

Conservation of Mass in the Governing Equations for Fluids in Earth Systems

Law of Conservation of Mass

can be converted into

Law of Conservation of Density

expressed mathematically as

Continuity equation

Relation between total and partial derivatives

combine to yield

Density tendency equation

prognostic equation

is

is

relates

material (Lagrangian) derivative of density

velocity divergence

density advection

density tendency (local or Eulerian density derivative)

equals and interpret as

combine and interpret as

fractional rate of change of parcel volume

mass flux divergence