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Space-based study of the mechanisms of surface fluids exchanges in the arid region of Badain Jaran.

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The 49,000-km^2 Badain Jaran Desert lies in the centre of Alxa Plateau in the western Inner Mongolian Region [1;2]. The southern part of this desert is characterised by the unique association of lakes with the tallest megadunes of Earth (general height varying between 150 and 350 m. The mean precipitation rate of this region is below 100 mm yr^{-1} and the evapotranspiration one is $\sim$2600 mm yr^{-1}. Around 140 lakes have been reported, mainly located in the interdunal region and they represent a mean surface of $\sim$23 km^2. According to their size and salinity, these interdunal lakes can be divided in two groups. The first group concerns the shallowest lakes ($\sim$2 m deep) where the salinity varies from 3 to 50 g l^{-1} and the second group include the deepest ones ($\sim$15 m deep) with a higher salinity that can reach 334 g l^{-1}. Different hypotheses have been proposed to explain the existence of the lakes and the formation of the megadunes. One of the most interesting hypotheses permits to explain both structures: the convective circulation of the groundwater [3;4;1;5]. Indeed, the ascending current of groundwater can 1) supply all the lakes, and thus permits their existence, and 2) may play a role in the cementation of the dunes, process that is considered as the starting point for the megadunes development. Interestingly, at the surface of the megadunes, a dry layer is present and its depth varies between 20 and 50 cm. But below this dry layer, the sand is moistened [6]; a humid layer can be an indirect evidence of the presence of an ascending current inside the megadunes.

This unique combination of megadunes with lakes can be a good natural laboratory to understand the inputs of remote sensing and more precisely the combination of space-based infrared and radar data to understand the spatial and temporal evolution of the soil humidity. This study can bring knowledge in 1) the evaporation/condensation inside sand that can give more clues to understand the cementation process of the dunes and 2) to localise the ascending currents of the convective circulation that can be indirectly detected in using remote sensing data. Finally, the combination with GRACE estimations can bring new comprehension in the regional hydrogeology.

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