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Very slow creep tests on rock salt sample

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In order to investigate the long-term behaviour of abandoned salt caverns, creep tests have been performed on rock salt samples under very small uniaxial loadings (σ = 0.02 to 0.1 Mpa).

Sample were 160-mm high and their diameter was 70-mm. To minimize the effects of temperature variations, testing devices were set in a 160-m deep galley where temperature fluctuations are of the order of one-hundredth of a degree Celsius. The mechanical loading was provided by dead weights. The displacements were measured through special sensors with a resolution of $\Delta\varepsilon = 10^{-8}$. Test duration was more than one year.

Strain rates as small as $d\varepsilon/dt = 7 \times 10^{-13}$ s^{-1} were measured. These tests allow rock-sample creep to be investigated at very smalll strain rates. Qualitatively, the behaviour of rock salt under small stress (σ = 0.1 MPa) exhibits the same general features as observed under larger stresses (say, σ = 5 to 20 MPa): rapid stress build-up leads to transient creep characterized by slow rate decrease; creep rate then becomes roughly constant (steady-state is reached). Loading decrease “stress drop” generates inverse creep. However the observed strain rates, even if exceedingly small, are much larger that can be extrapolated from creep tests performed under higher mechanical loading.