Searching for dark matter annihilating in galaxies and clusters with IceCube

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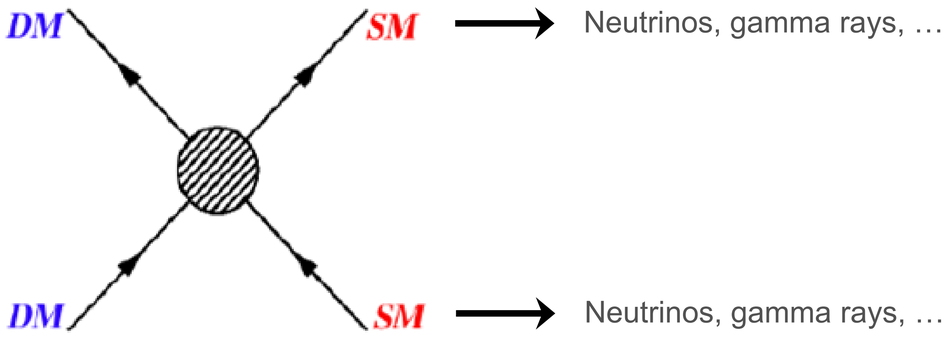
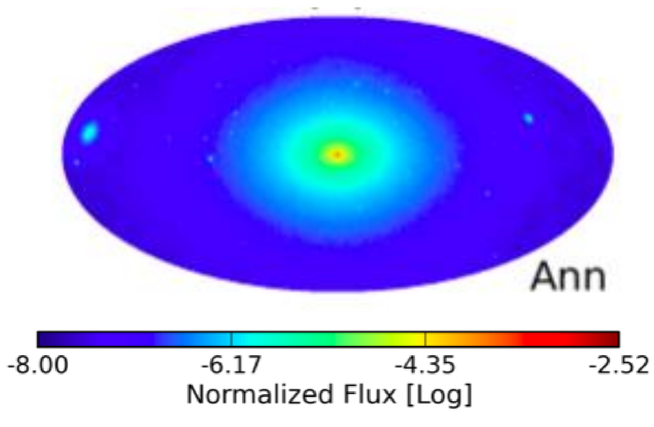
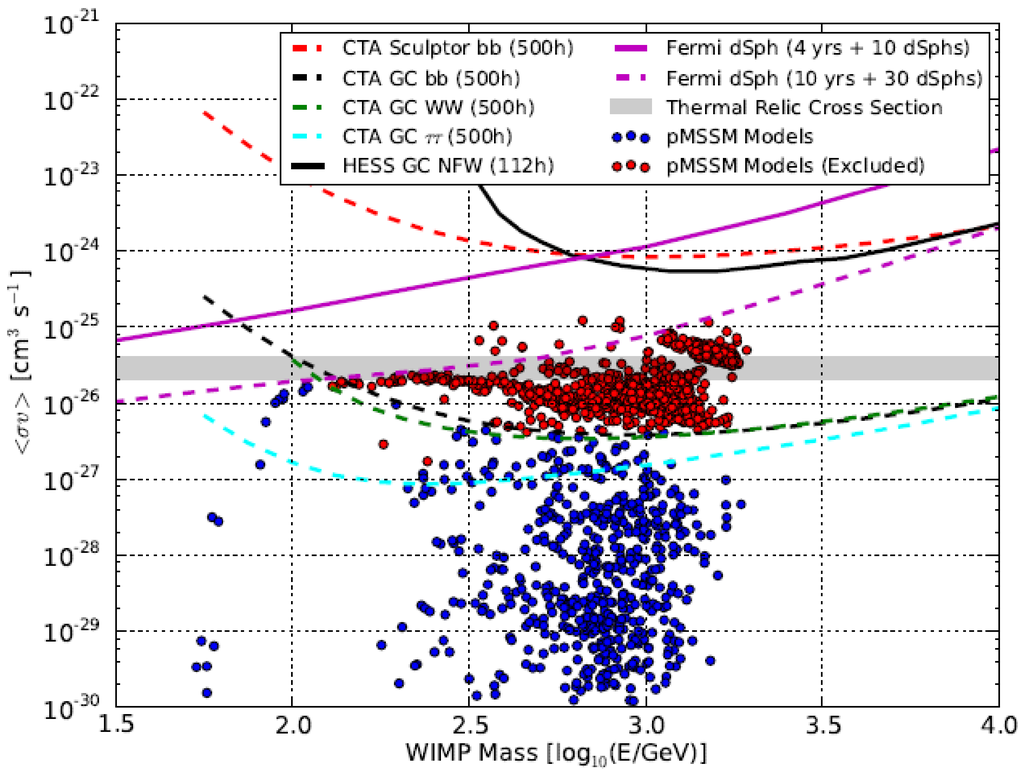
Indirect detection



Put limits on annihilation cross section for benchmark annihilation channel, use sources with high dark matter density



Limits from gamma-ray telescopes



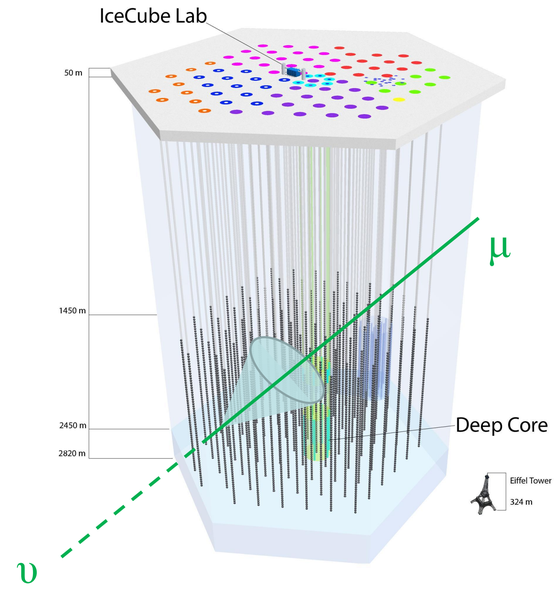
Comparison of current (solid lines) and projected (dashed lines) from gamma-ray searches

Galaxies and galaxy clusters

Dark matter forms halo around galaxies and galaxy clusters, use these as a source for search with IceCube

Use sources in Northern Hemisphere

The IceCube Neutrino Observatory



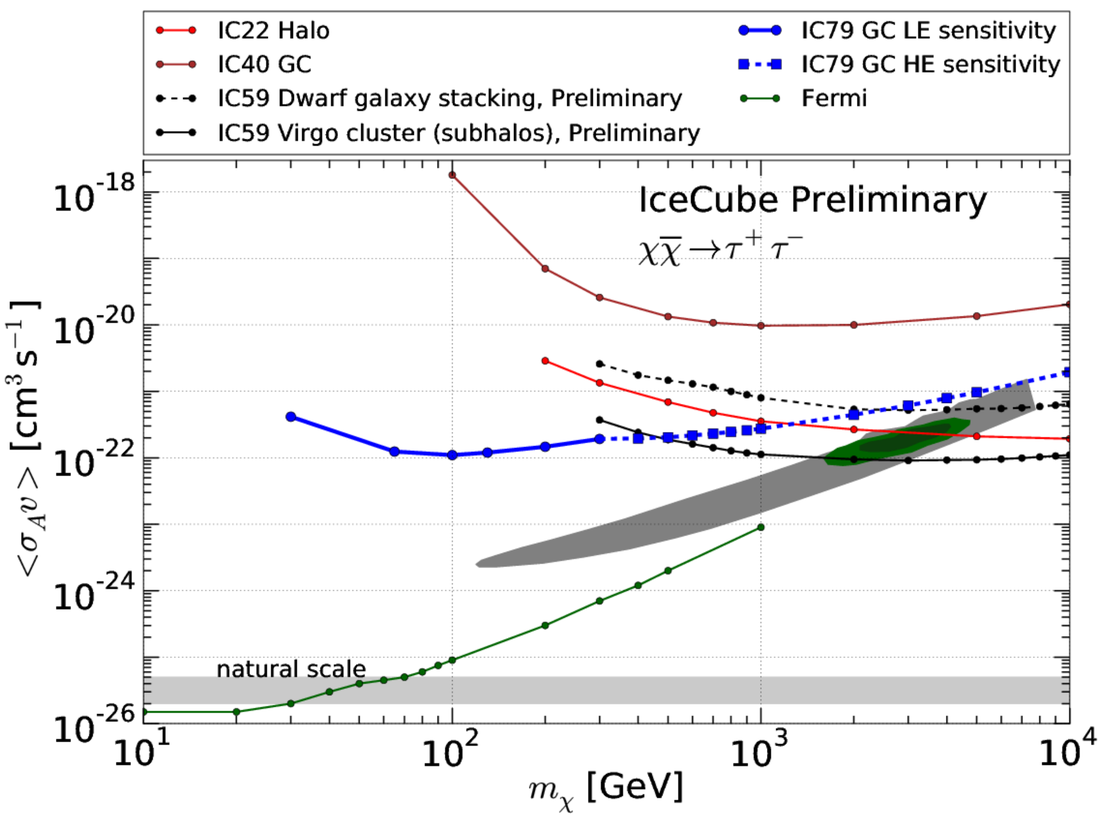
Cherenkov neutrino telescope at South Pole

Energy threshold:

~100 GeV for IceCube

~10 GeV for DeepCore

Current results of IceCube



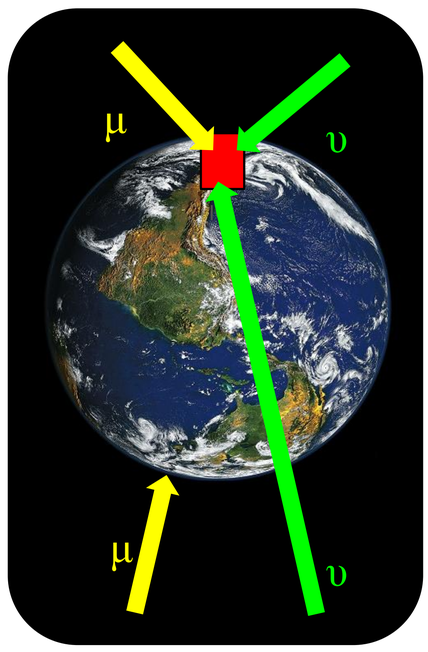
Event selection

Signal neutrinos have GeV-TeV energies and come from below

Two types of background:

- Atmospheric muons from above

- Atmospheric neutrinos from all directions (irreducible)



Using straight cuts on variables related to track quality and event containment:
remove 99.8 % of background, keep 30-50% of signal

Next and final step will be BDT, after that search for an excess from the direction of sources