Many astronomical observations have led to the suggested existence of Dark Energy and Dark Matter. I offer an alternative qualitative explanation of some of those observations based on an assumed geometry of the Universe. My hypothetical Universe is the hypersurface of a hypersphere. Newton’s law of gravity is shown to be modified by this geometry at very great distances, causing the gravitational field of a galaxy (for instance) to fall to a minimum half way across the universe and then increase to its original value at the antipode. My conclusion is that Dark Matter and Dark Energy may never be found because they do not exist.

1. Introduction

My analysis assumes that the shape of our Universe is the 3D boundary of a 4D sphere of radius $R$; $R$ is measured in units of length but we are not privileged to look in that direction. I will call the 4D sphere a hypersphere and its 3D boundary a hypersurface. Cosmological measurements indicate that for our Universe to have such a closed geometry, $R$ must be very, very large [1]. A new law of gravity in the hypersurface gives the framework for an alternative explanation of some, perhaps all, of the observations leading to the assumed existence of Dark Matter and Dark Energy.

Our Universe contains (an almost uncountable number of) particles with mass, each particle adding to the gravitational field at every point in space. There is a simple derivation based on Euclidian geometry for the total gravitational field in and near an object that is uniform and spherical: the gravitational field is zero at the center, increases linearly to a maximum at the surface, and then decreases by a factor of $1/D^2$ at a distance $D$ from the center. One way to understand the $1/D^2$ law is to assume that the total mass inside distance $D$ causes a gravitational field which is then evenly distributed over the entire surface of an enclosing sphere of radius $D$, and therefore over an area of size $4\pi D^2$. For irregular shapes the gravitational field is more complex, but at a distance approximates the same $1/D^2$ law.

The surface of a sphere of radius $D$ imbedded in a hypersurface of radius $R$ has instead an area $4\pi (R \sin(D/R))^2$ which reduces to $4\pi D^2$ for $D << R$. At distance $D=\pi R/2$, half way across the Universe, the surface of the sphere reaches its maximum, then decreases, tending to zero as it approaches the antipode at $D=\pi R$. By the reasoning of the previous paragraph, gravity is at a maximum at the surface of the massive object, decreases to a minimum half way across the Universe, and then increases to its original maximum just before reaching the antipode and is always directed toward the massive object.
I will call this point, the antipode of the center of mass of any body, its “Antipodal Gravitational Focus” (AGF). A massive body pulls other masses (space junk, stars, black holes, galaxies…) away from its AGF from across the Universe, leaving some space empty of mass behind. A galaxy clears a galaxy-sized space; a supercluster of galaxies clears a supercluster-sized space. This activity takes place far beyond our observable portion of the Universe.

Someone near a galactic AGF might observe that the AGF, an empty spot in space, repels matter and could discover that the anti-gravitational field obeys a $1/D^2$ law and is as forceful as a galaxy.

2. Dark Matter

Returning to our galaxy, it has been observed, since 1922, that stars near the galactic periphery orbit at a speed exceeding that predicted by Newton’s law[2]. We see galactic spiral arms, implying that the furthest stars are falling behind the rotation of the inner galaxy as expected. But detailed star-by-star speed measurement shows that the stars should fall behind even more. At the observed orbital speeds, stars in the outer galaxy should fly off into space. It is as though there were some invisible mass inside the galaxy, holding stars in tighter and faster orbits. Much theory and observation has been devoted to the “Dark Matter” problem without finding any definitive answers to date. I propose a new explanation based on AGFs.

I am going to call the mass (space junk, stars, black holes, dwarf galaxies…) pushed aside by a galactic AGF “displaced matter.” Each chunk of displaced matter has its own AGF, back near (but not too near) our galaxy. Each such near-side AGF is the center of an apparent anti-gravity field which is, in fact, just focused gravity from the far side of the Universe. The effect of surrounding a galaxy with AGFs is to increase gravitational force toward the center of the galaxy. Stars on the galactic periphery react to this force just as they would have reacted to attractive forces exerted by (the currently missing) intra-galactic Dark Matter – the stars go faster. Similar analysis applies to other measures of galactic mass, such as the results of the Dark Energy Camera[3] detection of mass based on gravitational lensing[4][5].

3. Detection of AGFs near a Galaxy

One observational approach to testing this idea is to find the near-side AGFs. Galactic star speeds need to be analyzed by galactic longitude and declination as well as distance from the center. The currently unexplained irregular pattern of peripheral star speeds might then be matched by a simulation assuming various placements of nearby AGFs.

4. Dark Energy

Superclusters of galaxies are said to be the largest gravitationally-bound features in the Universe. Each has an AGF. Those AGFs would repel other superclusters, causing the Universe to expand. The locations of the supercluster AGFs would be surrounded by celestial voids[6]. The effectiveness of supercluster AGFs, and therefore the rate of expansion, might depend on the degree of concentration of matter in the Universe at each stage since the Big Bang.


