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Hydrological concept of the Villerville-Cricqueboeuf landslides (Normandy coast, France): inferences from 20 years of groundwater observations and from geophysical investigation.

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In Normandy, along the Calvados coast, the 12 km long Pays d'Auge section is periodically affected by rotational and translational landslides. These landslides occurred in marly formations covered by chalks and quaternary deposits. In January 1982, major landslides have caused several damages and a retrogression cession of the hillslopes. The affected slopes are the Cirque des Graves at the West of the city of Villerville and the Fosses du Macre at the East of the city of Cricqueboeuf. Until now, these permanent slow-moving landslides (5-10 cm.year-1) were affected by three major accelerations in 1988, 1995 and 2001.

Analyses of the relationships among effective rainfall, groundwater levels and velocity of the landslides indicate clearly that the landslide mechanism is controlled by hydrology. The groundwater levels are recorded in several piezometers and wells within the hillslopes for almost 15 years.

The objective of this work is to present a concept for the hydrological behaviour of the landslides by combining a detailed analysis of the spatially distributed hydrological observations and results of a dense network of electrical resistivity tomography along 10 cross-sections. The electrical resistivity images were confronted to geological and geotechnical information available at several borehole locations and to the hydrological observations near the piezometers and the wells.

A synthesis of all the data allow to identify the spatial distribution of more porous media within the slopes, to characterize the aquifer geometry, to identify saturated and unsaturated parts of the hillslopes, and to present some hypothesis on the subsurface water pathways