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Topographically induced Alpine regional groundwater flow systems below the unconsolidated valley fillings constitute a substantial unused geothermal resource. Within the framework of the INTERREG VB project GRETA (shallow geothermal energy in the Alpine region), we developed a method to quantify the groundwater flux of complex alpine aquifers. The basis of the study is a regional-scale hydraulic groundwater model, which is based on a 3D tectonic model of the Davos region in Switzerland. Based on data from a large pumping test, we were able to calibrate the hydraulic model and to calculate basics for various usage scenarios of energetic exploitation for the Arosa Dolomite aquifer. Favourable conditions for an energetic exploitation are related to large-scale topography differences between groundwater recharge and potential exfiltration areas in the valleys, thanks to the 3D geometry of the large-area tectonic nappe units with their root zone located within river valleys. In general, the proposed concept could be applied to manifold similar geological and hydrogeological settings of the Alpine belt.

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