



## **The Geodynamic Equation of State in thermo-mechanical models**

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Over the last decades there has been significant progress on the numerical modeling of thermo-mechanical processes. All thermo-mechanical models are based on the equations of mass, momentum and energy balance. However, different conclusions have come from several authors regarding the importance of dissipative heating and volumetric deformation. These different conclusions arise from the use of different formulations that have been based on different simplifying assumptions. In this work we provide the theoretical framework on the equations that are needed in order to model thermo-mechanical processes in a thermodynamically consistent manner. The numerical results show that a non-Boussinesq approximation is necessary and viscous heating cannot be neglected in numerical geodynamic models.