Impact crater embayment on Venus and the termination of global resurfacing:
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The sequence of plains emplacement on Venus seems to follow a consistent pattern over large areas of the planet [1]. The plains units can be separated into materials responsible for the global resurfacing event of Schaber *et al.* [2] and materials which post-date this event. We studied embayed craters and determined the stratigraphic position of the embaying material to find if all embayed craters had been embayed since the resurfacing event, or if some were embayed by the event itself.

Stratigraphy: The material forming the plains can be divided into four stratigraphic groups [1]. The oldest is the Sigrun Group, which consists of plains that are heavily deformed by faults. This includes densely fractured plains (Pdf) and coronae (COdf). The next group in the time sequence is the Lavinia Group, which is deformed by broad ridges. This group contains the fractured and ridged plains (Pfr) and the ridge belts (RB), and may also contain the plains units composed of small shield volcanoes (Psh). Overlying this group is the Rusalka Group, which is composed of plains with wrinkle ridges (Pwr). This group is the most extensive, forming the bulk of the plains, and thus represents a large amount of resurfacing. The final group of plains-forming material is the Atla Group. This is composed of the smooth (Ps) and lobate (Pl) plains units, which are usually associated with rift zones or large volcanoes. In the global resurfacing model [2,3], these volcanoes and rift zones occurred after the end of the global resurfacing event. Thus the Atla Group can be considered post-resurfacing volcanism, and the Rusalka Group is the final unit produced by the global resurfacing event.

Observations: Craters which were listed as definitely embayed from the exterior in the databases of Strom *et al.* [3] and Herrick and Phillips [4] were examined by the authors. See Collins and Head (this volume) for a discussion of some of the criteria for crater embayment that were considered during this study. We used these criteria to assess the embayment state of each crater, and if the crater was embayed, we determined which plains unit was responsible.

Embayment and resurfacing: Collins *et al.*

Results: We determined that 58 of the craters in our study are embayed by plains material (~6.5% of the total population of craters), compared to the 46 craters (~5%) in list [3] and 74 (~8%) in list [4]. This is not a large departure from previous estimates of the total population of embayed craters. Of these craters, 40-45 are embayed by smooth and lobate plains of the Atla Group, and 13-18 are embayed by plains of the Rusalka Group or older. In reference to the global resurfacing model [2,3], this means that 40-45 craters have been embayed by post-resurfacing volcanism and 13-18 were embayed during the resurfacing event.

Relation to global resurfacing model: The model of Strom *et al.* [3] assumes that the volcanic resurfacing of Venus ended relatively abruptly. They assumed that all of their "embayed craters were the result of post-global resurfacing volcanism. This constrained the termination time of the global event to be short (<10 m.y.)." [5, p. 23,364] They assume that global resurfacing would obliterate all craters formed during that event. As the event ends, some craters may form on the newly resurfaced volcanic plains and be embayed by the last lavas associated with resurfacing instead of being obliterated. Thus, the length of that final stage can be estimated by the number of craters embayed by these lavas. Strom *et al.* [5] ran Monte Carlo simulations to estimate this relationship, assuming that the production of global resurfacing lavas trailed off exponentially. The results of these models is shown in fig. 2 of that paper. Using the 13-18 craters we found to be embayed by global resurfacing units, together with the published results from their models, it took about 140-190 m.y. (based on a 500 m.y. surface age), or 85-115 m.y. (based on a 300 m.y. surface), for the volcanic element of the hypothesized global resurfacing event to terminate. This is an order of magnitude greater than the previous estimate of Strom *et al.* [3].

References: [1] Basilevsky, A. T., and Head, J. W., *Planet. Space Sci.*, 43, 1523, 1995; [2] Schaber, G. G., *et al.*, *JGR*, 97, 13,257-13.302, 1992; [3] Strom, R. G., *et al.*, *JGR*, 99, 10,899-10,926, 1994; [4] Herrick, R. R., and Phillips, R. J., *Icarus*, 111, 387-416, 1994; [5] Strom, R. G., *et al.*, *JGR*, 100, 23,361-23,365, 1995.