

Revealing Shallow Near Surface Channels in Rub Al-Khali Using High Resolution Aero-Magnetic Data

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ABSTRACT

During semi-arid interval in the late Pleistocene, heavy rains and floods carried sediments and gravels from the exposed basement in the Arabian shield and deposited them in the Wadis. Gravels from basement rocks have magnetic properties, which can be detected by high-resolution magnetic survey. Three major Wadis, namely Wadi Al-Batin, Wadi Sahba and Wadi Al-Dawasir, flow eastward into the lowlands in the Eastern Arabia and Rub' Al-Khali. Satellite images and surface geology maps identify visible parts of these Wadis. However, areas of these Wadis are totally covered by thick sand dunes and cannot be seen by the satellite imagery. To detect the shallow magnetic response of the deposited magnetic gravels, I use the High Resolution Aero-Magnetic (HRAM) survey that was initially acquired to map the deep basement structures. The main objective aims at tracking both visible and buried parts of the channels. As a first step, I extracted the short wavelength of the HRAM data to map both surface and near surface features including the ancient shallow rivers and lakes in Rub Al-Khali and in Eastern Arabia. In the next step, I enhanced the mapped anomalies using vertical exaggeration techniques followed by the sun-shaded relieve process. The resulting anomalies explains well the fact that the magnetic signature of these channels decreases when we go from highlands in the west toward lowlands in the east due to the less deposition rate of the heavy magnetic gravels with respect to distance. In conclusion, the identified near surface channels will be used in near future projects of mapping surface geological events. In addition, it will help highlighting areas of possible seismic near surface problems and may assist in detecting hazards for civil engineering projects.