

EGU2020-10534

<https://doi.org/10.5194/egusphere-egu2020-10534>

EGU General Assembly 2020

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



Loading history dependence of stress field around salt diapirs due to path dependence of visco-elasto-plastic rheology

Ibragimov Iskander¹, Yury Podladchikov², and Artem Myasnikov³

¹Moscow State University, Faculty of Mechanics and Mathematics, Department of Computational Mechanics, Russian Federation (iskander.ibragimov@skoltech.ru)

²Lausanne University, ISTE, Faculté des géosciences et de l'environnement (yury.podladchikov@unil.ch)

³Moscow State University, Faculty of Mechanics and Mathematics, Department of Computational Mechanics, Russian Federation (A.Myasnikov@skoltech.ru)

One of the most unstable and unpredictable process in sedimentary basin is salt diapir movement. It changes the structure of strata and can break its integrity and make trap structures for hydrocarbons. The movement of salt diapir through geologic timescale can be described in viscous terms, elastic terms were used to predict the geomechanical response of sediment surroundings.

This work describes the workflow of visco-elastic flow modeling of salt diapirism process. Salt has different geomechanical property such as much lower viscosity comparing to typical sediments. Mixed rheology make different geomechanical response such as stress, which cannot be solved in the same timescale. To solve the problem of different timescales of viscous and elastic flow there was used a pseudo-transient method of solving the system of equations. Used equations calculate full stress tensors and pressure over time which can help in understanding of stress evolution around salt diapir. Maximizing time step during each calculation was accomplished with density scaling, which assumes that inertial forces are negligible.

The used approach allows taking into account the loading history and easily can be supplemented with sedimentation mechanisms.