

Dark Matter search with neutrino telescopes through Angular Power Spectrum

Ariane Dekker

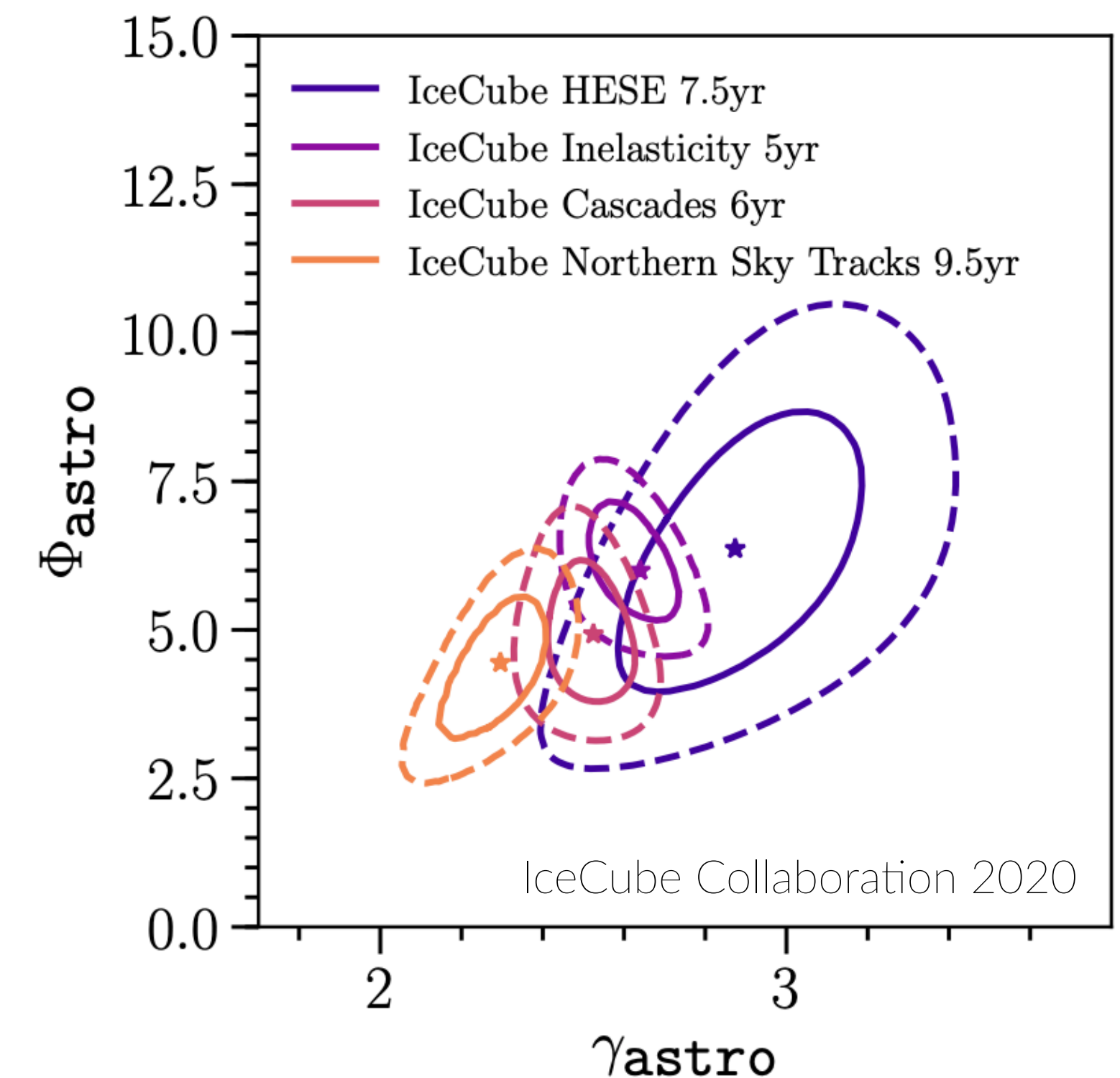
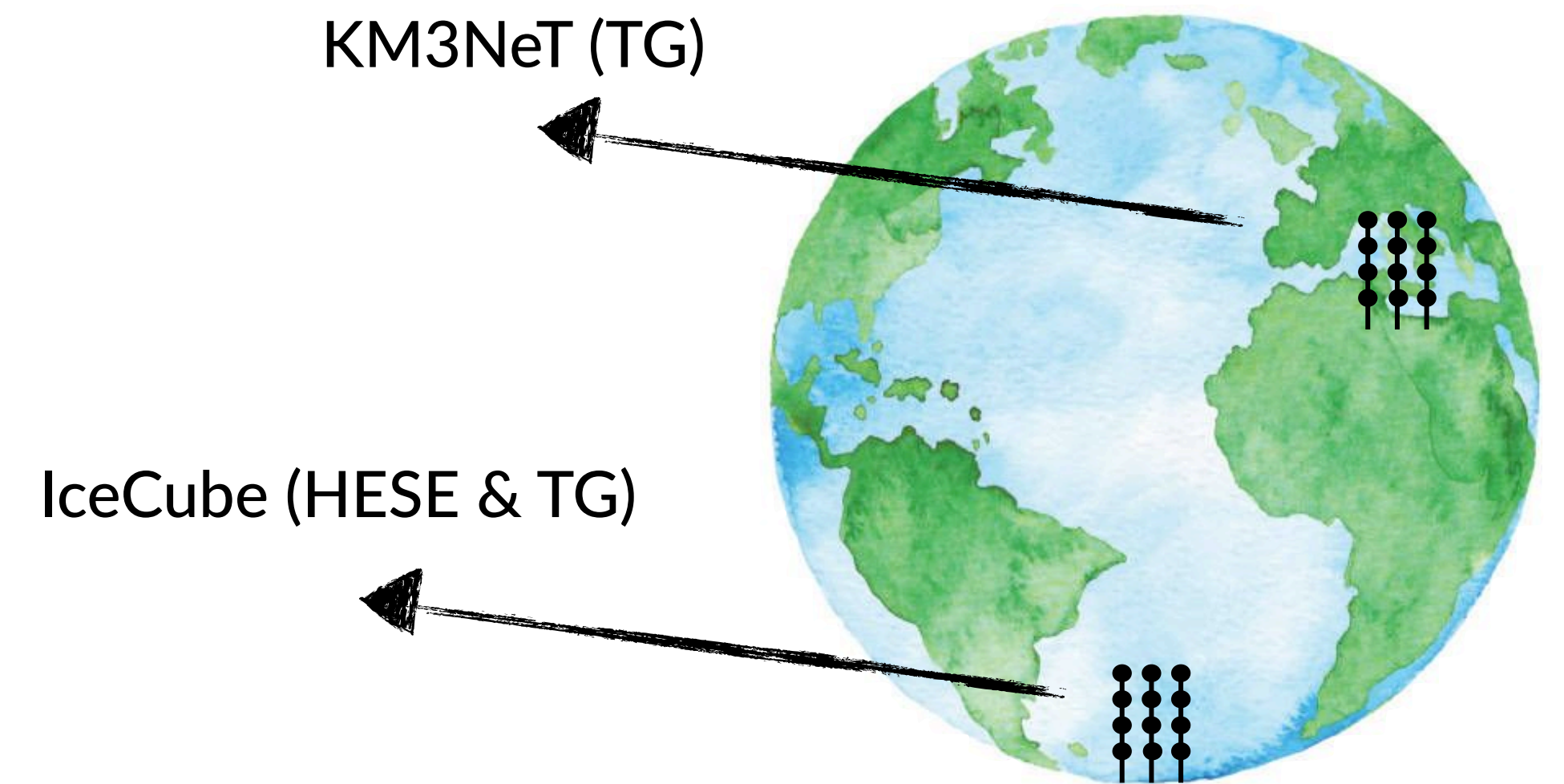
XIX International Workshop on Neutrino Telescopes



Ariane Dekker, Marco Chianese, Shin'ichiro Ando
JCAP 09 (2020) 007
arXiv: 1910.12917

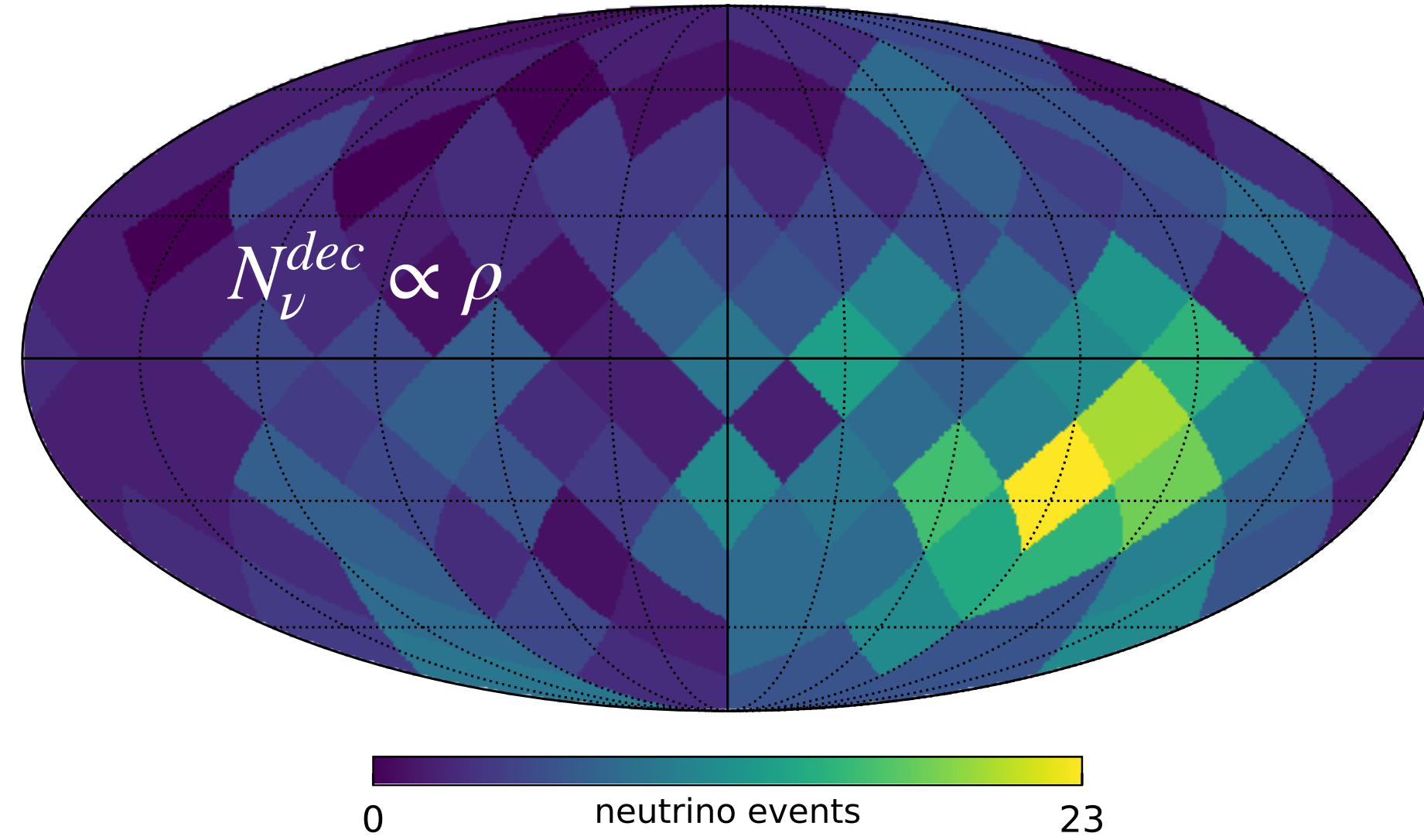
Motivation

- ν - IceCube observations:
No point sources — Spatial distribution isotropic
Suggesting an EG origin, produced at CR accelerators
- ν - Slight tension between HESE (full sky) and
Through-Going (Northern hemisphere)
- ν - Could be explained by additional component in
HESE data
- ν - Dark Matter decay/annihilate $\rightarrow$ produce HE
neutrinos
- ν - Spatial correlation with Galactic Centre $\rightarrow$
anisotropic feature
- ν - Constrain DM parameters with IceCube,
IceCube-Gen2 & KM3NeT



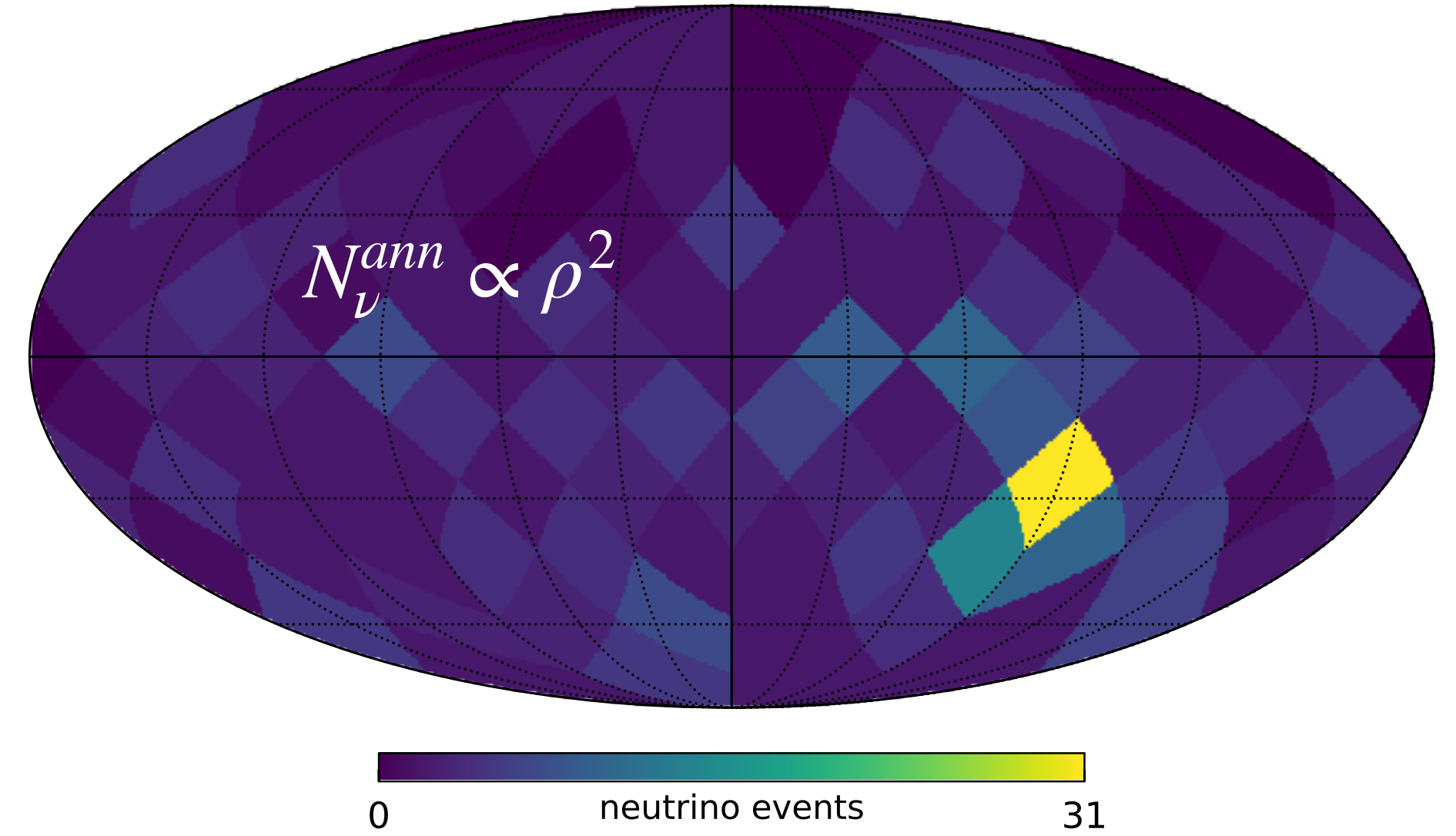
Model

Decaying DM + Astrophysical flux TG best fit



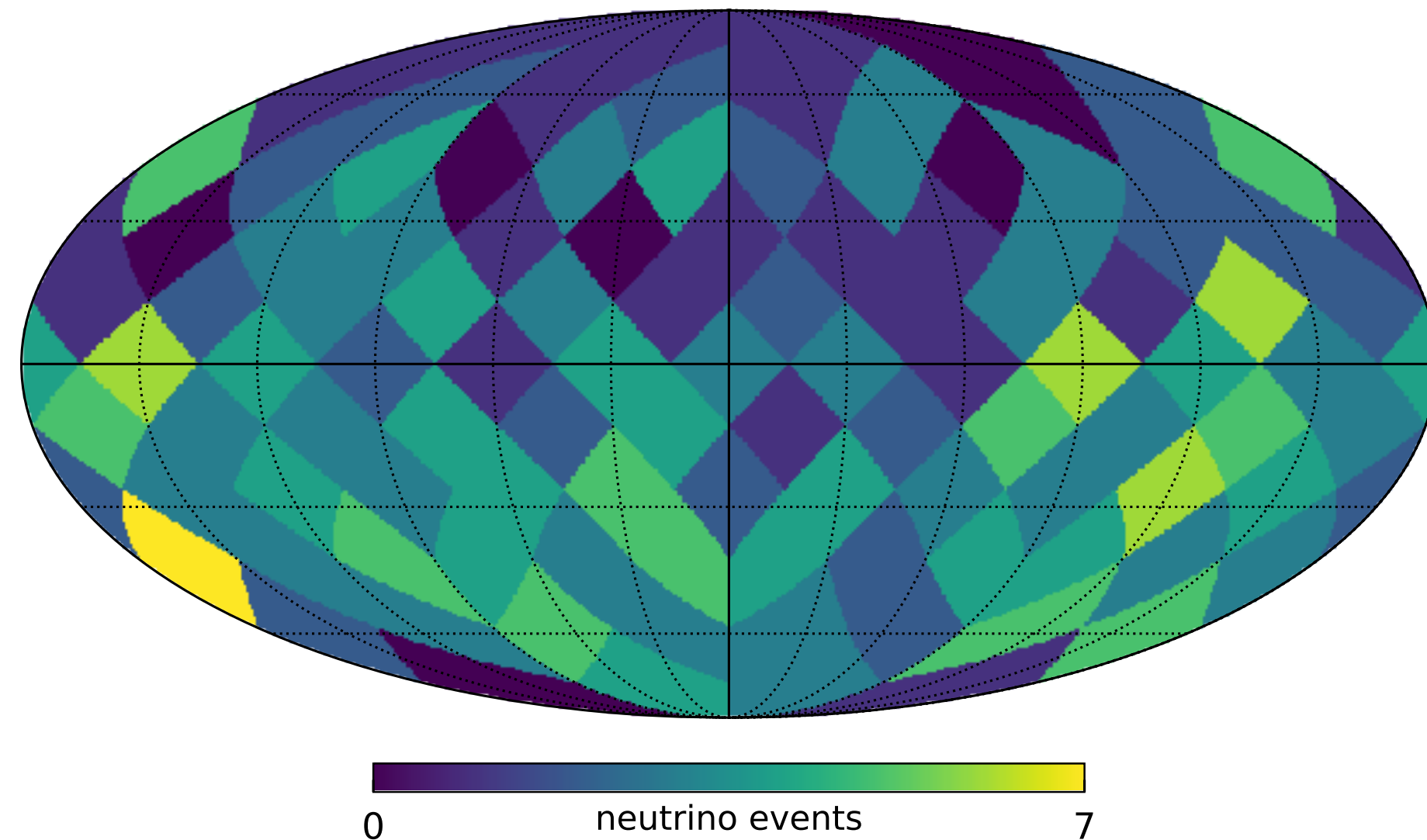
Model

Annihilating DM + Astrophysical flux TG best fit



Null hypothesis

Astrophysical flux HESE best fit



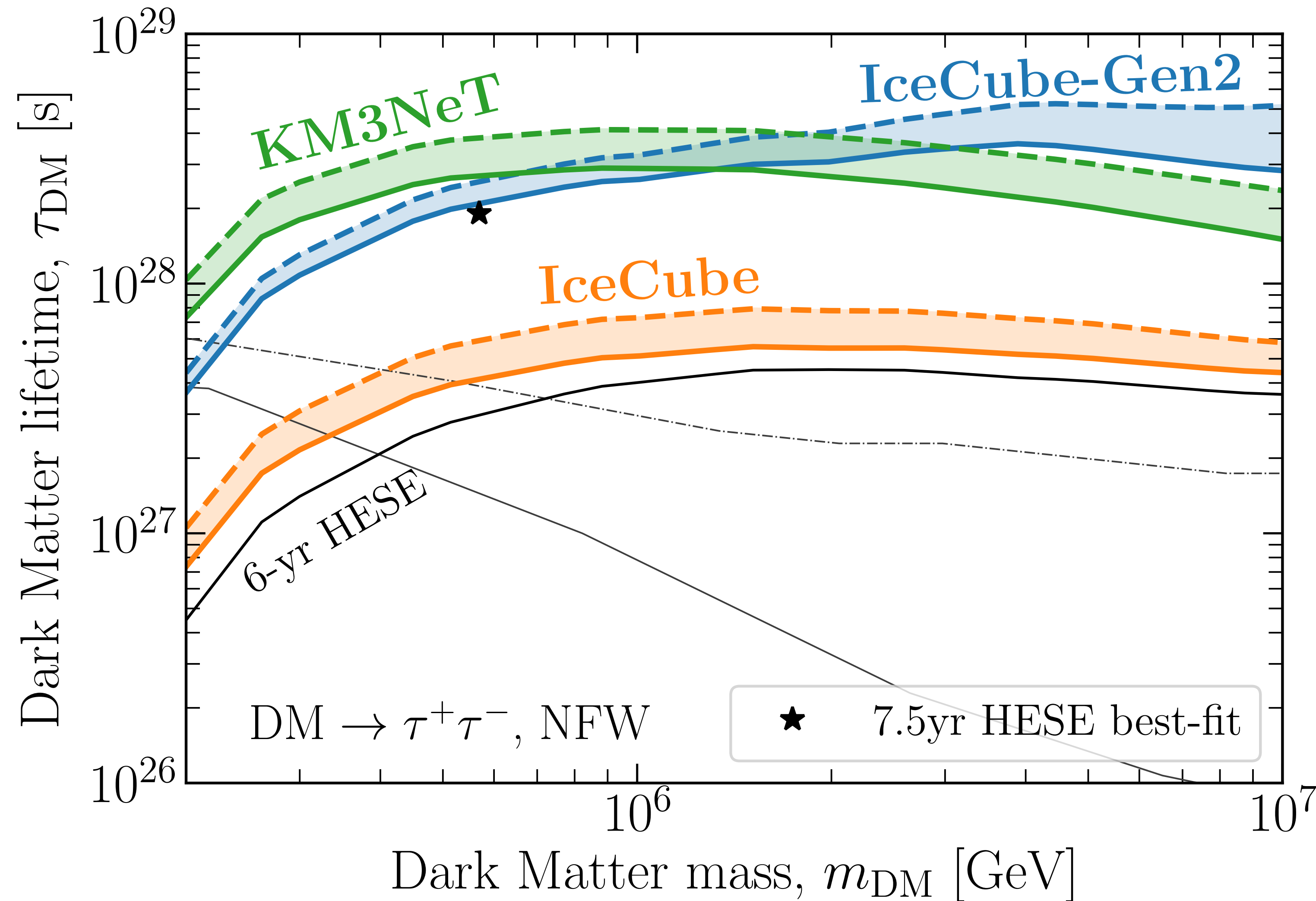
Angular Power Spectrum

$$N(\theta, \phi) = \sum_{lm} a_{lm} Y_{lm}(\theta, \phi)$$

$$C_l = \frac{1}{2l+1} \sum_{m=-l}^l |a_{lm}|^2$$

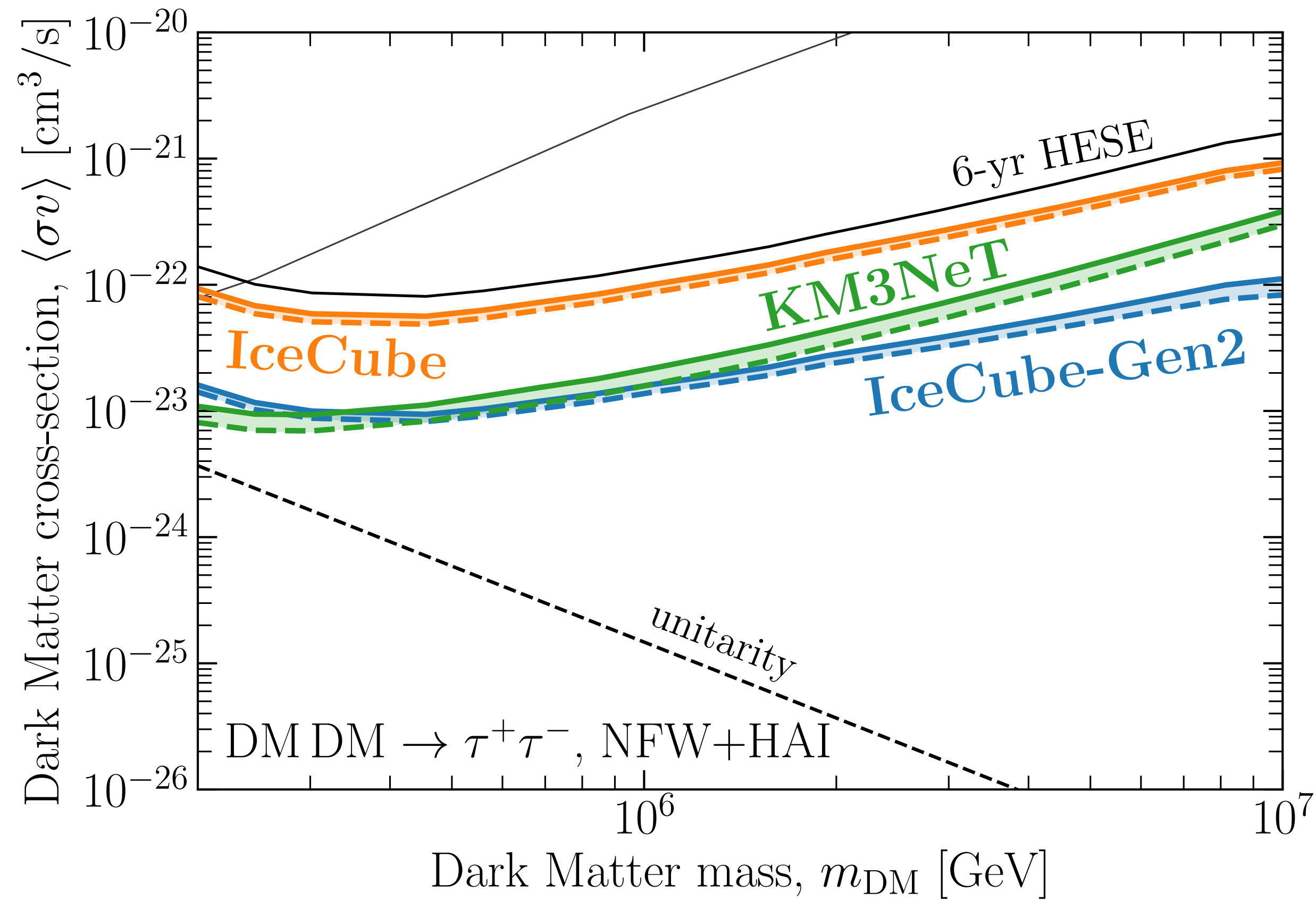
Monte Carlo simulations & χ^2 -analysis

Decaying DM 10-yr Sensitivity



- ν - Benchmark model DM $\rightarrow \tau^+ \tau^-$
- ν - Exclusion at 95% CL after 10 years
- ν - Current best fit for DM
- contribution based on 7.5 yr HESE ★
Chianese et al. JCAP 1911 (2019)
- ν - Gamma-ray constraints
Abeysekara et al. JCAP 1802, 049 (2018) & Cohen et al. Phys. Rev. Lett. 119, 021102 (2017)

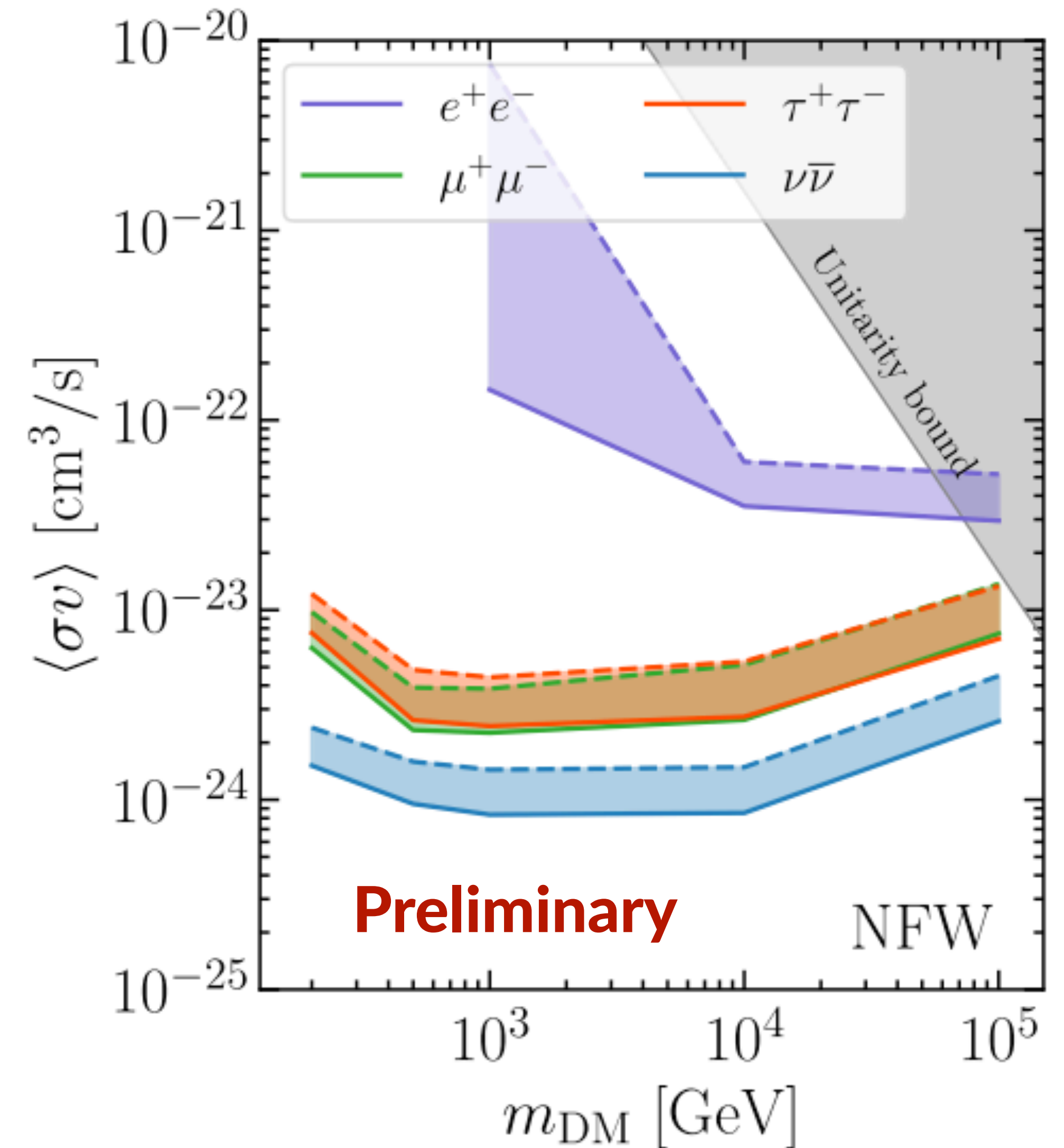
Annihilating DM 10-yr Sensitivity



ν - Annihilation constrained by unitarity limit

ν - Extend to lower mass with KM3NeT:

$$m_{\text{DM}} = 200\text{GeV} - 10\text{ TeV}$$



Take home message

- ν - Tension in IceCube data could be explained by additional DM component
- ν - Solid constraints on DM parameters by using angular information only
- ν - Stay tuned for new work probing smaller DM mass with KM3NeT

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Thank you for your attention