Poroelastic energy storage equation

What are the equations governing poroelasticity?
The equations governing poroelasticity are to some extent similar to the equations governing thermoelasticity. This implies that specific solutions to problems in one field may be used to solve the corresponding problems in the other (Geertsma, 1957). In Eq. (1.185) the poroelastic stress-strain law was written as

What is a poroelastic constant?
The poroelastic constant is independent of the fluid properties,and it is defined as An important distinction when applying this formulation to rock is to consider the compressibility of the constitutive materials. For soils,B and a are equal to unity,but in rocks,these are significantly less than one.

What is poroelasticity in chemistry?
Poroelasticity is traditionally used to describe the coupling between the solid and the interpenetrating fluid in their mixture,in which the solid is believed to be saturated by the fluid. In other words,it is an area of studying the movement/flow of material points in both the liquid phase and the solid skeleton.

What is static poroelasticity theory?
The static poroelasticity accounts for a process in which water movement and solid skeleton deformation occur simultaneously and affect each other. Therefore,it can be termed as hydromechanics. This static poroelasticity theory is a generalization of the consolidation theory in soil mechanics.

How many material constants are required for a poroelastic system?
For the definition of a poroelastic system,five material constantsare required. These material constants include the drained shear modulus G,the drained Poisson ratio n,the undrained Poisson ratio nu,the Skempton's pore pressure coefficient V,and the intrinsic permeability k.

What is Poroelasticity Theory?
In the theory of poroelasticity, first introduced by Maurice A. Biot (1941), porous medium is assumed to consist of two separate phases that interact with each other, so this theory enables modeling deformation of the medium together with the fluid flow.

This book treats the mechanics of porous materials infiltrated with a fluid (poromechanics), focussing on its linear theory (poroelasticity). Porous materials from inanimate bodies such as sand, soil and rock, living bodies such as plant ...

The equations of motion can be written in terms of rotation-free and dilatation-free equations similar to the equation for P and S wave in linear elasticity. However, unlike linear ...

Over the past decades, a wide range of simulation techniques has been developed to model the flow through fractured porous media. Recent overviews of the state of the art can ...

438 H.Steeb,J.Renner r Current density of the mixture at time t r0 Initial density of the mixture at time t0 ra Current partial density of constituent ra 0 Initial partial density of ...

In this equation, S p is the storage coefficient (SI unit: 1/Pa), which can be interpreted as the weighted compressibility of the porous material and the fluid. The storage can be an ...

We use a staggered algorithm to solve for the reactive transport, flow in poroelastic media and the phase field of fracture equations (Algorithm in Fig. 2b). Such an approach ...

The storage S can be an expression involving results from a solid-deformation equation or an expression involving temperatures and concentrations from other analyses. The Darcy""s Law ...

Written in terms of S {sub s}, these equations show that pore fluid mass diffusion is governed by a diffusivity equal to the ratio of hydraulic conductivity to specific storage under ...

Eqs. (5), (8) and (9) constitute the governing field equations for the rock matrix. In addition to the above field equations, a set of boundary and initial conditions are needed to ...

The uniqueness principle of the poroelastic energy density function is herein used to construct and solve a system of equations between the described sets of poroelastic ...

With the assumption of uniaxial strain and constant vertical stress, then f = Sp, which when used in equation (90) leads to the standard ow equation in hydrogeology

This paper presents a hydro-mechanical phase field model that integrates the unified phase field fracture theory and Biot"s theory, emphasizing the correction of the volumetric ...

In this section, we present the equations governing mechanic deformation in a linear elastic system and then extend the formulation to the linear poroelastic case by coupling the linear ...

Structural Mechanics Fluid-Structure Interaction Poroelasticity Defining Poroelasticity. Poroelasticity is the term used to describe the interaction between fluid flow and ...

Statistical energy analysis (SEA) is one such approach developed for high-frequency analysis. Based on the energy balance equation, which is statistically represented in ...

We examine nonlinear poroelasticity within the framework of the Biot (1973) semilinear theory of fluid-saturated porous solids. As before, the rock is assumed to be a homogeneous isotropic ...

The development of a continuum phase-field model of brittle fracture for poroelastic solids is presented. Three

treatments for deriving the evolution equation of the phase-field are ...

The derived energy balance equation is identical to those utilized by Lewis et al. and Noorishad et al. ... such as heat storage, advection, ... The finite element method is ...

Chapter 2 presents the constitutive equations and ield equations govern-ing non-isothermal quasi-static thermo-poroelastic processes. The restriction to quasi-static processes ...

of geothermal energy or hydrocarbon production, fracturing is something that must actively be avoided in other contexts. In the emerging engineering discipline of geological CO 2 storage, ...

The paper develops theoretical estimates for the parameters that describe the classical theory of poroelasticity for a fluid-saturated porous medium, with a porous elastic ...

Specific storage is an undrained poroelastic rock property, thus it is possible to estimate it from the simultaneous volumetric strain measurements. The main inputs into the calculation of specific storage are Kbp, porosity f, ...

The Lagrange equation is d dt ? ??x (Ek -Ed)- ? ?x (Ek -Ed) = F, d d t ? ? x ? (E k - E d) - ? ? x (E k - E d) = F, where x x is the generalized coordinate (s), Ek E k is the kinetic ...

Energy storage and dissipation functions are analytically derived and computed quantitatively based on a mixed FEM model. ... where (Psi (varepsilon _{ij},zeta,D)) is the ...

Table 1, Table 2 list the thermal properties of the constituent phases and the poroelastic parameters for the partially saturated porous medium, respectively. The poroelastic ...

The development of pore pressure is given in the form of coupled diffusion equations (Rice and Cleary, 1976; Gao et al., 2022): (1) r f S ? p ? t - ? ? (r f k m d ? p) = Q m ...

Poroelasticity. Introduction. Poroelasticity is traditionally used to describe the coupling between the solid and the interpenetrating fluid in their mixture, in which the solid is ...

Note that the second term in both equilibrium equations represents a drag force due to the fluid slipping past the solid. To see the equivalence, we can borrow a table from ...

Section 3 presents an energy stable formulation with simple penalty fluxes for the symmetric hyperbolic form of the poroelastic wave equations. Section 3 also discusses issues ...

In geological CO2 storage operations, wellbore deformations and leakage pathways formations can occur around injection and abandoned wells subjected to high rates and long ...

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Herbert F.Wang.Theory of Linear Poroelasticity with Applications to Geomechanics and Hydrogeology. (,,): -...

The Poroelastic Storage node adds Equation 7-2 and Equation 7-17 (excluding any mass sources). Use it to define the fluid and porous media properties, including a storage term to ...

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