Flow characterization in fractured black marls by single well pulse injection tests (Alpes de Haute Provence, France)

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1. INTRODUCTION

Black marls hilltops in the French South Alps are prone to weathering processes and landslide generation (Antoine et al., 1995; Malet et al., 2003). Few studies have been carried out on flow processes in stable fractured marl rocks. Bedrock is usually covered in weathered material and soils which makes the investigation tricky and expensive. Yet knowing and quantifying flows conditions in fractured marl bedrock and the hydrological interaction with the overlying weathered material are important issues for understanding rainfall-induced landslides generation and motion. In July 2007, a single well pulse injection test has been carried out in the Drain ERB black marls (Alpes de Haute-Provence, France) by using artificial tracers, Fluorescein and bromide.

2. SITE PRESENTATION

3. RESULTS IN SD1 AND SD2

3.1 Injection A (Water)

The hydraulic impact on SD1 and SD3 was observed 170 m and 13.5 hours after the start of the injection, respectively. The upstream well SD1 was the only one to remain unaffected. The steady state was not reached at the start of the second injection B as water levels in SD1, SD2 and SD3 were still increasing. The water level rose at a maximum of 2.5 m in SD1, 0.67 m in SD2 and 0.3 m in SD3.

3.2 Injection B (Water and Bromide)

The maximum concentration peak (217 mg.L-1) was observed in SD1, 15 hours after the end of the experimentation. In SD2, bromide concentration was 20 mg.L-1 over the 4 first hours after the detection of tracer. These results illustrate the spatial and vertical heterogeneity in the hydraulic properties of the material and show the role of preferential flow on the groundwater response.

4. INTERPRETATION

Transmissivity in SD1 and SD2 by Cooper-Jacob graphic method:

Discharge by Darcy's equation:

Bromide mass found in SD1 and SD2

5. CONCLUSION

Conceptual diagram of the flows during the injection B

References


With the financial support of the Regional Council Provence-Alpes-Côtes d’Azur

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