STRUCTURAL MODELING WITH GEOCOGNITIVE PROCESSES

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This contribution introduces a geocognitive approach to the process of structural modeling based on expert's knowledge. This process is a dialogue between data interpretation and numerical representation, where different experts put together their knowledge and expertise to represent at best how they conceptualize the geologic reality. Existing modeling systems give experts substantial assistance in parameterizing and realizing their conceptual understanding of geologic architectures. However, these systems intensively rely on experts to understand and interpret these architectures especially when using spares data like wells and field observations. this is because they are conceived with a focus on resulting information and not in the entire knowledge and mechanisms behind the interpretation. The proposed approach is inverting this paradigm of modeling through the automation of the conceptualization processes based on expert's knowledge. In this approach, expert's knowledge is formalized by the mean of a semantically rich knowledge model in a human-machine readable format (ontology). This knowledge includes aspects about geometrical characteristics of geological features (objects and structures) in combination of relevant contextual geological aspects. Relationships between these features and the multiple types of modeling inputs and modeling operations are also highlighted in the knowledge model. To use this knowledge model, we propose a comprehensive structuration of the modeling operations. We give particular interest to the interpretation phase, in which we simulate how experts proceed in their interpretations, e.g., how they select data, how they interpret these data and confirm their interpretations, and how they upgrade their prior knowledge. Based on the preliminary results on synthetic data, we argue that this knowledge-based paradigm is effective as it requires less human interplay and does not necessitate resting on large initial datasets. Also, it opens new avenues for exploring structural uncertainties related to geological knowledge.