Noise Autocorrelations on Mars

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InSight landed on Mars on November 26th, 2018 with several geophysical instruments including a short-period seismometer and a broadband seismometer (SEIS, Seismic Experiment for Interior Structure). Both seismometers are now installed directly on the Mars surface and enable to analyze the continuous seismic signal. The purpose of this study is to analyze autocorrelations of Mars continuous seismic signal. Seismic interferometry by ambient noise autocorrelations is a special case of Green's function retrieval for single-station analysis. High-frequency noise autocorrelations can be used to extract the zero-offset reflectivity and basin resonances beneath of the landing site while low-frequency noise autocorrelations contain mainly orbiting surface waves and are useful to extract normal modes. We analyze the signal by using both the classical and phase autocorrelations. Correlograms are stacked using the phase weighted stack method in order to enhance the signal to noise ratio.

The method was tested also on the two blindtest datasets provided by the Marsquake Service (MQS) and by the Mars Structure Service (MSS). It is further applied to analyze the first data recorded on Mars by the co-located broadband and short period seismometers.