Mapping recent activity on Venus: the tectono-magmatic evolution of Ozza Mons and the history of Atla Regio. A. T. Kildaras and P. J. Mason, Imperial College London, Exhibition Rd, South Kensington, London, SW7 2BU. atk2518@ic.ac.uk, p.j.mason@ic.ac.uk.

**Introduction:** Once dismissed as a geologically quiescent planet, a growing body of research suggests Venus is host to geologically-recent activity that may be ongoing today. On the basis of stratigraphic relationships with radar-dark parabolic halos, spatial variation in the radar-emissivity of lava flows, and possible transient hotspots [1-3], one proposed area of geologically recent volcanism and tectonism is Atla Regio, but this region remains unmapped. In this study, the flow apron of the large shield volcano Ozza Mons has been mapped in great detail along with its surrounding area – which includes distal Maat Mons flows – to determine the region’s tectono-magmatic evolution and to evaluate its potential for ongoing activity.

**Methods:** Previous attempts to determine the geological history of Venus based on global geomorphic units (e.g. tesserae) have been limited because the deformation or processes represented by each unit are likely time-transgressive – e.g. a ‘rift zone’ is not a geological era. However, detailed stratigraphic analyses, enabled by mapping primary material units separately from the secondary structures that deform them, show promise in elucidating geological history on a regional scale [4,5].

**Tectono-magmatic evolution:** Detailed mapping shows Ozza Mons to be located at the center of three converging rift zones, with a 1,000 x 800 km flow apron. The oldest, low-emissivity flows are embayed by later extensive radar-dark sheet flows which were likely dyke-sourced. Following this, eruptive phases became increasingly restricted to the summit region. Detailed SAR analysis reveals an 80 km radar-dark region at the summit that represents a relict caldera – potentially the largest summit caldera yet identified on Venus - which has been significantly deformed by tectonism. The youngest phase of volcanism at Ozza Mons consists of a small shield cluster which has partially buried the relict caldera and young rift structures. A structural survey reveals the flanks of Ozza Mons have been deformed by a radial graben-fissure system and three incipient rifts (Ganis Chasma, Dali Chasma and Kicheda Chasma) which have approached the near-summit region. Volcanic activity at Ozza Mons has therefore waned, although it could not be determined if the volcano is extinct or simply in a phase of inactivity.

Supporting this, stratigraphic analysis of Uvaysi Crater’s parabolic halo confirms that Ozza Mons’s western flank predates the impact, which has tentatively been dated to younger than 60 – 9 Ma [2]. However, in agreement with previous research [1,2], distal Maat Mons flows were found to postdate this halo, demonstrating they are younger than both the impact and much of Ozza Mons. Furthermore, no structures could be identified on the mapped portion of Maat Mons even though distal sheet flows flood the young Dali Chasma rift system, indicating these flows were emplaced recently; the suite of caldera and dyke-sourced flows that lie on top of these flows must therefore be younger still. This, in combination with Maat Mons’ smaller and structurally simpler caldera complex [6] and lack of a radial graben-fissure system, suggests the volcano is less mature than Ozza Mons and could remain active today.

**Figure 1.** Summit and north flank of Ozza Mons

a) LL Magellan SAR imagery basemap b) Initial geological map, showing mapped material and lithodemic units (polygons) and lineaments (lines) c) Lithostratigraphic geological map.
Additionally, two intermediate-sized (~150 km diameter), unnamed shields are described for the first time. The first is located in Ganiki Planitia at 159.2°W 10.0°N. Structural mapping reveals its flow apron is overprinted by wrinkle ridges belonging to a compressional regime which pre-dates the arrival of the Atla plume, therefore this volcano is relatively old. The second, located in Dali Chasma at 161.4°W 1.8°N, has had its edifice deformed by incipient rifting, and hosts a partially overprinted caldera complex.

A regional chronostratigraphy: A chronostratigraphic framework for Atla Regio is proposed based on regional stratigraphic markers. A ‘Lower Atla Era’ encompasses the onset and early phase of plume-induced tectono-magmatism in Atla Regio, concentrated in a zone of magma-assisted rifting along Dali Chasma. This produced three large shields located along this axis, including Ozza Mons. The ‘Upper Atla Era’ began with the Uvaysi impact. Lithostratigraphic analysis reveals that, by the time of this impact event, these three shields had declined in activity or gone extinct, with Maat Mons becoming the locus of recent volcanic activity in Atla Regio. Two further sites of recent geological activity were also discovered where activity could continue in the present-day. These three sites represent key targets for the forthcoming VERITAS and EnVision missions in the search for ongoing volcanic and tectonic activity on Venus.


**Figure 2.** Genetic block model of the Ozza Mons region