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Creep flow and pressure relaxation in bubbly medium

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Abstract

General equations governing the slow creep motion of a nonlinear viscous, incompressible medium containing a large number of small gas bubbles are analyzed on the basis of asymptotic averaging methods for periodic structures. Special attention is paid to account for the interaction of bubble compression (decompression) relaxation and deviatoric macro deformations in the two-phase system. The corresponding approximate rheological relations and averaged macroscale mass and momentum balance equations are derived. The relationship between gas-medium pressure drop and volume expansion (compression) rate, as well as the one between deviatoric macro-stresses and macro-strain rates are numerically examined in application to bubbly ice rheology.