VENUS' RADAR-DARK STREAKS: BAKISAT CRATER AND IMPACT-RELATED ORIGINS.

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Introduction: Many large impact craters on Venus are associated with SAR-dark parabolic deposits [1,2], which are inferred to form as plumes of ejecta penetrate up through Venus's atmosphere, spread ballistically, fall back down, and are dispersed by zonal winds. Many smaller craters are associated with SAR-dark deposits which are not typical parabolae. We investigated the SAR-dark streak on Nissaba Corona, confirm its association with the impact crater Bakisat, and speculate on mechanisms for the formation of it and similar SAR-dark streaks [3].

Nissaba Dark Streak: Nissaba Corona, on the north flanks of Sif and Gula Montes, shows a long narrow SAR-dark streak oriented ~E-W with its E end near the Bakisat impact crater, Fig. 1 [3-5]. Bakisat is a double impact crater, 7.2 km across. The streak is clear in Magellan SAR for at least 330 km, and is as wide as 40 km. The streak passes over an elliptical depression on Nissaba and is slightly mis-aligned with Bakisat.

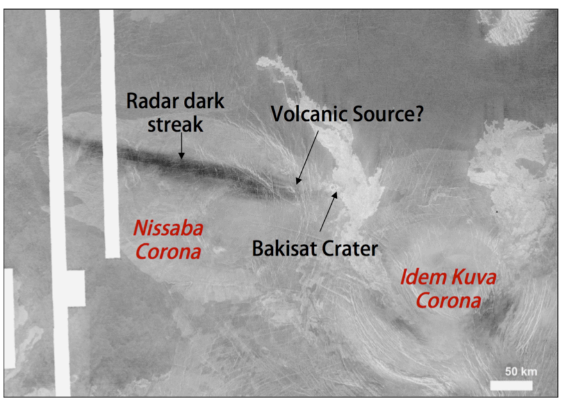

Figure 1: Magellan SAR image of Nissaba Corona and Bakisat radar dark streak. Bakisat Crater post-dates the radar-bright lava flow from Idem-Kuva, which overlies the flanks of Nissaba Corona.

The Nissaba streak has lower RMS slope than its surroundings (Fig. 2), and lower radar emissivity. These data are consistent with the geological mapping (from Magellan SAR) that the Nissaba streak is best interpreted as a airfall deposit of relatively smooth and porous material.

Streak Formation: The idea that the Nissaba streak is volcanic in origin [4] does not withstand scrutiny; it appears that the dark material post-dates the potential caldera source, the elliptical depression. The Nissaba streak is clearly not a parabolic impact deposits [1,2], nor is it like eroded remnants of a parabola's deposits [6,7].

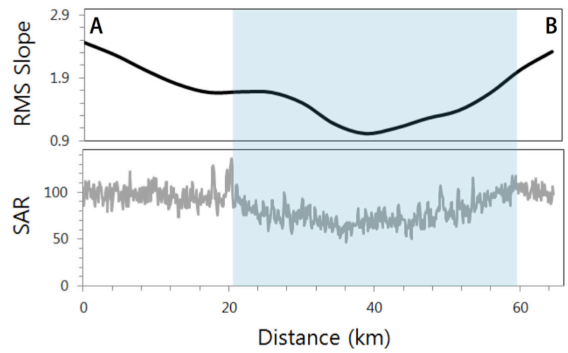

Figure 2. N-S profiles of Magellan RMS slope (degrees) and SAR brighness (DN) taken across the Nissaba dark streak. The blue region denotes the streak.

Other Impact Processes. Accepting that the Nissaba streak is genetically related to the Bakisat Crater, several mechanisms for streak formation can be proposed. 1) A streak could represent ejecta from a post-impact plume, similar to those which produce parabolae [8], but which was not buoyant enough to penetrate through Venus' atmosphere. 2) A streak could represent a low-angle jet of ejecta from impact (e.g., Ferber crater). 3) A streak could represents dust created in an airburst as the crater-forming meteoroid descended through the atmosphere [9]. 4) A streak could represents dust shed by a bolide travelling at low angle through the atmosphere (e.g., at -19.5°, 358.5°) [10].

It is not yet clear how to distinguish among Venusian dark-streak deposits that might have formed by these mechanisms. At least 12 narrow, linear streaks exist at Venus craters, including Bakisat. Nine of the 12 craters are less than 23 km diameter. The absence of parabolic deposits at these craters indicates a lack of ballistic spreading, consistent with ejecta plumes that remained confined within the Venus atmosphere. The association with small craters is consistent with a buoyancy mechanism such as mechanism 1 above but does not rule out contributions from other processes.

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