Massive Winds Triggered by Supernovae in the Large Magellanic Cloud Galaxy

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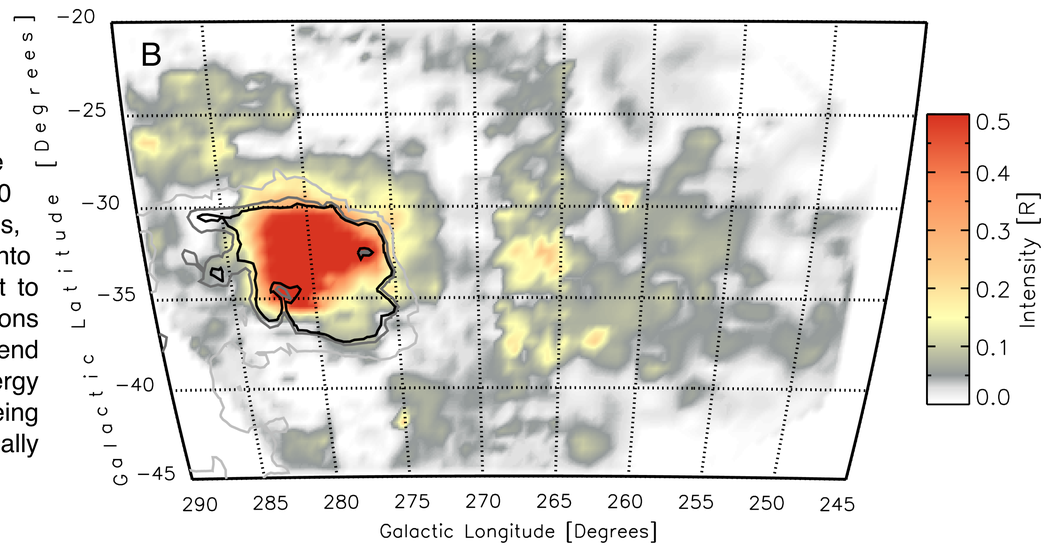
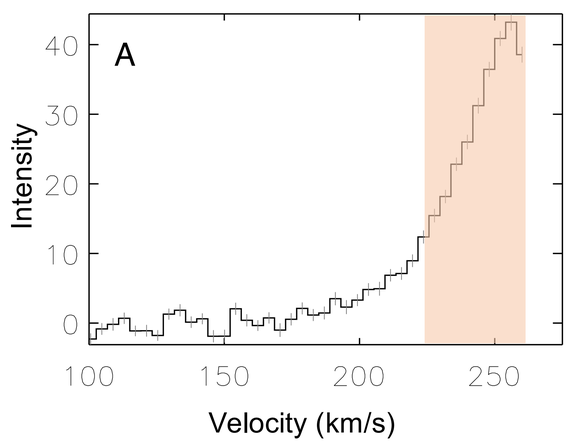
Nearby, the Large Magellanic Cloud galaxy (LMC), has ejected massive amounts of gaseous material, some of which is headed toward the Milky Way. The material consists of ionized hydrogen gas which is a consequence of significantly energetic events that have occurred in the LMC. Such events are not only the cause of the ionized material, but also the immense amount of material being thrown out. This ejected wind holds a substantial amount of information regarding both galaxies in general and the LMC's physical processes. Studying this ionized outflow will reveal new details concerning the internal processes that produce such massive ejections, the potential for galactic outflows to replenish gas reservoirs for future star formation, and the environments surrounding galaxies. The latter will influence our view of a galaxy's environment and how it may interact with nearby neighbors such as our Milky Way galaxy.

Summary:

Nearby, in one of the closest galaxies to our own the Large Magellanic Cloud (LMC), The galaxy is spewing out massive amounts of gas aimed toward our Milky Way (MW) galaxy. This gas contains over 10 million times the mass of the Sun[2,3] and is traveling at speeds up to 100 km/s. For such a massive wind to travel at those speeds, something extremely powerful must have thrust this cloud into motion. Recent studies have shown the potential catalyst to the ejection of this cloud to be tied to supernovae reactions inside the LMC. These violent explosions, which mark the end of a massive star's life, expel a tremendous amount of energy in every which direction. While the idea of the gas being ejected by supernovae is easy to say, how do we actually prove this and is this something we should care about?



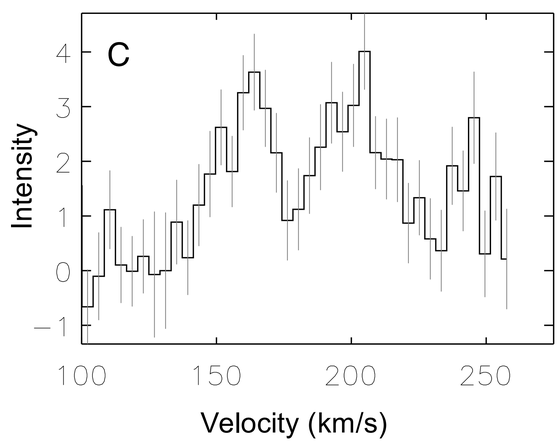


Questions:

1. **What is the effect of the outflow on the environment?**
   a. What mass is contained in the outflow and what rate does it flow?
   b. How much energy does the wind carry?
   c. Does the wind fall back into the LMC or travel to the MW?

Results:

Figures A and C represent the emission spectra that make up the emission map that is show in Figure B. While Figure A shows the H-alpha emission spectrum on the LMC, Figure C is a location off the LMC. This difference is clearly seen in the velocity range of 225 to 250 km/s where the intense emission from the LMC is present in Figure A, but not in C. By integrating each of these spectra for every sightline, over a certain velocity range, we can construct the emission map in Figure B. Here we again see the intense H-alpha emission located at the position of the LMC, but interestingly enough there is still emission present off the galaxy which is the suspected wind that we are studying. This map will allow us to answer the questions presented and provide further information about the nature of this wind.



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