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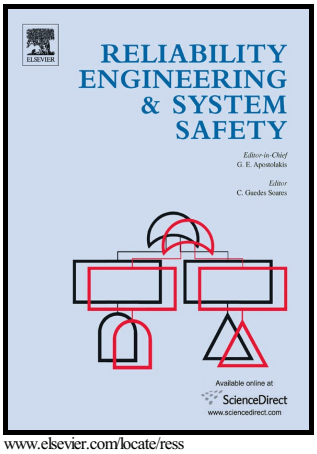

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RISK ASSESSMENT UNDER DEEP UNCERTAINTY: A METHODOLOGICAL COMPARISON

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ABSTRACT:

Probabilistic Risk Assessment (PRA) has proven to be an invaluable tool for evaluating risks in complex engineered systems. However, there is increasing concern that PRA may not be adequate in situations with little underlying knowledge to support probabilistic representation of uncertainties. As analysts and policy makers turn their attention to deeply uncertain hazards such as climate change, a number of alternatives to traditional PRA have been proposed. This paper systematically compares three diverse approaches for risk analysis under deep uncertainty (qualitative uncertainty factors, probability bounds, and robust decision making) in terms of their representation of uncertain quantities, analytical output, and implications for risk management. A simple example problem is used to highlight differences in the way that each method relates to the traditional risk assessment process and fundamental issues associated with risk assessment and description. We find that the implications for decision making are not necessarily consistent between approaches, and that differences in the representation of uncertain quantities and analytical output suggest contexts in which each method may be most appropriate. Finally, each methodology demonstrates how risk assessment can inform decision making in deeply uncertain contexts, informing more effective responses to risk problems characterized by deep uncertainty.

Keywords: Deep uncertainty, probabilities, probability bounds, robust decision making

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