# Comment on the Paper

## 'A NEW RESONANCE IN THE SOLAR ATMOSPHERE'

## by Joseph V. Hollweg

(*Research Note*)

P. VENKATAKRISHNAN and S. S. HASAN

*Indian Institute of Astrophysics, Bangalore-560 034, India*

**Abstract.** In the absence of genuine forcing terms, there is no resonance between linear fast mhd and gravito-acoustic waves.

Recently Hollweg (1979) reported a new 'resonance' in the solar atmosphere wherein a fast mhd wave 'matches' a gravito-acoustic wave. We propose to show in what follows that this resonance is spurious.

Following Hollweg, we write the linearized equations of continuity, motion and magnetic induction as

$$\frac{\partial}{\partial t}\delta\rho + \nabla \cdot \rho_0 \delta\mathbf{v} = 0 , \tag{1a}$$

$$\rho_0 \frac{\partial}{\partial t}\delta\mathbf{v} = -\nabla\delta p + \delta\rho\mathbf{g} - \nabla\left(\frac{\mathbf{B}_0 \cdot \delta\mathbf{B}}{4\pi}\right) + \frac{\mathbf{B}_0 \cdot \nabla}{4\pi}\delta\mathbf{B} , \tag{1b}$$

$$\frac{\partial}{\partial t}\delta\mathbf{B} = \nabla\times(\delta\mathbf{v}\times\mathbf{B}_0) , \tag{1c}$$

where $\delta\rho$, $\delta p$, $\delta\mathbf{v}$, and $\delta\mathbf{B}$ are the first order variations in density, pressure, velocity and magnetic field while $\rho_0$ and $\mathbf{B}_0$ are the zero-order density and magnetic field. We confine our discussion to the isothermal case (the same arguments being valid for the adiabatic case as well). The energy equation will be, therefore,

$$\delta p = T_0\delta\rho , \tag{1d}$$

where $T_0$ is the zero-order temperature. Using expressions of the form $a(z)\exp i(k_x x + \omega t)$ for the first order quantities we can write Equations (1a) through (1d) as

$$i\omega\delta\rho + \rho_0 \frac{\partial}{\partial z}\delta v_z + \delta v_z \frac{\mathrm{d}\rho_0}{\mathrm{d}z} = -ik_x\rho_0\delta v_x , \tag{2a}$$

$$i\omega\rho_0\delta v_x = \frac{B_{0z}}{4\pi}\left[\frac{\partial}{\partial z}\delta B_x - ik_x\delta B_z\right] - ik_x\delta p , \tag{2b}$$