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Characterization by gravity method of the geometry of a large-scale gently dipping permeable zone in the crystalline rock aquifer of Ploemeur (French Brittany).

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Crystalline rocks aquifers are often difficult to characterize since flow is mainly localized in few fractures or faults. In particular, the large-scale geometry of potential aquifers is often unknown and such aquifers are sometimes supposed limited in space to local scale hydrologic systems. Surprisingly, the groundwater site of Ploemeur (French Britanny), that is located in crystalline rocks at the roof of a granite, is well recharged since 1991 although it is used for water supply for a town of 18000 inhabitants. This crystalline rock aquifer is characterized at the local scale but its limits at large scale are not clearly defined. In particular, the main permeable zone that is located within a highly fractured contact between the Ploemeur's granite and the surrounding micaschists, is not defined at depth although its geometry should control partly the water budget of the aquifer. To characterize the geometry of this contact and in particular its dip, we achieved a gravimetric survey combined with forward and inverse modeling.

The gravimetric survey was done using a high-density grid with a 250 meters spacing on a 25 km^2 area. The resulting gravity map shows a North-South decrease of the Bouguer's anomaly due to the progressive transition from high density micaschists to lower density granite. Gravimetric data have been used simultaneously with magnetic and geological data to establish the contact geometry by running a three-dimensional forward modeling. In complement, details about the shape of the interface have been obtained using an iterative scheme based on the method of Oldenburg (1974). Results show that the contact between granite and micaschist is relatively subhorizontal at

depth. Such a geometry implies a relatively large-scale aquifer that may explain the recharge of the aquifer despite the crystalline nature of the terrains. Moreover, the gravimetric model confirms also the presence of secondary subvertical faults that may act as important local recharge areas. Thus, investigations of large-scale gently dipping structures appear to be of great interest for water supply in crystalline rocks.