

EGU25-6634, updated on 01 Oct 2025

<https://doi.org/10.5194/egusphere-egu25-6634>

EGU General Assembly 2025

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Seismology on Venus: from measurement concepts to implementation in a planetary mission

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The deployment of surface seismometers on the Moon and Mars has demonstrated their ability to recover both internal structure and seismicity of these planetary bodies.

However, on planets with dense atmospheres and extreme surface conditions like Venus, seismometers deployed at the surface face significant challenges, including short measurement durations due to the high temperature limitations of the electronics and elevated background noise due to ground deformations generated by atmospheric dynamics. However, the relatively unconstrained internal structure of Venus is an important missing piece in our understanding of the formation and evolution of Solar System planets.

In response, atmospheric seismology measurement concepts that rely on detecting infrasound generated by seismic waves -- already successfully demonstrated on Earth -- are being explored for Venus exploration. In this context, we present a comparison of the seismic wave detection capabilities for ground based sensors, atmospheric balloon sensors, and airglow imagers measurements concepts. We then examine the scientific potential of different airglow imager configurations, demonstrating not only their relevance for Venus seismology but also their applicability to broader, high-level science questions. Furthermore, we address technical challenges associated with such a mission concept. These discussions provide valuable insights for the design of future missions to explore Venus' seismicity and internal structure.

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