Brightness of Potential Stars that will become Supernovae

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Introduction

One of the most energetic events in the universe is a supernova. There are many types of supernovas and all kinds end with enormous amounts of energy being emitted. When a star runs out of hydrogen as fuel for the process of fusion, the star will collapse and then explode as a supernova. The star will also propel heavy elements into outer space from the attempt of fusion with lighter elements (helium, carbon, neon, oxygen, silicon). A Supernova can emit more energy than what our sun will produce in its entire lifespan. The supernova can force out the material of the star at 10% of the spend of light. The shockwave produced by the supernova forces the materials and gas into the interstellar medium which is called the supernova remnant. Supernovas also have a remnant of a neutron star or if the core is even denser, a black hole. The stars that are most likely to become supernova are giant star and super giant stars. Stars that are in binary systems can also become supernova like a white dwarf becoming too massive from drawing in a companion star's matter (gas). Supernovae also can emit gamma rays while producing the other wavelengths of light. There are many stars expected to undergo supernova in the next 100,000 years. IK Pegasi is the closet star that is expected to have a supernova. IK Pegasi is a binary star with a massive white dwarf and an A-class star.

Experiment Details

IK Pegasi is the closet star that is expected to become a supernova in the next 100,000 years. A set of RBG 10 second exposure and 12 second exposure were taken of IK Pegasi with the .35 meter telescope at PARI also. ImageJ was used to calculate the magnitude of IK Pegasi in the green and blue filter. This was done by knowing the magnitude of a star (TYC 1672-92-1) also in the capture of IK Pegasi and using some equations with pixel relationships.

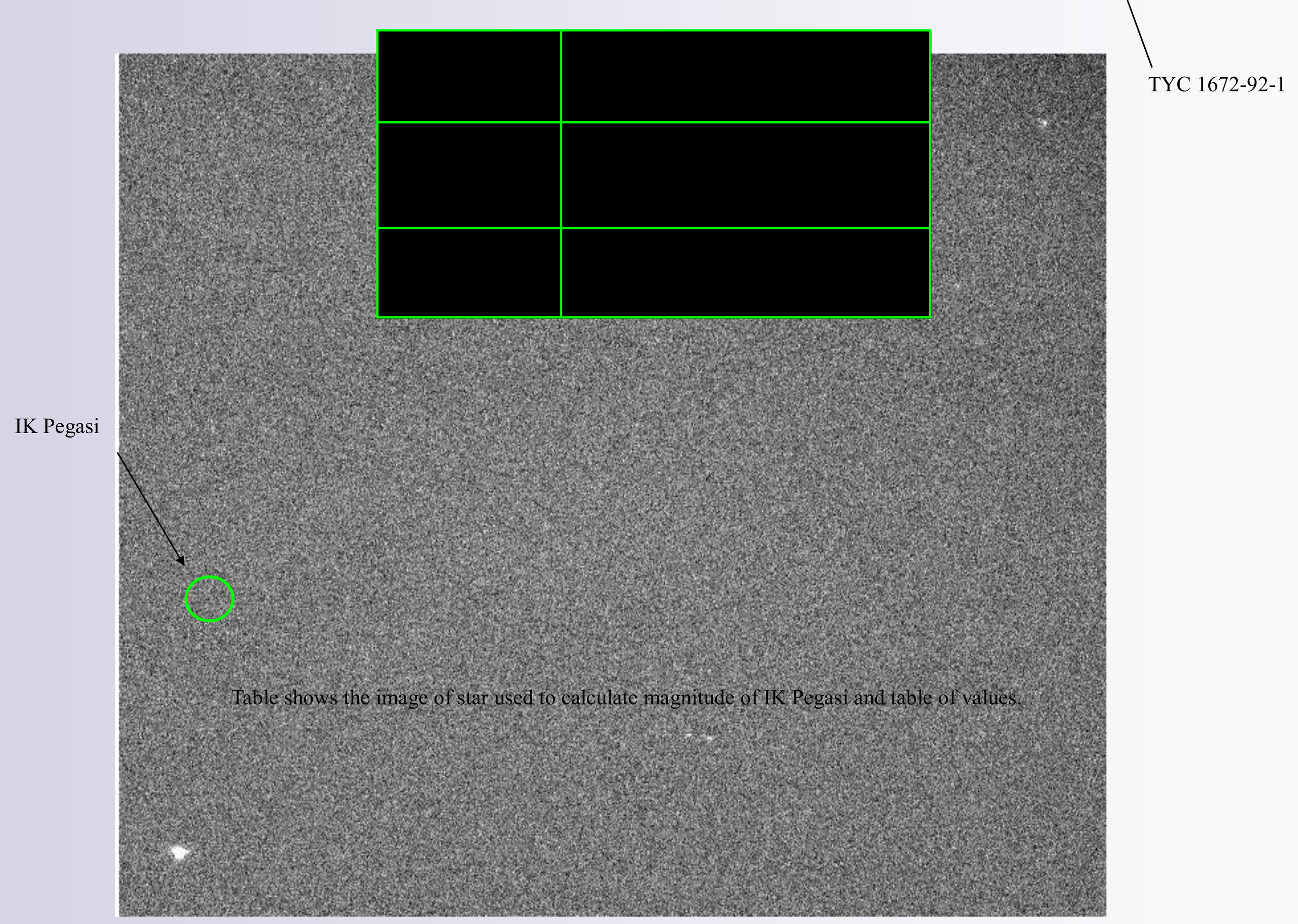

Table shows the image of star used to calculate magnitude of IK Pegasi and table of values.

Results and Their Meaning

The RBG filter exposures of IK Pegasi showed that the calculated magnitude of IK Pegasi was 7.49998 in the blue filter and 6.699 in the green filter. These magnitudes are less bright when compared to astronomical data on catalogues. The magnitude recorded on SIMBAD is 6.078 with the V filter and 6.294 in the blue filter. The V filter is closely related to the green filter so no significant difference of magnitude should occur. The difference between the SIMBAD records of magnitude and the recent calculations of magnitude are not great but enough to make conclusions of some astronomical variation of the star's properties to be possible. IK Pegasi is in a binary system and the white dwarf is expected to become more massive by drawing in the matter from the A-class star to eventually become a supernova. The class A star is brighter than the white dwarf and will lose mass as the white dwarf steals its matter. It is possible that the white dwarf has drawn in enough matter to make the binary system appear dimmer then previous observations. Another possibility for IK Pegasi to appear dimmer is that the white dwarf has partially covered the class-A star from the view of the telescope. A combination of the two previous theories for why the star's calculated magnitude is also possible.

Summary

Stars that will potentially become supernovas that are in a binary system will theoretically become dimmer when a white dwarf sucks in material from the brighter star. The white dwarf could also be passing in front of the larger star to cause the binary system to appear less bright. The data from IK Pegasi suggests either of the theories could be happening. If the first theory is true then the star could be studied further to let astronomers better understand the process of binary star systems to lead to supernovae.

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References

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