# The asymmetry of Nathair Facula: A volcanologic mystery on Mercury

## Conference or Workshop Item

# THE ASYMMETRY OF NATHAIR FACULA: A VOLCANOLOGIC MYSTERY ON MERCURY

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**Introduction:**

Nathair Facula is the largest and most spectrally-distinct of nearly 200 'bright red' spots on Mercury's surface, most of which are accepted to be deposits from explosive volcanic eruptions. Like most of Mercury's faculae, it hosts a central pit (in this case about 40 km wide and over 3 km deep). However the centre of this facula does not coincide with the vent, but is displaced about 20 km northwards. This poses as-yet unresolved questions about the nature of the eruption mechanism. Furthermore, the vent area is almost certainly a 'compound vent' (Pegg et al., 2019) within which the locus of eruption has migrated between eruptive episodes, and it is unclear how the same asymmetry could be repeatedly engendered and reinforced by a series of eruptions rather than averaging out to a symmetrical distribution.

**Nathair Facula:**

The bright red spot that in 2018 received the formal name of Nathair Facula was formerly known by reference to nearby named impact craters as either as NE Rachmaninoff or S Copland. Its radius was estimated to be 71 km by Kerber et al. (2011) on the basis of MESSENGER flyby images, but revised to 130 km by Thomas et al. (2014) who were able to use higher resolution colour images from MESSENGER's orbital campaign (Fig. 1). As mapped by Wright et al. (2019) its radius is about 120 km (Fig. 2). Besse et al. (2019) used MESSENGER MASCS to analyse the radial dependence of normalized VIS slope, depth of the UV downturn and the normalized NIR slope from which they determined a radius of 140 km.

Such discrepancies are not surprising given that by their very nature faculae become fainter towards their outer edge, consistent with their origin from pyroclastic ejecta that has followed parabolic trajectories from its source. However, what is surprising is that although this facula is close to circular, its midpoint is offset northwards from the central vent complex, irrespective of whether the facula is defied by visual inspection or multispectral classification. A volcanological explanation is currently lacking.

**References:**

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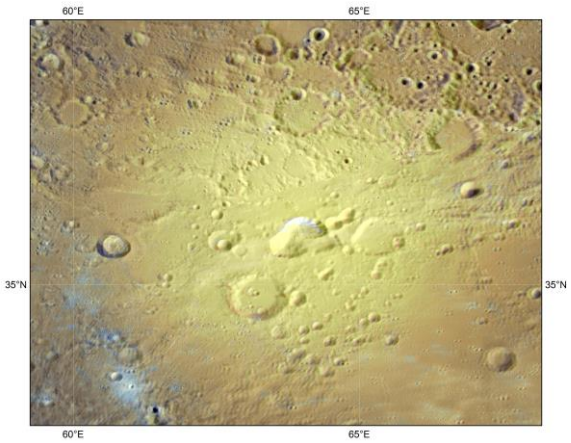


**Fig 1** Nathair Facula as seen in exaggerated colour MESSENGER MDIS imagery.


**Fig 2** Nathair Facula as shown on the quadrangle map of Wright *et al.* (2019).