ASSESSING A LARGE IGNEOUS PROVINCE (LIPS) CONTEXT FOR VOLCANISM, TECTONICS AND ATMOSPHERIC EVOLUTION ON VENUS.

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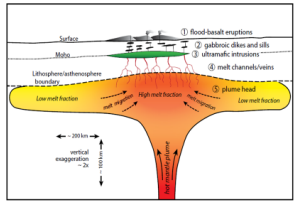
Venus Research Group

Grouping Magmatic Units into Events (LIPs)

TYPES OF UNITS ASSOCIATED WITH LIPS ON EARTH

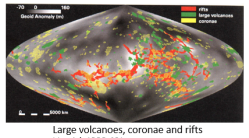
- Flood basalts
- Plumbing system: Dykes, sills, layered intrusions, magmatic underplate
- Typically linked with mantle plume



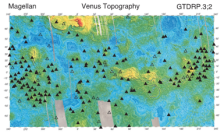
Venusian magmatic components

- Large volcanoes (mons)
- Coronae, novae
- Large flow fields (flucti)
- Early plains
- Minor components: shield fields, canali
- Within tesserae?

Can be linked to plumes/diapirs & largest components can be considered LIP analogues (e.g. Head and Coffin, 1997; Ernst and Desnoyers 2007; Hansen 2007)



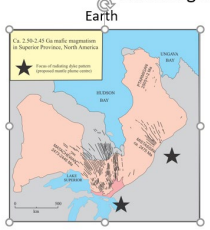
Large volcanoes, coronae and rifts
Herrick 1999 GRL



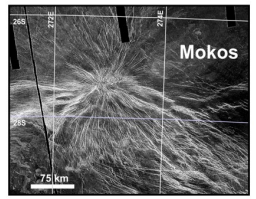
Large flow fields (≥50,000 sq km)
Magee and Head 2001, GSA SP352

Graben-Fissure Systems as the Surface Expression of Dyke Swarms

Radiating dyke swarms

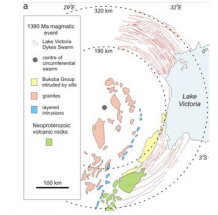


Matachewan & Mistassini dyke swarms

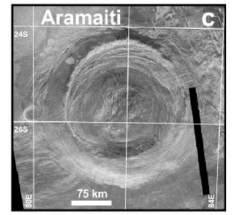


Mokos nova (from JMARS, in Buchan & Ernst 2021 Gond. Res.)

Giant circumferential swarms

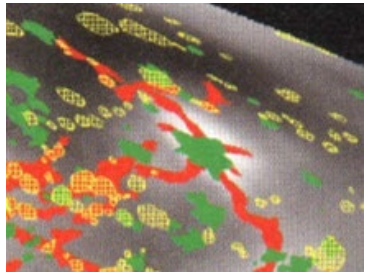


Lake Victoria event (1385 Ma)
modified from Makitie et al. 2014 J. Afr. E. Sci.

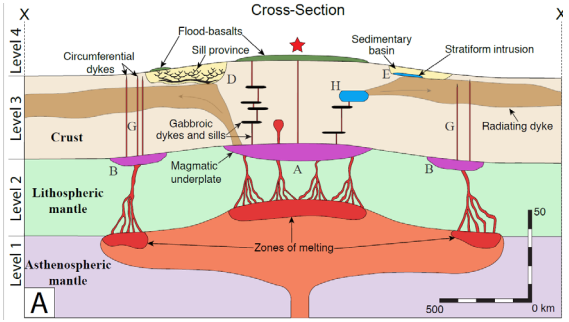


Aramaiti corona
(from JMARS, in Buchan & Ernst 2021 Gond. Res.)

Link to Mantle Plumes

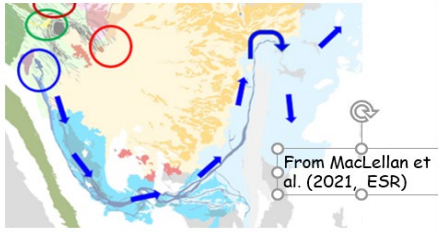


Beta Regio

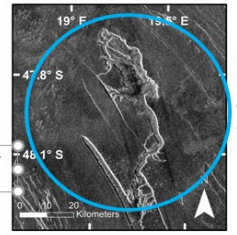


Locating Magma Reservoirs

HUGE FLOW SYSTEM (153,000 KM2) FED FROM SMALL SOURCE AREA (SHALLOW INTRUSION?)

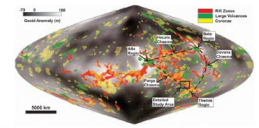


From MacLellan et al. (2021, ESR)

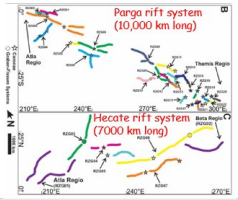


Interpreted as roof collapse above a sill-like shallow intrusion

Triple junction rifting



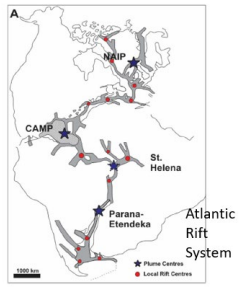
Graff et al. 2018, Icarus; base after Herrick 1999 GRL



Graff et al. 2018, Icarus

Venus

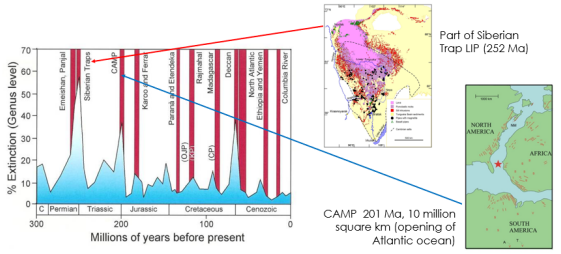
Earth



Atlantic Rift System

Effect on Climate

LIPS, CLIMATE CHANGE AND MASS EXTINCTIONS ON EARTH



Part of Siberian Trap LIP (252 Ma)

CAMP 201 Ma, 10 million square km (opening of Atlantic ocean)

INFLUENCE OF LIPS ON VENUSIAN ATMOSPHERE OVER TIME