Mini-marsquakes measured by InSight lander show effects of sun and wind

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Ikeda explains, "Our polarization analysis revealed that seismic waves of different frequencies and types showed different patterns of variation over the course of the Martian day. The temporal variations in low-frequency P-waves were related to distant changes in wind and solar irradiation, and the low-frequency Rayleigh waves were related to the wind direction in the region near the lander. Higher-frequency ambient noises were dominated by vibration of the lander itself. Thus, microtremors of different types and frequencies likely have different sources, and some are probably influenced by geological structures."

These important differences between the dominant sources of different types of Martian microtremors may help in efforts to identify geological structures in Mars' interior, as researchers inferred the lithological boundary beneath the seismometer from high frequency ambient noise.

A single seismometer is not yet enough to reconstruct images of the planet's interior, however. On Earth, data from networks of multiple seismometers must be used together for that purpose. But this analysis of the InSight lander's seismic data is an important step toward achieving that goal on Mars. Senior author Takeshi Tsuji says, "These results demonstrate the feasibility of ambient noise methods on Mars. Future seismic network projects will enable us to model and monitor the planet's interior geological structure, and may even contribute to resource exploration on Mars, such as for buried ice."


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