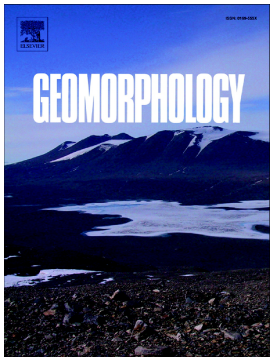

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Quaternary sediment architecture in the Orkhon Valley (central Mongolia) inferred from capacitive coupled resistivity and Georadar measurements

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Abstract

Detailed information on shallow sediment distribution in basins is required to achieve solutions for problems in Quaternary geology, geomorphology, neotectonics, (geo)archaeology, and climatology. Usually, detailed information is obtained by studying outcrops and shallow drillings. Unfortunately, such data are often sparsely distributed and thus cannot characterize entire basins in detail. Therefore, they are frequently combined with remote sensing methods to overcome this limitation. Remote sensing can cover entire basins but provides information of the land surface only. Geophysical methods can close the gap between detailed sequences of the shallow sediment inventory from drillings at a few spots and continuous surface information from remote sensing. However, their interpretation in terms of sediment types is often challenging, especially if permafrost conditions complicate their interpretation. Here we present an approach for the joint interpretation of the geophysical methods ground penetrating radar (GPR) and capacitive coupled resistivity (CCR), drill core, and remote sensing data. The methods GPR and CCR were chosen because they allow relatively fast surveying and provide complementary information. We apply the approach to the middle Orkhon Valley in central Mongolia where fluvial, alluvial, and aeolian processes led to complex sediment architecture.

The GPR and CCR data, measured on profiles with a total length of about 60 km, indicate the presence of two distinct layers over the complete surveying area: (i) a thawed layer at the surface, and (ii) a frozen layer below. In a first interpretation step, we establish a geophysical classification by considering the geophysical signatures of both layers. We use sedimentological