Using Bayesian Networks for Sensitivity Analysis of Complex Biogeochemical Models

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Objective
Use a Bayesian-network based method to measure and rank which components of complex predictive numerical models contribute the most uncertainty to model outputs.

New Science
Researchers integrated Bayesian network-based methods into existing sensitivity analysis frameworks, allowing for the full representation of uncertainty sources and relationships between them.

Significance
- The use of Bayesian networks in sensitivity analysis frameworks increases the flexibility and power of these tools to quantify the contribution of uncertainty from a variety of controlling factors and rank them.
- The method can inform decisions on where to focus resources in order to improve the predictive capability of complex multi-physics models.

Figure shows a Bayesian network developed for a general situation of groundwater biogeochemical reactive transport modeling. All the Bayesian nodes are grouped into driving force (climate scenario) and three physical processes. The oval nodes are the deterministic nodes linked to their parents through physical laws.