CINDER CONE MORPHOMETRY AND VOLUME DISTRIBUTION AT NEWBERRY VOLCANO, OREGON: IMPLICATIONS FOR AGE RELATIONS AND STRUCTURAL CONTROL ON ERUPTIVE PROCESS

TAYLOR, Stephen B., TEMPLETON, Jeffrey H., and GILES, Denise E.L., Earth and Physical Sciences Dept, Western Oregon Univ, 345 N. Monmouth Ave, Monmouth, OR 97361, taylors@wou.edu

Newberry Volcano of central Oregon covers greater than 1300 km^2 and is associated with over 350 basaltic cinder cones (Holocene-Late Pleistocene). Digital geologic maps and 10-m USGS DEMs were compiled with 182 single cones selected for morphometric and volume analyses using GIS. This robust data set provides a framework from which to evaluate cone volume distributions and relative ages in the context of erosional degradation models.

Based on visual inspection of DEM-derived shaded relief maps, each cone was qualitatively ranked with a morphology classification ranging from 1 (well defined cone-crater morphology) to 7 (very poorly defined cone-crater morphology). Morphometric measurements include cone height (H_c), average cone slope (S_c), long-axis diameter (D_l), short axis diameter (D_s), and height:width ratio (H_c/W_c where $W_c=(D_l+D_s)/2$). Individual cone DEMs were extracted and volumes (V_c) calculated using a kriging-based algorithm. Average slopes were derived from 10-m elevation nodes contained within cone polygons. Results according to qualitative morphology rank are summarized as follows: **(A) Frequency (no.)** 1=11, 2=21, 3=10, 4=35, 5=11, 6=35, 7=59; **(B) Average V_c (m^3)** 1=1.46 x 10^7, 2=1.53 x 10^7, 3=1.25 x 10^7, 4=4.88 x 10^6, 5=4.65 x 10^6, 6=3.07 x 10^6, 7=1.10 x 10^6; **(C) Average S_c (deg)** 1=19.9, 2=18.2, 3=18.1, 4=14.9, 5=14.4, 6=11.9, 7=10.2; **(D) Average H_c (m)** 1=132, 2=124, 3=126, 4=76, 5=78, 6=59, 7=50; **(E) Average H_c/W_c** 1=0.18, 2=0.20, 3=0.19, 4=0.15, 5=0.14, 6=0.13, 7=0.13. Existing cone degradation models demonstrate that with increasing cone age, S_c, H_c, and H_c/W_c decrease, respectively. Systematic t-tests (α=0.05) of these parameters between morphology classes statistically separates cones into two relative age groups: (1) "Younger"=ranks 1-3, and (2) "Older"=ranks 4-7, suggesting that there are two distinct age populations of cinder cones at Newberry. Spatial analysis of cone-volume distributions shows maxima oriented NW-SE, parallel to regional fault trends (Tumalo Fault and Northwest Rift zones), implying that these structures may have an important control on eruptive processes in the region. This study provides a framework to guide future geomorphic analysis and radiometric age dating of cinder cones at Newberry Volcano.