Is it really true that the Universe experiences accelerating expansion?

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Abstract

According to Standard Model cosmology, the universe experiences accelerating expansion, which creates the need for dark energy models. But I read other possible theories, for example Lemaitre-Tolman-Bondi (LTB) model which suggests that there are large structures (void) which introduce inhomogeneity in the Universe. See for instance: http://arxiv.org/abs/0709.2044. Therefore it seems that the homogeneous-isotropic assumption of the Standard Model is questionable.

Another possible explanation is Kashlinsky-Tsagas's dark flow model. Basically it says that the observed accelerating expansion is a mere illusion. See http://www.nbcnews.com/id/44690771/ns/technology_and_science-science/t/accelerating-universe-could-be-just-illusion/#.U4vYcvFhiK1

Answers:

[1] **Adarsh. M. J.**

Yeah,i guess the universe is accelerating and most of the proofs point out in the same direction. I guess finding out what exactly banged at the time of big bang might provide the answer. Besides, the "inflationary model", says that the "inflaton field" was responsible for the accelerated expansion of the early universe and dark matter and dark energy hypothesis with all its WIMPS seem to solve atleast a part of the "accelerated expansion" problem, of course we havent detected any of the dark matter or dark energy..... i guess thats why they are named as WIMPS!

[2] **R. Rakhi**

Yes. According to observations, viz. Supernova observations, CMBR, BAO etc, the Universe is undergoing accelerated expansion.

[3] **Vikram Zaveri**

The attached theory shows that the repulsive gravitational force can exist when total kinetic energy of a system dominates the total potential energy. A gravitational attractive force can exist in a smaller local system in which total potential energy dominates the total kinetic energy. Because the equation is associated with the reversible process, both forces can be described by same equation. The velocity vector in this equation appear in squared form. So if v is positive or negative, the result is the same. The term particle anti-particle has a different definition in this theory than the term matter anti-matter. The former has opposite velocity and the latter has oposite charge as well. The repulsive gravitational force is associated with the accelerated expansion of the universe. This is different than the suspected repulsive gravitational force between matter and anti-matter in other theories.

[4] **Trevor Bamidele Davies**

I think the universe is indeed in a state of accelerated expansion as evidenced from Type 1a supernova, CMB, integrated Sachs-Wolf effect and several other observations. For me it is rather a question of whether the whole dark energy thing is a viable explanation or alternatively that the gravitational field equations may need to be modified at super large scales. I tend to lean towards the latter as I do not believe that the gravitational constant G in Einstein's field equations remain constant for all times. In other words, if the mass/ energy density is finite but the size of the universe keeps increasing, then why should we expect the gravitational coupling between matter fields to remain the same? This of course is a consequence of Mach's principle which is curiously absent from GR.

[5] **Juan Casado**

A tiny acceleration of the expansion is the best fit to observations. However, these observations could be also compatible with a linear expansion at present, a model supported by an increasing number of papers. See for instance:
https://www.researchgate.net/publication/251572020_steady_flow_cosmological_model

[6] **Michael Peck**

Victor,
I have just submitted an article for peer-review that conclusively rules out cosmological redshift originating from metric expansion. If you want a private copy, feel free to send me a message. For each observation that supports the big bang theory, there are at least two that directly contradict it. These problems have existed for over 40 years and appear to be systematically neglected due to an over-reliance on confirmation rather than rigorous attempts at refutation.

[7] **Michael Peck**

Victor,
If you want a short overview of the foundations that are explored in my latest article, they are explained in layman terms (about a minute) here:
https://www.youtube.com/watch?feature=player_detailpage&v=4ItFWXAfDHY#t=146

Realistically when sticking to classical explanations of redshift there are 2 possibilities. The first is accelerated metric expansion due to "dark energy", while the second is due to objects accelerating into a cosmological scale gravitational potential where the deflection of light (gravitational lensing) provides the illusion of accelerated expansion. It is very simple to differentiate between these two perspectives because (1) There will be a large-scale B-mode polarization pattern in the CMB that is circular with respect to the direction of least gravitational lensing (and hemispherical power asymmetry), (2) the differences in angular diameter distance predictions reaches several orders of magnitude at high redshift.

In the first part of the video and my first book on the subject, I used the extent of gas within the largest clusters as rods. It is known that this gas is primordial and does not originate from the galaxies contained within. Therefore, the only way for the gas to grow is through mergers. After a rather substantial analysis, I ended up with merger fractions, results from published hydrodynamic simulations and a basis to determine the maximum change in size possible with respect to LCDM. Well these results confirmed my suspicions of similar luminosity FR II radio lobes being standard rods (due to their mechanical nature like SNIa and well known relations between size and luminosity), where all discrete objects follow the trend of a static metric. In short, the answer has been in plain sight since at least WMAP three year polarization data, while the problems from angular-diameter distances and volume element have existed for over four decades.

[8] **Victor Christianto**

@Michael, thanks for your answer. May i ask something? If you suggest that dark energy can be thought of as cosmological scale gravitational potential, then why don't it show attractive potential? Instead we know that the observed effect shows repulsive, because it triggers accelerating expansion. Best wishes

[9] **Michael Peck**

Victor,

The model does not require dark energy. It is instead a classical gravitational potential due to matter within the universe. Therefore, the cosmic background radiation can be interpreted as black body radiation from a central object since the potential would need a concentrated source. In short, we would be observing a flow back into the potential with some motion ourselves. There are several factors to consider for the directional dependence (which have been reported in several recent articles such as local distance modulus-redshift anisotropy). I instead use a linear gravitational potential offset by the average distance to the start of flow (averaged over all local directions). Of course, you could still have classical explanations for the CMB in this paradigm. But when all observations are taken into consideration, a much more consistent model is that of a steady state. Objects are falling towards the center, reach close to the speed of light and are then collaminated into a continuous big bang scenario (kind of like a cosmological scale jet). This later cools and arrives locally as the "dark flow", detected by both WMAP and Planck; i.e. a massive bulk flow of hot, low metallicity x-ray emitting gas. There are two hot streaks in the CMB that originate from the center of the B-mode pattern, which theoretically originate from the S-Z effect due to hot x-ray emitting gas.

[10] **Victor Christianto**

@Michael. Thanks for your clarification. Yes it seems interesting to see if the Universe has a center. Perhaps you should write another paper discussing this hypothesis.

Although i am not an expert in cosmology, i think it would be interesting to ask: if the universe had a center, then is it possible to model it as sink-source? Because if you talk about dark flow, then it seems to point to sink-source model.

Besides, i have a short review paper discussing sink-source model of galaxies, if you like you can find it in my publications in this researchgate.net. Best wishes

[11] **Michael Peck**

Victor,

Yes, the B-mode polarization can be applied for a precise test. What happens to the CMB E-modes when they undergo gravitational lensing is mixing into B-modes. So if the CMB is emitted from some source (classical black body radiation) at the center of a global gravitational potential, then the B-mode polarization will be arranged in a circular pattern. Of course, my latest paper does this calculation in a more precise manner (I had to convert the WMAP 3 year data to azimuthal equidistant coordinates in order to remove the angular distortions of the Molleweide projection). But without correcting for the dipole's influence, the signal is around 4 sigma and requires no free variables or parameters. With more precise data and corrections for the dipole, I'm sure it would be possible to boost this to 5+ sigma.

The near perfect alignment between the CMB hot streaks, B-mode center of the universe, local dark flow, SNIa redshift-distance modulus anisotropy and poles of hemispherical power asymmetry however almost guarantee that this is the case. The later is due to gravitational lensing mixing phases of the CMB, where the fluctuations become dampened. Realistically, there are two explanations for redshift and the sink-source model substantially outperforms LCDM in every aspect. Furthermore, if the universe does not have a finite age then the sink-source model is the only one that does not violate the laws of thermodynamics or conservation of energy. I'm therefore surprised that this possibility has not been explored in the past, because it’s the only model that actually competes (substantially outperforms) with the big bang theory when all observations are taken into consideration.

The simplest type of sink-source would be similar to the double lobes of radio galaxies (for example http://www.jb.man.ac.uk/atlas/images/3C98.JPG). This would explain how the primordial gas in clusters is locally hot, while substantially cooling at moderate redshift. A large-scale structure like this would require several advancements to be able to model the more complicated aspects of CMB.

[12] **Victor Christianto**

@Michael. Thank you for your answer. Yes, sink-source model seems very interesting, because it offers a simple model to imagine. I only explore this sink-source model for galaxies, but i do not explore yet its possibility for universe modeling. Perhaps it would be more appealing if you write a separate paper discussing this subject, the title could be: a sink-source model of the Universe. Hopefully it would attract more interests if you compare with drak flow model. Best wishes

[13] **Michael Peck**

That may potentially be a future article depending on how my current attempts at publishing the basics go. IMO there are three fundamental cosmological tests (1) distance modulus versus redshift (SNIa), (2) angular diameter distances versus redshift and (3) the volume element (amount of sources per deg^2 per z_bin). Unfortunately, big bang proponents have abandoned all discrete objects as possible rods and have resorted to strongly model dependent and biased measurements (BAO). BAO measurements suffer from several bias and anomalies including the large-scale power predicted by LCDM being incompatible with the recently proposed local hole (<0.1z galaxy counts). So we are left with LCDM being wrong, a massive local hole that Earth is somehow perfectly centered on (variations of the big bang model that would alter current BAO studies) or a static metric with global gravitational potential. In general, any test that requires prior angular scale to physical scale conversions are poor (strong model dependency that cannot rule out a false positive). To make matters worse, the sigma_8 parameter predicts 2.5x the amount of clusters as observed in optical or x-ray studies. One cannot simply ignore all discrete objects following a static metric and then resort to poorly constrained, non-classical alternatives; this by definition is pseudoscience (when I say all I mean similar luminosity radio lobes, 90% light radii of galaxies, extent of gas in clusters, separation between brightest cluster galaxies and several volume element tests). Regardless, the sink-source model requires for the existence of a global gravitational potential. My current intent is to get the potential on solid grounds and then work from there (latest article in review), as I have essentially proven that this is the case. If I can't break the censorship, then there is simply no reason to move on to more advanced topics. With what is acceptable nowadays, the big bang theory may have become "too big to fail".

[14] **Victor Christianto**

@Michael. I wish your paper will survive in mainstream journal. But you are right that many reviewers cling to standard big bang paradigm, so chance is that any new paper that challenges this orthodox paradigm will be screened out. That is why i suggest that you consider non-mainstream journal.

My point is that failure of your papert be a accepted in mainstream journals do not mean that your paper has no merit. Especially if you can follow through your present paper with a sink-source model of the Universe, that would be a very interesting hypothesis to work with. Best wishes

[15] **Michael Peck**

Victor,

It is not only improper screening due to challenging the big bang paradigm, but a serious failure of the peer-review system. I have done extensive research and reanalysis of currently published papers and have found substantial flaws. One example would be Stanford et al. 1998 (http://arxiv.org/abs/astro-ph/9708037), where they fudged their color-magnitude slopes to support passive evolution. This should have easily been caught due to the obvious offset in their delta(H-K) and similar trend in delta(J-K) (see figure 7), but it was ignored because it supported the current paradigm. Another example would be the more recent attempts at arguing against radio structures as standard rods. Buchalter et al. 1997 (http://arxiv.org/pdf/astro-ph/9709174.pdf) claim that the luminosity-size relation plays no role. Yet if you compare their smaller sample to that of Nilsson et al. 1993 (http://adsabs.harvard.edu/abs/1993ApJ...413..453N), it is clear theirs covers a wide range of luminosities and therefore suffers from Malmquist bias (and angular scale limitations.. really basic stuff). In fact, just applying the upper envelope in size clearly supports a static metric, let alone the application of only similar luminosity sources (http://adsabs.harvard.edu/full/1987IAUS..124..251K). Not only are more recent results moving backwards, but the mistakes being made would be expected of an undergrad or high school student.

The problems with non-mainstream journals is (1) my article will remain censored by arXiv, (2) most individuals reading such journals or submitting to them usually work on pseudoscience and (3) it will not bring the idea into the mainstream any faster. I've seen the works that others have produced against the big bang theory or their own interpretations. They are almost all pseudoscience except for a few examples; i.e. no proofs, no strict predictions, no mathematical framework, ect. I know my paper is of outstanding merit, it just won't do any good until others do their jobs and (1) allow the preprint(s) onto arXiv, (2) if they disagree with it then write a rebuttal or article against it and (3) stop censoring competing theories as this is by definition pseudoscience.

Concluding remarks

While these discussions are not conclusive yet, it seems possible to suppose a sink-source model of the Universe, as suggested by Dr. Michael Peck. This possibility seems to be a very interesting alternative to dark energy model.

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