355(3): Hydrodynamics and Fluid Dynamics from the ECE Wave Equation.

In previous work it has been shown that fluid dynamics can be reduced to one wave equation:

$$\square V^\mu = \frac{1}{a_0^2} J^\mu \quad -(1)$$

where

$$V^\mu = \left(\frac{\Phi}{a_0}, \underline{v} \right) \quad -(2)$$

and

$$J^\mu = \left(a_0 q, \underline{J} \right) \quad -(3)$$

Here a_0 is the speed of sound. Eq. (1) reduces to the ECE wave equation:

$$(\square + R) V^\mu = 0 \quad -(4)$$

provided that

$$R V^\mu = -\frac{1}{a_0^2} J^\mu \quad -(5)$$

i.e.

$$R \Phi = -q \quad -(6)$$

and

$$R \underline{v} = -\frac{1}{a_0^2} \underline{J} \quad -(7)$$

The units are:

$\Phi = m^2 s^{-2}$; $q = s^{-2}$; $R = m^{-2}$; $\underline{J} = m s^{-3}$

and $v = m s^{-1}$.

From eqs. (6) and (7):

$$\frac{\underline{v}}{\Phi} = \frac{a_0^2}{q} \underline{J} \quad -(8)$$

So it is possible to find Φ from eq. (8) and the curvature from eqs. (6) and (7). The existence of curvature means that the theory is developed in a space with finite torsion and curvature.

The scheme of calculation is to start with the vorticity equation derived from the Navier Stokes equation:

$$\frac{\partial \mathbf{w}}{\partial t} = \nabla \times (\mathbf{v} \times \mathbf{w}) + \frac{1}{\rho^2} \nabla \rho \times \nabla p + \frac{\mu}{\rho} \nabla^2 \mathbf{w} \quad -(9)$$

where the baroclinic term is:

$$\frac{1}{\rho^2} \nabla \rho \times \nabla p = -\nabla \times \left(\frac{1}{\rho} \nabla p \right) = -\nabla \times \nabla h \quad -(10)$$

$$= \underline{0}$$

in the Cartan theory. So:

$$\frac{\partial}{\partial t} (\nabla \times \mathbf{v}) = \nabla \times (\mathbf{v} \times \mathbf{w}) + \frac{1}{R} \nabla^2 \mathbf{w} \quad (11)$$

where the Reynolds number is approximately:

$$R = \rho / \mu \quad -(12)$$

So:

$$\frac{\partial \mathbf{w}}{\partial t} + \nabla \times (\mathbf{w} \times \mathbf{v}) = \frac{1}{R} \nabla^2 \mathbf{w} \quad -(13)$$

Now use:

$$\nabla^2 \mathbf{w} = \nabla (\nabla \cdot \mathbf{w}) - \nabla \times (\nabla \times \mathbf{w}) \quad -(14)$$

$$= -\nabla \times (\nabla \times \mathbf{w})$$

) because: $\underline{\nabla} \cdot \underline{W} = \underline{\nabla} \cdot \underline{\nabla} \times \underline{v} = 0$ — (15)

Therefore:

$$\frac{\partial}{\partial t}(\underline{\nabla} \times \underline{v}) = \underline{\nabla} \times (\underline{v} \times \underline{W}) - \frac{\mu}{\rho} \underline{\nabla} \times (\underline{\nabla} \times \underline{W}) \quad -(16)$$

and

$$\frac{\partial \underline{v}}{\partial t} = \underline{v} \times \underline{W} - \frac{\mu}{\rho} \underline{\nabla} \times \underline{W} \quad -(17)$$

as in previous work. So $\underline{v}$ can be calculated from eq. (17). Note that:

$$\underline{v} \times (\underline{\nabla} \times \underline{v}) = \frac{1}{2} \underline{\nabla} v^2 - (\underline{v} \cdot \underline{\nabla}) \underline{v} \quad -(18)$$

and

$$\underline{\nabla} \times (\underline{\nabla} \times \underline{v}) = \underline{\nabla} (\underline{\nabla} \cdot \underline{v}) - \nabla^2 \underline{v} \quad -(19)$$

so:

$$\frac{D\underline{v}}{Dt} = \frac{\partial \underline{v}}{\partial t} + (\underline{v} \cdot \underline{\nabla}) \underline{v} = \frac{1}{2} \underline{\nabla} v^2 - \underline{\nabla}(\underline{\nabla} \cdot \underline{v}) + \nabla^2 \underline{v} \quad -(20)$$

This is a useful form of the vorticity equation and resembles the Navier Stokes equation. Eq. (1) is derived with the Lorenz condition:

$$\frac{1}{a_0^2} \frac{\partial \Phi}{\partial t} + \underline{\nabla} \cdot \underline{v} = 0 \quad -(21)$$

from which Φ can be calculated given $\underline{v}$ from eq. (20). The charge and current are calculated using:

$$q = \underline{\nabla} \cdot \left((\underline{v} \cdot \underline{\nabla}) \underline{v} \right) \quad -(22)$$

and:

$$\underline{J} = a_0^2 \, \underline{\nabla} \times (\underline{\nabla} \times \underline{v}) - \frac{\partial}{\partial t} \left((\underline{v} \cdot \underline{\nabla}) \underline{v} \right) \quad -(23)$$

The $\underline{\Phi}$ calculated from eq. (21) must be self consistent with eq. (8):

$$q \, \underline{V} = a_0^2 \, \underline{\Phi} \, \underline{J} \quad -(24)$$

So given $\underline{V}$, q, $\underline{J}$ and $\underline{\Phi}$, the speed of sound a_0 in a given system can be calculated.

Finally, the curvature of the system can be found from eqns. (6) or (7).

Note carefully that these equations are for the aether or vacuum and are worked out in terms of the potentials $\underline{\Phi}$ and $\underline{V}$. The vacuum transfers energy to a circuit.