Heterogeneous Structure of Martian Surface as Seen by InSight

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In December 2022, communication with NASA’s Martian Lander InSight (Interior exploration using Seismic Investigations, Geodesy and Heat Transport) was lost. This is likely due to lack of power to maintain the lander activities and the observation came to an end. InSight has carried out more than 4 years of continuous monitoring of Martian seismicity through SEIS seismometer (Seismic Experiment for Interior Structure) and about 1300 marsquakes have been detected. One of the interesting features that we found with InSight was that there seems to be two different types of seismic signals. One is what is called a low frequency family which shows Earth like feature with relatively impulsive signal arrivals and faster decay. On the other hand, another family of events, knowns a high frequency family, has somewhat different feature with long ringing coda where the amplitude increase gradually and decays slowly. This type was more similar to moonquakes where intense scattering of regolith and/or megaregolith and low attenuation environment creates a long coda that can last as long as an hour. In this study, we would like to review some key achievements made by InSight mission on the Martian lithosphere. we would like to focus on what we learned about the regolith and the heterogeneous structure of Martian surface though seismic investigations and coda analyses. Finally, we will highlight some similarities and differences with the Lunar lithosphere.

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