

ANTIMATTER IN COSMIC RAYS:

THE DARK MATTER – COSMIC RAYS

CONNECTION

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THE MAIN INGREDIENTS

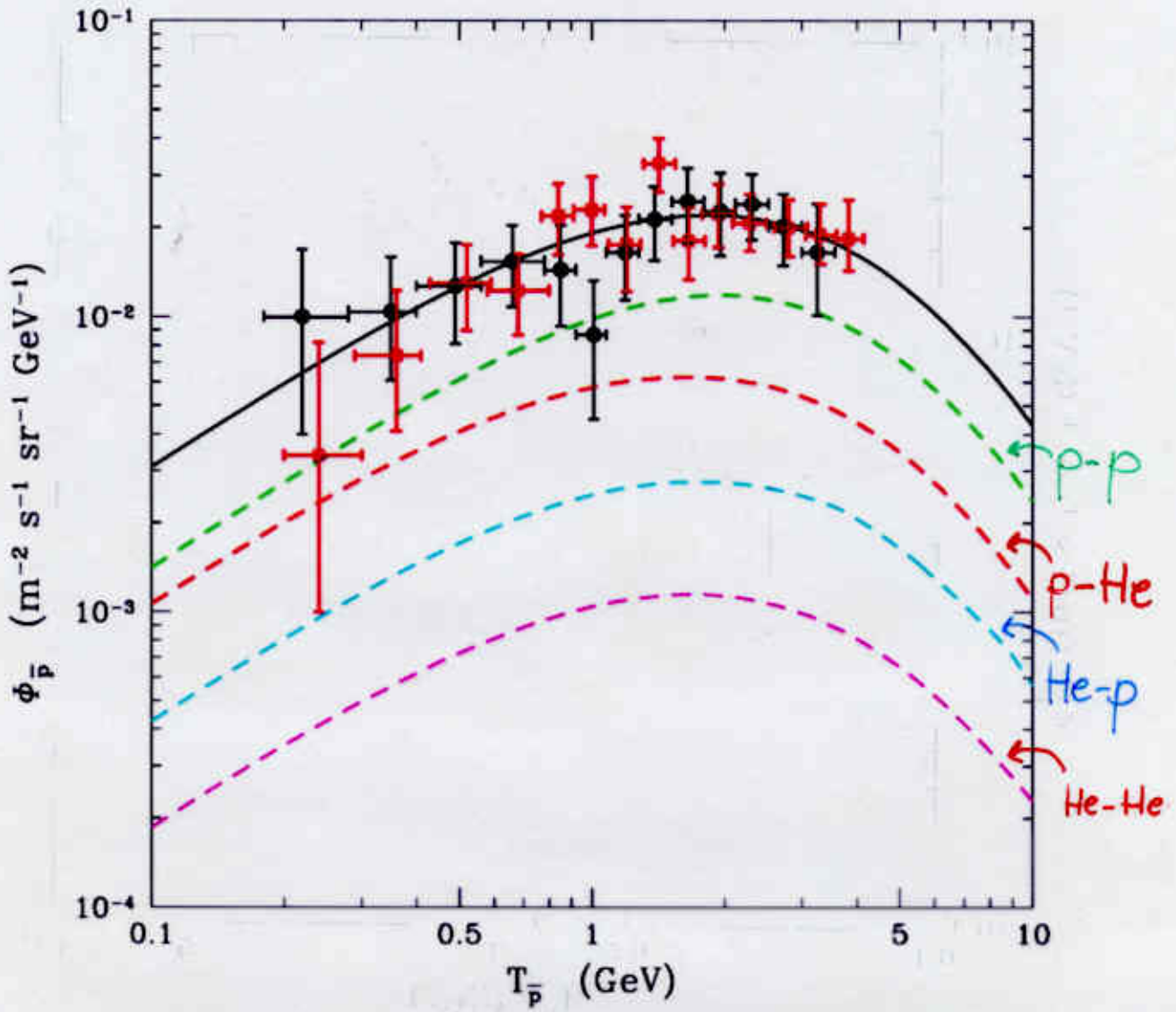
- H and He (data from BESS and AMS)
- nuclear interactions:
p-p (Tan & Ng); p-He, He-p, He-He (DTUNUC)
- non-annihilant inelastic interactions over IS protons
(tertiary \bar{p})
- energy losses (Coulomb, ionization)
- diffusion parameters from nuclei:
diffusion coefficient: $K = K_0 \beta R^\delta$
convective velocity: V_c
Alfven velocity: V_A
diffusive halo thickness: L

B/C analysis was systematic ($\chi_{\text{red}}^2 \lesssim 1.8$)

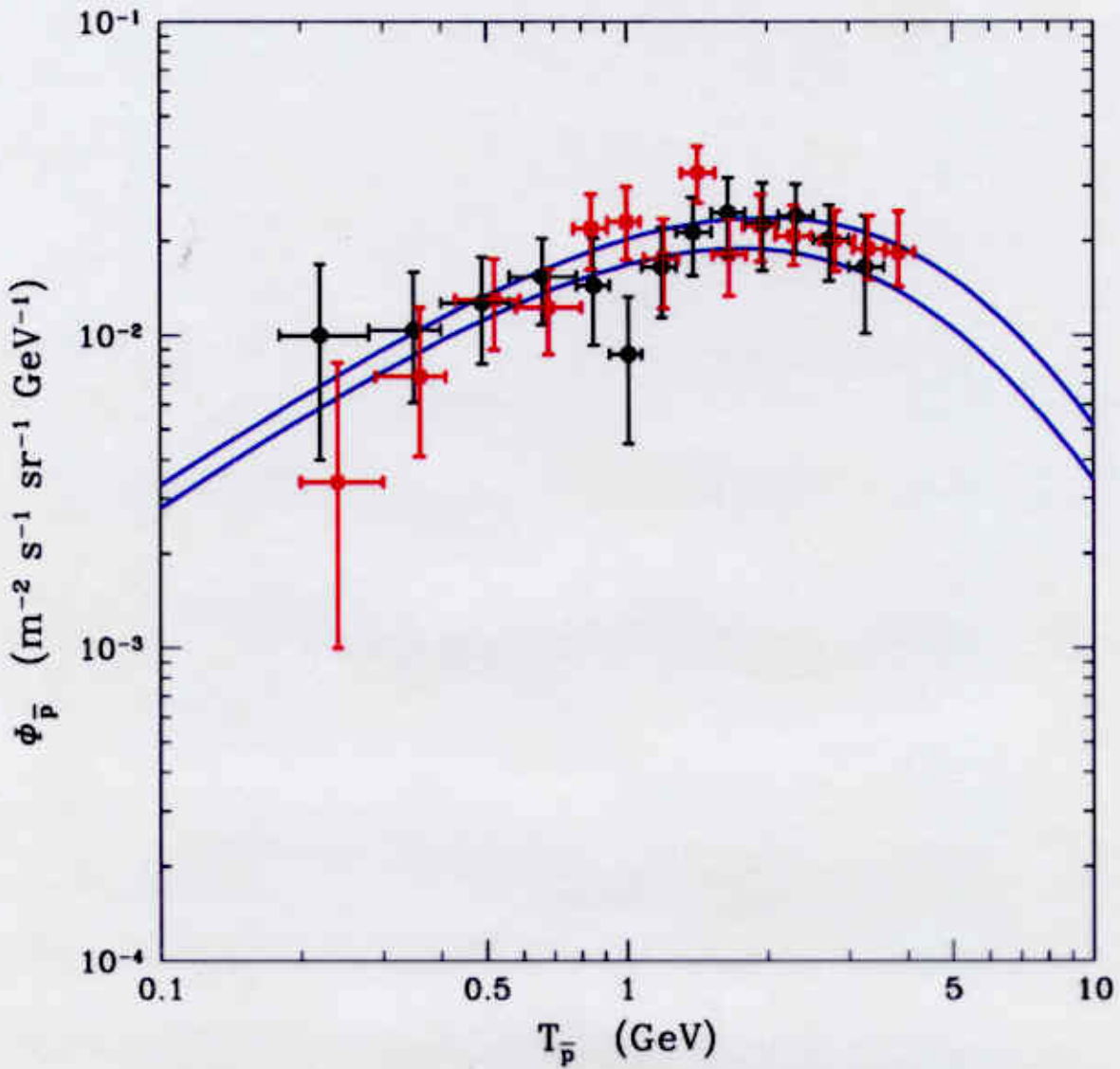
(D. Maurin, F.D., R. Taillet, P. Salati, ApJ 555 (2001) 585)

● BESS 95+97

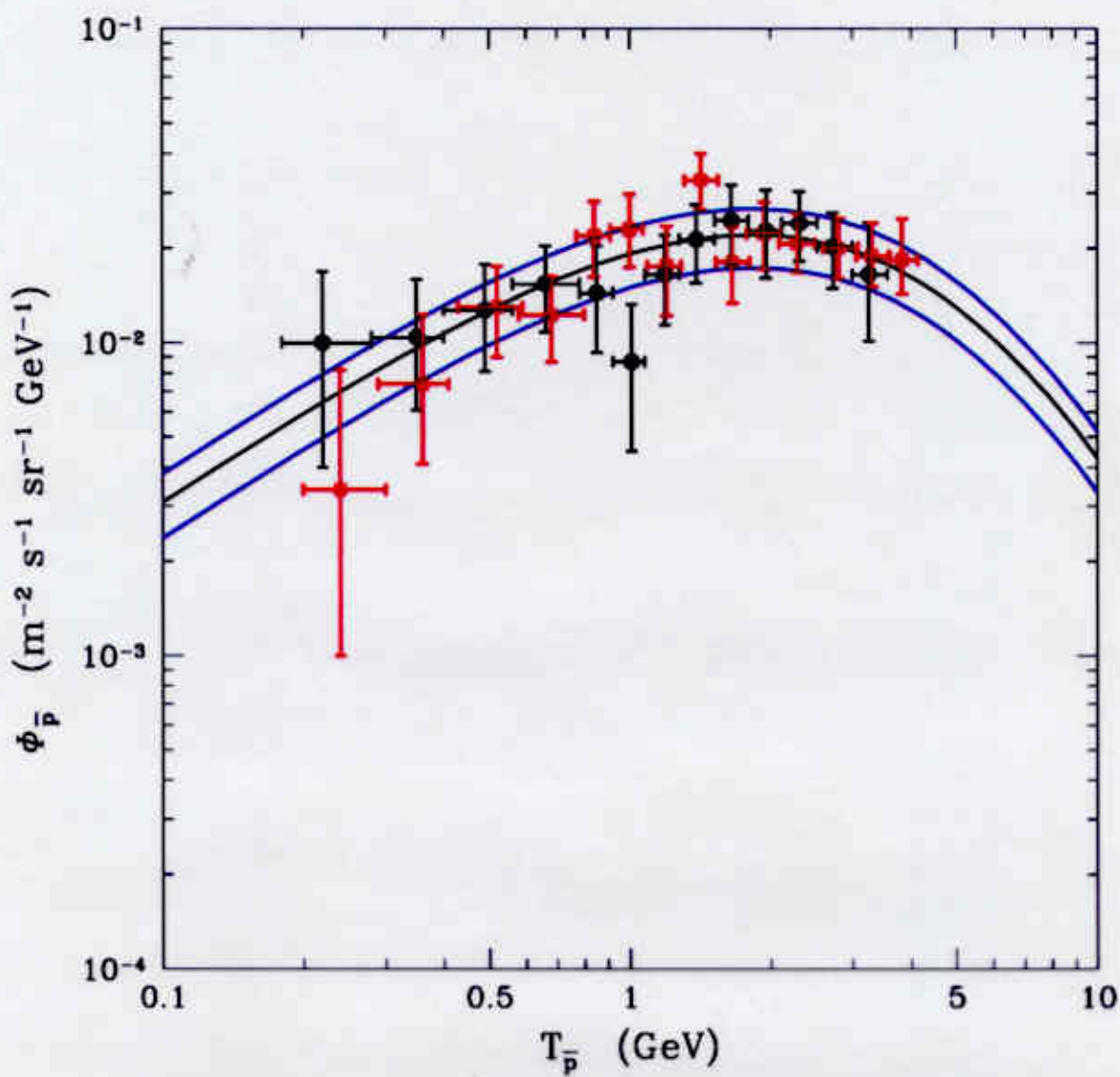
■ BESS 98



All δ . UNCERTAINTY DUE TO PROPAGATION



UNCERTAINTY DUE TO NUCLEAR CROSS SECTIONS



ANTIDEUTERONS: a new signature in indirect neutralino searches

F. D., N. Fornengo, P. Salati, Phys. Rev. D62 (2000) 043003

F. Donato, astro-ph/0006188

In order for **fusion** to take place, the two antinuclei must be at rest.

- kinematics of spallation reactions prevents the production of very low-energy particles

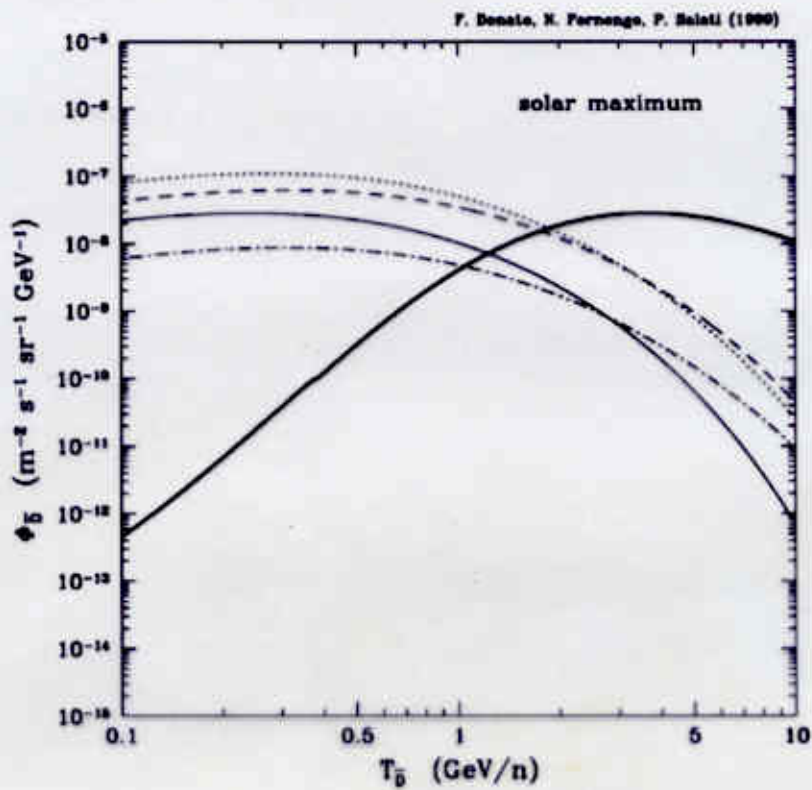
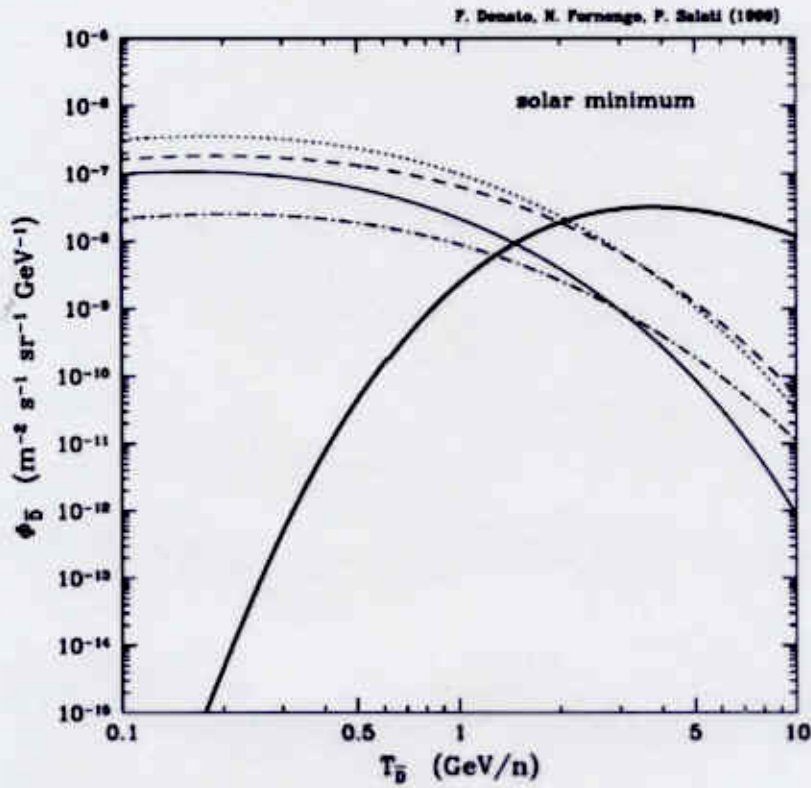
⇒ low-energy secondary spectrum is strongly depleted

- χ - χ annihilate almost at rest and the ensuing \bar{D} 's are produced with very low-energies.

⇒ low-energy primary (supersymmetric) \bar{D} spectrum is fairly flat

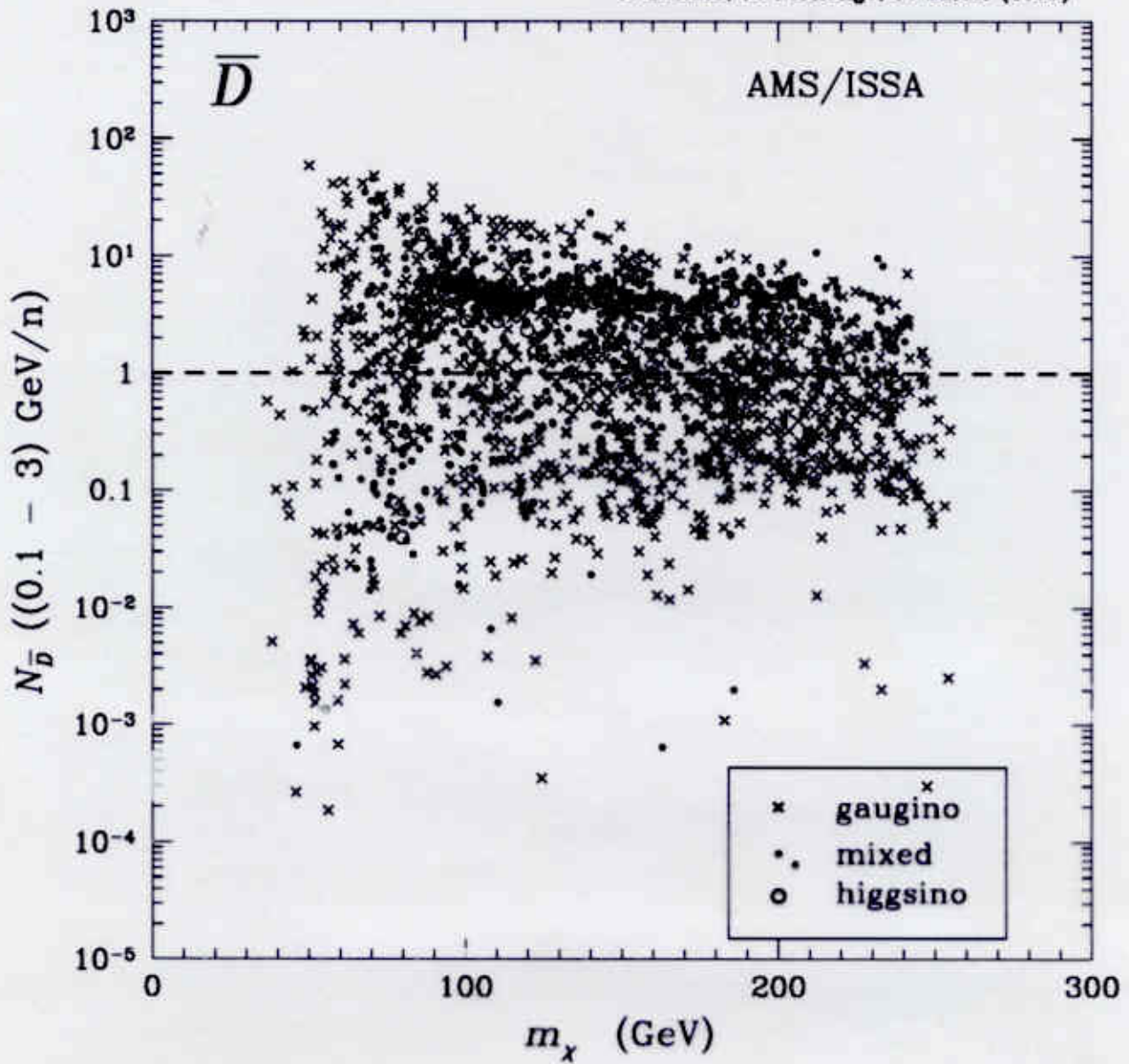
The low-energy suppression of spallation \bar{D} 's with respect to the primary component is **MUCH MORE** effective than for \bar{p} 's.

PRIMARY \bar{D} 's



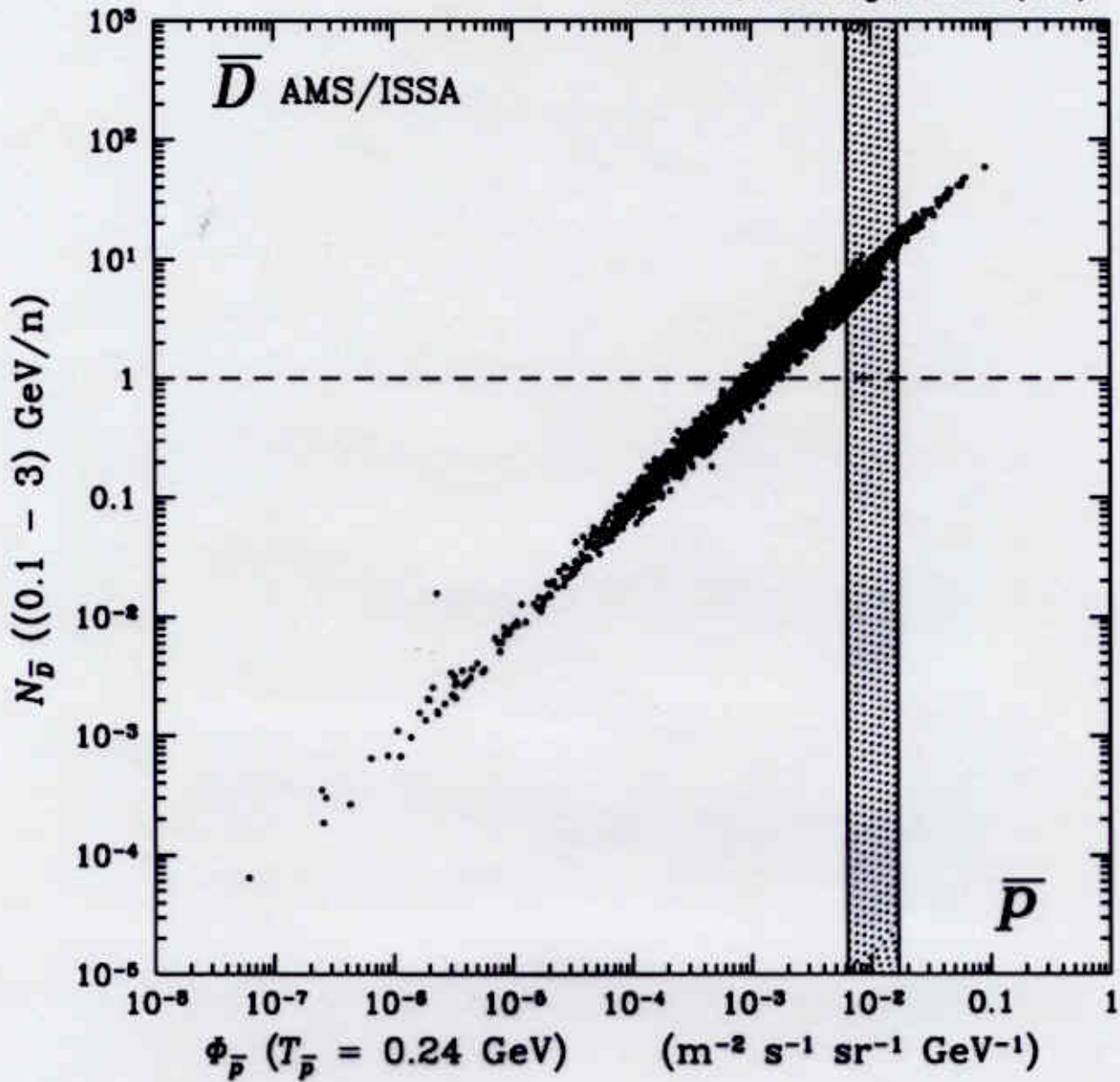
SUSY \bar{D} 's and AMS

F. Donato, N. Fornengo, P. Salati (1999)



SUSY \bar{D} 's and \bar{p} 's

F. Donato, N. Fornengo, P. Salati (1999)



CONCLUSIONS

All the cosmic \bar{p} fluxes calculated with diffusion parameters as derived from nuclei are completely contained within the error bars of BESS data.

All possible uncertainty sources have been derived and significantly improved:

- propagation: 10 – 25%;
- nuclear physics: \lesssim 25%
- other sources (nuclear parameterization, helium fraction, interstellar matter density, ...): few %.

Antideuterons may play an important role in the study of propagation of secondary galactic antimatter and in the search for exotic dark matter.