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Hydrology and Earth System Sciences Discussions

Interactive comment on "Potential and limitations of using soil mapping information to understand landscape hydrology" *by* F. Terribile et al.

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This a valuable paper for at least three reasons:

1. The authors are correct that a thorough description of soil survey procedures is not easily available for hydrologists who are interested to explore the potential of using soil survey data for characterizing hydrological catchment behavior. By not only describing traditional procedures but also recent developments in terms of digital mapping and pedometics, they provide a useful, be it somewhat wordy, account.
2. The authors demonstrate in four case studies that soil maps and the associated

soil databases can be used for modern quantitative hydrological characterization by linking soil data with hydrological parameters through the use of pedotransfer functions. This has been done before in literature, but the link has most often been made with abstract databases rather than with soil maps being linked to landscape characteristics. Besides, the authors clearly demonstrate that blind, mechanistic application of soil data leads to poor results and that additional field-work to fine-tune such applications is necessary.

3. The authors demonstrate convincingly that more complex models don't necessarily produce better data and that consideration of costs versus benefits is (or better: should be) a crucial element in choosing methodologies. The Manna et al (2009) paper is a landmark paper in this regard. In general, this reviewer is of the opinion that Italian research groups are the leaders in field-tested hydropedology.

There are, however, several comments to be made. In general, the paper is long, rather wordy and occasionally rather repetitive. It has more the appearance of a chapter in a book rather than a paper in a scientific journal. A professional editor could perhaps assist in providing a briefer and sharper focus. Furthermore:

1. P.4930. The statement that "the question as to how data from soil databases could be useful for hydrologists has yet to be addressed" is not correct. Think of all discussions on pdf's and on functional characterization of soils
2. P4938 and following. The statement is made that soil surveys have focused mainly on agriculture and that therefore data would not be useable for hydrology. I would question this statement. Think e.g. of the drainage classes in soil survey, of aquic suborders in soil classification and of the pdf's that are particularly useful for hydrology. Mottles by their morphology can indicate periodic surface stagnation of water (pseudogley) or permanent stagnation (stagnogley) that strongly affects hydrology. Locations of iron precipitates in relation to manganese precipitates

can indicate the direction of water movement into our out of the soil matrix etc. As the authors indicate, a problem occurs when features are relict but this can usually be determined. Overall, this reviewer believes that soil survey has even more to offer than the contributions suggested by the authors and this aspect may need more emphasis.

3. Case study 1 is good but the authors should better explain what they mean by“predictive ability” and by“performance indexes”. The Manna et al paper is complex and the authors should make another effort to focus on the highlights in this paper in terms of its main results. To really understand what the Manna et al paper is all about the reader needs now to go to the paper itself. This is unfortunate. When talking about costs/benefits the main emphasis is on methods versus performance, which is usually cropyield. This reviewer would like to learn more about what the users of the land would like to know. Possible yields? Or – more likely- improved management through, perhaps, precision agriculture? Here, pedological expertise can make significant contributions (e.g. Bouma et al 2008: Advances in Agronomy 97:175-237). This is a general comment: the focus is rather inward looking into the scientific discours. That's OK for now, perhaps„ but ultimately users will have to conclude that hydropedology really helps them to reach their goals. Some reference to the users of soil information and their wishes would be usefull.

4. Case study 2 is interesting in its development of the d800 index. Here, and in all the other cases, the “representative” profile of mapping units is the (empirical) basis for hydrological characterization. This represents a choice on the basis of expert knowledge and hardly offers a possibility to express internal variability within a mapping unit. Additional field observations have been reported for several of the case studies adding to the cost but improving results in terms of a better characterziation of internal variability of mapping units. However, no specifics are provided on sampling schemes followed: was there a statistically

defined sampling scheme using geostatistics? Substantial work has been done to statistically define internal variabilities of mapping units. The authors should acknowledge this type of research (see examples in, for example, Bouma et al, 2008 as cited above). In case study 3 an interesting aspect of using soil information was mentioned by demonstrating the occurrence of allophane with nontypical clay behavior. Examples like that are effective in showing the additional value of pedological input.

5. In their conclusions the authors emphasize that the alluvial soils in case 1 were homogeneous, had 1D flow, no clear macropores, no hydrophobicity, no irregular rooting patterns and no slowly permeable soil horizons. So, conclusions reached do not apply universally because many soils in the field do have such heterogeneous properties and pedological descriptions of soils can be quite helpful in identifying such features and in formulating ways in which their effects can be expressed hydrologically. This, in fact, may represent the major contribution of pedology to hydrology! The authors may want to add a comment tot his effect indicating that their well-supported positive conclusions about using hydropedology to improve hydrological studies has an even wider scope than is indicated in their paper.

6. An overall concern of this reviewer, also expressed by the authors of this paper, is the fact thats oil databases can be used by anyone to mechanistically derive hydrological haracteristics using pdf's. Who needs soil scientists anymore? Next, models are fed with data obtained and results are not necessarily in agreement with real field conditions. In fact, results maybe wrong and misleading. The authors recommend additional fieldwork to fine-tune methods for data collection requiring and this important conclusion may need some additional emphasis.

When the authors pay attention to comments made, this paper can make an important contribution to hydropedology serving hydrology.

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