Cosmic Dust Holds In Question The Period-luminosity Relation In Cepheid Stars

Source: Thomas Prevenslik
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The Cepheid period-luminosity relation that stars with long periods are brighter than those with short periods including measurements of the distance to the star based on the Baade-Wesselink method are placed in question by cosmic dust

Period-Luminosity Relationship

The Cepheids are stars 5-20 times as massive as the sun with dim to bright periodic pulsations. In the early 1900's, the period-luminosity relationship of Cepheids was first reported by Henrietta Leavitt at the Harvard Observatory. See http://outreach.atnf.csiro.au/education/senior/astrophysics/variable_cepheids Stars with longer periods were thought brighter than those with shorter-periods. Since the stars in the same distant clouds are about the same distance from the Earth, any difference in apparent magnitude was therefore thought related to a difference in absolute magnitude.

Helium Heat Engine Mechanism

In 1917, Eddington proposed the mechanism for the Cepheid pulsation was a heat engine using helium as the working fluid. See thumbnail (TN) showing the dim and bright images from the Cepheid's cycle. But Zhevakin in 1953 identified doubly ionized helium as the valve for the engine. See http://en.wikipedia.org/wiki/Sergei_Alexandrovich_Zhevakin At the dim part of a Cepheid's cycle, the ionized gas in the outer layers of the star is considered opaque, and so is heated by the star's radiation, and due to the increased temperature, begins to expand. As the helium expands, it cools, and so becomes less ionized and therefore more transparent, allowing the radiation to escape. Then the expansion stops, and reverses due to the star's gravitational attraction. The process then repeats itself.

Problem

The problem with the Cepheid mechanism is that ionized helium is not opaque, at least not to red light. The TN shows the dim part of the cycle to be clear and distinct with a faint red halo while the bright part is red-spotted and fuzzy. Neutral or ionized helium atoms should produce clear and distinct images for both dim and bright parts of the cycle. Only the lumpiness of the mass ejected from a Cepheid explosion could make the bright image spotted and fuzzy. In this regard, the Cepheids find similarity with the explosions of Supernova where the redshift of light emission is proportional to the mass ejected. See http://www.scienceblog.com/cms/blog/8209-redshift-cosmic-dust-trumps-hubble-and-tired-light-theories-26678.html

Proposed Cepheid Mechanism

The proposed mechanism of Cepheid pulsation is similar to the explosion of Supernovae, except Cepheid explosions are smaller in magnitude and periodic. The visible (VIS) light in the TN is not produced by the Cepheid radiation heating the ejected mass, but rather by QED induced radiation in submicron cosmic dust particles (DPs) that accompany the ejected mass. Ibid. But unlike the Supernovae, the mass ejected from the Cepheid is returned by gravitational attraction, except for a small fraction of DPs that produce the faint red halo in the dim image of the TN. In contrast, the fuzziness in the bright image is caused by lumpiness of the mass ejected from the Cepheid. Infrared (IR) radiation is also produced by QED induced UV radiation in larger micron sized DP. By this theory, the dim part of the Cepheid cycle is clear and distinct because the DPs have mostly been returned to the star surface by gravity. IR from thermal radiation by heating DPs with UV to produce the 40-500 K temperatures necessary to explain the excess in IR is not necessary because QED induced emission creates the IR from DPs without an increase in temperature.

QED Induced Redshift in Cosmic Dust

QED induced radiation produces VIS and IR photons by the redshift of UV radiation from the Cepheid. Upon the absorption of UV photons at wavelength L by the DPs, QED creates photons of wavelength Lo = 2nD, where n is the refractive index and D the diameter of the DP. E.g, the red photons of wavelength Lo = 0.675 microns in the TN are created from UV at L = 0.25 microns absorbed in DPs having D = 0.25 micron and n = 1.35. The red photon is created in the DP by redhshifting the UV photon to Z = (Lo-L)/L = 1.7. In larger DPs having D > 1 micron, the UV is induced by QED to create IR photons with Lo > 1 micron at Z >3. All QED induced VIS and IR radiation is produced in DPs without an increase in temperature.

Similarity of DPs in Cepheids with Supernova Explosions

The mass ejected from Cepheids is similar to that from Supernova explosions. See Deasy and Butler, "Evidence for mass loss from IRAS observations of classical Cepheids," See http://www.nature.com/nature/journal/v320/n6064/abs/320726a0.html Unlike Supernova, the Cepheid period-luminosity relationship does not include any explicit correction for DPs. Since the brightness of a star is inversely proportional to the concentration of DPs in the mass ejected, stars having the maximum absolute magnitude should produce greater quantities of DPs that tend to reduce brightness. It is therefore not obvious that the Cepheid period-luminosity relationship is valid. In fact, Cepheids with long periods most likely have absolute magnitudes far greater than observed. Conversely, stars having minimum absolute magnitude likely appear dimmer than observed. Only in the unlikely event DPs are not present in the Cepheid surroundings is period-luminosity relationship valid. DPs therefore hold in question the period-luminosity relationship.

Cepheids in Distance Measurements

The Baade-Wesselink method is used to determine the distance of a Cepheid by measuring the radial velocity of the star surface from the Doppler shift of spectral lines. See http://www.eso.org/gallery/v/ESOPIA/illustrations/phot-30a-04-normal.jpg.html However, the redshift in spectral lines is in fact caused by absorption in DPs and has nothing to do with the radial velocity of the star surface. Instead, the spectral lines from DPs can only be proportional to the motion of ejected mass from Cepheid explosions.

The Doppler shift of spectral lines as a method to determine the surface velocity of a Cepheid has misled astronomers for some time. In *Astronomy: A Physical Perspective*, by Kutner (1987), the inward radial surface velocity of the star surface is shown out of phase with the outward moving star radius. If the spectral lines are interpreted by QED induced redshift in DPs that are proportional to mass emission, both the radial surface velocity and the star radius would only then correctly be in phase with each other.

Conclusions

In general, the negation of Doppler shift velocities by cosmic DPs has concerned astronomers since Hubble. See http://www.scienceblog.com/cms/blog/8209-redshift-cosmic-dust-resolves-galaxy-rotation-problem-without-dark-matter-and-mond-27333.html Applied to Cepheids, the conclusions are:

1. Cepheid pulsation cycles by UV heating are not caused by opaqueness of ionized helium. Fuzzy bright spotted images can only be caused by DPs.
2. Ejected mass in periodic explosions is the more likely Cepheid mechanism and is consistent with the one and only Supernova explosions. Gravitational attraction tends to return ejected mass to the Cepheid.
3. The Cepheid period-luminosity relationship is invalidated by DPs.
4. Baade-Wesselink spectroscopy provides a measure of mass emission rather the radial velocity of the star surface

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About QED induced EM radiation: Classically, EM energy is conserved by an increase in temperature. But at the nanoscale, temperature increases are forbidden by the quantum mechanics restriction of vanishing specific heat. QED radiation explains how the EM energy is conserved by the emission of nonthermal EM radiation.

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Tags	astronomy, cepheid, baade-wesserlink, doppler shift, qed radiation, cosmic dust
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