$$\nabla\cdot\boldsymbol{u}=0,\quad \nabla\cdot\boldsymbol{B}=0,$$

$$E\left(\frac{\partial\boldsymbol{u}}{\partial t}+\boldsymbol{u}\cdot\nabla\boldsymbol{u}-\nabla^2\boldsymbol{u}\right)+2\boldsymbol{k}\times\boldsymbol{u}$$

$$=-\nabla P+R_a\frac{\boldsymbol{r}}{r_o}T+\frac{1}{P_m}(\nabla\times\boldsymbol{B})\times\boldsymbol{B},$$

$$\frac{\partial\boldsymbol{B}}{\partial t}=\nabla\times(\boldsymbol{u}\times\boldsymbol{B})+\frac{1}{P_m}\nabla^2\boldsymbol{B},$$

$$\frac{\partial T}{\partial t}+\boldsymbol{u}\cdot\nabla T=\frac{1}{P_r}\nabla^2 T.$$