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The Galaxy curves explained by implementation of Hamilton's principle in fluids with angular momentum

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Abstract

Hamilton's principle is applied to the whirl-well flow in fluids with angular momentum in the form of the minimum energy principle. As a result, this kind of flow presents specific properties enabling to explain the Galaxy curves

1. Minimum energy principle implementation

The kinetic energy of the fluid particles contained in a spherical film of thickness dr is a function of the square of the variable speed for the tangential speed, but constant for the radial speed. Furthermore, the variation in the kinetic energy of fluid particles in well flow occurs proportionally to the distance from the well whereas, in eddy flow, it occurs proportionally to the circumference.

$$d\,l_{r.} / dt = d\,(r - r_0)/dt \qquad d\,l_\theta = d\,(2\pi r)/dt$$

$$d\,l_{r.} / dt = d\,r/dt \qquad d\,l_\theta = 2\pi dr/dt$$

$$\frac{1}{\rho}\frac{\partial p}{\partial r} = V_r \frac{\partial V_r}{\partial r} + \frac{V_\theta^2}{r} \qquad \frac{1}{\rho}\frac{\partial p}{\partial r} = -\frac{2k^2}{r^5} + \frac{k'^2}{r^2}$$

$$\frac{1}{\rho}\frac{\partial p}{r\partial\theta} = V_r \frac{\partial V_\theta}{\partial r} - \frac{V_r V_\theta}{r} \qquad \frac{1}{\rho}\frac{\partial p}{r\partial\theta} = -\frac{kk'}{2r^3\sqrt{r}} - \frac{kk'}{r^3\sqrt{r}}$$

There is therefore a ratio of 2π between the energy variations. Additionally, the energy corresponds to the work of the pressure component collinear with the motion of the fluid particle. The work of the forces resulting from the pressure, is represented for a fluid particle, over the distance dr, by:

$$\mathrm{W} = -\frac{2k^2}{r^5} + \frac{k'^2}{r^2} - 2\pi\frac{3}{2}\frac{kk'}{r^3\sqrt{r}}$$

k is the flow parameter; its value cannot be a condition of the minimum energy. It shall exist at least one solution for each value of k. Derivation shall be performed on k':

$$\frac{\mathrm{dW}}{\mathrm{dk'}} = +\frac{2k'}{r^2} - 2\pi\frac{3}{2}\frac{k}{r^3\sqrt{r}} = 0$$

The minimum is obtained for

$$k' = \frac{3}{2}\pi\frac{k}{r\sqrt{r}} \qquad V_\theta = \frac{3}{2}\pi\ V_r$$

There is therefore only one well-vortex flow conforming to the principle of minimum energy.

There is a ratio of $\frac{3}{2}\pi$ between the tangential speed and the radial speed.

2 Energy transfer

It should be noted that a fluid particle located at a distance r from the well, in a perfect fluid without angular moments, is driven by two opposing rotational movements: the first due to the overall rotation in the vortex, the second due to the variation of the tangential velocity of the vortex between the ends of the fluid particle closest to and farthest from the well.

Now, in the swirl well in perfect fluid, the angular velocities of these two rotations are equal and opposite:

$$\omega_1 = \frac{V_\theta}{r} = \frac{k'}{r^2} \qquad \omega'_1 = \frac{1}{2}\frac{\partial V_\theta}{\partial r}dr / \frac{dr}{2} = -\frac{k'}{r^2}$$

There is therefore no rotation of the fluid particles. However, this results in a differential rotation of fluid particles which does not correspond to the classical model since the Laplacian is zero and consequently there is no friction in the classical sense. This flow is called irrotational. On the other hand, there is friction described as kinetic, because it comes from relative rotations which also make it possible to explain the anomaly linked to the lifting of the free surface near the drain compared to the theoretical surface obtained by not considering the kinetic frictions, therefore in this case, in the absence of any friction. We can note in passing that this "kinetic" approach to friction in fluids also makes it possible to explain the behaviour of fluids in their flow around a cylinder

On the other hand, in the well-vortex flow in fluid with angular moments, the angular speed of the overall rotation is the opposite of twice that of the rotation due to the variation in tangential speed:

$$\omega_2 = \frac{V_\theta}{r} = \frac{k'}{r\sqrt{r}} \qquad \omega'_2 = \frac{1}{2}\frac{\partial V_\theta}{\partial r}dr / \frac{dr}{2} = -\frac{1}{2}\frac{k'}{r\sqrt{r}}$$

So that there is an energy transfer needed.

Fluids with angular momentum are composed of particles with Brownian angular momentum whose corresponding rotational energy is equal to the kinetic energy of agitation. In these fluids, the notion of temperature is excluded, and, since friction must be considered negligible at the extremely low speeds envisaged, the energy exchanges required by forced displacements occur by pumping or contribution of kinetic energy of rotation to the kinetic energy of Brownian rotation.

The whirl rotation requires an input of angular momentum. It can only come from the angular kinetic energy of particles of the fluid. The rotation of the whirl absorbs a part of the angular kinetic energy of the particles of the fluid.

As a consequence the tangential speed changes from 1 on square root of R to 1 on R.

The momentum pumped $\mathcal{M}_p$ by the rotation of the whirl is proportional to the angular velocity, the distance from the centre of the well and the distance travelled by the particles of the angular momentum fluid. However, the angular speed is inversely proportional to the distance from the centre of the well while the distance travelled is proportional to this distance.

$$\omega = \frac{V_\theta}{r}$$

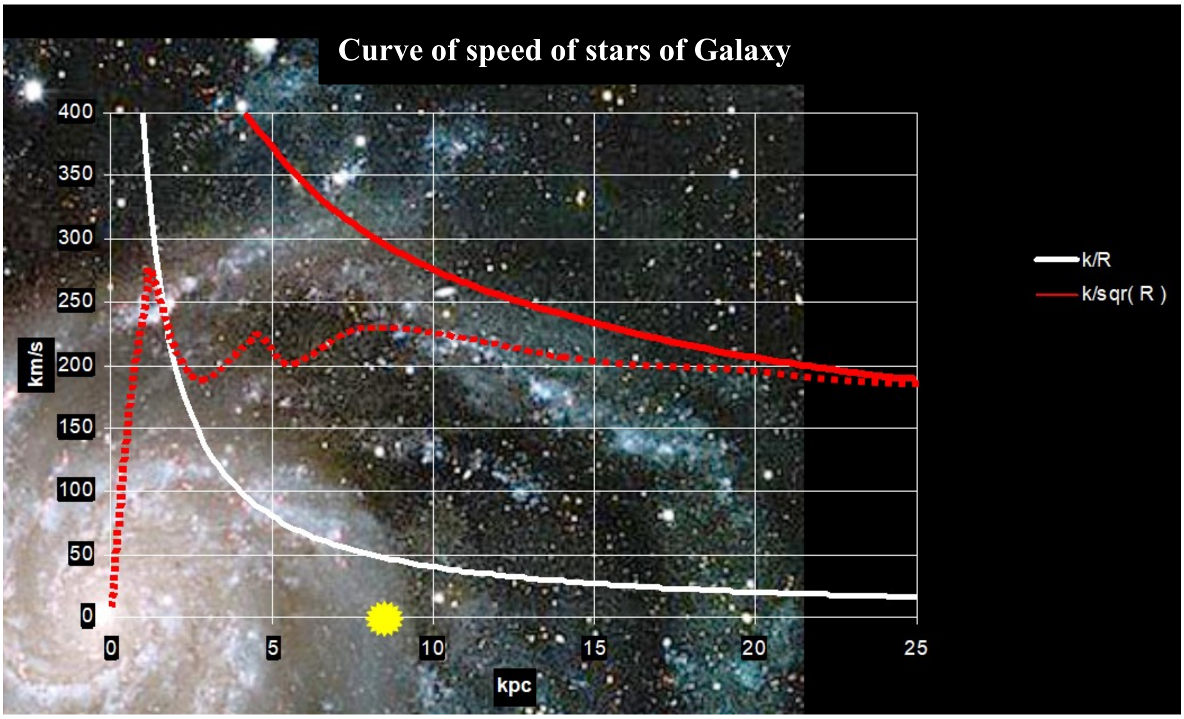
$$\mathcal{M}_p = K\, j\, \omega\, r = K\, j\, V_\theta$$

The pumped moment is therefore independent of the distance from the centre of the well and the speed curves of all the whirl-well flows with angular momentum are homothetic.

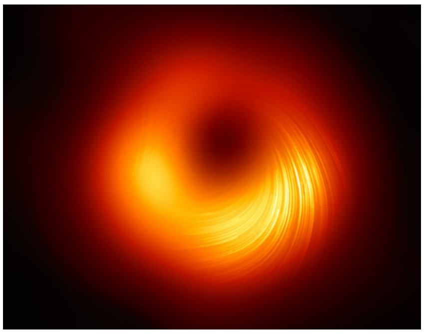
3 Implementation to Galaxy

Space can be assumed to be filled with a fluid with kinetic moments condensing in matter. Well-vortex flows are therefore formed around the condensation zones which are essentially the stars and planets. It is demonstrated in the book SPACE that the bodies placed in these flows have a movement conforming to Kepler's laws. Galaxies, however, have a particularity.

The tangential velocity curve is only Keplerian at the edge of the Galaxy at about 20 kpc. At such distances, the tangential speed of the whirl well-flows is less than 170 km/s. In addition, the curve of the velocities of the stars of the galaxies is modified by the progressive reduction of the stellar mass contained in the trajectory of the stars when approaching the eye of the galaxy. The curve therefore descends as the distance from the eye decreases. In the same way, when all the angular momentum of the fluid particles is absorbed, the curve of the tangential velocities of the stars increases less quickly than the inverse of the distance.



The dotted red curve represents the curve of the tangential velocities of the stars of the Galaxy. The red curve the law in $1/\sqrt{R}$ in fluid with angular momentum, the white curve the law in 1/R in perfect fluid.



At the centre of the galactic whirlpool, a hole can appear if the rotation speed of the whirlpool is high enough. This galaxy hole is free of matter, free of atoms, so it appears to be black because there is no emission of light when there are no atoms. It's a black hole.

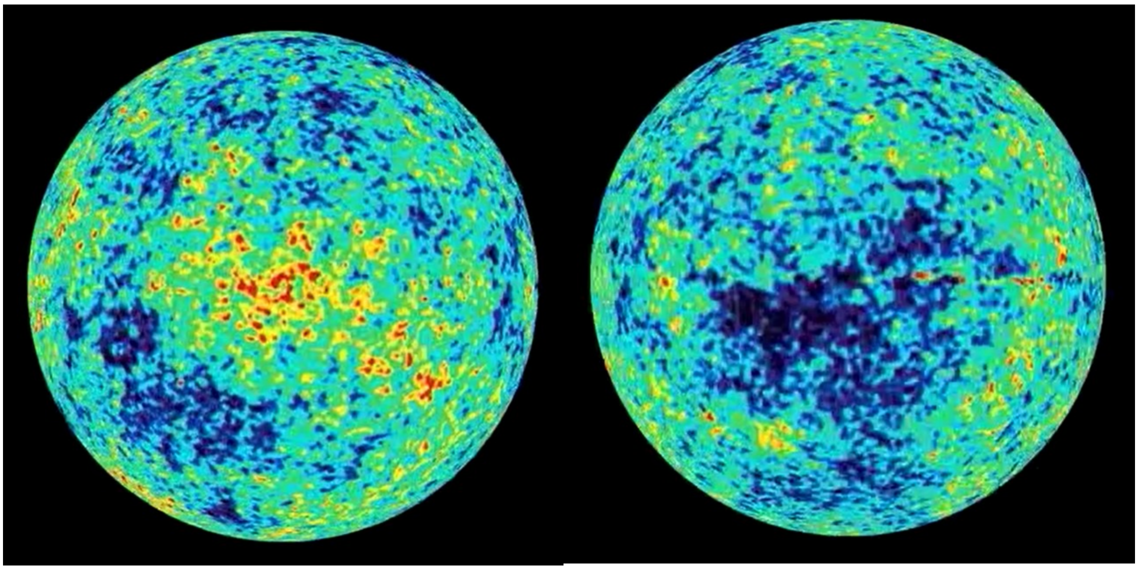
4 The red shift of the light emitted by Galaxies

Space being assumed to be filled with a fluid with angular momentum condensing in matter, the nuclei of the atoms must gradually grow in size. The light that reaches us from very distant galaxies was emitted billions of years earlier. At that time the nuclei were smaller and therefore emitted red-shifted light compared to the emission of the same atoms today on Earth. It is therefore useless to assume that galaxies are moving away from us at increasing speeds with distance and therefore that the Universe would be expanding at an accelerated rate.

5 The Hubble tension

This fluid with kinetic moments necessarily has a limited extent in Space. The condensation of this fluid in matter cannot be the cause of this limitation since, at its borders, the condensation speed tends towards zero and therefore the fluid would vaporize indefinitely. Action is required to limit its extent, just as gravity, the condensation of this fluid, keeps the atmosphere relatively confined around the Earth. We can think of an electric field or a magnetic field.

In the current state of knowledge, Fluid Mechanics does not provide an answer to the limitation of the extent of the fluid in Space. However, the pressure of the fluid must decrease as it approaches its confines. As a result, condensation must be slower and the atoms grow slower in this area. The red shift must therefore be greater than that which would result from distance alone. This area is characterized by an emission of light described as the Cosmic Microwave Background. But the Galaxy having no reason to be at the centre of the Universe, there is an asymmetry in the measurements of this Cosmic Microwave Background as shown by the readings of the measured shifts. The Galaxy is closer on one side to the periphery of the fluid than on the opposite side.



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