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Emission properties of compact star clusters

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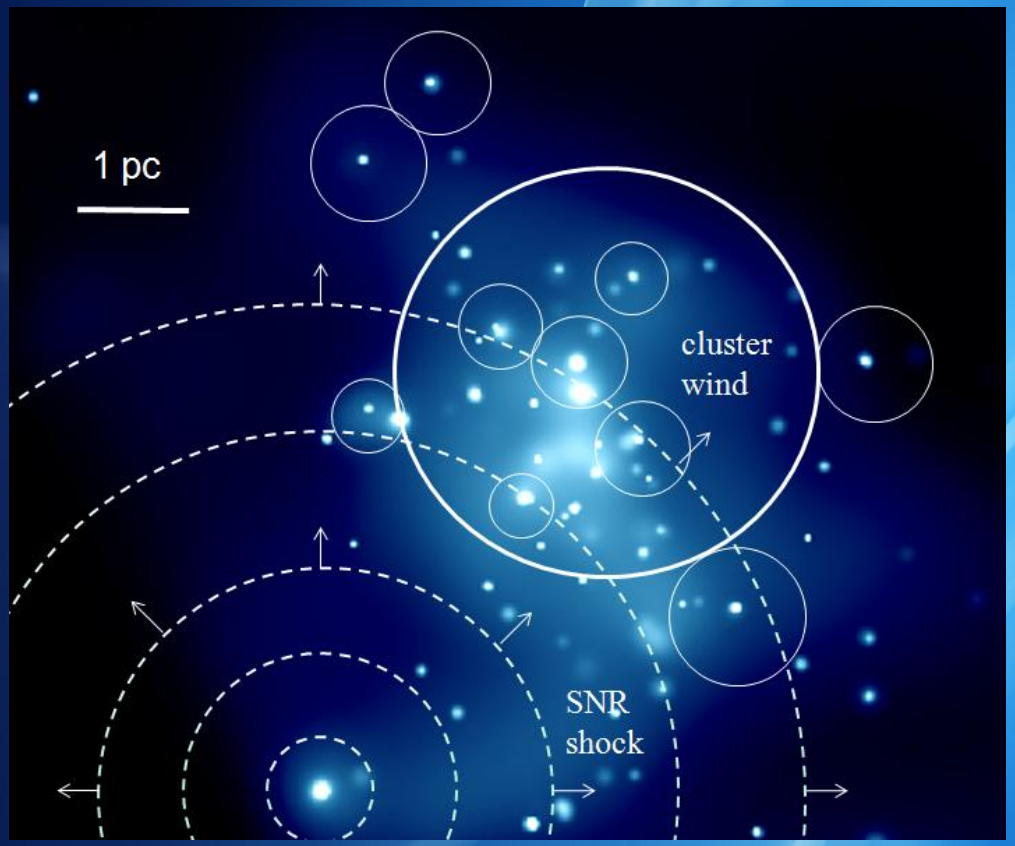
Supernova remnant inside the young compact star cluster



Credit: NASA/CXC/UCLA/M.Muno et al.

SNR shock collides with the shocks from the winds of the stars and cluster wind. Colliding shock flows system is formed!

CSF system:

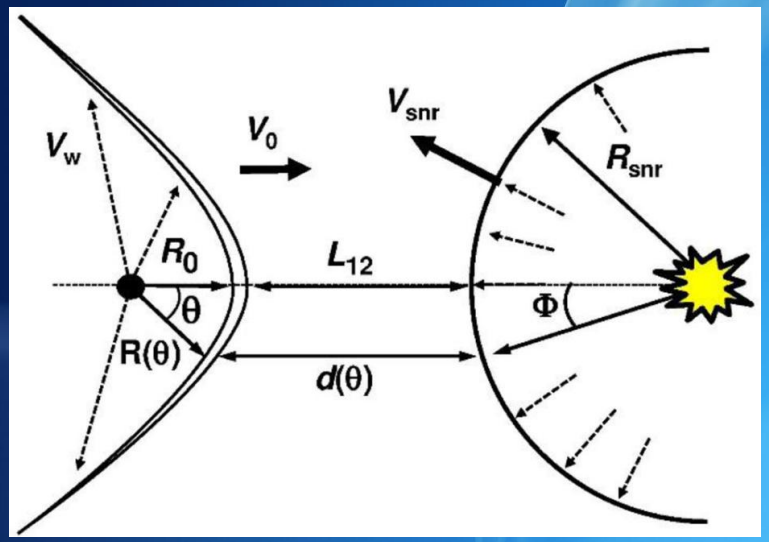
1. Increasing efficiency of Fermi I particle acceleration;

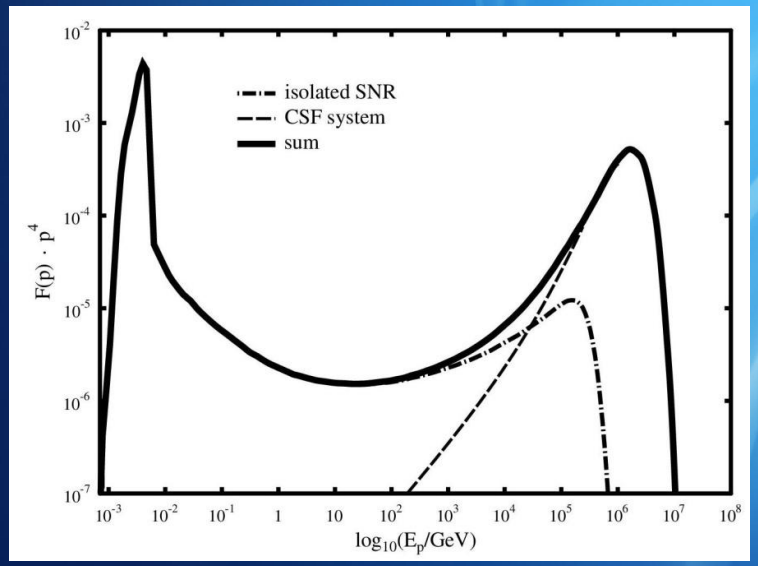
2. Piecewise spectrum with $\gamma \approx 2$ below 1 TeV and $\gamma \approx 1$ above 1 TeV with exponential cut-off;

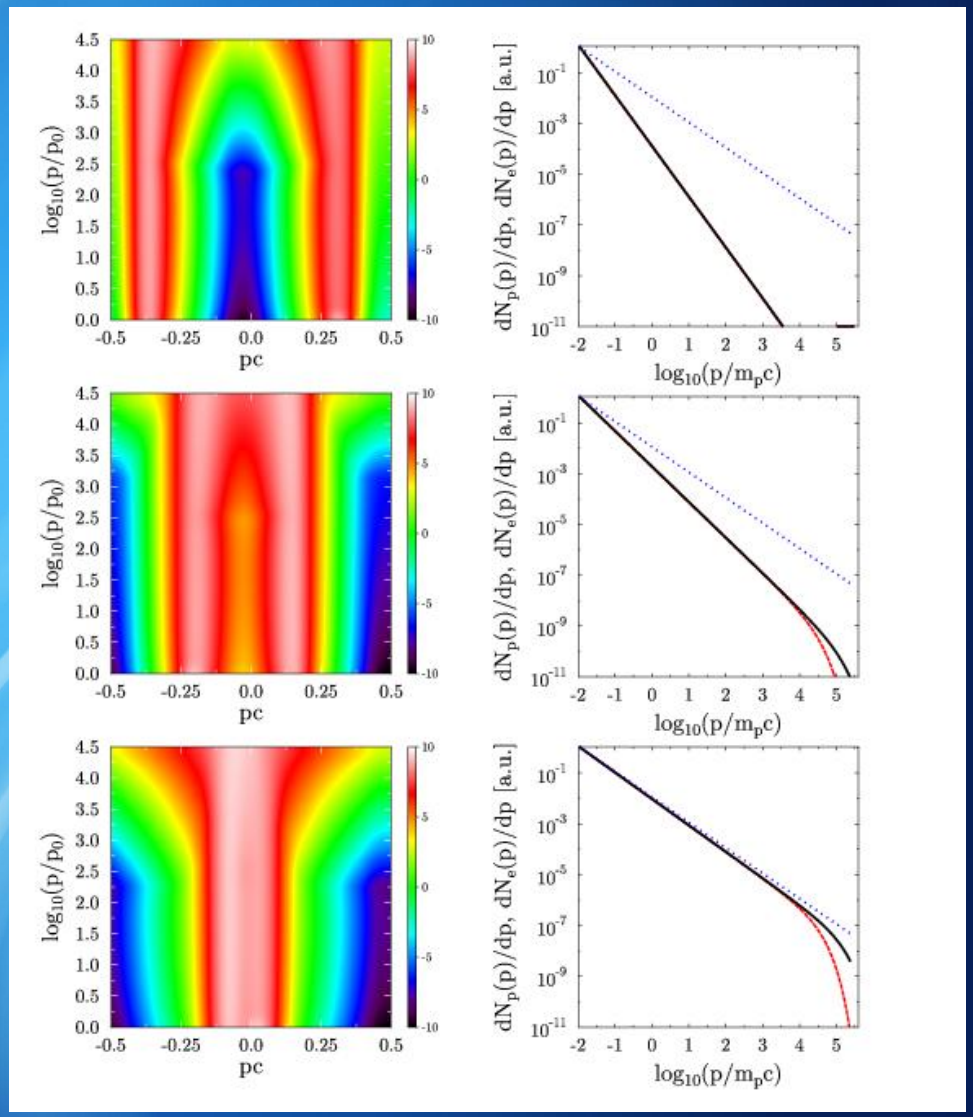
3. Increasing maximal energy of the accelerated particles up to 10^{16}-10^{17} eV.

Bykov + (2013,2015)

Colliding Shock Flows System: SNR + nearby Stellar Wind

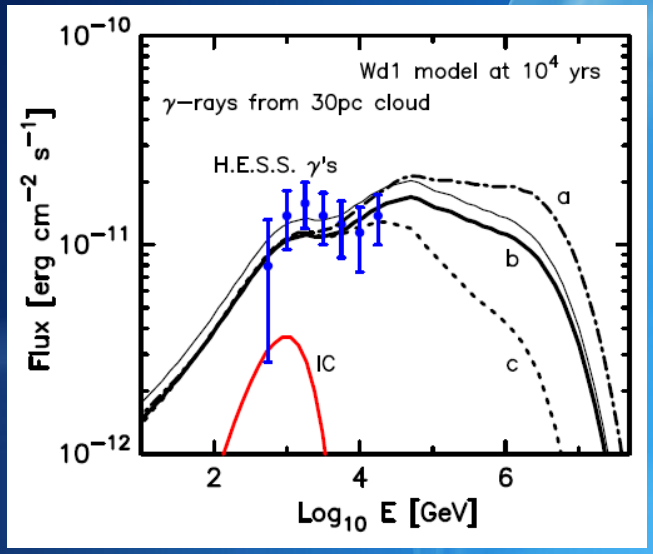


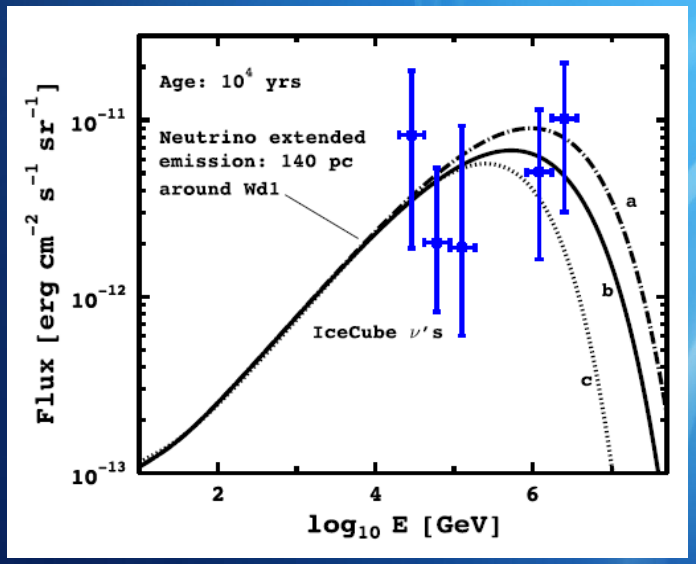


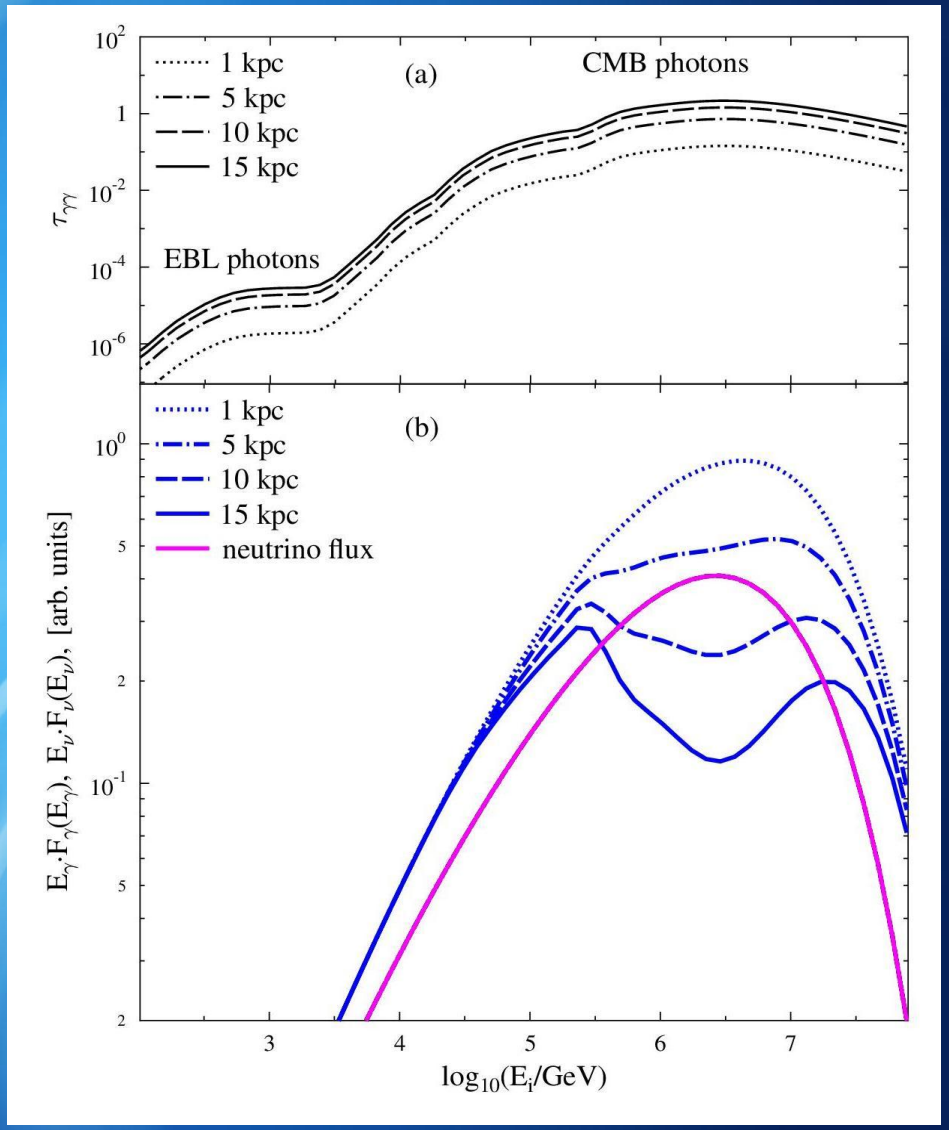


Bykov + (2013,2015), Gladilin + (2014)

VHE neutrino and gamma-emission from long-distant clusters







Bykov + (2015), Gladilin + (2016)

Brief summary:

- CSF systems in compact galactic clusters are very suitable sources of VHE neutrino and gamma emission;

- SNR remnant inside (or outside) the cluster increases maximal energy of the accelerated particles and the emission power of the cluster up to several hundreds years;

- Pair-production suppresses gamma-emission at VHE range. For galactic clusters at 5-10 kpc (e.g., Arches, Quintuplet) this will cause that neutrino flux will exceed corresponding gamma-ray emission up to an order of magnitude near 1 PeV;

- Future measurements of this difference between gamma-ray and neutrino emission spectra could be an additional tool for the estimation of the distance to the source.