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Arc scale distributions of small and large volcanoes: implications for magma supply

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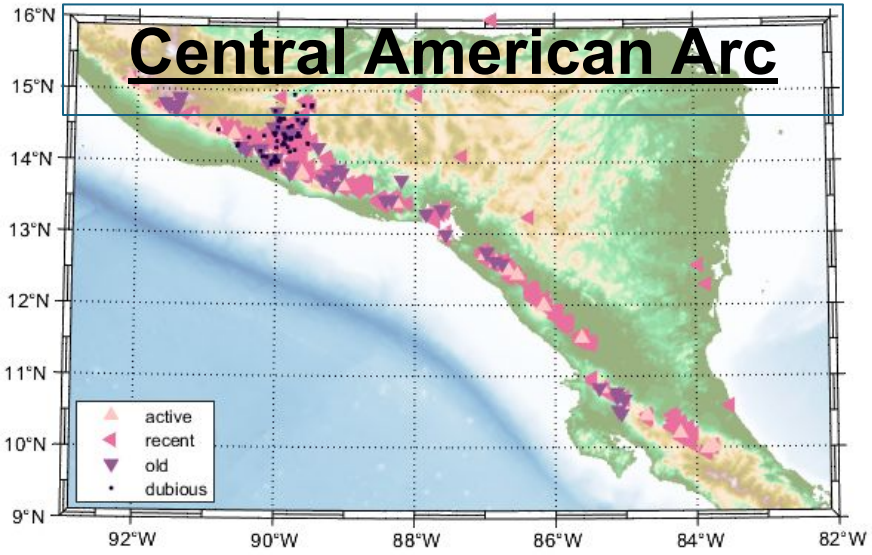
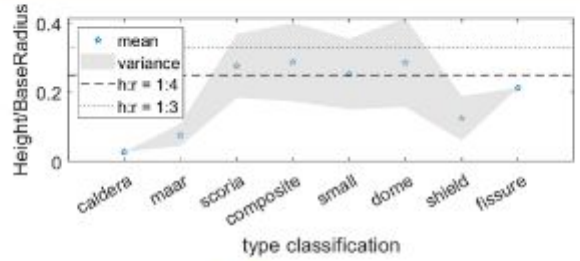
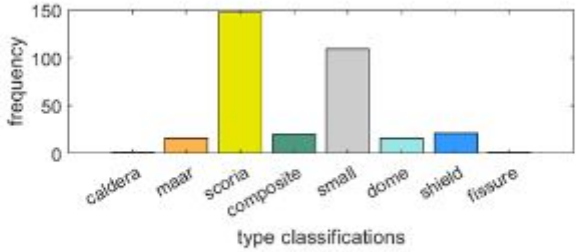
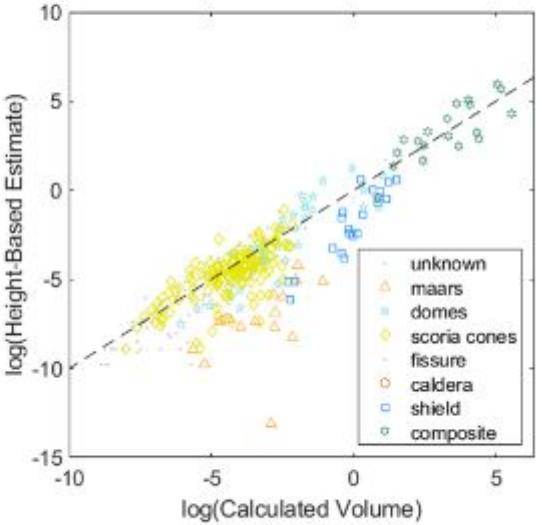
Predicting Volume from Height

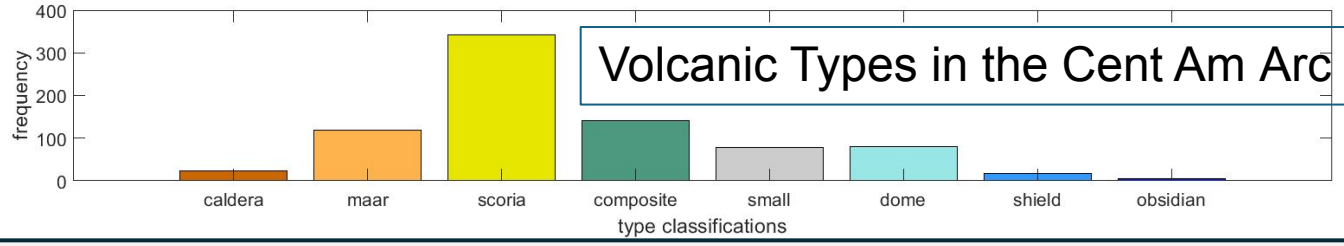
- **Cone height, basal radius, and volume are generally highly correlated** for all types of volcanoes (Bemis et al., 2011; Bemis, 1995).
- While height-to-base ratios vary a lot, the most common types (composite and scoria cone) have **similar height-to-base ratios averaging between 0.25 and 0.33.**
- Estimate the total volume V based on height h by assuming the basal radius is 4 times the height:
  $V=16*pi*(h^3)/3$
- For the northern Central American arc, **the estimated volumes mostly match the actual volumes.** This enables us to use the data set for the full Central America Arc which only includes edifice height.











Data Sources

- The Northern Central America (GSVF) cone data includes height, basal radius, and volume as wells as location and cone type (Bemis, 1995).
- The full Central America arc data includes only cone height, summit elevation, cone description, and location (Carr, 2017).

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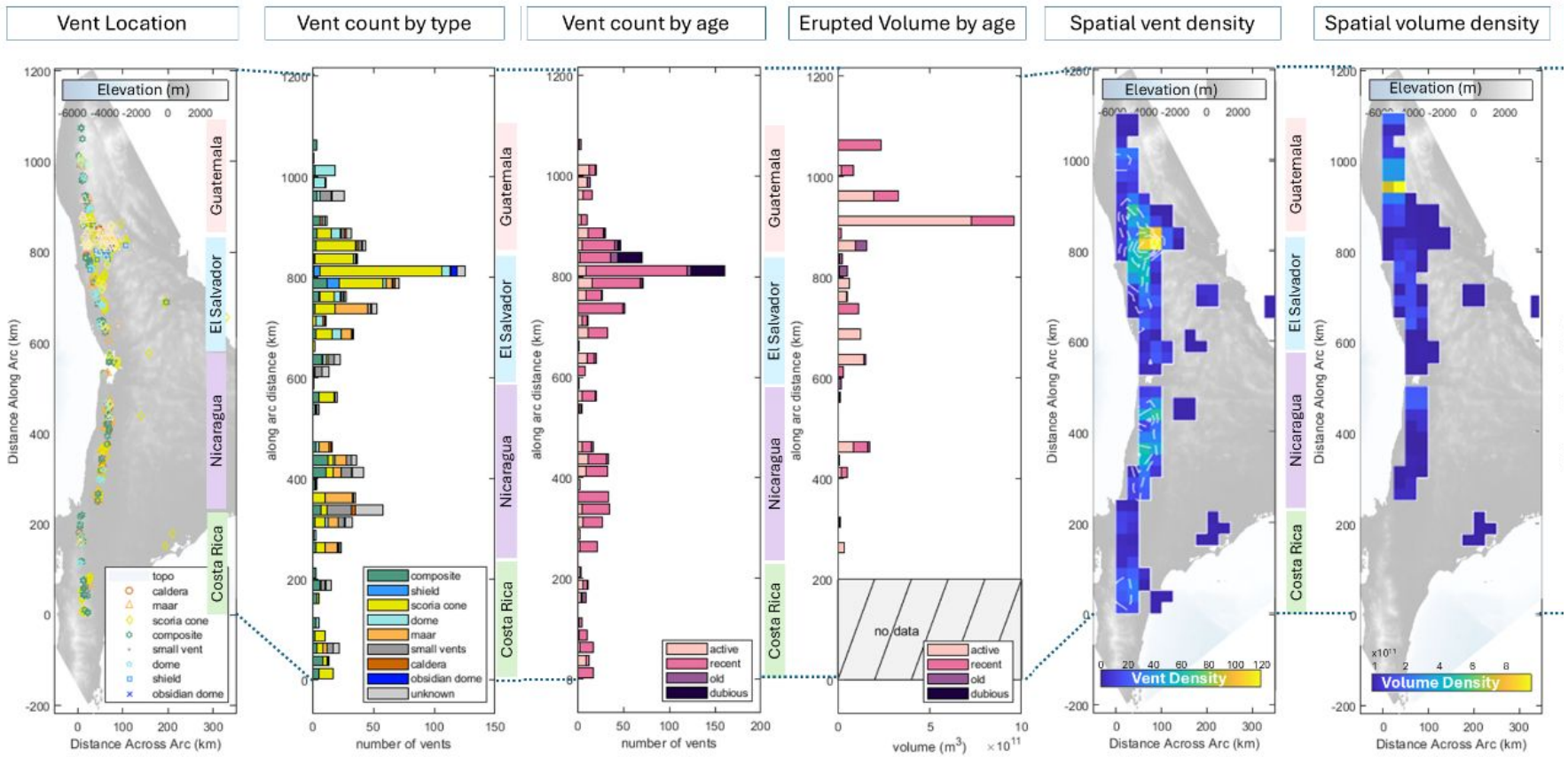

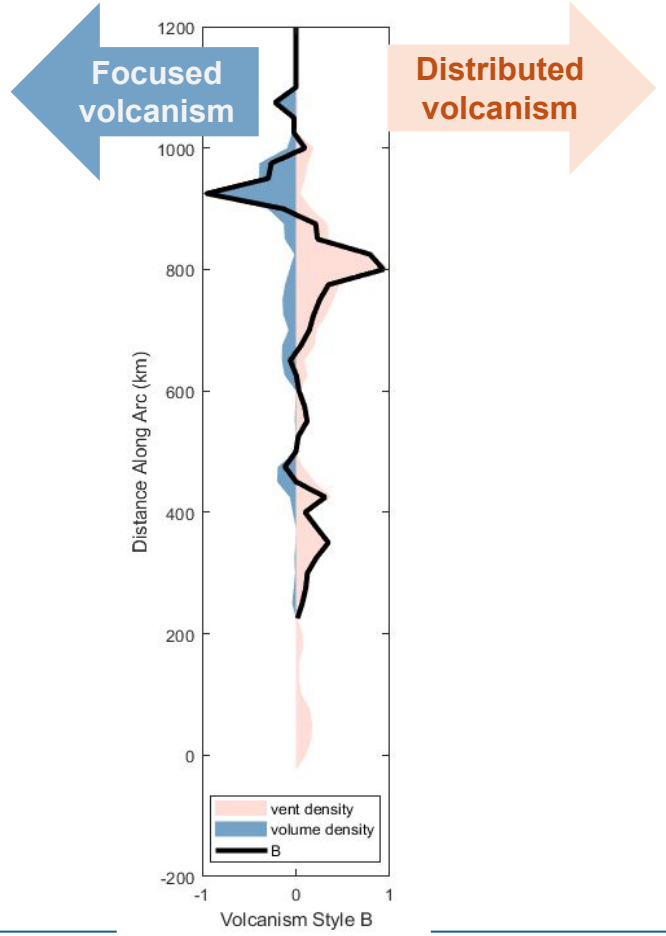

Conclusion – Type Patterns

A few large composite volcanoes dominate the volumetric magmatic output of the arc while **most edifices represent smaller eruptions**.

Conclusion – Age Patterns

More new edifices were created in the "recent" time period although the **"active" period seems to have greater volumetric output**.

Conclusion – Spatial density

- **Distributed volcanism** (more smaller cones over a larger area) is **most pronounced** near the segmentation break (see Gazel et al., 2021) **between Guatemala & El Salvador** but also found in southeastern Nicaragua.
- Data to access distributed versus focused volcanism in Costa Rica is not currently available (there are insufficient cone heights estimated).