The 13th Global-COE International Frontier Seminar

September 24st, 2009, from 11:00, at 4F meeting room

Physical reasons for abandoning plastic deformation measures in plasticity and viscoplasticity theory

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Constitutive equations, which characterize the response of a material to future loadings, must depend on state variables that, in principle, can be measured without any prior knowledge of the past history of deformation of the material. This notion of state is consistent with that proposed by Onat and it is consistent with Gilman's comment on physical problems with using total strain as a state variable in plasticity theory. Within the context of this notion of state, elastic strain is a state variable, whereas the total strain and plastic strains are not state variables since they are measured relative an arbitrary reference configuration. Alternative constitutive equations which are formulated in terms of elastic deformation measures have been discussed in the literature for finite deformations of elastically isotropic and anisotropic elastic-plastic and elasticviscoplastic materials. These constitutive equations have the physical properties that they are independent of the choice of the reference configuration, and they do not utilize any measures of total deformation or plastic deformation. The main objectives of this paper are to discuss physical reasons for abandoning plastic deformation measures in plasticity and viscoplasticity theory and to present an alternative small deformation theory which is formulated in terms of elastic strain. Also, aspects of alternative finite deformation theories are reviewed.

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Meeting room, Sogo-Kenkyu-Bldg 1 4F, Ehime University

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