The active volcanoes of Kamchatka as suitable terrestrial analogs within the AVENGERS initiative: an opportunity for in-situ operational tests for future landing Venus missions.

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Introduction:

The next decade will see the return to Venus thanks to a number of missions which have been recently selected and proposed for launch. The Roscosmos Venera-D mission, along with the NASA DAVINCI, NASA VERITAS, ESA EnVision, the ISRO Shukrayaan-1, and the CNSA VOICE missions will open a new era for the exploration of the Earth's hellish twin planet.

The next missions to Venus should be able to shed new light on the science questions such as: a) whether the volcanic activity on this planet is locally constrained, or volcanism acts on a global scale, b) the rate of the present-day volcanic activity, and c) the style of volcanism on Venus, whether it is predominantly effusive, or the occurrence of local episodes of pyroclastic volcanism is also possible. In preparation for the future missions to Venus, the Analogs for VENus' Geologically Recent Surfaces (AVENGERS) initiative will select and analyze a number of active terrestrial volcanoes as suitable analogs for the identification and analysis of active volcanism on Venus.

Among the future missions to Venus, the Roscosmos Venera-D is the only one to be equipped with a lander which will analyze the elemental and mineralogical composition of the surface. As the young topographic rises (areas characterized by recent volcano-tectonic activity) on Venus are being proposed as one of the possible terrain types for the Venera-D landing, it is crucial to look for volcanic areas on Earth where to perform operational tests such as surface drilling and in-situ elemental composition analysis. To this regard, we propose here the analysis of the active volcanoes of the Kamchatka Peninsula in Russia as a very suitable analog for the Venera-D mission, as well as for the analysis of surface change detection due to ongoing eruptions.

The Kamchatka Peninsula is located on the eastern margin of the Eurasia plate, in proximity of the Kuril-Kamchatka subduction zone. The volcanoes of the Kamchatka Peninsula are among the most active volcanoes of the world, making them a suitable terrestrial analog in the search for active volcanism on Venus. Moreover, the volcanoes of Kamchatka are characterized by pyroclastic activity. Since the previous Soviet Venera and Vega missions landed over areas which elemental composition was most likely consistent with that of tholeiitic basalts, performing operational tests over areas characterized by pyroclastic activity also offers the unique opportunity to provide us the tools to potentially interpret the diverse output given by landing over portions of the surface of Venus possibly characterized by explosive volcanic products.

Finally, the frequent eruptions characterizing the volcanoes of the Kamchatka Peninsula make them also a suitable terrestrial analog for the possible detection of ongoing eruptions on Venus by future missions, which can be achieved by comparing two (or more) radar images of the same volcano (and its surroundings) in two (or more) different moments of time.