

1086-60-1066

**Jef K Caers\*** ([jcaers@stanford.edu](mailto:jcaers@stanford.edu)), Energy Resources Engineering, Stanford University, CA 94305-2220. *Generalized Sensitivity Analysis for Managing Uncertainty in Complex Earth Systems.*

In this presentation we develop a new generalized sensitivity analysis typically applicable in the engineering of complex Earth systems. Applications are the engineering of groundwater, oil and gas reservoirs, CO<sub>2</sub> sequestration, mineral extraction, climate modeling etc. Most critical in such modeling is to find which model parameters (including combinations) are impacting the decision variables most. Many parameters need to be considered in all aspects (geophysical, geological, geochemical) of the Earth model. Some parameters are continuous; others discrete, other have no intrinsic value and are scenario-based. In this paper we develop a method of regional sensitivity analysis that classifies the response variables into a limited set of discrete classes. Then we start from the following principle: if the parameter frequency distribution is the same in each class, then that means there is no sensitivity, while the deviation from this null-hypothesis would indicate sensitivity. Based on this simple idea we develop a new measure of sensitivity that is general, as well as develop ways to understand multi-way interaction between such parameter based on class-conditional distribution models. We illustrate our techniques in a real case study of a West Africa off-shore oil reservoir. (Received September 18, 2012)