A multi-component model for the interpretation of Astrophysical neutrinos

(Palladino-Winter, arXiv:1801.07277, accepted for publication in A&A)

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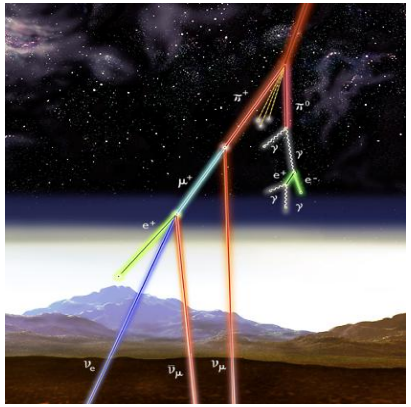
HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

The origin of the observed astrophysical neutrinos remains a mystery. There are many open issues:

- different spectra observed using HESE and throughgoing muons
- galactic neutrinos. Are they present or not ?
- no point sources have been resolved
- a 4.5 PeV tracks has been detected, produced by an about 10 PeV neutrinos —> more than 100 PeV proton. What is the source and mechanism of production of this very energetic neutrino ?

A single power law flux cannot address all open questions at the same time

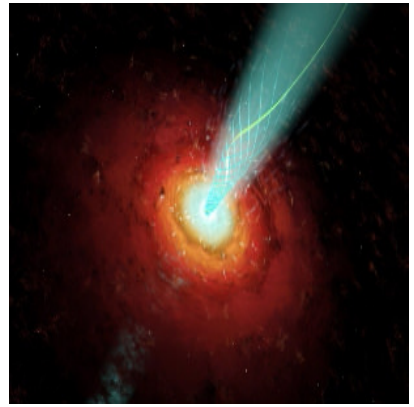
Residual atmospheric background



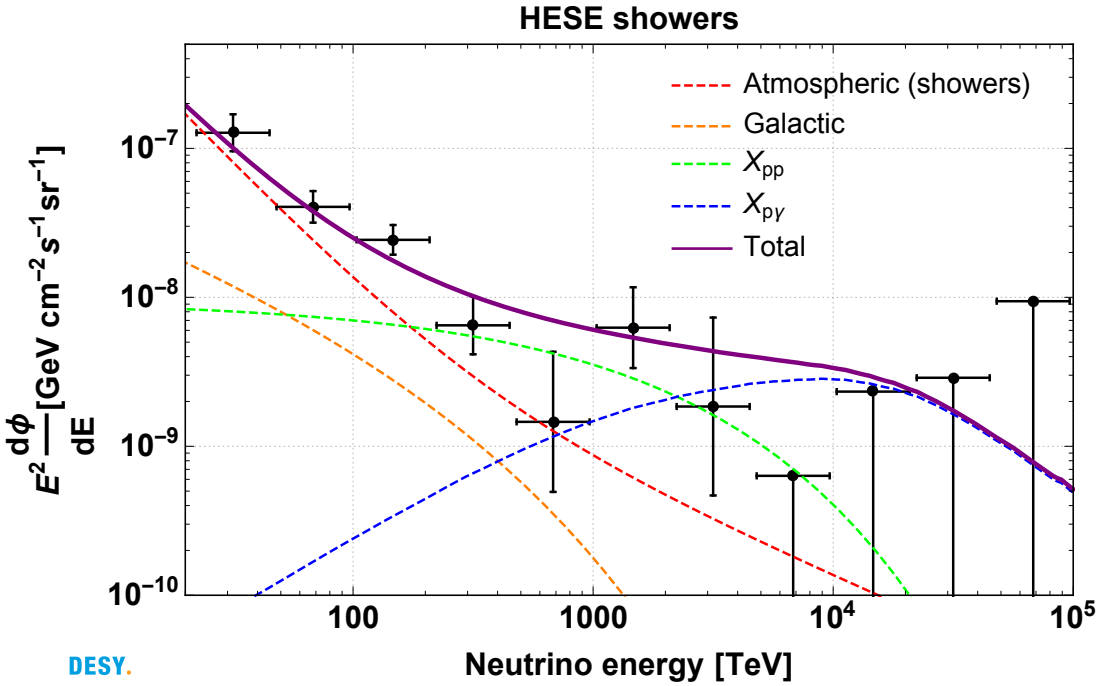
Galactic neutrinos

Neutrinos from pp interaction (SBGs ?)

Neutrinos from pgamma interaction (Blazars ?)



Name	Production mechanism	Spectral index	Angular	Energy	Possible sources
Residual atmospheric	Pion/kaon decays, charm decay, atmospheric muons	3.7 (conv.), 2.7 (charm)	Almost isotropic	< 100 TeV	Atmospheric neutrinos
Galactic	Ap or pp interaction	about 2.6	Not isotropic (Galactic plane ?)	< few hundreds of TeV	Cosmic ray interaction with gas + point sources
Xpp	Ap or pp interaction	2	Isotropic	200 TeV - 1 PeV	Starburst galaxies, radio galaxies, AGN winds
Xpg	Agamma or pgamma interaction	<< 2	Isotropic	above 1 PeV	TDE, Blazars, Low luminosity GRB



- A multi-component model can naturally interpret the spectrum of high energy neutrinos.
- It solves the issues presented in the previous slides, reconciling all the available observations

Reconstructed data points, obtained with the procedure described in arXiv:1801.07277