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We Need a Fresh Start for Flood Estimation in Ungauged Catchments

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The two standard methods for flood estimation in ungauged basins, regression-based statistical models and rainfall-runoff models using a design rainfall event, have survived relatively unchanged as the methods of choice for more than 40 years. Their technical implementation has developed greatly, but the models' representation of hydrological processes has not, despite a large volume of hydrological research. I suggest it is time to introduce more hydrology into flood estimation.
The reliability of the current methods can be unsatisfactory. For example, despite the UK's relatively straightforward hydrology, regression estimates of the index flood are uncertain by +/- a factor of two (for a 95% confidence interval), an impractically large uncertainty for design. The standard error of rainfall-runoff model estimates is not usually known, but available assessments indicate poorer reliability than statistical methods. There is a practical need for improved reliability in flood estimation.
Two promising candidates to supersede the existing methods are (i) continuous simulation by rainfall-runoff modelling and (ii) event-based derived distribution methods. The main challenge with continuous simulation methods in ungauged basins is to specify the model structure and parameter values, when calibration data are not available. This has been an active area of research for more than a decade, and this activity is likely to continue. The major challenges for the derived distribution method in ungauged catchments include not only the correct specification of model structure and parameter values, but also antecedent conditions (e.g. seasonal soil water balance). However, a much smaller community of researchers are active in developing or applying the derived distribution approach, and as a result slower progress is being made.
A change in needed: surely we have learned enough about hydrology in the last 40 years that we can make a practical hydrological advance on our methods for flood estimation! A shift to new methods for flood estimation will not be taken lightly by practitioners. However, the standard for change is clear - can we develop new methods which give significant improvements in reliability over those existing methods which are demonstrably unsatisfactory?