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Potential of ground penetrating radar in sounding buried structural elements in Mars cratered terrains

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We report results from a field survey performed on a recently discovered impact field in the southwestern Egyptian desert, using a 270 MHz Ground-Penetrating Radar (GPR). This hyperarid region has significant similarities to the Martian heavily eroded mid-latitude cratered terrains in terms of crater density, size, and geomorphology. Profiles across small-buried craters revealed a coherent sequence of tilted layers constituting the cratonic infill resulting from aeolian deposits. In the intercrater areas the radargram revealed a poorly defined subsurface stratigraphy and the presence of shallow structural elements associated with potential evidences of the consequences of the shock effects, i.e., faulting, fractures, and chaotic bedrock. The radar-penetration depth varied from 2 to 15 m, depending mainly on the amplitude of the volume and multiple scattering in the subsurface, caused by fractures and debris created by the impacts. We conclude that mid-frequency GPR onboard future Martian rovers can successfully perform similar structural mapping resolving crucial information on the nature of the surface environmental changes responsible for erosion and sedimentation that occurred in such terrains.

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