PRELIMINARY ANALYSIS OF ASSOCIATIONS OF SMALL VOLCANIC EDIFICES WITH MAJOR GEOLOGIC FEATURES BY LATITUDE ON THE SURFACE OF VENUS- Kyle Gerlach, Evergreen Senior High School, Vancouver, WA, Mike Safford, Sahuaro High School, Tucson, AZ, Evergreen High School Astronomical Research Class, Sahuaro High School Astronomical Research Class,,Advisors: G. Komatsu, J. Johnson (Univ. of Arizona, Tucson, AZ 85721), J. Lockwood (Sahuaro High School, Tucson AZ 85710), M. Ellison (Evergreen High School, Evergreen, WA 98682)

Introduction: The high resolution and global coverage of the Magellan spacecraft now allow a detailed study of small volcanic edifices on the surface of Venus. A simplified classification scheme for small volcanic edifices (less than 20 km in diameter) that was based on observations of 556 significant shield fields done by Aubele[1] was used for this study by the astronomy research classes of Evergreen and Sahuaro High Schools. The four classes of small volcanic edifices located are shield-shaped (the most common type of small volcanic edifice on Venus)[1]; dome-shaped; cone-shaped; and flat-topped (which are distinctive and similar to some sea-floor volcanoes imaged by GLORIA)[1]. Some of these edifices are very similar to larger and less common Venusian volcanic land forms, implying a continuum of similar volcanic processes, materials, eruption rates, or conditions operating at different scales. [1]

Volcanic features are not evenly distributed on the surface of Venus. Head theorizes that the paucity of volcanic features in the lowlands may be due to an altitude dependent inhibition of volatile exsolution and the resulting production of neutral buoyancy zones sufficient to form magma reservoirs and favoring flood lavas at lower elevations.[2]

Volcanic centers are rare within some geologic centers and occur heavily in others. Within tesserae volcanic centers are virtually absent, with the exception of a few small volcanic edifices. The reason may be due to evidence that tesserae is a thicker and older region of the crust that impedes magma ascent. Volcanic centers are also infrequent in areas characterized by ridge belts, mountain belts, and ridged plains. However, volcanic edifices are common within or around coronae, novae, and arachnids. These features are also commonly associated with each other.[3]

This study was conducted to find a relationship between small volcanic edifice classes and major geologic features such as coronae, arachnids, novae, tesserae, and large and intermediate volcanoes. There are several questions raised by Aubele about small volcanic edifices, however, in this study we will only be dealing with two: (1) What type of volcanic activity is represented by these edifices? (2) What is the volume contribution of these numerous, but small volcanic source vents?[1] Detailed mapping of the geologic relationships of these small volcanoes to the plains of larger volcanic features is essential to the exploration of these questions.

Methods: Student researchers at Evergreen High School in Vancouver, Washington, and Sahuaro High School in Tucson, Arizona, measured and located small volcanic edifices (1 to 20 km) in 16 F-MIDR's taken from 5 Magellan CD-ROMs. Most of the F-MIDR's were located along Venus's 0° longitudinal line. The diameter of each edifice was determined by taking measurements along the latitudinal and longitudinal axes and finding their average length. The latitude and longitude of the edifice was then recorded and used to locate the edifice on the GTDR images for measurement of the edifice's elevation.

The class of the edifice was determined by the above mentioned simplified classification scheme by J.C. Aubele[1]. However, there are many subclasses of these types of volcanoes, and a supplementary catalog, also made by Aubele[1], was used for clarification. This list included the morphologies of the different subclasses.

Results: Figure 1 clearly shows a deviance from a similar graph in Keddie and Head, 1992[4] (Fig. 2). This deviance is most evident in the large peaks at -50 to -25 deg. S latitude and 50 to 75 deg N latitude. The major hindrance in the interpretation of this graph is the lack of data taken between 25 and 50 deg. N latitude. Other than this, the plot shows a sharp increase in the number

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of edifices at -50 deg. S lat., then a drop of roughly 50% that declines again slightly, then experiences an increase in edifice occurrence of about 40% from 25 to 75 deg. N lat.
Figure 2[4], in contrast, shows a smooth expected curve, and while the observed curve follows the expected curve in rough shape, it tends to peak in areas where Fig. 1 drops, and drops in areas that peak in Fig. 1.

Conclusions: The graph produced from the data collected by this year's Astronomical Research class does indeed hint at a possible relationship between latitude and small edifice occurrence. As evidenced by the peaks in the -50 to -25 deg. bin and the 50 to 75 degree bin. This may be due to the concentration of plateau areas corresponding to the bins that show a higher concentration of edifices as well as associations with larger volcanic constructs[5]. When compared to concentrations of features that may influence volcanic activity (such as coronae, large volcanoes, novae, and craters) as well as evidences of widespread volcanism (such as flow patterns), the areas of concentration of small volcanic edifices correspond very closely. In contrast, these small edifices are relatively sparse in areas covered by tesserae. This lack of an association with a particular type of large scale construct presents possibilities for future investigation. The most intriguing aspect of this graph is the apparent contradiction of Keddie and Head, 1992 with volcanic activity not being concentrated near the equator[4]. This, too, warrants further investigation. A high-resolution planetwide survey of small volcanic edifice distribution by latitude, in addition to the results of this investigation, would produce a result with a higher degree of accuracy.

References: 1-Aubele, 1993, *LPSC XXIV* pp. 47-48; 2-Head et. al. *JGR* vol. 97, no. E8, pp. 13153-13197; 3-Head et. al. *Science*, vol. 253, July 30; 4-Keddie and Head, 1992, *International Colloquium on Venus*, pp. 56-57; 5-Crumpler and Aubele, 1992, *LPSC XXIII*, pp. 275-276

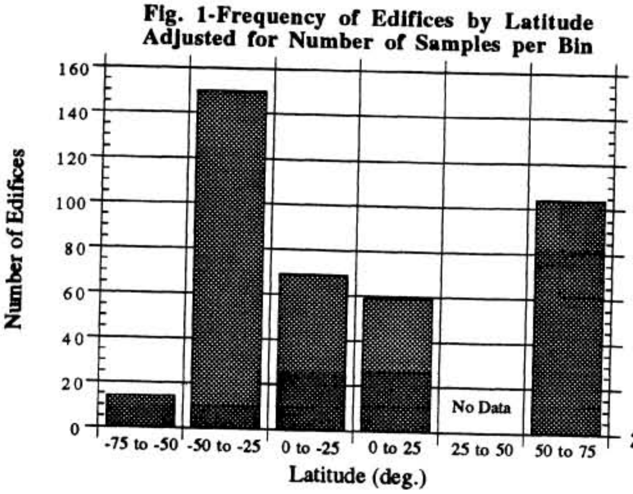

Fig. 2