Reaction to the *Interactive comment* by K.Beven on:"Hydrological insights when considering catchment classification"by J.Bouma et al. HESSD 8,C684-C689.

We thank Keith Beven for his comments on our paper that were valid and quite helpful in revising our paper, providing more focus, detail and context. We like to make four general comments and a number of specific ones relating to parts of the paper.

General comments:

1. The first author was invited to present a keynote paper in a Leonardo session on catchment classification in Luxemburg, focusing on experiences obtained when classifying soils that might be of use to the hydrology community where classification has so far received less attention. The main suggestion in the paper (and it is, of course, entirely up to the profession to consider this) is to focus first on improving characterization of the hydrology of catchments rather than on classification . We feel that classification has distracted pedologists from functionally charactering soils (as is attempted in hydropedology) which would – in our opinion- have been more productive. Dr.Beven has not commented on this aspect and we therefore assume that he agrees with this suggestion.

2. In retrospect, we see, after reading the review, that the hydropedological procedures have been presented in a manner that could easily suggest to an uninitiated reader that all is clear and that procedures can be applied in a routine manner. Nothing is farther from the truth as there are many uncertainties. We have noted this in the revised paper by emphasizing the role of expert knowledge and we have also indicated that studies are in progress, be it in a far too small number, to define uncertainties, errors and inaccuracies involved.

3. We have also tried to describe the general dilemma that researchers are facing. Questions are raised by society. Our strategic plans emphasize the important link between science and society and make claims for the crucial role that science can play when realizing sustainable development. Certainly, with so many uncertainties involved, simulating catchment behavior needs more study before a truly scientifically sound procedure can be presented. But waiting for this with no action by research at this time would not affect the political process where the usual give-and-take would most likely lead to poor and often irreversible results. We therefore emphasize now the role that expert knowledge can and should play, as in our reported studies. At the same time we plead for basic research to improve the scientific quality of the work. Any suggestion that we know already what we need to know is misleading and dangerous. This aspeact was not covered in our original paper and we thank dr. Beven for inspiring us to include these considerations.

4. We hear that some comments might be considered insulting. This certainly was not intended and we strongly regret the impression made. We trust that the revised paper will correctly reflect our joint goal to improve the quality of simulating catchment behaviour.

Specific comments:

1. The paper does describe how soil data are being used in the case studies. The first one on the Tana case, for example, combines data from a number of databases with SWAT modeling. This is new. Results were published in a report, not in a scientific journal. Only the second case study was published in a journal. We emphasize now that the HRU determination in the Tana study was based on expert knowledge and we pointed out the inaccuracies involved and the need for also defining them in remote sensing studies, such as in case study 3.

2. In case-study 2 spatial variability of bypass flow was characterized by making multiple measurements in subareas in the landscape that could be defined well by gemorphological criteria. Dr.Beven is correct when stating that subsoil irregularities and large scale processes may strongly affect soil behavior in a catchment context if only when they result in varying soil depths. That was not the case here but must certainly be considered in other landscapes. Soil maps indicate where this is likely to occur but also when this is unlikely, as in case 2.

3. Upscaling of point data presents major problems. In our case study 1 and in soil survey in general, expert knowledge is used to define "representative profiles" for each mapping unit, supposedly reflecting internal variability. As indicated, methods are available to better characterize variability, allowing , for example, monte-carlo type simulations, presenting bands rather than single curves (see IPCC). We certainly believe that more variability studies in soil survey are needed.

4. Ideally, one would like to devise a model that would yield results that do not need calibration and that would correctly reflect the hydraulic behavior of a catchment, not only in terms of discharges but also in terms of other features of practical interest, as discussed. We need more possibilities for calibration and remote sensing has been proposed in case 3. Dr. Bevin is correct when he states that our paper does not as yet produce hard data to show that hydropedology- input significantly improves the quality of catchment hydrology simulations as expressed by discarge rates. We don't show, for example, what the discharges would be when no hydropedology data would be used and the land was represented in terms of slopes only with a single type of soil. Indeed:"results can be right for the wrong reason". But we do know for sure that when we try to answer questions in the Green Water program (and in other programs), we need hydropedology data and the data from the various databases. But, again, we should also realize that we should improve and refine our procedures, at least defining variabilities involved. So questions

raised determine what is needed and considering the global land-use questions of the future there would appear to be a function for a fine-tuned hydropedology. So we were happy to note that Dr.Beven ended on a "really positive note" expressing the hope that introduction of geno- and phenotypes might help ensure that models might be getting:"the right results for the right reasons".