Idunn Mons as the landing site of the Venera-D mission: scientific relevance and possible operational tests on Mount Etna.

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Introduction:
Along with the recently selected NASA DAVINCI [1] and VERITAS [2] missions, and with the ESA EnVision mission [3], the Roscosmos Venera-D mission [4,5] opens the new decade of Venus exploration. Among these missions, the Venera-D is the only one to be equipped with a lander which could drill the surface of Venus and analyze its chemical composition. For this reason, it is crucial to select a future landing site based on its scientific relevance, as well as on safety constraints.
We propose here Idunn Mons (Figure 1a), a major large volcano of Imdr Regio, as the landing site for the Venera-D mission. We also indicate Mount Etna in Italy (Figure 1b) as a suitable test site on Earth for drilling tests and in-situ elemental and mineralogical analyses [6,7].

A reasonable balance between scientific relevance and safety constraints:
One of the major science discussions on Venus concerns whether the planet is still volcanically active today [8,9], and if so, what is the current rate and style of resurfacing on the planet. The young volcanic rises with their related large volcanoes are considered as the geologically youngest regions of Venus. Imdr Regio and its major volcanic structure, Idunn Mons (Figure 1a) is one of the most promising areas for active volcanism [i.e., 10]. Chemical analysis of eruptive products of a recently active volcano such as Idunn Mons may tell us about the volatile content of the mantle, thus shedding light on the debate between catastrophic [i.e., 11] and equilibrium [i.e., 12] resurfacing on Venus.
During the 70s' and 80s' of the last century, ten Soviet landers successfully landed on and conducted chemical analyses of Venusian surfaces (i.e., 13,14). These landers appear to have landed on regional plains of Venus. Such regional plains are generally considered as the safest areas for landing on Venus due to their gentle topography. The geochemical composition of at least some regional plains is now known from the previous Soviet landing missions. On the contrary, the scientific relevance and unknown geochemistry of possibly active large volcanoes such as Idunn Mons make these sites unprecedented landing targets, which deserve more attention. While being a scientifically relevant objective, the gentle slopes of Idunn Mons as well as the expected roughness of its lava flows would keep this volcano within the safety

constraints for the lander of the Venera-D mission [15]. Other areas of comparable scientific interest on Venus, such as the tessera terrains, may likely constitute a too dangerous target for the landing [15].

Mount Etna as a terrestrial laboratory for operational tests

We propose Mount Etna (Figure 1b) in Sicily (Italy), one of the most active volcanoes on Earth, as a suitable test site for drilling operations and in-situ elemental and mineralogical analyses to be performed by the Venera-D mission lander. Unlike other potentially suitable analog sites on Earth (i.e., East African Rift), Mount Etna is more easily accessible. Moreover, given its composite nature, this volcano offers unique opportunity to perform tests on different types of eruptive products.

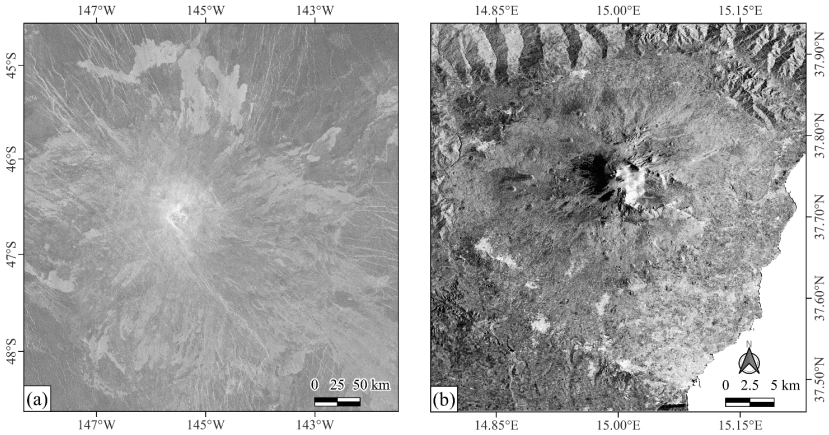


***Figure 1**: a) Idunn Mons (46 S; 146 W), Imdr Regio - Venus. Magellan left-look SAR scene - Resolution ~75m, b) Mt. Etna (37.75° N, 14.99° E), Sicily - Italy. S-1 GRDH SAR Ascending - Resolution ~75m.*

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