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Lock-ins and path dependency in evaluation metrics used for hydrological models

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Science, being conducted by humans, is inherently a social activity. This is evident in the development and acceptance of scientific methods. Science is not only socially shaped, but also driven (and in turn influenced) by technological development: technology can open up new research avenues. At the same time, it has been shown that technology can cause lock-ins and path dependency. A scientific activity driven both by social behavior and technological development is modelling. As such, studying modelling as a socio-technical activity can provide insights both in enculturation processes and in lock-ins and path dependencies. Even more, enculturation can lead to lock-ins. We will demonstrate this for the Nash-Sutcliffe Efficiency (NSE), a popular evaluation metric in hydrological research. Through a bibliometric analysis we show that the NSE is part of hydrological research culture and does not appear in adjacent research fields. Through a historical analysis we demonstrate the path dependency that has developed with the popularity of the NSE. Finally, through exploring the faith of alternative measures, we show the lock-in effect of the use of the NSE. As such, we confirm that the evaluation of models needs to take into account cultural embeddedness. This is relevant because peers' acceptance is a powerful legitimization argument to trust the model and/or model results, including for policy relevant applications. Culturally determined bias needs to be assessed for its potential consequences in the discipline.