



Knowledge representation of rock plastic deformation

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The first iteration of the Rock Plastic Deformation (RPD) ontology models the semantics of the dynamic physical and chemical processes and mechanisms that occur during the deformation of the generally inhomogeneous polycrystalline rocks. The ontology represents the knowledge about the production, reconfiguration, displacement, and consumption of the structural components that participate in these processes. It also formalizes the properties that are known by the structural geology and metamorphic petrology communities to hold between the instances of the spatial components and the dynamic processes, the state and system variables, the empirical flow laws that relate the variables, and the laboratory testing conditions and procedures.

The modeling of some of the complex physio-chemical, mathematical, and informational concepts and relations of the RPD ontology is based on the class and property structure of some well-established top-level ontologies. The flexible and extensible design of the initial version of the RPD ontology allows it to develop into a model that more fully represents the knowledge of plastic deformation of rocks under different spatial and temporal scales in the laboratory and in solid Earth. The ontology will be used to annotate the datasets related to the microstructures and physical-chemical processes that involve them. This will help the autonomous and globally distributed communities of experimental structural geologists and metamorphic petrologists to coherently and uniformly distribute, discover, access, share, and use their data through automated reasoning and enhanced data integration and software interoperability.