

# Cosmic Rays and Neutrinos in Paris

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A list of questions to try and stimulate today's last session  
(plus a special one, which I have been trying  
to get answered for many years).

With many thanks to the Organizers for the invitation  
and to the Speakers for a beautiful scientific day spent together.

- Do we all agree that the discovery of non-atmospheric neutrinos has already been made?
- Further testing of IceCube's experimental results is *necessary* or it is simply very *desirable*?
- If so, what are the key quantities that we should verify better with the highest priority?
- How essential is to improve the angular resolution?
- How convincing are the cases of hadronic sources from  $\gamma$  ray data?
- ★ Are the expectations of 3 flavor oscillations reliable?
- ★ Do the 'track' and 'shower' datasets of IceCube fit in a consistent interpretation?
- ★ How important is to search for charm-neutrinos? Is it likely to test the cosmic ray knee?
- ★ Is the astrophysical origin of the new component a convincing hypothesis?
- ★ What are the most promising sources? Which next steps do they suggest?
- ★ How large are theoretical uncertainties? (Are we all confident with Poisson statistics?)
- ▽ What do we know *for sure* about the new component seen by IceCube?
- ▽ Do we see a power spectrum in some range? Are there features at low / high energies?
- ▽ Is angular distribution *fully* isotropic? How crucial is observing from northern hemisphere?
- ▽ How to compare time dependent and independent signals?
- ▽ Is multi-messenger approach good *per se* or theory/template is necessary?
- ▽ What input we need: more CR studies? 0.01-1 PeV  $\gamma$ ? X, IR... ordinary astronomy?

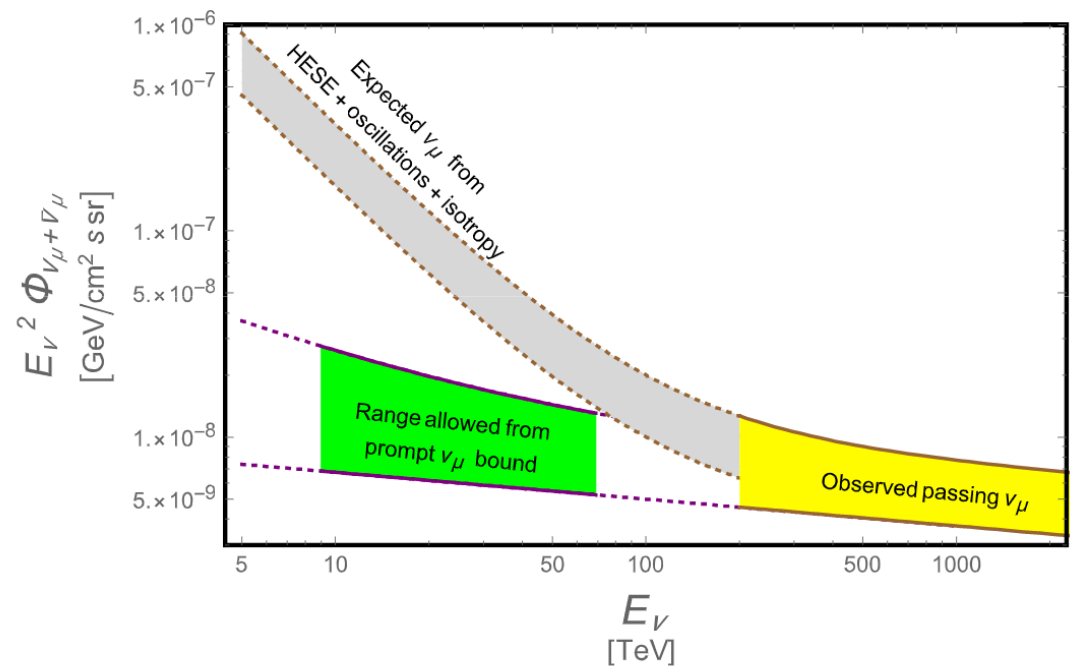
# TESTING HESE WITH MUONS BELOW 0.2 PEV

If the HESE flux is isotropic it should be also in the Northern sky

If neutrino oscillate on cosmic scales, electron tau and muon neutrinos are almost the same

Expectation: there are muon neutrinos from Northern sky also below 0.2 PeV

Remark: IceCube searched in this dataset for atmospheric prompt neutrinos, w/o success



Palladino et al 2017