

Astrophysical Boost factor for Dark Matter indirect detection

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And can we help LHC finding new physics?

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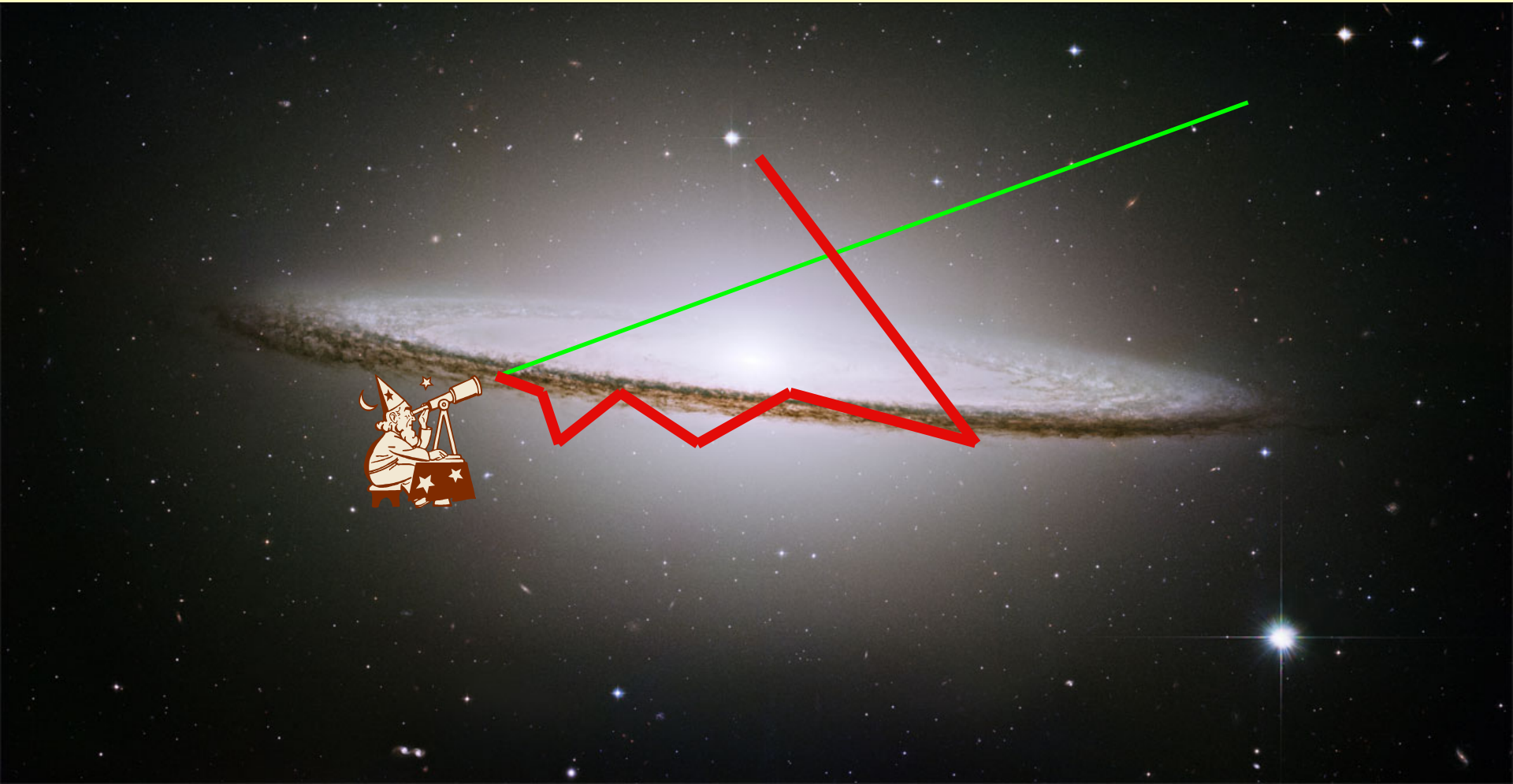


In colaboration with...

- Pierre Brun (Paris)
- Jürg Diemand (Santa Cruz)
- Stefano Profumo (Santa Cruz)
- Pierre Salati (Annecy)
- Céline Bøehm (Annecy)

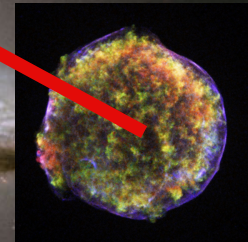
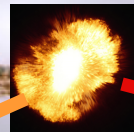
Dark Matter indirect detection

$$\chi + \chi \rightarrow q\bar{q}, W^+W^-, \dots \rightarrow \gamma, \bar{p}, \bar{D}, e^+ \text{ \& } \nu's$$

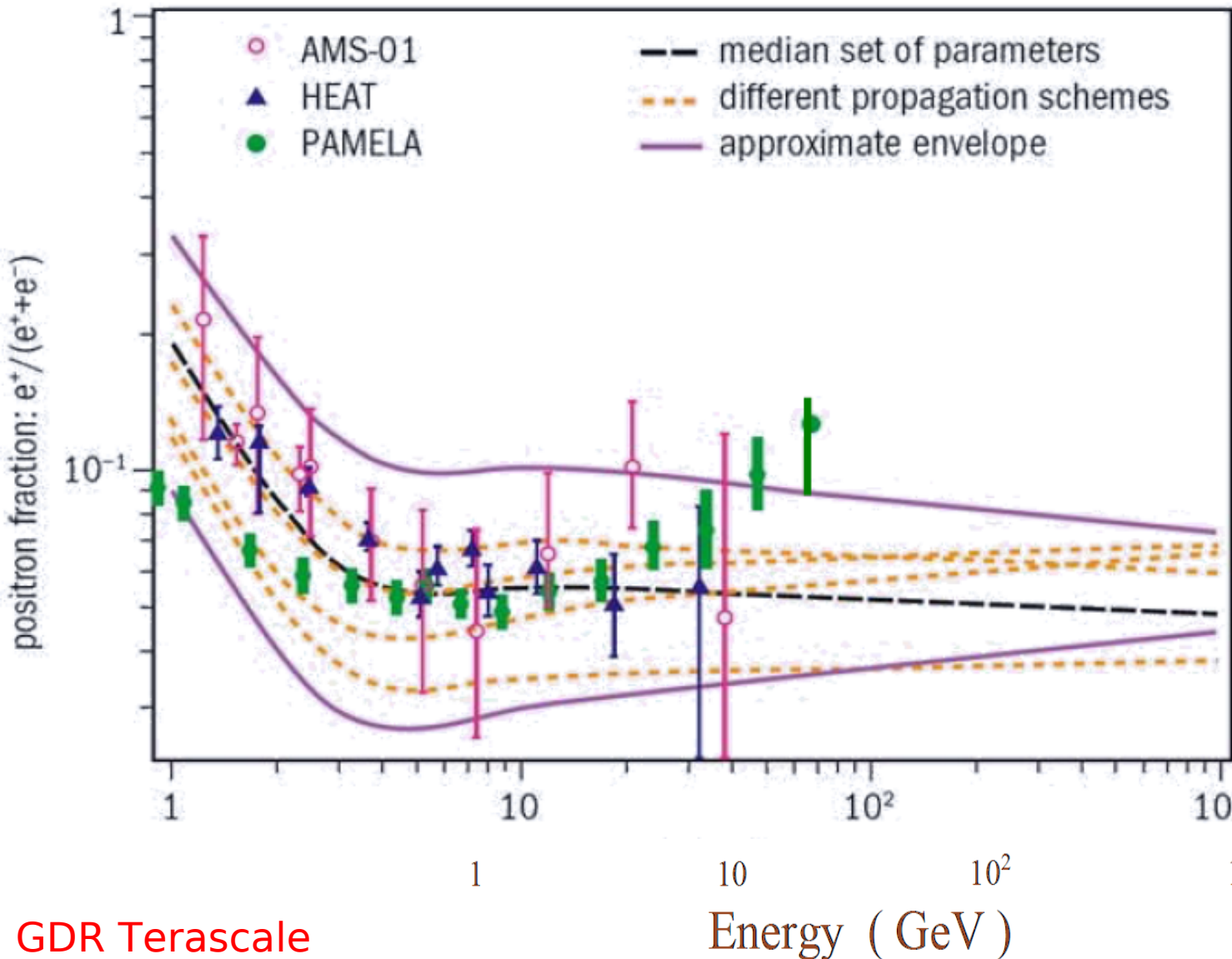


Background

$\rho_{CR} + \rho_{ISM} \rightarrow K, \pi^0 \dots \rightarrow \gamma, \bar{p}, \bar{D}, e^+ \text{ \& \ } \nu's$



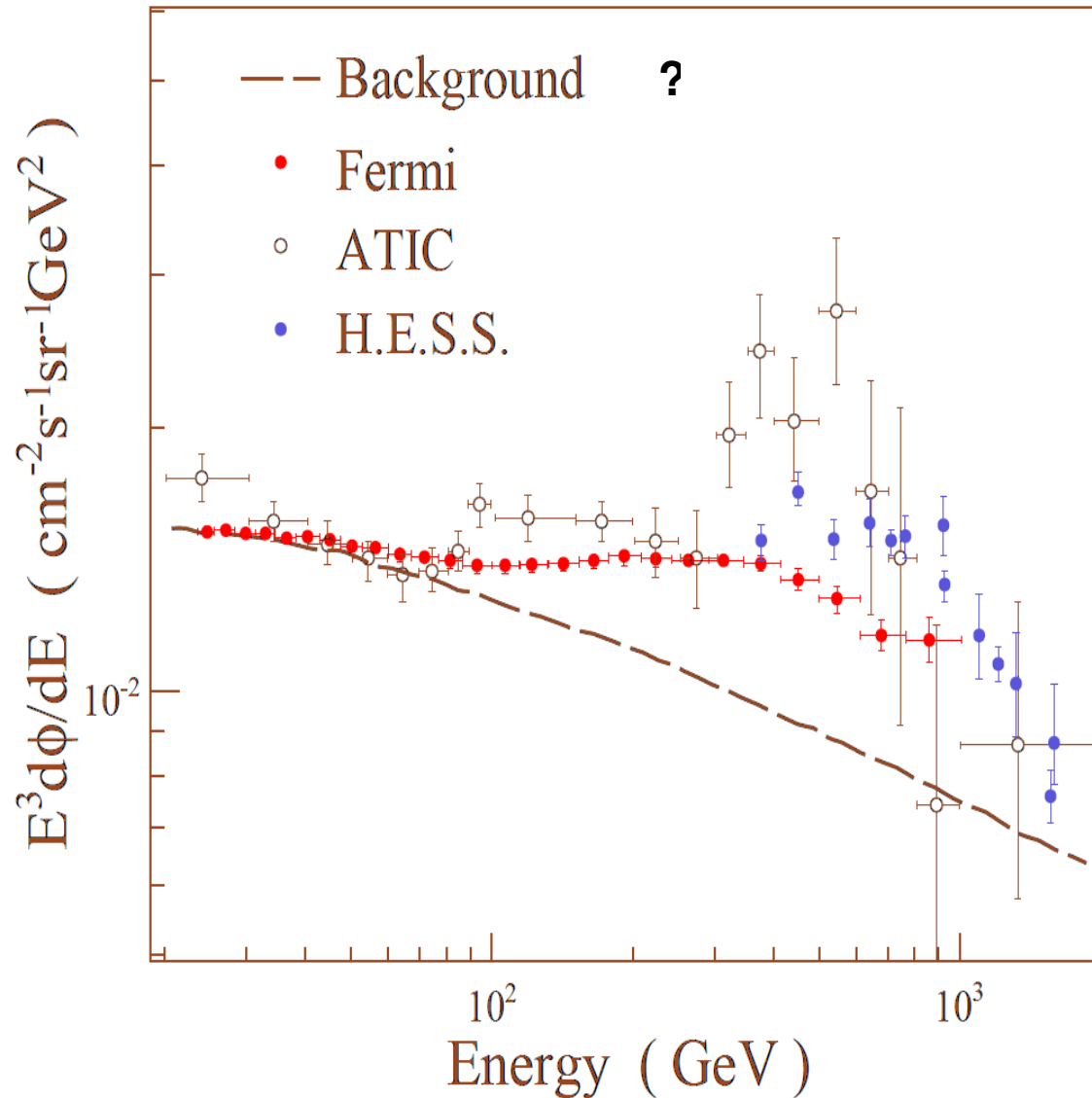
PAMELA



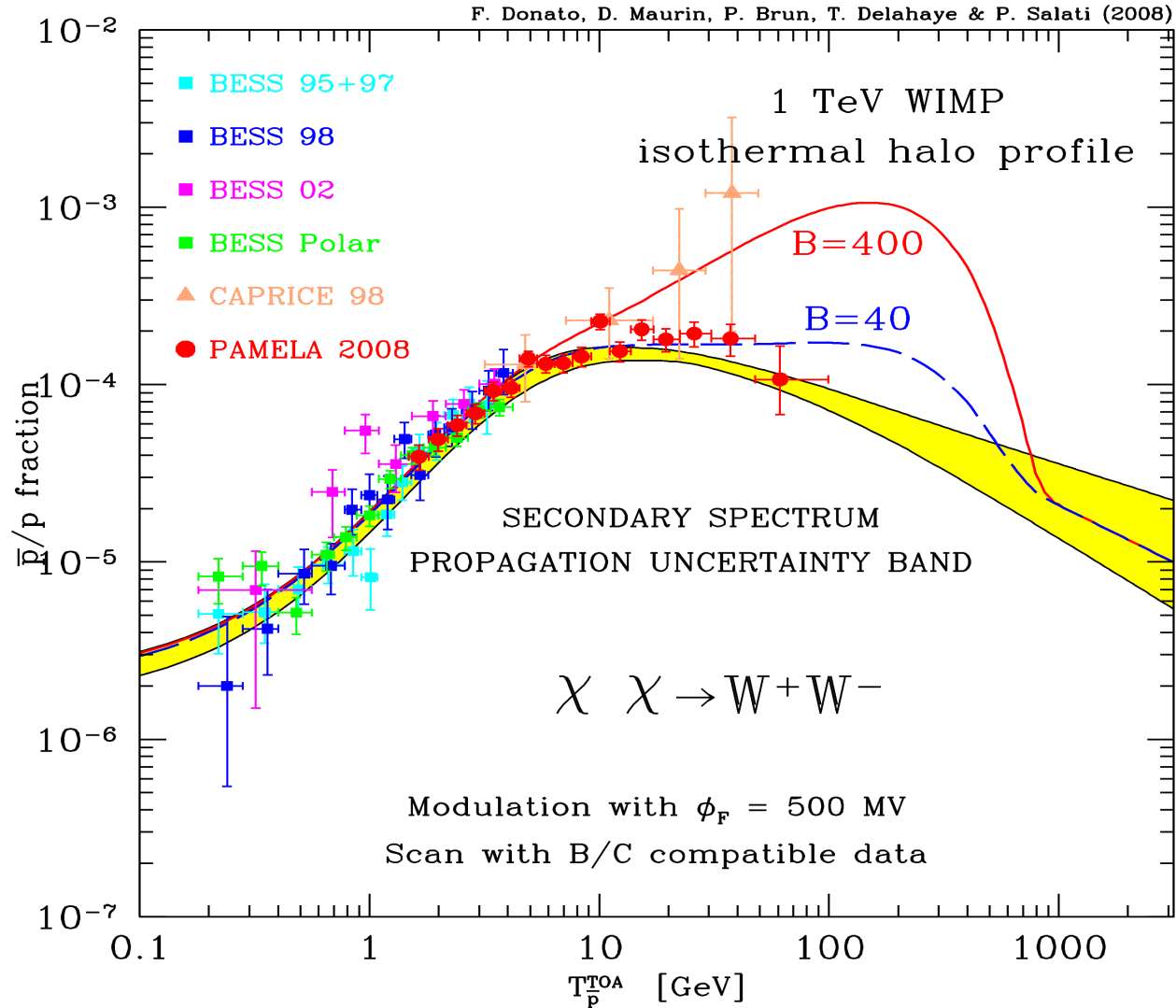
P.Brun&T.D.

CERN courier sep'09

New data



Anti-protons



PRL102
071301,2009

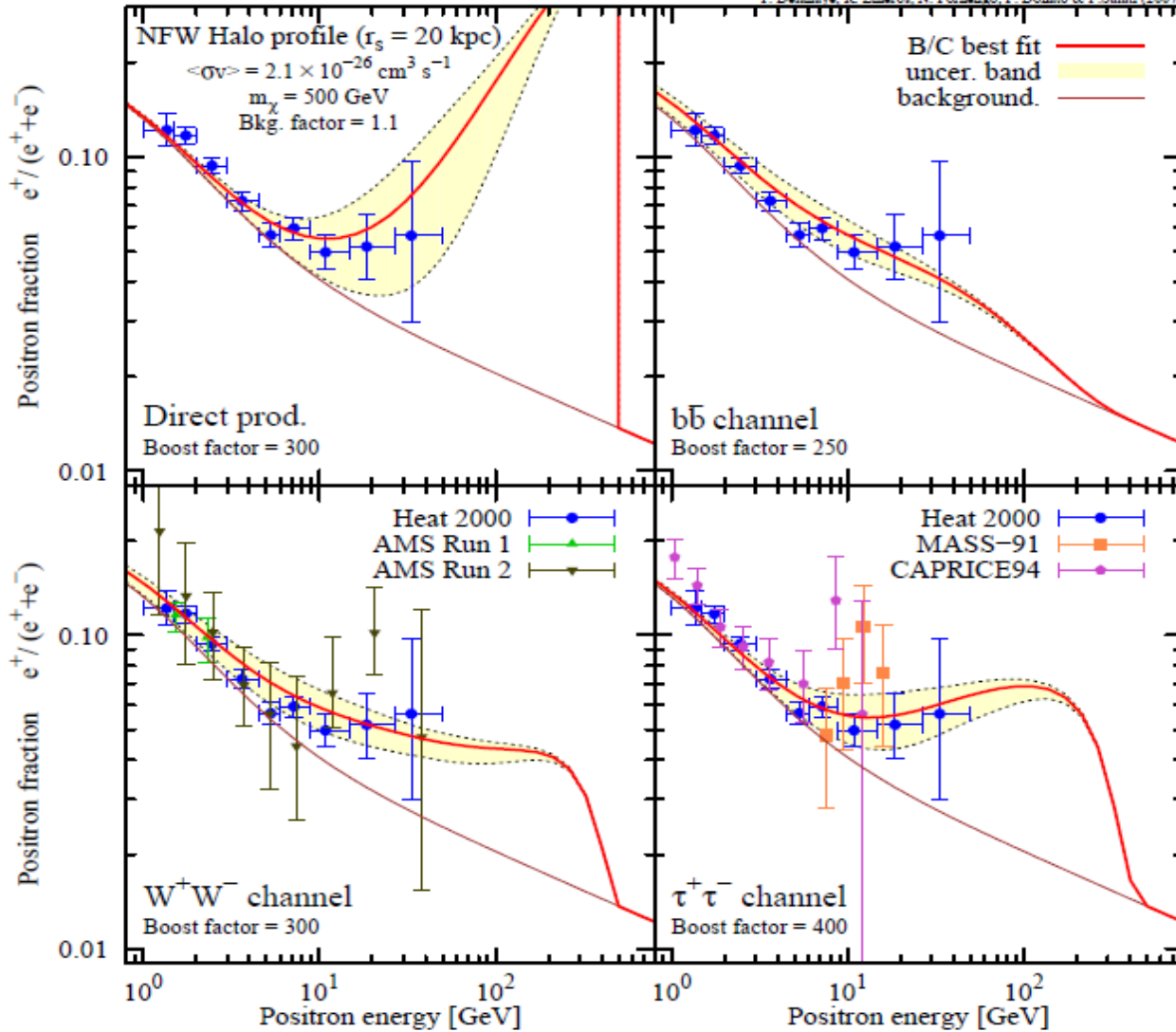
Solutions to the cosmic ray puzzle ?

- **Leptophilic** Dark Matter?
 - Cirelli et al. Nucl.Phys.B813:1-21,2009
- **Pulsars?**
 - Yüksel et alii Phys.Rev.Lett.103:051101,2009
- Secondaries in **Supernova remnants?**
 - Blasi Phys.Rev.Lett.103:051104,2009
 - Ahlers et alii arXiv:0909.4060

Primaries

Dark Matter?

T. Delahaye, R. Linares, N. Fornengo, F. Donato & P. Salati (2007)



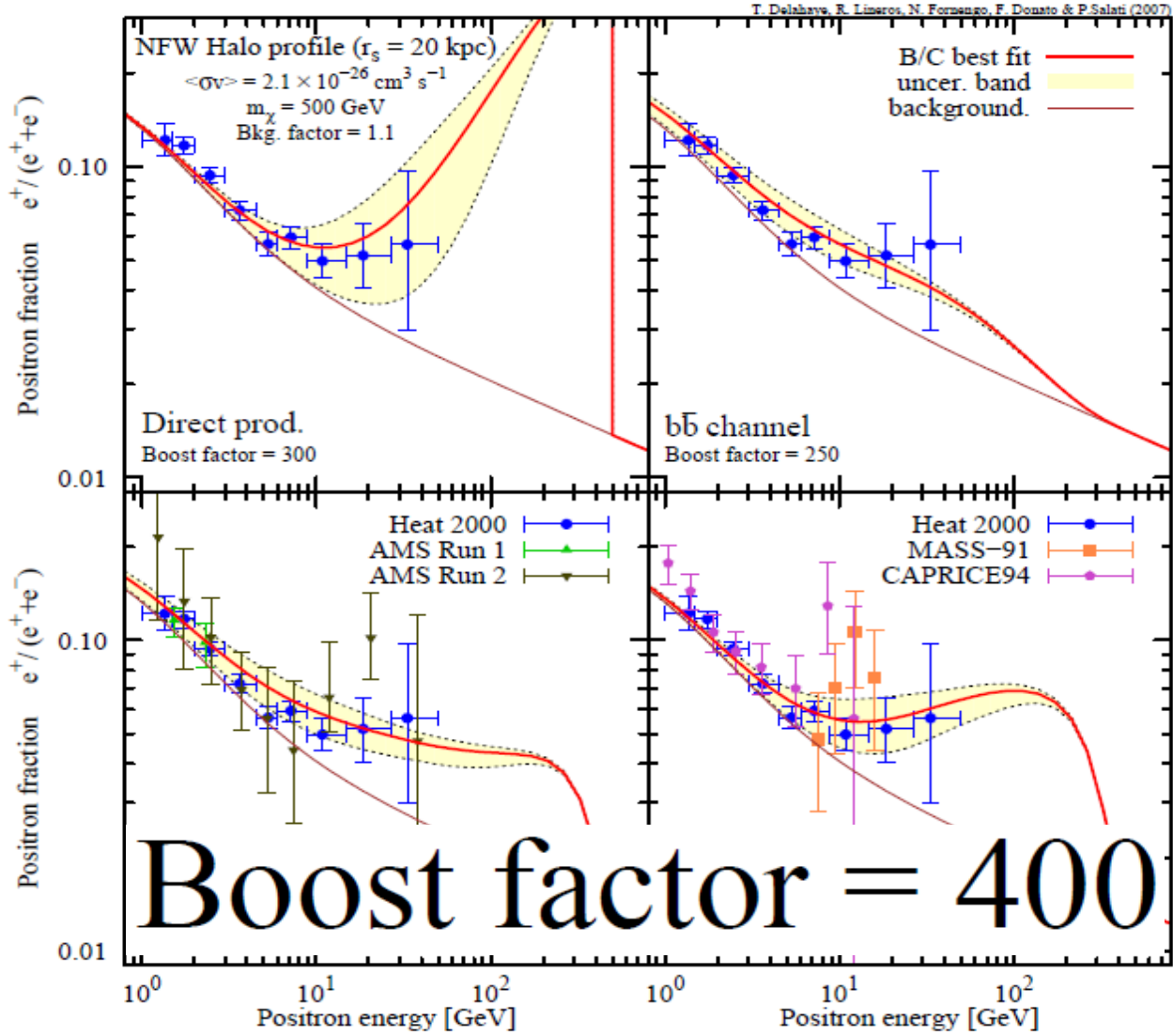
2ndaries from GALPROP APJ 493 (1998) 694

PRD77 (2008) 063527

Primaries

Dark Matter?

2ndaries from
GALPROP
APJ 493
(1998) 694



PRD77 (2008)
063527

Boost Factor(s)

- Particle Physics:
 - Sommerfeld Effect
 - Resonances
 - Exciting Dark Matter
 - ...

!! Warning !!
Naturalness ?

Boost Factor(s)

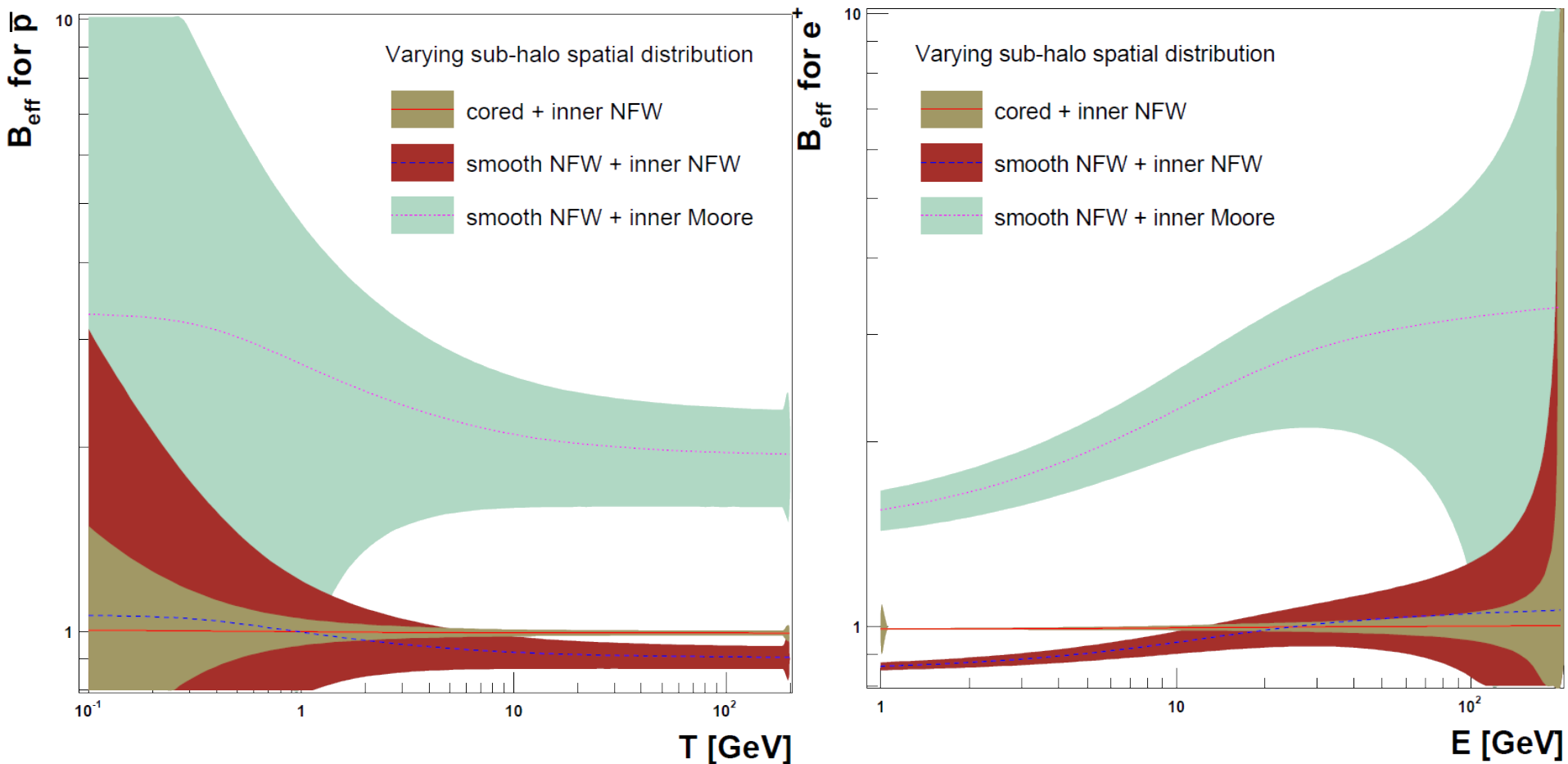
- Astrophysics: Clumps

Limited value: Lavalle et alii A&A 479, 427-452
(2008)



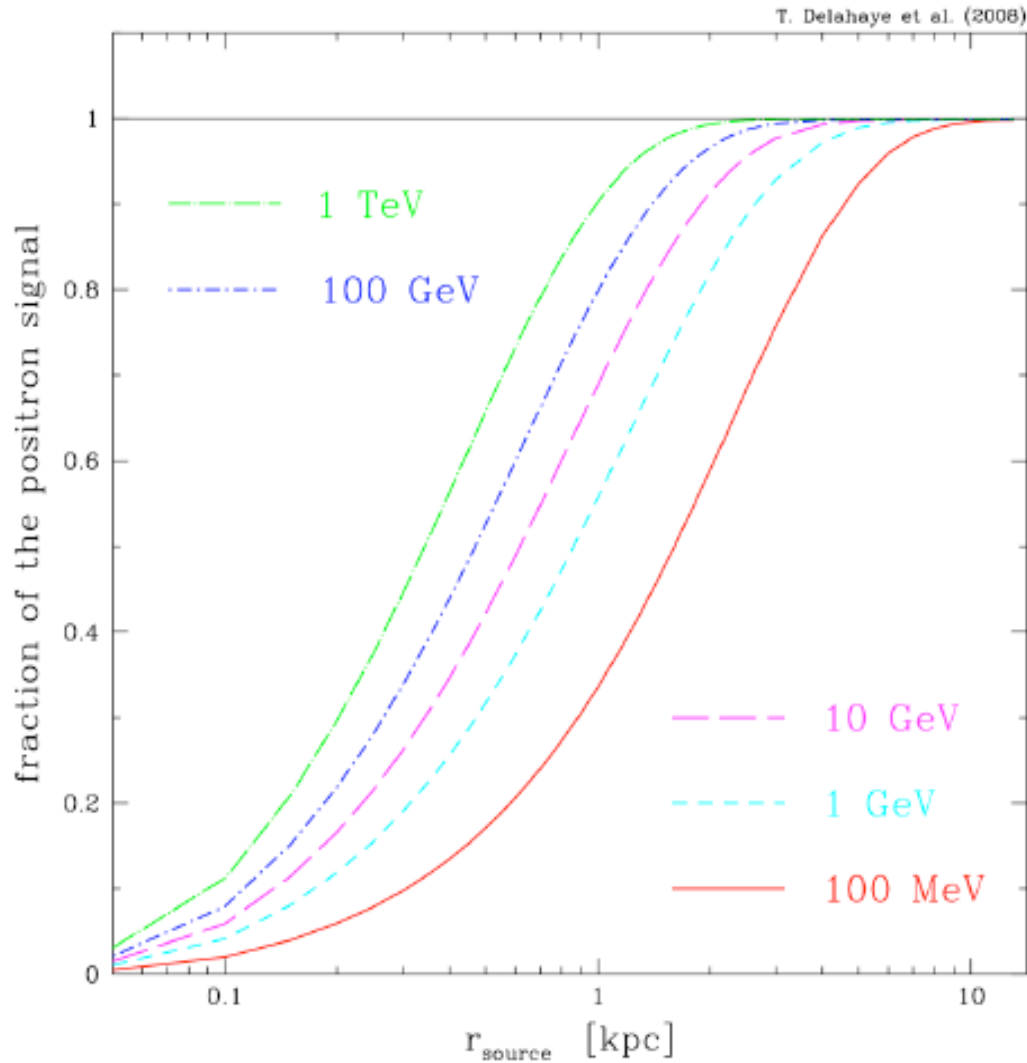
Different for positrons and anti-protons

Astrophysical boost factor



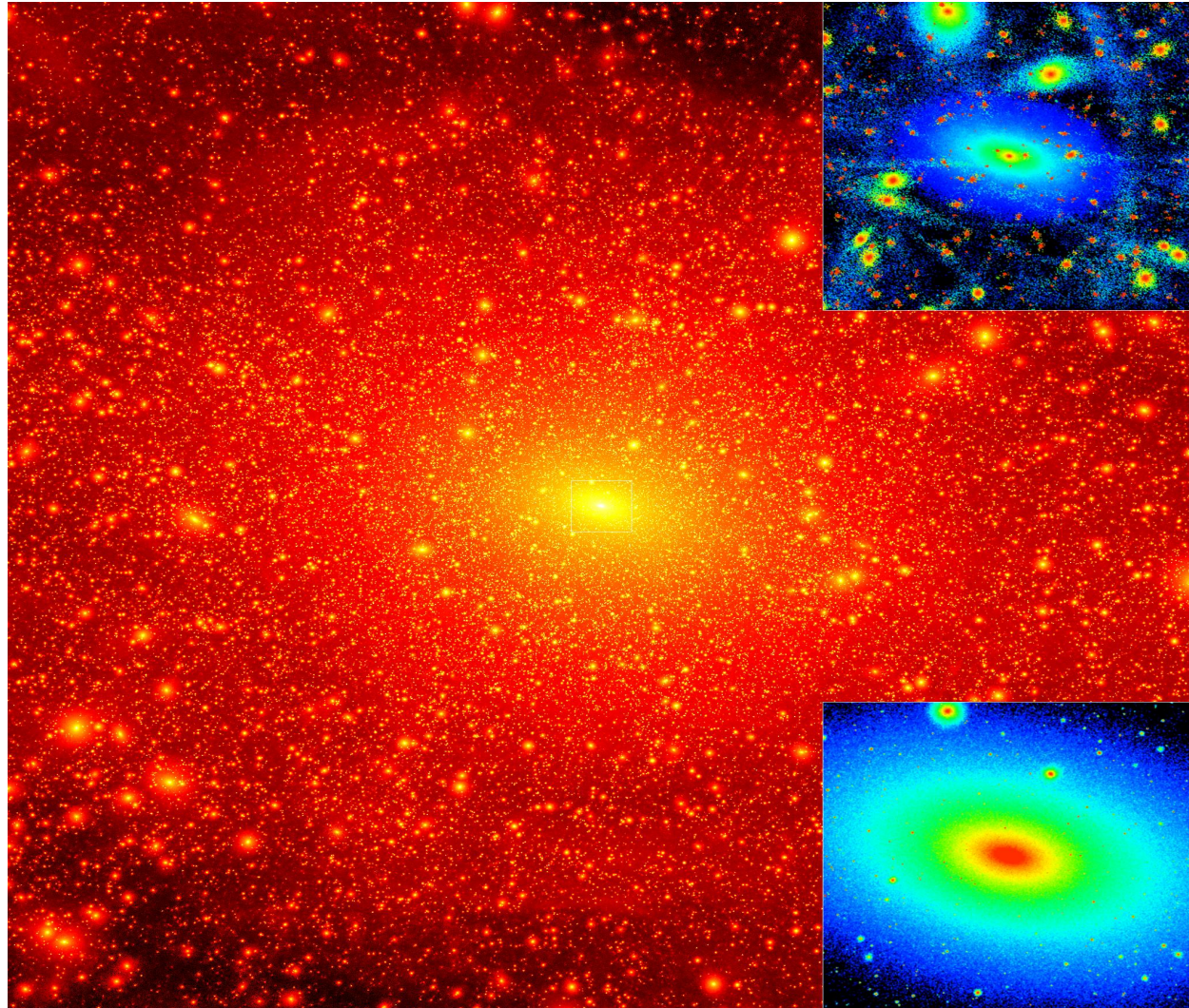
Lavalle et alii A&A 479, 427-452 (2008)

Origin of 2ndary positrons



A&A Volume 501,
Issue 3, 2009

Via Lactea 2

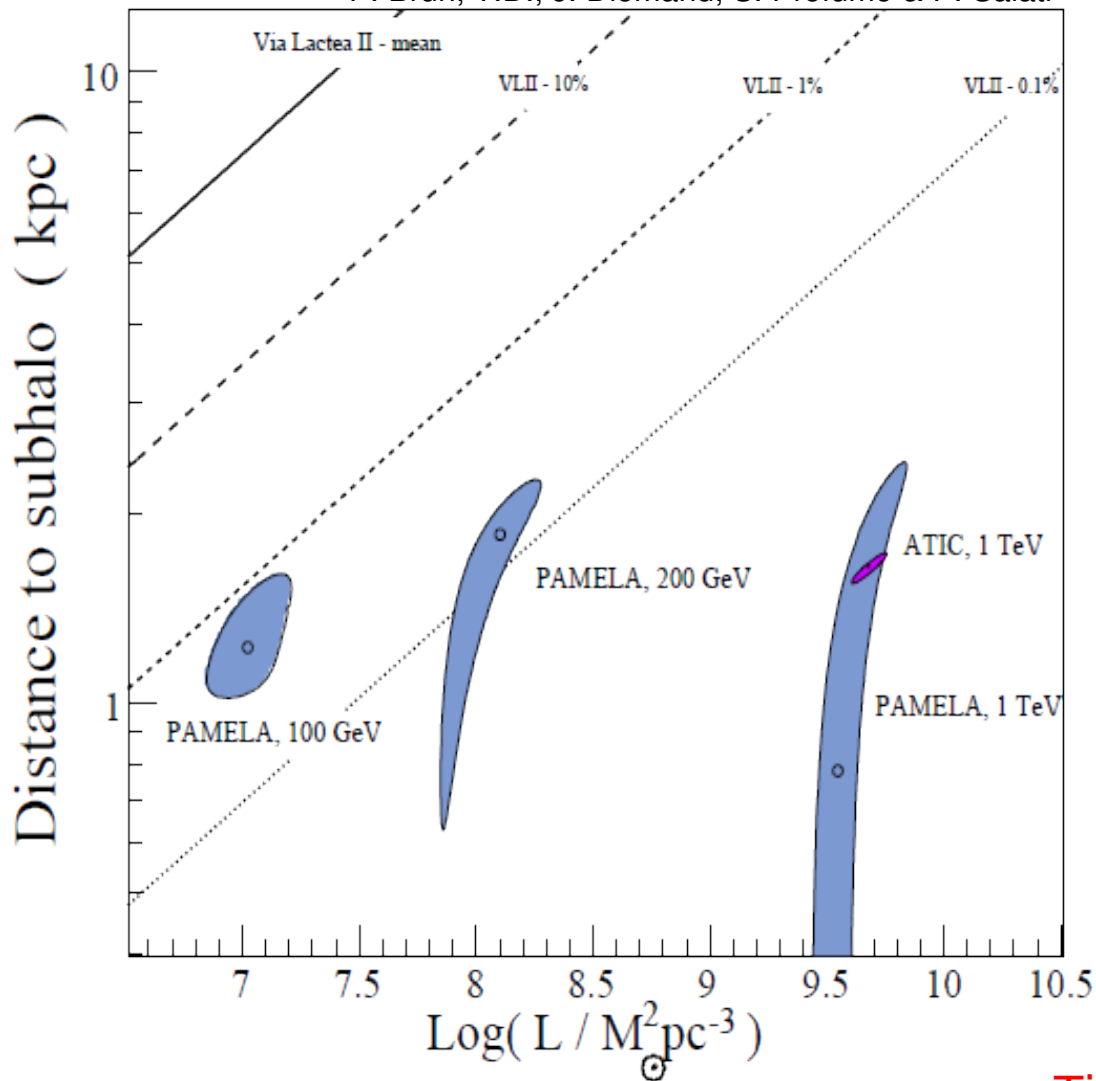


The Graininess of Dark Matter Haloes

Zemp, Diemand, Kuhlen, Madau, Moore, Potter, Stadel, 2009, MNRAS

Clumps

P. Brun, T.D., J. Diemand, S. Profumo & P. Salati

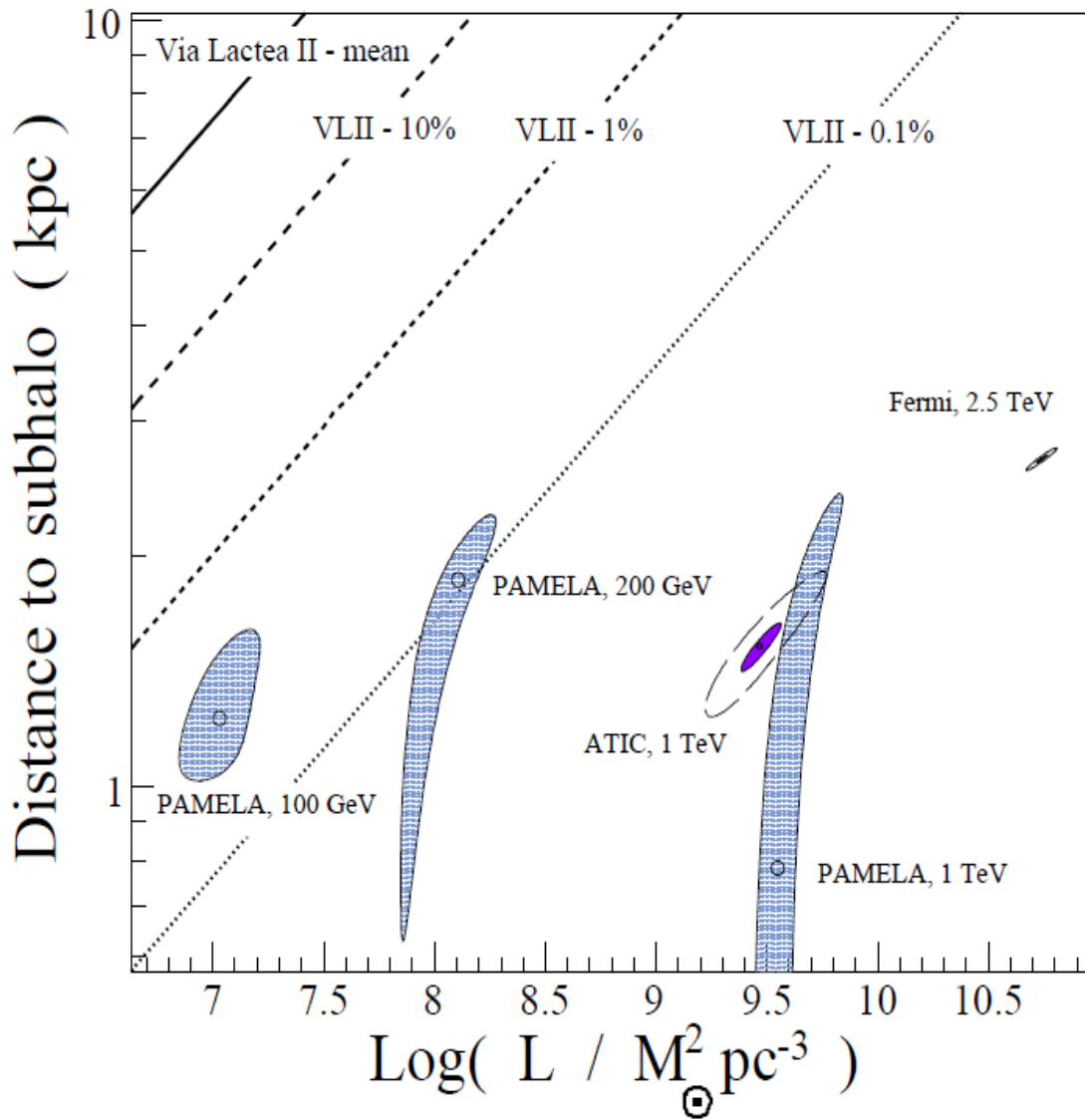


$$e^- \approx E^{-3.3}$$

Phys.Rev.D80:
035023,2009

Clumps

P. Brun, T.D., J. Diemand, S. Profumo & P. Salati

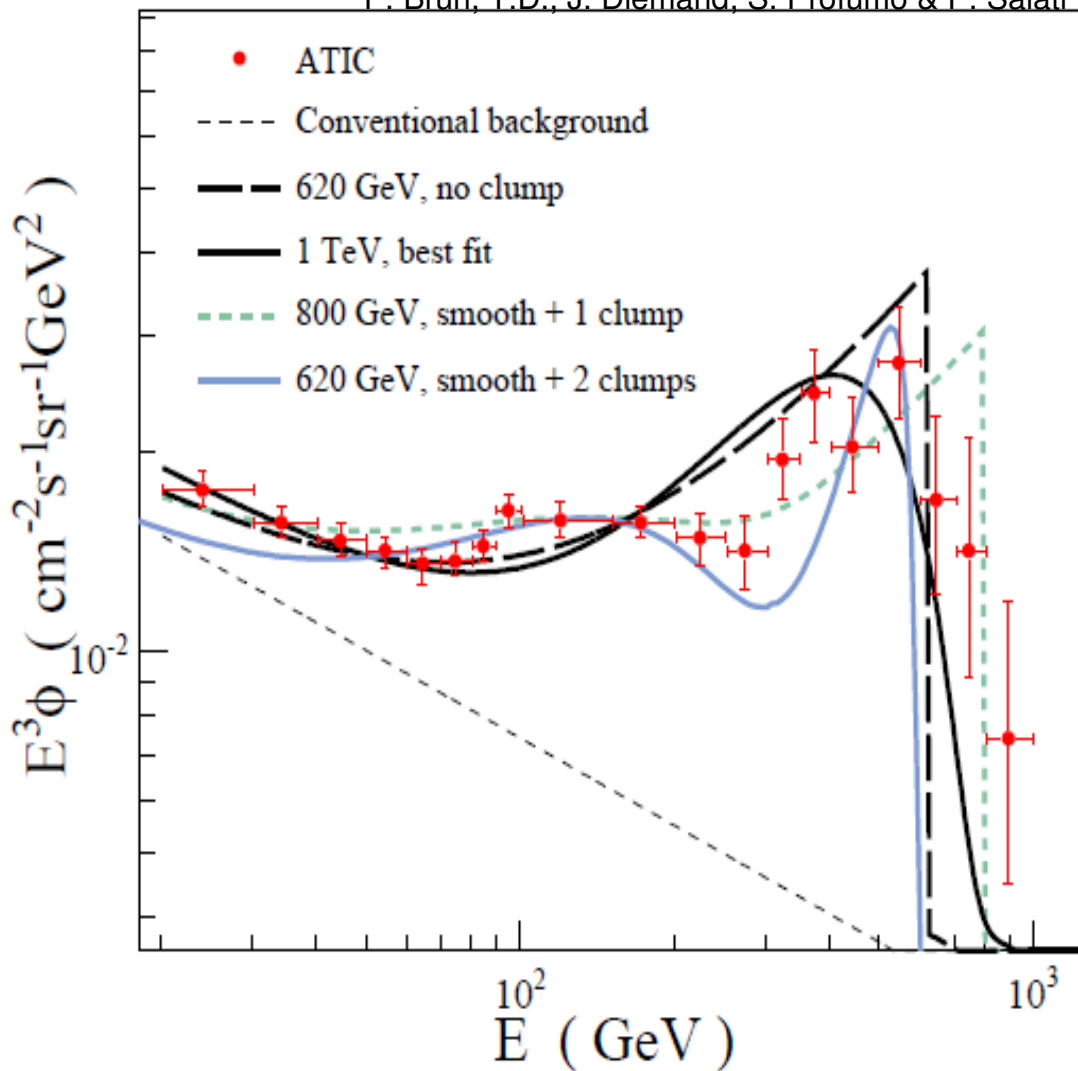


$$e^- \approx E^{-3.1}$$

Phys.Rev.D80:
035023,2009

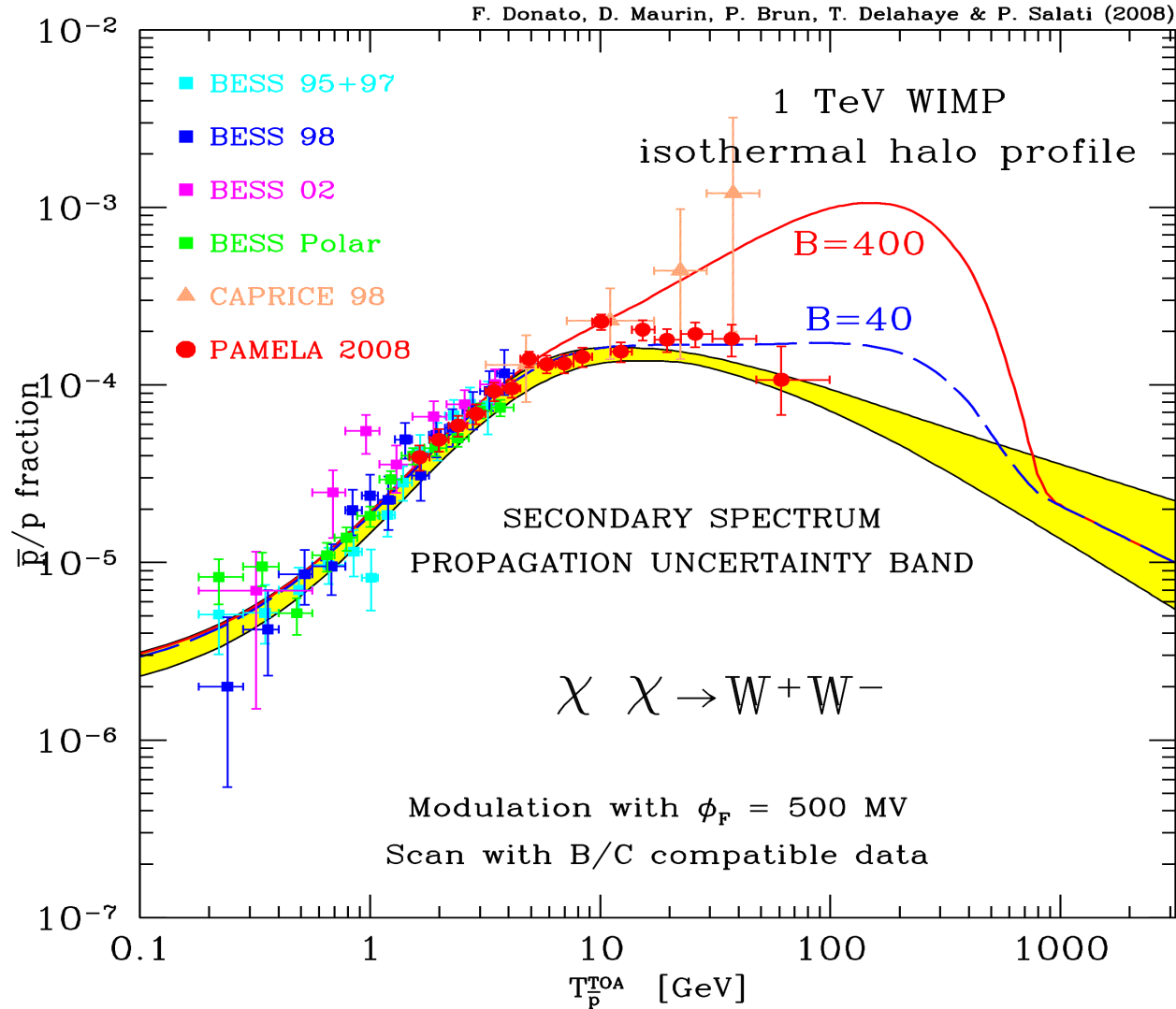
Clumps

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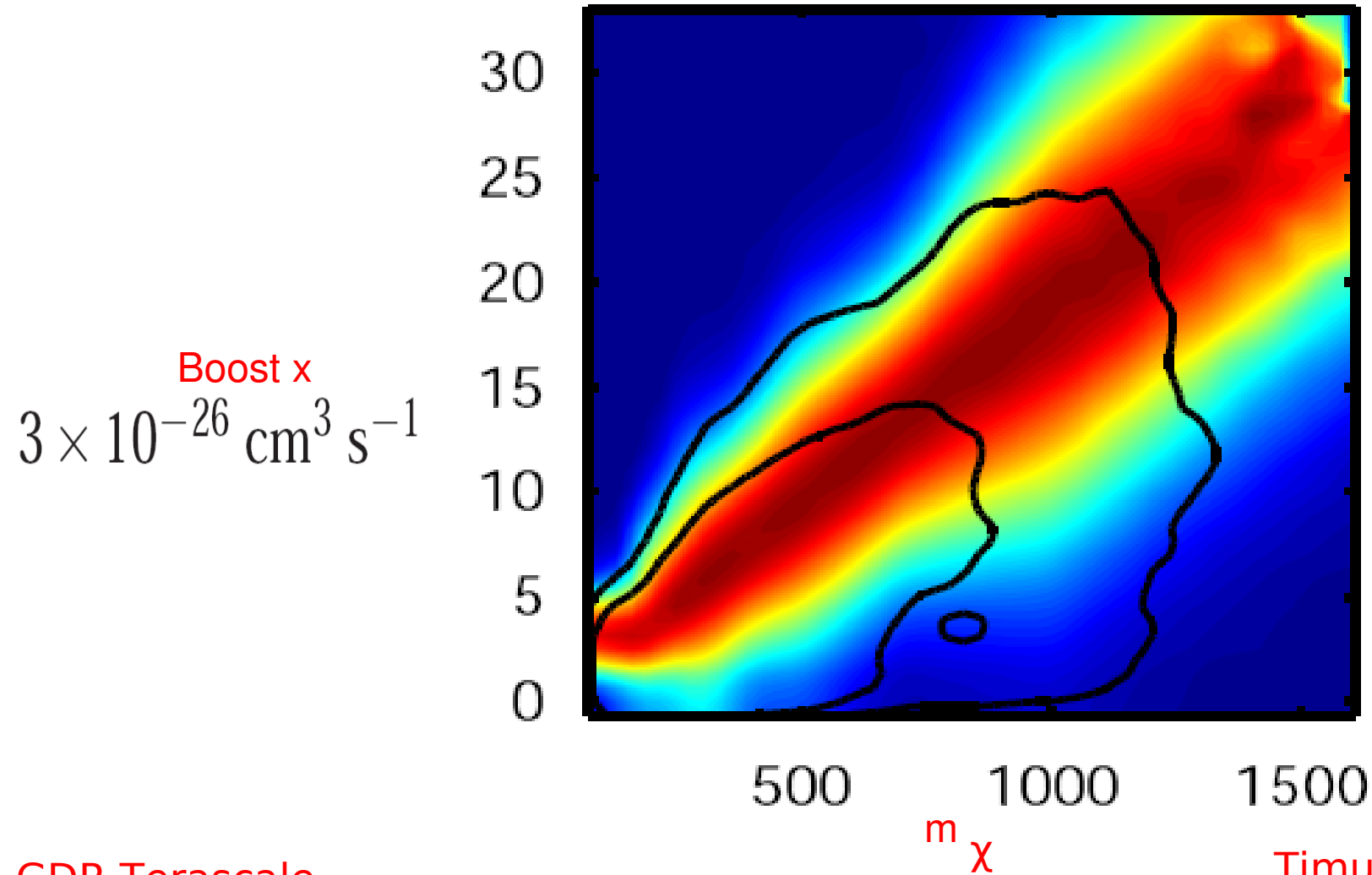
Phys.Rev.D80
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Anti-protons

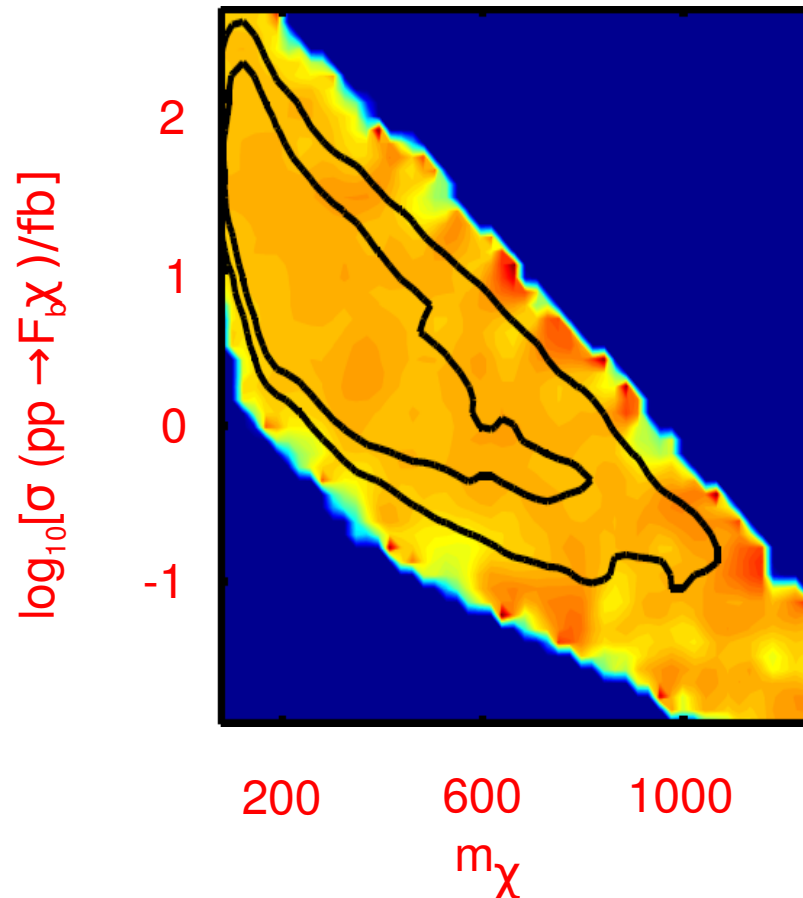


PRL102
071301,2009

Helping LHC?

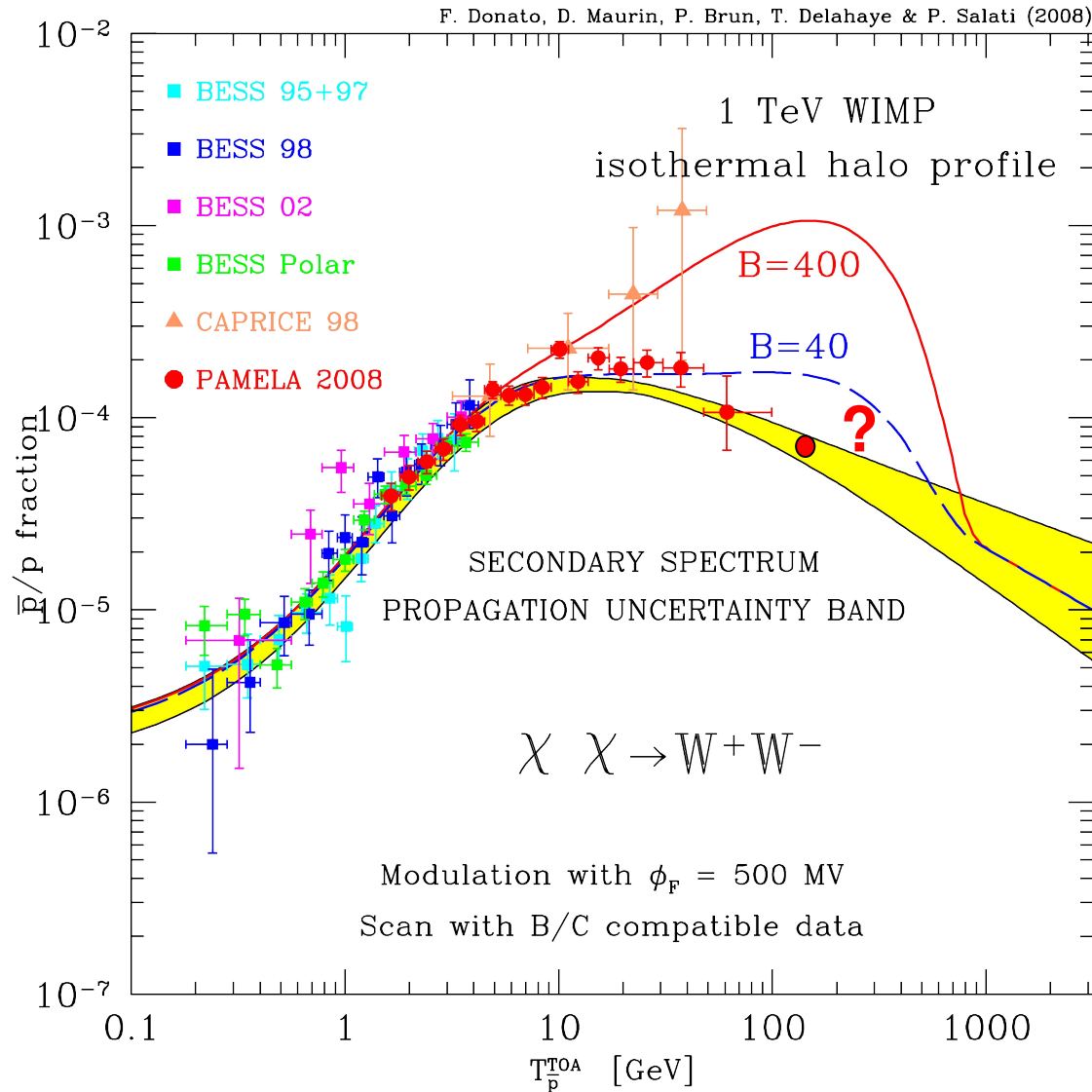


Helping LHC?



Bøhm, TD, Salati, Staub & Singh arXiv:0907.4511 Submitted to JCAP

Anti-protons



PRL102

071301,2009

GDR Terascale

Timur Delahaye

Conclusions

- One local clump could explain the e^+ data
 - But it is **very very unlikely**.
- Boost factor is highly **energy dependent**
 - Signal analysis may be more difficult than expected.
- **pbar** data may be more useful for LHC than e^+