Title: Clustered supernovae as Galactic PeVatrons

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Abstract:

Although supernova remnants are believed to be the most plausible sources of galactic cosmic rays, it is yet unclear how they can accelerate particles beyond 1 PeV, especially when they evolve in the warm phase of the interstellar medium (ISM). On the other hand, extra-galactic sources are not expected to contribute below hundreds of PeV. This indicates a glaring gap in our understanding of the cosmic ray spectrum observed near the Earth. The standard model does not however take into account the fact that most supernovae don't occur in the warm ISM, but rather in hot cavities blown by powerful star clusters. Within the latter, the mixing of stellar winds generate a strong turbulence and large magnetic fields which create favorable conditions for particle acceleration. In this talk I will show how supernova remnants expanding in the vicinity of young massive star clusters can explain the origin of galactic cosmic rays up to several hundreds of PeV. as well as puzzling gamma-ray observations such as the detection of PeV photons from the Cygnus region.Although supernova remnants are believed to be the most plausible sources of galactic cosmic rays, it is yet unclear how they can accelerate particles beyond 1 PeV, especially when they evolve in the warm phase of the interstellar medium (ISM). On the other hand, extra-galactic sources are not expected to contribute below hundreds of PeV. This indicates a glaring gap in our understanding of the cosmic ray spectrum observed near the Earth. The standard model does not however take into account the fact that most supernovae don't occur in the warm ISM, but rather in hot cavities blown by powerful star clusters. Within the latter, the mixing of stellar winds generate a strong turbulence and large magnetic fields which create favorable conditions for particle acceleration. In this talk I will show how supernova remnants expanding in the vicinity of young massive star clusters can explain the origin of galactic cosmic rays up to several hundreds of PeV. as well as puzzling gamma-ray observations such as the detection of PeV photons from the Cygnus region.

Publications:

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