EGU22-11490
https://doi.org/10.5194/egusphere-egu22-11490
EGU General Assembly 2022
© Author(s) 2022. This work is distributed under
the Creative Commons Attribution 4.0 License.

Creep and acoustic emission in Shales from the Barents Sea

Alina Sabitova[1], Sergey Stanchits[1], **Viktoriya Yarushina**[2], Georgy Peshkov[1], Lyudmila Khakimova[1,3], and Vladimir Stukachev[1]
[1]Skolkovo Institute of Science and Technology, Skoltech Center for Hydrocarbon Recovery, Moscow, Russian Federation (alina.sabitova@skoltech.ru)
[2]Institute for Energy Technology, Kjeller, Norway
[3]University of Lausanne, Lausanne, Switzerland

Nowadays, environmental awareness has become one of the key directions of humankind development. There are a lot of projects aimed at preserving the environment: ensuring the environmental safety of geothermal energy facilities; study of global geodynamics and its influence on the composition, state, and evolution of the biosphere; geoecological substantiation of safe placement, storage, and disposal of toxic, radioactive and other wastes, etc. An essential role is assigned to the storage of increasing volumes of carbon dioxide gas. This problem requires complex approaches and solutions. Given that both CO2 and radioactive storage are long-term projects, it is necessary to investigate the creep process to monitor the state of the underground environment and assess the risks of leakage. A viscous deformation of the formation accompanies the prolonged loading. Viscosity is an essential parameter in coupling fluid flow and deformation processes occurring on Earth [Sabitova et al., 2021]. At the same time, focused fluid flow is a common phenomenon in sedimentary basins worldwide. Flow structures often penetrate the sandy reservoir rocks and clay-rich caprocks [Peshkov et al., 2021]. The impacts of the viscoelastic deformation of clay-rich materials need to be evaluated from an experimental and modeling perspective to understand better the mechanisms forming such structures. Here, we present multistage triaxial laboratory creep experiments with acoustic emission analysis conducted on samples from the Barents Sea. We performed lithological and geochemical characterization of each sample as a petroleum system element. Bulk and shear viscosities used in numerical models are calculated for all samples. The experimental curves are explained using the theoretical model for porous rock viscoelastoplastic (de)compaction [Yarushina et al., 2020].

References:

Sabitova, A., Yarushina, V. M., Stanchits, S., Stukachev, V., Khakimova, L., & Myasnikov, A. (2021). Experimental compaction and dilation of porous rocks during triaxial creep and stress relaxation. Rock Mechanics and Rock Engineering, 54(11), 5781-5805.

Peshkov, G. A., Khakimova, L. A., Grishko, E. V., Wangen, M., & Yarushina, V. M. (2021). Coupled Basin and Hydro-Mechanical Modeling of Gas Chimney Formation: The SW Barents Sea. Energies, 14(19), 6345.

Yarushina, V. M., Podladchikov, Y. Y., & Wang, L. H. (2020). Model for (de) compaction and porosity waves in porous rocks under shear stresses. Journal of Geophysical Research: Solid Earth, 125(8), e2020JB019683.