

Aberration effects can account for the apparent surplus of spiral galaxies rotating in an opposite direction to the Milky Way

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Abstract

Recently published analysis of JWST deep field images confirms the previously observed trend for a surplus of spiral galaxies that rotate counter to our Milky Way. A trend that apparently is most pronounced the closer one looks towards either the north or south Milky Way polar axis. This is considered in recently published analyses to be inconsistent with current theories of the Big Bang. It is also suggested in these analyses that this surplus may only be an observational bias. Due possibly to Doppler shifting from the relative rotation directions between spiral galaxies and our own Milky Way. Or that new physics of galaxy rotations not yet discovered may also be able to account for the apparent surplus. However, the authors of this research also note that Doppler shifting of light from the relative rotation velocities and rotation directions between any one galaxy and the earth observer would be insufficient in magnitude to account for the approximately 50% surplus of counter rotating galaxies in the latest deep field JWST data. In this paper the aforementioned observational bias is still considered a possibility simply by invoking the centuries old classical effect of Stellar Aberration to model the apparent surplus of counter rotating galaxies seen in the data. In that due to differences in transverse rotational directions and internal stellar velocities between any observed spiral galaxy and our own Milky Way, the displacement effects of stellar aberration will make light from co rotating galaxies incident to the earth observer more dispersed or blurred than light coming from counter rotating galaxies. Thus, making it harder to identify co rotating spiral galaxies than counter rotating spiral galaxies at any similar redshift. Resulting in an apparent surplus of counter rotating galaxies in the universe.

Introduction

Recently published data and analysis (1,2) has confirmed the previously observed trend that there is a surplus of spiral galaxies in the universe that rotate with our Milky Way as opposed to rotating counter to our milky ways' direction of rotation. Various explanations as to what mechanism may be creating this "asymmetry" have been offered in these papers including the possibility that this also may only be an observational bias due to the different directions of rotations of galaxies relative to our Milky Way's direction of rotation. However, their research noted Doppler shifting alone could not explain the magnitude of almost 50% more counter rotating galaxies than co rotating galaxies in the JWST data and that new physics of galaxy rotations may have to be invoked. To address this problem and proposed here in this paper is a model that assumes this surplus is an observational bias. But an observational bias due not to Doppler shifting or any new physics of galaxy rotation but instead as due only to the displacement effects of Stellar aberration on light coming from these spiral galaxies and incident on the earth observers image plane.

Stellar aberration is a classical theory first devised by James Bradley in 1727 to explain the apparent annual motion or displacement of a stars position as being dependent on the earths annual relative motion to the star as it rotates around the sun. Here in this paper the incident angle and subsequent

displacement of a galaxy's light from aberration onto the earth observer image plane invokes a blurring effect at the JWST image plane. A blurring whose magnitude is dictated by both the relative transverse velocities and rotational directions between any particular spiral galaxy and our Milky Way in conjunction with the range of different velocities and rotational directions around the spiral core of individual stars within each observed galaxy.

Theory

Observations of our own Milky Way stars show that they have a wide range of rotational velocities around the Milky Way core. And this also tells us that other galaxies must also have a similar wide range of internal stellar velocities relative to the overall average rotation speed of that galaxy as a whole. Which in turn means any light from any galaxy will always have a range of incident angles due to aberration when incident on the earth observers image plane. And in turn must produce a range of displacements of any galaxy's light as it arrives on the earth observers image plane. An optical effect no theorist to date appears to have even accounted for. This collection of a range of displacements of light from all the different stellar sources within each spiral galaxy must then produce different degrees of blurring of any spiral galaxy's image, depending on what the relative transverse rotational direction is between each galaxy and the earth observer combined with the range of transverse stellar velocities within each spiral galaxy itself. The conclusion in this paper is that it is this stellar aberration effect only and not any Doppler shifting or new physics of galaxy rotation or even relativistic beaming, which is considered to be solely responsible for all of the observational bias of a surplus of counter rotating galaxies in our universe.

For example, for the earth observer, when looking at any external counter rotating spiral galaxy, the total collection of this spiral galaxy's stars will have a net transverse rotational velocity of the average galactic rotation velocity of approximately 200km/s relative to our Milky Way. But within that spiral galaxy all of its stars will individually also have a separate range of transverse rotational velocities as they rotate around the spiral galaxy's core. Resulting in a range of transverse velocities for the stars in that spiral galaxy of between 180-220 km/s relative to the earth observer. And conversely for a co rotating galaxy the net rotational transverse velocity of the galaxy as a whole relative to the earth observer will be on average zero km/s. But that individual stars within the co rotating galaxy will have a range of velocities of on average between +20 to - 20 km/s relative to the earth observer. In Bradley's theory of stellar aberration, it is predicted that there will always be progressively smaller increases in incidence angles at the observer image plane for any progressively larger difference in relative transverse velocities between source and observer. Which in turn will give a smaller range of displacements where there is a higher transverse rotational velocity of the galaxy relative to the earth observer. Because counter rotating galaxies have the higher transverse velocity range of 180-220kms relative to the earth observer it follows then that there must be a smaller range of displacements of light at the earth observer's image plane from these counter rotating spiral galaxies compared to the larger range of displacements of light coming from co rotating galaxies. The result is that light from a counter rotating galaxy will always be less blurred than light from a co rotating galaxy at any similar redshift. And in turn make it easier to identify the rotation direction of a counter rotating galaxy than a co rotating spiral galaxy at any similar redshift. It is this effect which this paper suggests creates all of the observational bias of an apparent surplus of counter rotating spiral galaxies observed in JWST and other related data.

Redshift relationship

For the aberration model proposed here the observed increase of this bias at higher redshifts can also be explained as being an effect dependent on the ratio of aberration angle/displacement vs image size. As these angles of aberration are solely dependent on relative transverse velocities between the source galaxy and our Milky Way, this means that the light from any galaxy will always arrive at its same incident angle to the earth observer regardless of its distance from earth. But because more distant

galaxies cover a smaller portion of the sky in the JWST camera image field, then the incident angle vs progressively smaller image size ratio creates a greater proportion of blurring for a more distant co rotating galaxy than for a nearby co rotating galaxy due to these limitations of less pixels covered for more distant galaxies on the image plane. This increased blurring of images makes it harder to detect rotation directions at higher redshifts and in turn gives the appearance of an observational bias of an increasing percentage of counter rotating galaxies compared to co rotating galaxies at successively higher redshifts.

Excess Luminosity

Although this proposed new model does not specifically address the excess luminosity observed for counter rotating galaxies as other research has suggested (1) it is also possible to attribute this asymmetry in brightness to the proposed blurring of light for co rotating galaxies. In that due to a wider range of incident angles and displacement due to aberration, the same total intensity of light for each star in the co-rotating galaxy is more dispersed and its intensity reduced by spreading the incident light across a wider part of the image plane. In that an emitted beam of light focussed on a small point on the image plane will appear to be brighter in luminosity at the image plane than the same intensity of beam of light will be if it is not as tightly focussed and spread out across a wider part of the image plane. As blurring of light is observed to do in everyday situations where the same 'amount' of light diffused over a wider area of image plane, i.e. more blurred, will appear to not be as bright as it was when focussed into a narrower beam at the image plane.

Modelling redshift in a non-expanding universe

Various alternative redshift models including Zwicky style and non-expanding theories have been suggested (1) as possible explanations for this observed rotational asymmetry. The model of a statistical bias, based on aberration proposed here can only be consistent with a non-expanding model of the universe and not consistent with the BBT. In that as the redshift increases in a Big Bang model, so too does the recession velocity. And if the recession velocity increases, the incident angle attributed to aberration must decrease with redshift for all galaxies. Making the distinction between co and counter rotating galaxies harder to measure. Effectively the predicted recession velocities of an expanding BBT model will not allow the progressively more blurring of the image of co-rotating galaxies at higher redshifts. Implying that this observed increase of asymmetry of galaxy rotations due to aberration is not only inconsistent with but refutes the expanding universe model of the Big Bang theory.

To model cosmological redshift in a non-expanding model the assumption is made that $z = 1$ is a reliable indicator of linear distance. In that light has to travel a certain distance A to double its emitted wavelength. And that the same distance A must then have been travelled by light again for every doubling of wavelength observed. This implies a linear distance scale where the linear distance A is the same distance between $z = 1-3$, between $3-7$, between $7-15$ etc. Implying that at $z = 1$ the original wavelength has been doubled by travelling distance A . Doubled again at $z = 3$ by travelling another distance A and again at $z = 7$ etc. As follows:

$z=0$ (500nm to 1000nm) = rest frame

$z= 1$ (1000 to 2000)=distance A = (z_0 to z_1) $z=3$ (2000 to 4000)=distance $2xA$

$z=7$ (4000 to 8000)=distance $3xA$

$z=15$ (8000 to 16000)

$z=31$ (16000 to 32000)

$z=63$ (32000 to 64000)

$z=127$

$z=255$

$z=511$

$z=1023$ (ie Microwave)=distance $10 \times A$

The assumption is that in a non-expanding universe an object at $z=1023$ is only twice as far away from earth as $z=31$. Or 10 times as far away as an object at $z=1$

It must be noted here that cosmological redshift in a non-expanding model does not imply, as Zwicky erroneously assumed, that light loses energy over distance. Only if one invokes the theoretical Photon, is light subject to this energy loss over distance. This apparent energy loss of photons over distance from Hubble's first observations of cosmological redshifts was not consistent with the photon model and is incidentally the prime reason why the Big Bang theory was initially invented. Whereas if light is treated as a classical wave only electromagnetic phenomena then it becomes obvious that red shifting of emitted light to lower wavelengths over distance does not have to lead to energy loss in cosmological red shifting. In that an emitted range of light from a source will always cosmologically redshift to a larger range of longer wavelengths and thus preserve the total energy between emission and observation. For example, emitted 10 - 20nm will redshift at $z = 1$ to 20 - 40nm.

Conclusion

Average spiral galaxy rotation velocities are observed to be around 200km/s. If one factors in the observed ± 20 km/s range of stellar velocities relative to the core as seen in our own Milky Way then the average rotational velocity range for any spiral galaxy will be in a range of 180-220km/s. For spiral galaxies that rotate counter to our Milky Way the transverse velocities relative to the earth will be in the range of 180-220km/s. And for co rotating galaxies the range of transverse velocities relative to earth will be lower at between $+20$ and -20 km/s. Invoking Stellar aberration as described above means that for any co rotating spiral galaxy the light is subject to a larger range of displacements at the earth observer image plane than light is from a counter rotating galaxy. Which in turn means any co rotating spiral galaxy will always appear to be more blurred than any counter rotating spiral at any similar redshift. And due to this relationship between different amounts of displacements from aberration at the image plane it follows that higher redshifted galaxies will be smaller at the image plane and in turn the blurring effect will be proportionally greater at the image plane for all co rotating spiral galaxies than counter rotating spiral galaxies at higher redshifts. And as a result, make it even more difficult to identify co rotating galaxies in the hi redshift data than counter rotating galaxies. Which leads to even fewer co rotating galaxies represented in final analyses of rotation directions at higher redshifts. And this predicted bias in the data due solely to the effects of aberration is consistent with the latest analysis of JWST deep field data.

Reference

- 1)The distribution of galaxy rotation in JWST Advanced Deep Extragalactic Survey 2025. Lior Shamir
- 2)Asymmetry in galaxy spin directions: A fully reproducible experiment using hsc data. Shamir, 2024