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Hydrology and Earth System Sciences
Discussions

Interactive comment on "HESS Opinions: Advocating process modeling and de-emphasizing parameter estimation" *by* A. Bahremand

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First I would like to appreciate this excellent opinion article. Although agree with most of opinions mentioned in this article, but I do not prefer the word "de-emphasizing" for parameter estimation. We believe that knowing everything about the system dynamics of watersheds is very ideal. But as we aware it is only a wish, and with our current knowledge, the use of parameter estimation techniques is inevitable. For instance, in most of hydrological models we use soil saturated hydraulic conductivity as an important parameter. To my knowledge most models are very sensitive to this parameter. Also it shows a great variability across the watershed. This is while, there is no certain data of it and no appropriate way of its measurement across the watershed. Furthermore, the author advocates focusing on a more hydraulic approach in hydrological

modeling. As we know one of the most used equations in flow transport and routing is the Manning equation. It again, requires the value of Manning's roughness coefficient as an input parameter. It is also very varied across a watershed system and is usually estimated from tabulated values and finally is optimized via parameter optimization techniques. Although I was impressed by reading this excellent opinion article, but I wonder why the author neglected the importance of measurement and monitoring of watershed systems and their variables and parameters. However, he highlighted the importance of a priori knowledge on system processes, but to my opinion in order to increase our knowledge on a system, requires detailed measurement techniques, methods, and tools. For instance, focusing on more hydraulically-based approaches for flow transport and routing, without having a detailed information and data on flow paths do not improve so much the hydrological modeling. To mention as an example, if we have access to a high resolution DEM, it will be easy to determine the accurate flow paths and even their dimensions such as hydraulic depth, flow cross section, channel gradient, channel curvature and etc. Another important input variable in hydrological models, especially event-based ones, is initial soil moisture content of the root zone which shows a high spatio-temporal variation and it is very difficult to get an accurate data of it across whole watershed. Although the author mentioned the HAND and topographic wetness index as promising techniques, but these techniques can not cover the effects of slope aspect on soil moisture variation across the watershed. As we know in higher latitudes the aspect plays a major role on solar radiation which in turn controls evapotranspiration and soil moisture content. As mentioned earlier in this text, other important input parameters of hydrological models which we do not have appropriate methods or tools to measure them include soil saturated hydraulic conductivity and surface roughness (Manning's N). So, why we should only focus on improving system processes simulation and neglect improvements on measurement and monitoring techniques and tools?

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