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Hydrogeological aquifer characterisation of the Zhagu subbasin (Tibetan Plateau) by using soil profile analysis and Electrical Resistivity Tomography (ERT

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The Tibetan Plateau (TP) is also called the “Third pole” because its aquifers constitute the origin for several major rivers which are the water supply for millions of people all over Asia. Due to increasing population especially on the Asian continent, water supply is getting increasingly important. As a consequence of climatic change in the past decades, increasing trends of precipitation, melting of glaciers and degradation of permafrost have generally lead to rising water levels in lakes on the TP. To ensure future water supply, aquifer characterisation is therefore an important issue on the TP. However, due to the remote character of the TP, hydrogeological aquifer information is scarce. The aim of this study is therefore to hydrogeologically characterise the Zhagu basin aquifer situated in the Nam Co Lake basin, which is the second largest lake on the TP. This project is part of the International Research Training Group “Geoecosystems in transition on the Tibetan Plateau” (TransTiP), funded by the DFG.

During a field work campaign in July 2018, the Zhagu basin aquifer was hydrogeologically characterised by the following methods: (i) borehole profiles were excavated, (ii) material samples considering different drill core layer properties were taken to be analysed for hydrogeological parameters, (iii) piezometers to monitor piezometric heads were installed, and (iv) geophysical methods (electrical resistivity tomography, ERT) was used to identify hydrogeological units and aquifer properties. The initial drill core assessment on one selected borehole shows six different layer properties over a depth of 8 m. Overall, the aquifer consists mainly of sand including silty and gravelly components. In addition, piezometric head measurements reveal groundwater occurrence at 3 m below ground surface, which was confirmed by the ERT analysis. An important result is therefore that appearance of liquid groundwater was shown by independent methods. Furthermore, the ERT enables the extrapolation of the local borehole information to a 2D section to identify the aquifer geometry. The applied methods show consistent results for detecting changes in hydrogeological units and detection of groundwater in the Zhagu basin aquifer as part of the Nam Co Lake basin. Further analysis of samples taken at all boreholes and sieve analyses will be carried out in the future in order to generate a 3D hydrogeological picture of the Zhagu basin aquifer. The measurements, observations, interpretation and conclusion on the initial drill core and aquifer structure will be shown and discussed in the contribution.