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The unique geological features of Venus and the tectonics of lithospheric instabilities

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Many physical features of Venus (e.g size and proximity to the sun) makes it to be comparable to the Earth but its different atmospheric composition and pressure, higher surface temperature, and unique tectonic features that developed in the absence of plate tectonics remains enigmatic. For instance, how did the quasi-circular coronae and associated 'pancake domes' formed in relatively closer distances? What geodynamic mechanism is responsible for the formation of the magmatic rocks with varying viscosities and the uplift of the Ishtar Terra plateau? These important questions have been addressed in the context of mantle upwelling in the form of mantle plumes, and lithospheric drip/delamination. Here, the two-end member lithospheric instability models (delamination and drip) are tested by forward geodynamic modeling technique in order to explain the formation of coronae and Ishtar Terra. Previous lithospheric instability models that aim to explain the enigmatic tectonic features on earth (e.g plateau uplift and magmatism in intraplate orogenic areas) suggest that the delamination topography is more inclined to develop in asymmetric pattern whereas drip topography and magmatism is associated with architectural symmetry. We first synthesized all the available topographic cross sections and crack orientations along Coronae and then we compared and contrasted our numerical model results in which different rheological characteristics of the lithosphere inferred by the compositional differences between the crust and the mantle are implemented. Especially models of the lithospheric drip tectonics show that the centre of the surface depresses more than the shoulders because of the more vigorous downwelling in the central region. This is in good agreement with many of the Coronae's cross section while smaller number of Coronae have opposite topographic cross sections where central sections have higher elevation than the margins.