A method for mapping topsoil field-saturated hydraulic conductivity in the Cévennes-Vivarais region using infiltration tests conducted with different techniques
Isabelle Braud, J.F. Desprats, P.A. Ayral, C. Bouvier, J.P. Vandervaere

To cite this version:
Isabelle Braud, J.F. Desprats, P.A. Ayral, C. Bouvier, J.P. Vandervaere. A method for mapping topsoil field-saturated hydraulic conductivity in the Cévennes-Vivarais region using infiltration tests conducted with different techniques. EGU General Assembly 2017, Apr 2017, Vienna, Austria. pp.1, 2017. hal-02606800

HAL Id: hal-02606800
https://hal.inrae.fr/hal-02606800
Submitted on 16 May 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers. L’archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.
A method for mapping topsoil field-saturated hydraulic conductivity $K_{fs}$ in the Cévennes-Vivarais region using infiltration tests conducted with different techniques

Isabelle Braud(1), Jean-François Desprats(2), Pierre-Alain Ayral(3), Christophe Bovier(4), Jean-Pierre Vandervaere(5)

(1) Irstea, UR HHLV, Villeurbanne, France (isabelle.braud@irstea.fr), (2) BRGM, Montpellier, France (3) LGEI, IMT Mines d’Alès, Alès, France, (4) HydroSciences, Montpellier, France, (5) IGE, Grenoble, France

1. CONTEXT AND OBJECTIVES

Context:
Flash floods are natural hazards that affect the Mediterranean region. They are caused by intense rainfall events but catchment characteristics, and particularly topsoil field-saturated hydraulic conductivity $K_{fs}$, are also influential on the hydrological response. For distributed hydrological models, maps of $K_{fs}$ are useful, as $K_{fs}$ impacts Hortonian runoff, but they are difficult to obtain from point measurements.

Objectives:
- Propose a method to map $K_{fs}$ from GIS layers with application to the Cévennes-Vivarais region where infiltration measurements obtained with different methods were available (Fig. 1)
- Propose a method to pool available infiltration measurements obtained with various techniques in the region for regionalization

2. STUDY AREA AND DATA

Study catchment and available data (Fig. 1 and 2): Infiltration measurements performed using
- Guelph permeameter (GP) and Double Ring infiltration devices (DR) between 2002 and 2008 in the Garden and Avène catchments
- Single Ring (SR) infiltration measurements in the Claudiène catchment (2012) and Yzeron catchment (2008, blue rectangle in Fig. 1)
- Tension Disk Infiltrometers (TI)

A two steps method for pooling $K_{fs}$ data from various methods:
- Pooling of GP and DR data by geology * land use (Desprats et al., 2010, Fig. 4) and conversion of GP data to equivalent DR data
- Pooling SR and DR + TI data (Fig. 5) to get a final set of homogenized equivalent DR + TI data set

3. POOLING INFILTRATION MEASUREMENTS

Raw data show significant difference in distribution among methods (Fig. 3) so pooling the data requires specific treatments

4. 6. CONCLUSIONS AND PERSPECTIVES

A method was proposed to pool infiltration measurements of $K_{fs}$ obtained with different techniques
- Geology and land use were found to be discriminant factors explaining the variability of $K_{fs}$
- Geology and land use can be used to map $K_{fs}$
- Perspective: use the map in a distributed hydrological model to assess if flash flood simulation is improved as compared to the use of pedotransfer functions

5. MAPPING TOPSOIL $K_{fs}$

Mapping method
- Field data analysis show that geology and land use are significant explaining factors of $K_{fs}$ and one value is assigned by geology * land use class (Fig. 6)
- Geology and land use were used to produce a map of $K_{fs}$ (Fig. 7a) that is compared to a map derived from Rawls and Brakensieck (1985, RB85) pedotransfer function (Fig. 7b) based on a pedology map with associated soil data base including information about soil texture

References: