# ChE SEMINAR

## Reservoir Forecasting and Decision Making under Uncertainty

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Dept. of Chemical Engineering
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## ABSTRACT

Recovery of Oil and Gas resources is increasingly subject to large financial risk due to the design of costly facilities and the uncertain subsurface. Resources are located in complex geological heterogeneity induced by structural and depositional traps. Recovery processes now involve enhanced methods that require understanding and simulating fluid flow of several phases and components. Understanding and modeling flow in complex heterogeneity is critical for decision making related to appraising and well planning for optimal reservoir production performance. In this seminar I will provide a broad overview of how such complex uncertainties can be handled with a relatively simple workflow. The workflow takes the view that uncertainty on geological, geophysical and reservoir engineering parameters is not relevant if such parameters do no influence the decision. For that reason, a new generalized sensitivity analysis method determining sensitive parameters and how they interact to influence key decision variables is presented.

A second component of this workflow liesin the use of geophysical and reservoir production data to reduce an initially large uncertainty emanating from geological interpretation. While most conventional modeling tools rely on seismic inversion and history matching, it is advocated to use these data first to validate and possibly falsify hypothesized geological scenarios. The latter avoids providing statements of uncertainty that are too narrow, thereby understating risk. Using several case studies from various parts of the world, I will show how these methods can be used to provide realistic uncertainty in decision making.

# ABOUT THE SPEAKER

Jef Caers received both an MSc (’93) in mining engineering / geophysics and a PhD (’97) in engineering from the Katholieke Universiteit Leuven, Belgium. Currently, he is Professor of Energy Resources Engineering at Stanford University, California, USA. He is also director of the Stanford Center for Reservoir Forecasting, an industrial affiliates program in reservoir modeling and geostatistics with over 25 partners from the Energy Industry. Dr. Caers’ research interests are in the area of geostatistics, spatial modeling and modeling uncertainty applied to various areas in the Earth Sciences. He was awarded the Vistelius award by the IAMG in 2001, is Editor-in-Chief of Computers and Geosciences and served as chairman for the IAMG 2009 conference. Dr. Caers has received several best paper awards and written two best-selling books entitled "Petroleum Geostatistics” (SPE) and “Modeling Uncertainty in the Earth Sciences” (Wiley-Blackwell). His latest book "Multiple-point Geostatistics: stochastic modeling with training images" is published with Wiley-Blackwell in 2014. Dr. Caers was awarded the 2014 Krumbein Medal of the IAMG for career achievement.