HI absorption and the Galactic Centre Excess

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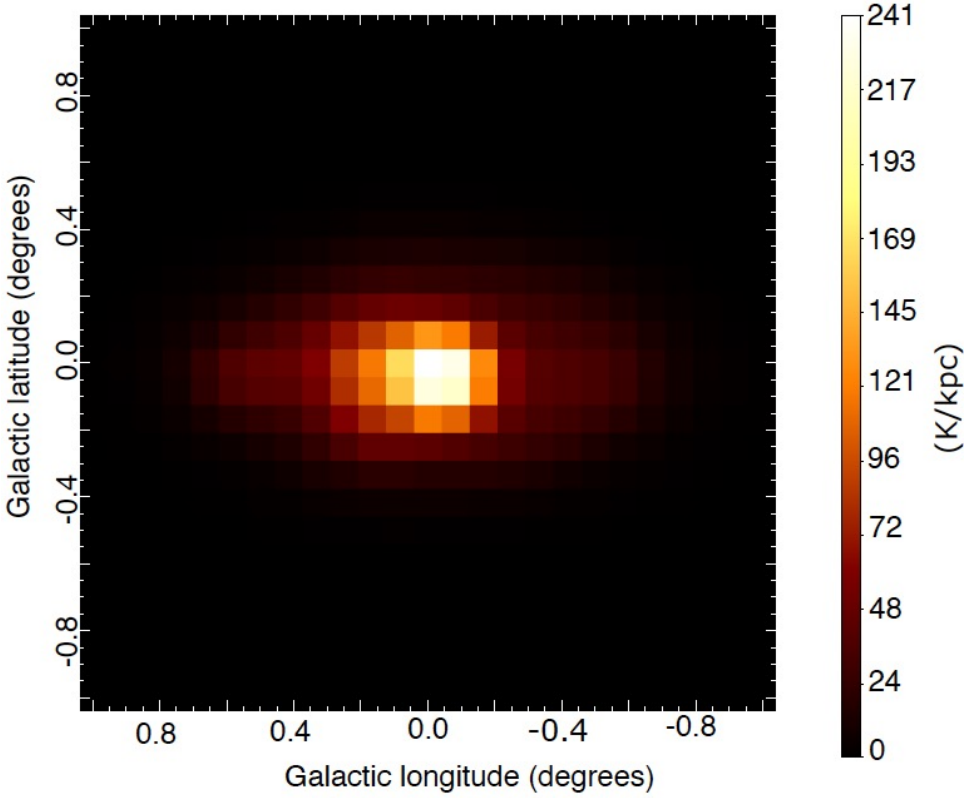
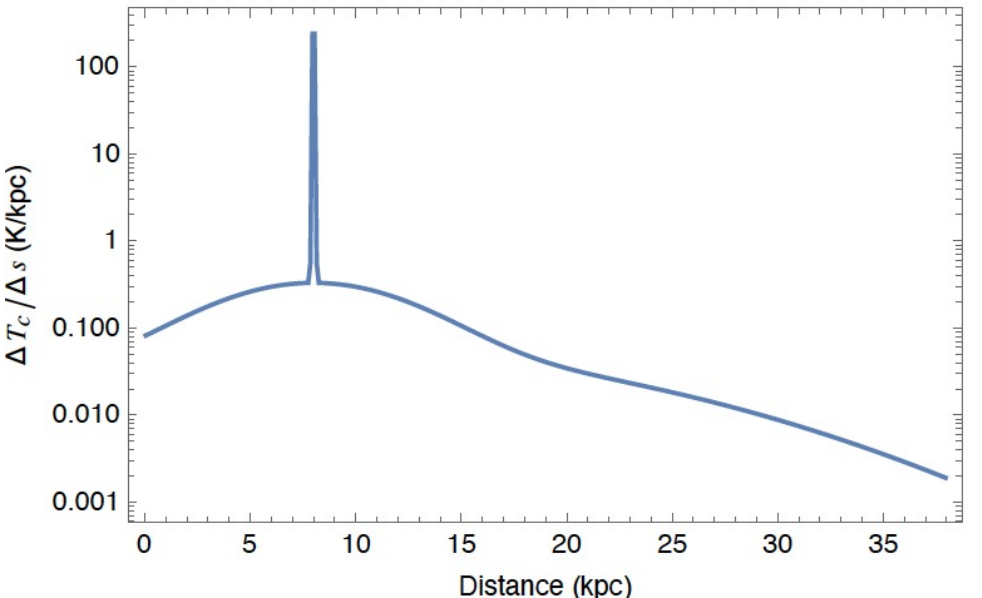
- The Fermi-LAT gamma-ray data indicate an Galactic center excess (GCE) of gamma rays which is peaked at around 1 GeV.
- The two main explanations are either a unresolved population of millisecond pulsars or self annihilating dark matter.
- It is important that the diffuse galactic background is adequately accounted for.
- This requires an accurate estimate of how the HI gas is distributed in our galaxy.
- We present an advanced model of atomic gas in the Galaxy and apply it to the analysis of gamma-ray emission from the Galactic center.
- We account for both line and continuum emission in the radiation transport, which allows the modelling of negative line intensity and traces gas in both emission and absorption.

Continuum emission model based on CHIPASS and Stockert data sets

- Continuum data fitted with an axisymmetric model. See proceedings for more details.
- Top: Cross section at a distance of 8 kpc from the solar system.
- Bottom: Profile for *(l,b)=(0°, 0°).*

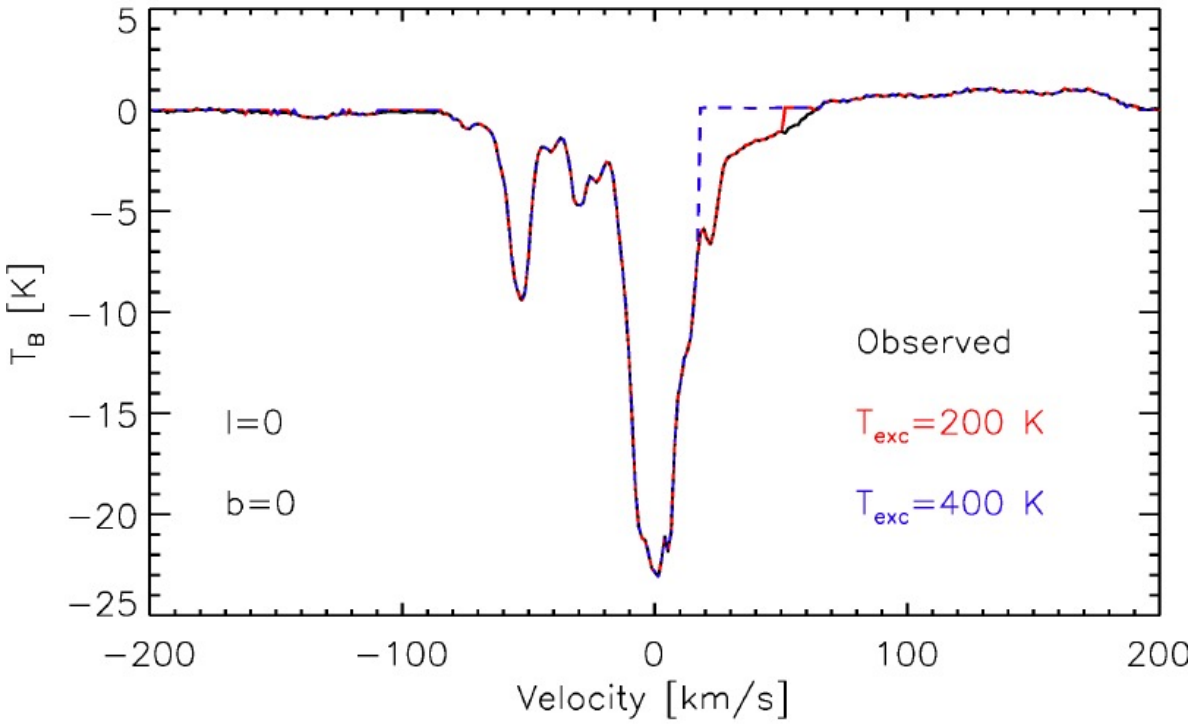


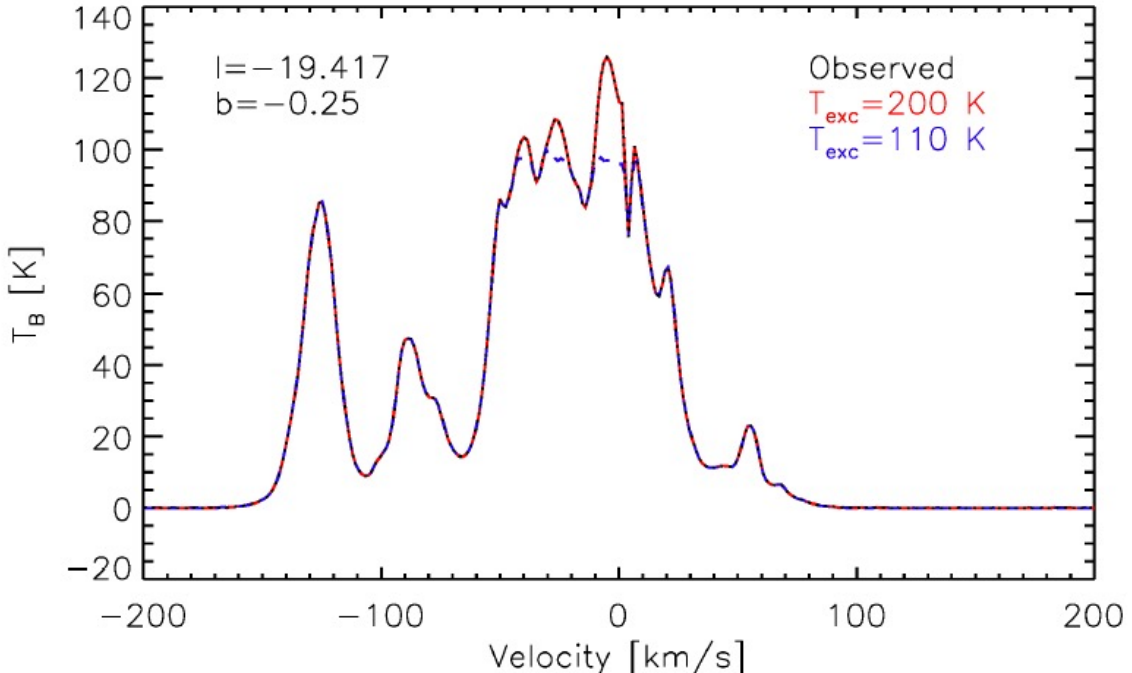


HI spectrum

- Comparison of the HI spectrum observed toward the Galactic Center (top panel).
- The absorption feature could be caused by cold gas immediately in front of the Galactic Center, whereas most of the gas clouds have temperatures of a few hundred Kelvin.

- A line of sight with a high intensity peak (bottom panel) needs larger T_{exc}.





Fermi-LAT Likelihood

- Dashed line is for old method which didn't account for continuum emission.
- As can be seen, a wide range of excitation temperatures fit the Fermi-LAT data better once continuum emission is accounted for.
- Provisional results still find a significant Galactic Center Excess but with a slightly reduced significance.
- The unresolved MSP model still provides a better fit to the Galactic Center Excess in comparison to the self-annihilating dark matter model.