [2], or the scar left behind by a massive gas explosion [3]. None of these explanations is entirely consistent with observations of Ina: if Ina is an ancient caldera, why are its surfaces bouldery, fresh, and spectrally immature [3]? If Ina's floor and mounds formed due to recent volcanism, why does that floor depart from an equipotential surface, and why are its mounds so much older (heavily cratered, spectrally mature) than its floor? If Ina is an explosion crater, where is its young, spectrally immature ejecta? As an alternative, we have suggested that Ina formed (and is forming) by ongoing ground collapse into a porous subsurface [4], perhaps into large aggregated vesicles or voids in a ~1 Gya lava flow unit. How can these hypotheses be tested?

Ina is not alone. High-resolution LROC NAC imagery reveals dozens of pits resembling Ina in form (though in every case smaller and shallower), with sharp cusped or lobate walls surrounding a bright, bouldery floor up to 10 m below surrounding regolith. Low, irregular mounds rise from these boulder floors. These pits, which we call "Ina-like features", often cluster at local and regional scales to form complexes of pits, and are associated with volcanic-tectonic features such as graben.

Stooke [5] and Braden [6] have previously mapped and described Ina-like features. We have independently identified ~30 Ina-like features in NW Mare Tranquillitatis. We are currently mapping the largest of these features, characterizing their morphometry (area, depth, volume) with photoclinometry, and documenting their geological associations. Preliminary maps of two large Ina-like features are presented in Figures 1 and 2 below. Widespread similarities between Ina and Ina-like features point to a similar process of formation.

Figure 1. Map of a Japan-shaped Ina-like feature at 10.465°N, 23.667°E. Yellow lines indicate discrete low mounds.

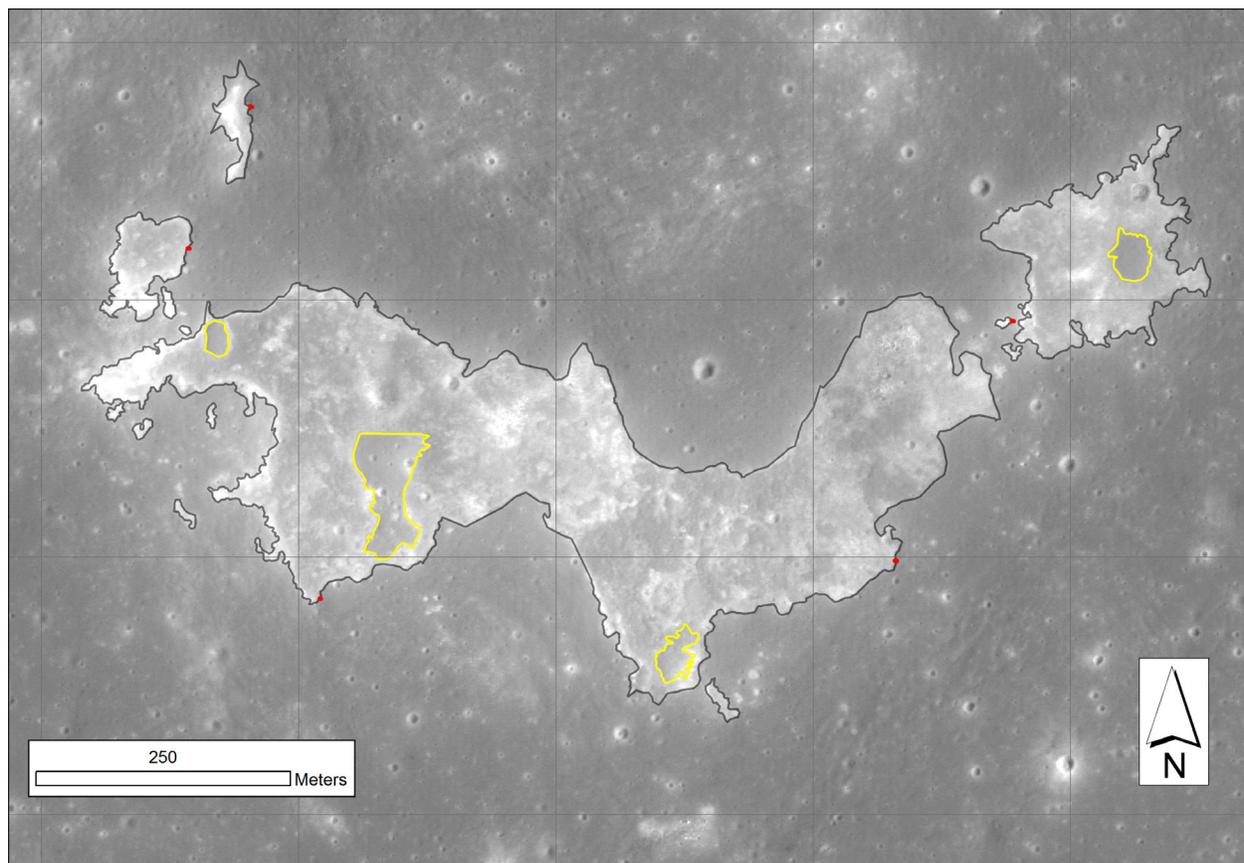
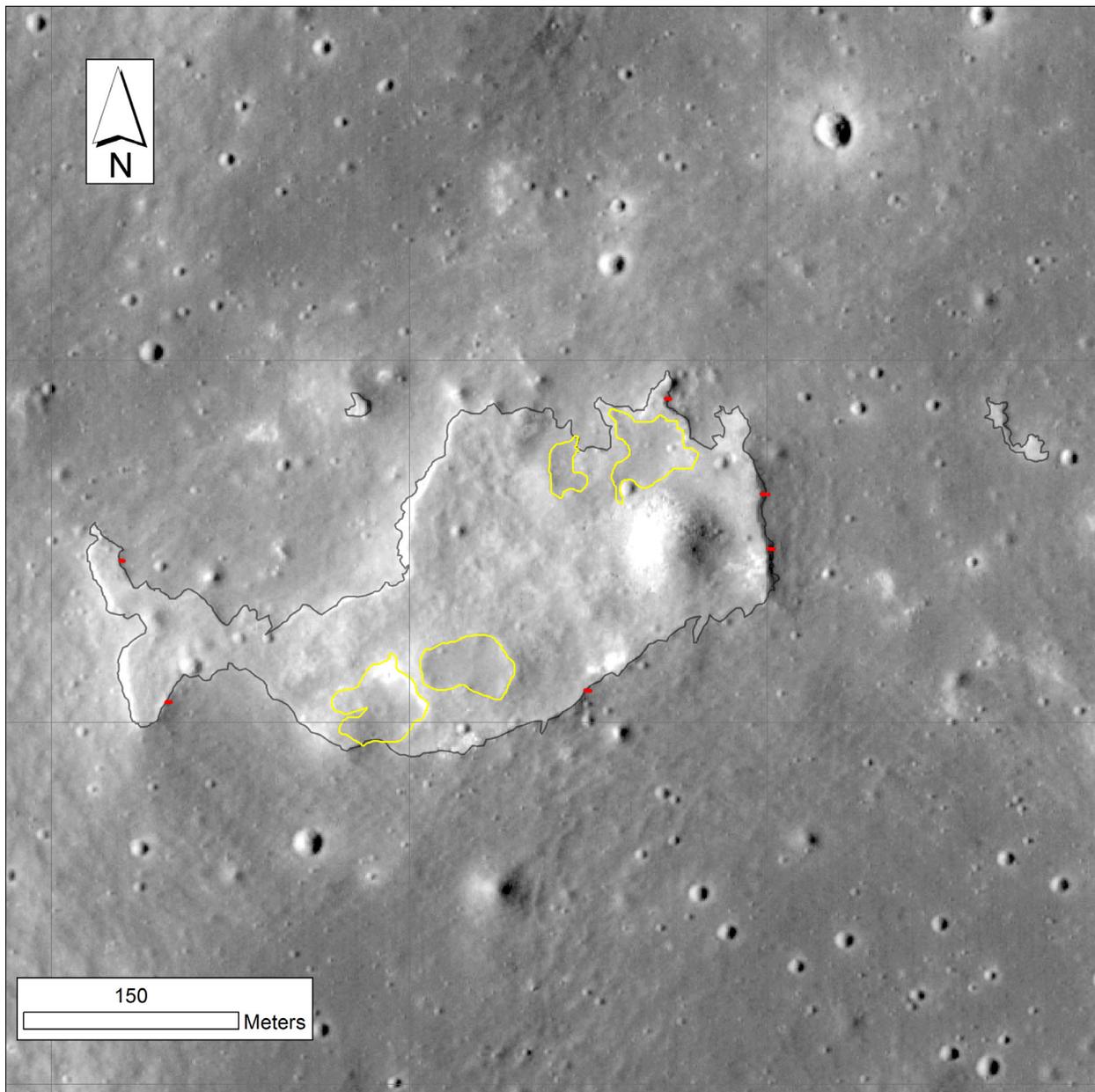


Figure 2. Map of a whale-shaped Ina-like feature at 8.895°N, 21.485°E. Yellow lines indicate discrete low mounds.



References: [1] Strain, P. L. and F. El-Baz (1980), *Proc. Lunar Planet. Sci*, 11. [2] Garry, W. B. et al. (2012), *JGR*, 117. [3] Schultz, P. H. et al. (2006), *Nature*, 444. [4] [Vaughan, W. M. and J. W. Head \(2012\), *Lunar Sci. Forum*](#). [5] Stooke, P. J. (2012) *LPSC*, abstract 1011. [6] Braden, S. E. et al. (2013) *LPSC*, abstract 2843.

For additional information on Ina and Ina-like features, [visit Will Vaughan's Ina webpage](#).