The properties of dark matter fluid from Zou Metric

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Abstract

Zou proposed a metric for rotation. The formation of galaxy velocity curves, etc., can be well explained by this rotation metric. It only needs to go through the field equations of general relativity, and no longer needs to be corrected by introducing additional dark matter gravity. This study believes that the rotation coordinates in the Zou metric are actually due to the dark matter vortex caused by the turbulent flow of the dark matter fluid. From the Zou metric, far from the center of the galaxy, the speed of the rotating coordinate will decrease to 0, becoming a flat metric. This reflects that far from the galactic matter, there is actually a laminar flow of dark matter fluid. Therefore, the Zou metric can be used to describe some important properties of dark matter fluids. This study applies it to explain the flight of the Voyager spacecraft after entering the galaxy space. It is thought that Voyager will first enter an interface between the visible and dark matter laminar flow of galaxies. The enter of dark matter turbulence will cause a certain degree of random change in the attitude of Voyager. Once it passes through this dark matter turbulent layer, the Voyager spacecraft will enter the high-speed dark matter laminar flow region. In this region, due to the energy dissipation characteristics of the dark matter fluid, the spacecraft will have an automatic acceleration phenomenon.

1 Introduction

In Zou's research [1], he pointed out that a rotating metric can be used to describe the space-time in which galactic matter resides.

The metric can formally be expressed in cylindrical coordinates as:

$$g_{\mu\nu} = \begin{pmatrix} -c^2 & 0 & -\beta(r) & 0 \\ 0 & 1 & 0 & 0 \\ -\beta(r) & 0 & r^2 - \frac{q}{b}\beta(r) & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

In which

$$\beta(r) = -bsln\,(\frac{1+e^{\frac{r}{s}}}{e^{\frac{w}{s}}+e^{\frac{r}{s}}})$$

Where the *r, w, s* and *b* are constants.

If *r* is large enough, then

$$\beta(r) = -bsln\left(\frac{e^{-\frac{r}{s}}+1}{e^{\frac{w}{s}-\frac{r}{s}}+1}\right) \approx 0$$

Zou metric spacetime becomes flat metric spacetime

But if in the same time

$$e^{\frac{w}{s}-\frac{r}{s}} \gg 1$$

This corresponds to a position far from the center of the galaxy, but less than a certain speed limit. Corresponds to the main region of the visible matter distribution of galactic matter. Then

$$\beta(r) \approx bs\left(\frac{w}{s}-\frac{r}{s}\right) = b(w-r)$$

Its distance squared is

$$ds^2 = -c^2\left(dt + \frac{\beta(r)}{c^2}\,d\phi\right)^2 + dr^2 + \left(r^2 + \frac{q}{b}\,\beta(r) + \frac{\beta(r)^2}{c^2}\right)d\phi^2 + dz^2$$

So

$$d\phi' = \sqrt{r^2 + q(w-r) + \frac{b^2}{c^2}(w-r)^2 d\phi}$$

Therefore the Zou metric is reduced in scale in the $d\phi$ direction. Therefore, under the condition of constant v, as r increases, the angular velocity will decrease compared to the flat space-time. Of course, under gravitational conditions, the reduction in angular velocity helps the matter to be bound in galaxies.

That is to say, under the condition of using the Zou metric, it is not necessary to modify Newton's law of gravity. There is also no need to introduce additional dark matter to maintain a constant velocity of galactic matter.

2 Vortex and rotating coordinates

If we think of the entire visible matter system as being built on a giant vortex of dark matter fluid. This way we can also obtain a rotated coordinate system. The rotational speed of this rotating coordinate system is the same as the flow velocity of the dark matter vortex.

If the rotation speed of this dark matter vortex is consistent with the Zou metric, Zou's method can be applied to the so-called solution process of solving the galaxy velocity curve and the energy density distribution.

But the dark matter vortex is only one component of the entire dark matter fluid. The dark matter vortex is the turbulent part of the dark matter fluid. Beyond the turbulent flow of the dark matter fluid, there is the laminar flow of the dark matter fluid. As shown in Figure 1.

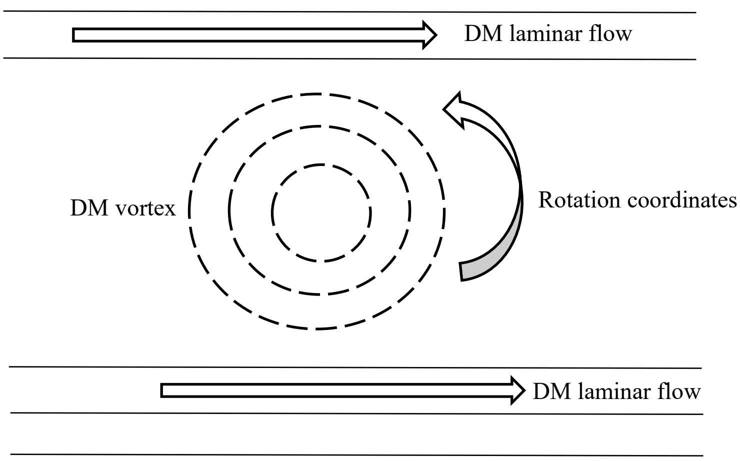

Figure 1. Vortex and laminar flow of dark matter

From Zou's paper, the position where r is small in Zou paper's Figure 1 [1]is the center of the vortex. And the speed v is constant is the main part of the dark matter vortex. When r is relatively large, the speed of rotating the coordinates drops rapidly to 0. At this time, it means that the coordinates no longer rotate, which corresponds to the laminar flow region of dark matter. Similar to a normal inertial frame of reference, the metric of flat spacetime can be used for calculations.

But existing observational data suggest that there is still a gravitational interaction between the dark matter fluid and visible matter. Therefore, in such a dark matter fluid inertial system, all visible matter has energy dissipation. That is to say, in such an inertial frame of reference with a seemingly constant velocity, visible matter will continue to gravitationally interact with the dark matter fluid. And finally, driven by the dark matter fluid, it is continuously accelerated until it remains relatively static in the dark matter fluid. Considering that dark matter has a relatively high laminar velocity. Therefore, in the galactic reference frame, the visible matter will be observed to be gradually accelerated by the dark matter fluid.

3 The fate of Voyager in interstellar space

On May 18, 2022, NASA's Voyager 1 project issued an announcement [2, 3], confirming that there were some problems with the data transmitted by Voyager 1's Attitude Articulation and Control System (AACS).

I did a simple analysis in my previous paper [4]. With the Zou metric, we can analyze the operation of Voyager 1 after entering interstellar space in more detail.

The first is to enter the turbulent region of dark matter.

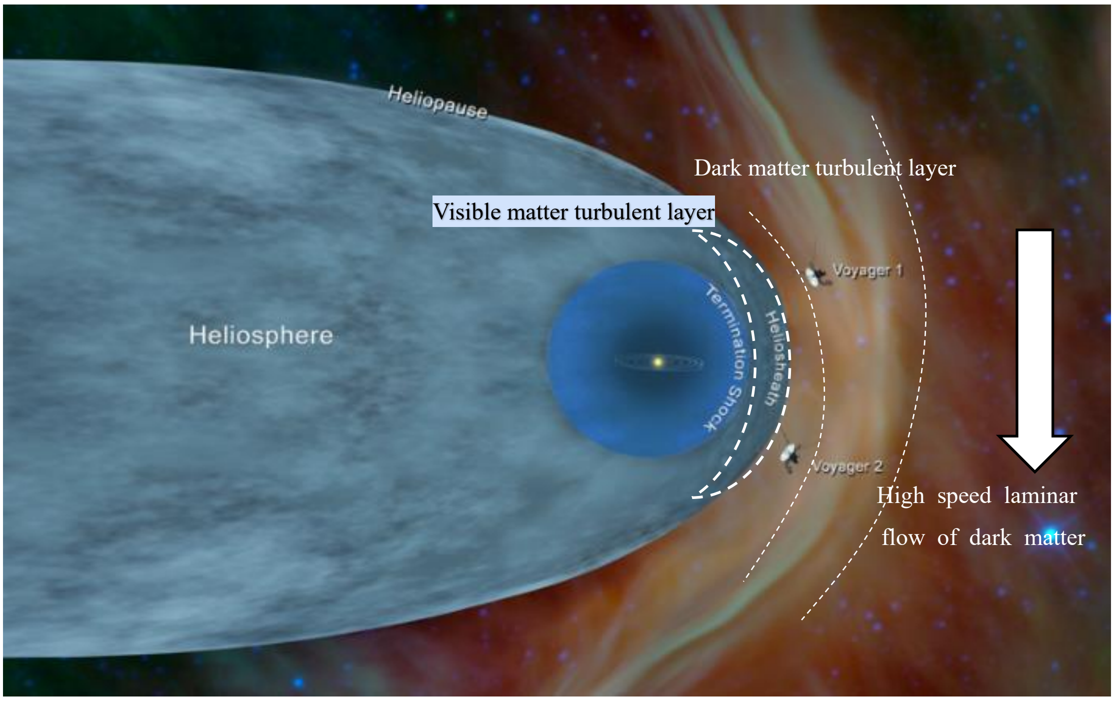

Figure 2. Voyager and the heliosphere

In Figure 2 there are two turbulent layers. One is the turbulent layer of visible matter. This can be measured by various instruments that measure radiation. The other is the dark matter turbulent layer. This cannot be measured by radiation detection instruments. But it may affect the flight status of the spacecraft.

Because of the existence of this dark matter turbulent layer. As we can see from the Zou metric above, the way this dark matter fluid flows can also affect the speed and mass distribution of galaxy matter. So the space-time properties inside and outside the heliosphere of the solar system will be very different. Since the turbulent flow of dark matter fluid is very random, a relatively random space-time bending phenomenon may occur in this part of the space-time.

If space-time curvature occurs in the dark matter turbulent layer at the edge of the sun's heliosphere, it may cause Voyager 1 to adjust its flight attitude and the direction of its antenna to obtain the strongest signal to communicate with Earth.

The curvature of spacetime due to turbulence can also be very random. This causes the spacecraft to continuously adjust its controller data, allowing the spacecraft to always maintain the strongest signal connection to Earth's ground equipment.

This possibility may also explain why the spacecraft's control data is abnormal, but the actual direction of the ground communication equipment aimed at the earth is always correct.

Of course, if Voyager can still successfully pass through the dark matter turbulent layer shown in Figure 2. Then there may be more serious problems later.

From the law of turbulence, we can see that at the edge of turbulence, the intensity of turbulence will become weaker and weaker. In regions far from turbulent flow, the dark matter fluid becomes laminar. Since the frictional force on the fluid is reduced after moving away from the turbulent region, the velocity of the fluid becomes very fast. The high-velocity dark matter fluid layer shown in Figure 2.

Although the gravitational interaction between dark matter and visible matter may be very weak. But given that the Voyager spacecraft has been flying long enough, such an effect will also become very large. Therefore, after the Voyager flew out of the dark matter turbulent layer, it entered the high-speed dark matter laminar layer, which will be driven by the dark matter fluid, and then continuously accelerated. Until the speed of the spacecraft is the same as that of the dark matter fluid.

It can be seen from one of my previous estimates that the laminar velocity of dark matter fluid can reach $v_d \approx 3 \times 10^{14}\, m/s$ [5]

Of course, due to the relatively high density of visible matter in the Milky Way, it is still impossible for the dark matter in the Milky Way to reach such a speed. But once the spacecraft enters the laminar flow of dark matter, its speed will also be quite fast. At least as fast as the entire galaxy.

Therefore, it is foreseeable that once the Voyager spacecraft flies out of the dark matter turbulent region, we will find that the spacecraft will continue to accelerate in a relatively short period of time. This phenomenon cannot be explained by gravitational interactions between visible matter. Because there are no other stars in this part of interstellar space, the phenomenon of gravitational slingshots is impossible. The only possible explanation is the interaction of dark matter with the spacecraft. Therefore, if such a phenomenon occurs, it means that this will be the first time that humans have experimentally confirmed the existence of dark matter.

Of course, if the Voyager spacecraft can successfully receive the signals sent by the earth, it should also be able to continue to communicate with the earth and send some important scientific data of dark matter fluids back to the earth. Just considering the delay of the signal transmitted by the earth and the speed of the spacecraft becoming very fast, it is possible that the ground antenna will not be able to adjust the angle of the transmitted signal in time. Eventually we may lose communication with Voyager.

4 Conclusions

So far Zou has done a very good job [1]. This job is to establish a rotating coordinate system. By performing general relativity calculations in this rotating coordinate system, it is found that no additional dark matter gravitational force is required, the galaxy velocity curve can be obtained, and the energy density distribution consistent with the actually observed luminous mass density profile of a real galaxy can be calculated.

This study argues that this rotating coordinate system can actually be explained by dark matter fluids. Because if the dark matter fluid is turbulent, it may appear like a fluid vortex. If we can establish a space-time metric consistent with the vortex of dark matter, we can deal with the gravitational problem of visible matter in a relatively stationary frame of reference. Zou's work provides a great start.

Voyager 1, on the other hand, has now entered an area completely unknown to mankind. Therefore, any abnormality in the signal sent back by Voyager is worthy of high attention.

The abnormality of the Voyager 1 control data this time indicates that the spacecraft has entered a relatively special area. Although the cosmic ray signal is relatively strong in this region, considering that the radiation signal of the solar wind is also decreasing synchronously, the possibility of the spacecraft signal being affected by cosmic radiation is weaker. So the most likely influence on Voyager 1's control data is dark matter. This also provides a very rare opportunity for humans to directly obtain data on dark matter [6, 7].

This paper argues that Voyager 1 is currently entering a region called the "dark matter turbulent layer." But this dark matter turbulence is not a vortex, but a relatively random change in space and time. This results in random changes in the spacecraft attitude due to the randomness of the turbulence. The spacecraft's Attitude Articulation and Control System will adjust accordingly. However, the signals sent by the spacecraft can still be received normally on Earth, and it seems that the spacecraft does not need any attitude adjustment. This led the ground station staff to believe that there might be a problem with the spacecraft's control data transmission. This study believes that if the hypothesis of this paper is correct, considering the uncertainty of dark matter turbulence, the possibility of losing contact between Voyager 1 and the earth ground station during the process of crossing the dark matter turbulent layer exists.

But since we still have Voyager 2 as a backup. So in about eight months or so, if the same phenomenon occurs on Voyager 2, it can prove that this dark matter turbulent layer is real.

In addition, this paper also analyzes the fate of the Voyager spacecraft after passing through this dark matter turbulent layer. This study considers that there will be high-speed laminar flow of dark matter in addition to the dark matter turbulent layer. Once the spacecraft enters this area, it means that just like an object floating on the surface of flowing water, the spacecraft will also flow with the dark matter fluid. This means that in the laminar flow of dark matter, we should be able to observe that the spacecraft will be continuously accelerated until the speed of the spacecraft is consistent with the speed of the dark matter fluid.

Considering that the laminar flow of dark matter far exceeds the speed of turbulent dark matter, the spacecraft will be accelerated to an unusually high speed. Eventually we will lose contact with the Voyager spacecraft due to the inability of signals from Earth's ground station to adjust the transmit and receive angles in time.

References

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