# *Constraining the origin of UHECRs and astrophysical neutrinos*

## Executive Summary

Marco Muzio* (NYU), Glennys Farrar (NYU), Michael Unger (KIT)

### *What is the contribution about?*

A multimessenger analysis into properties of ultrahigh energy cosmic ray (UHECR) sources, their ability to explain astrophysical neutrinos, & to infer preferred candidate source types.

### *Why is it relevant/interesting?*

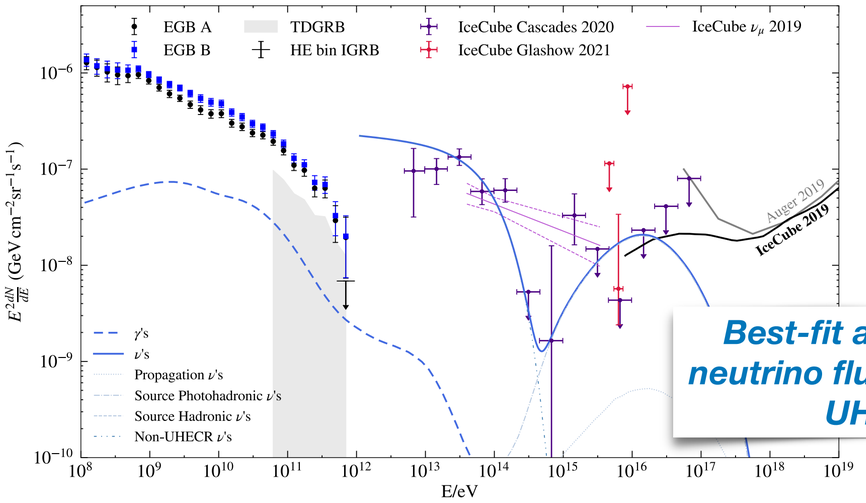
The origin of UHECRs is a longstanding problem but here we make new progress, while also probing astrophysical & particle physics processes.

### *What has been done?*

We have conducted a fully consistent multimessenger analysis using a newly elaborated phenomenological UHECR source model to infer constraints and determine preferred astrophysical properties with an MCMC.

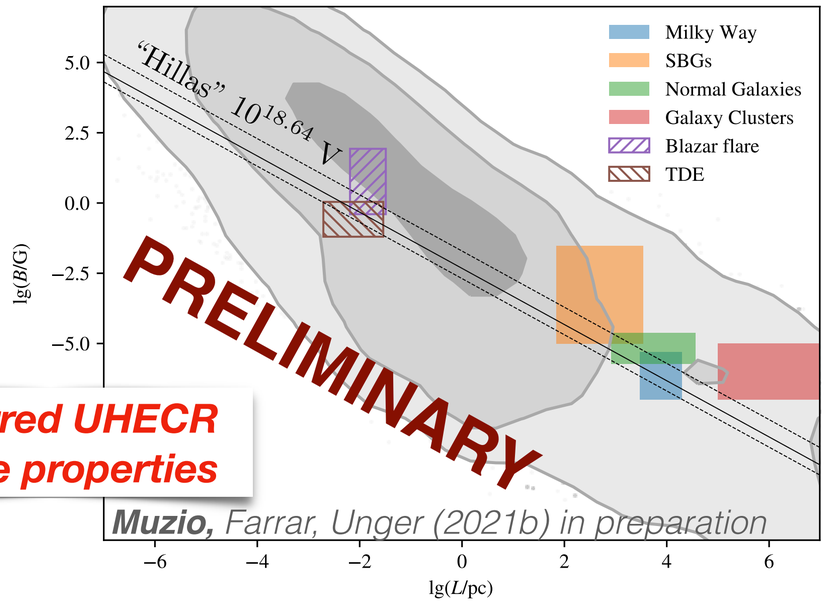
### *What is the result?*

- UHECR data can be explained by both gas- and photon-dominated source environments, but **gas-dominated sources are in tension with neutrino bounds**
- **~10 PeV neutrinos will determine the viability of** conventional acceleration mechanisms producing soft spectral indices, like **diffusive shock acceleration**
- Only astrophysical neutrinos above ~1 PeV can be explained by UHECR sources
- Data prefers small (< 10 pc) sources with strong (>1 mG) magnetic fields, similar to TDEs & AGN




***Best-fit astrophysical neutrino flux produced by UHECRs***

***Muzio,*** *Farrar, Unger (2021a) in preparation*




***Preferred UHECR source properties***

***Muzio,*** *Farrar, Unger (2021b) in preparation*