



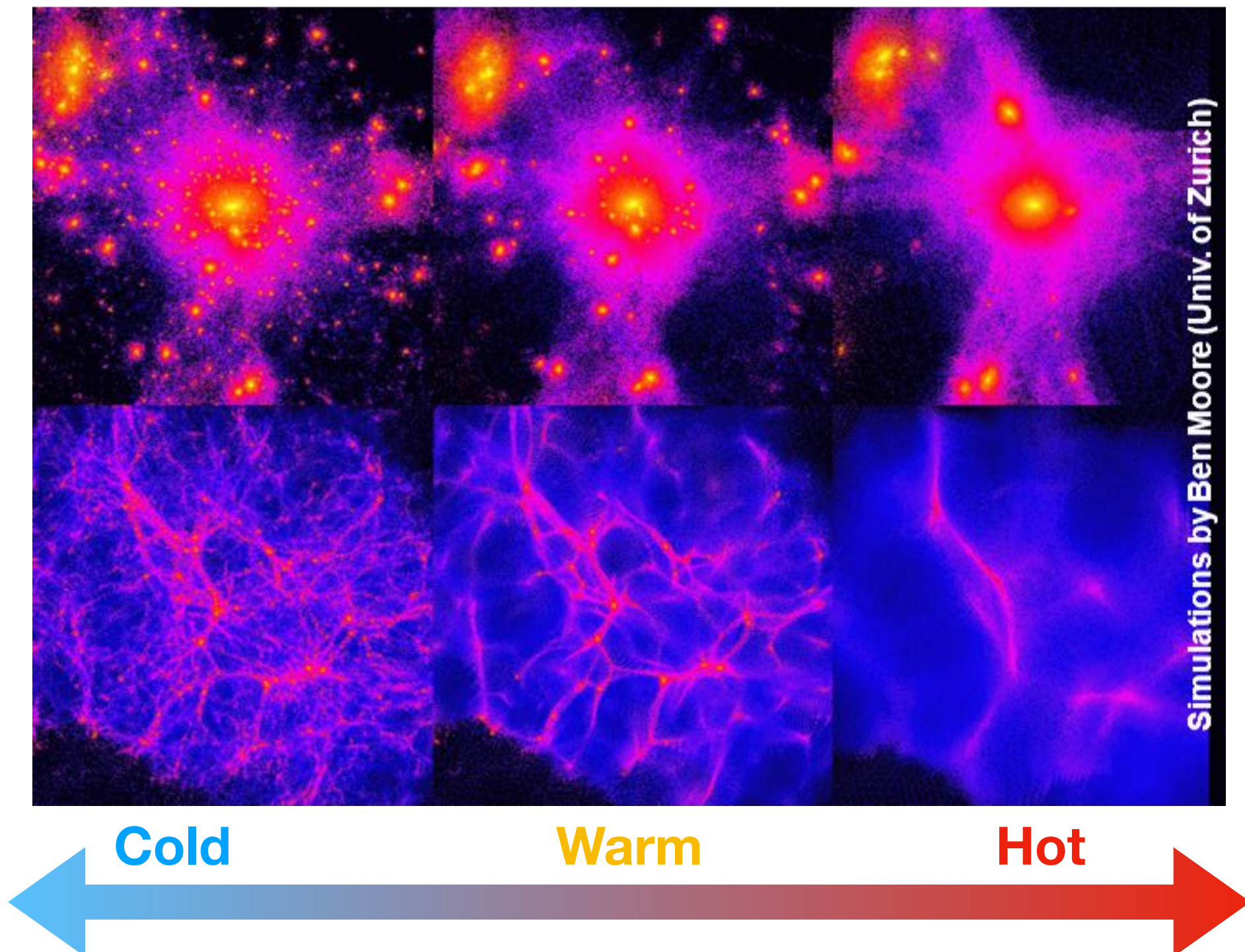
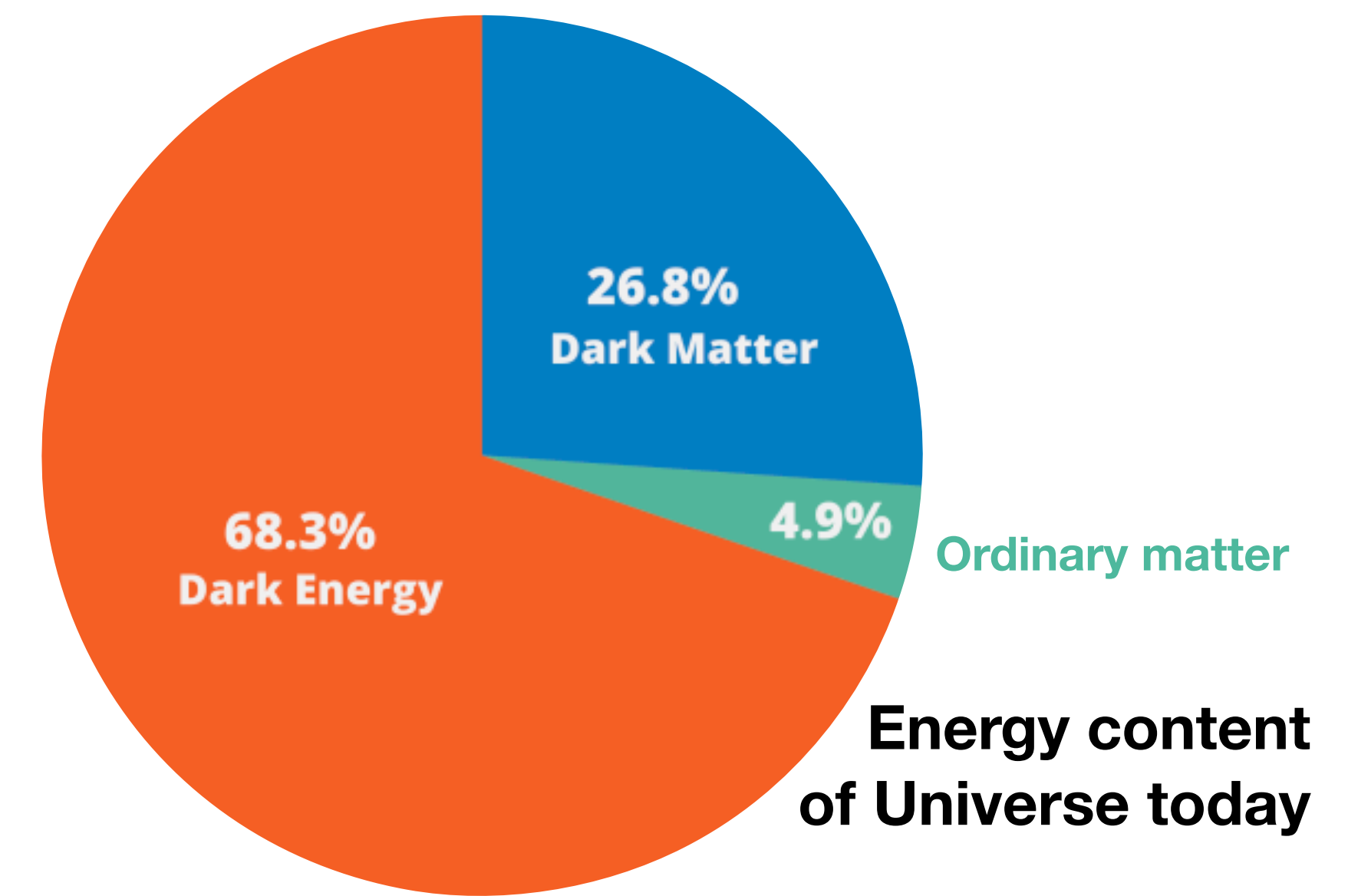
Searching for Dark Matter from the Sun with Ten Years of IceCube Data

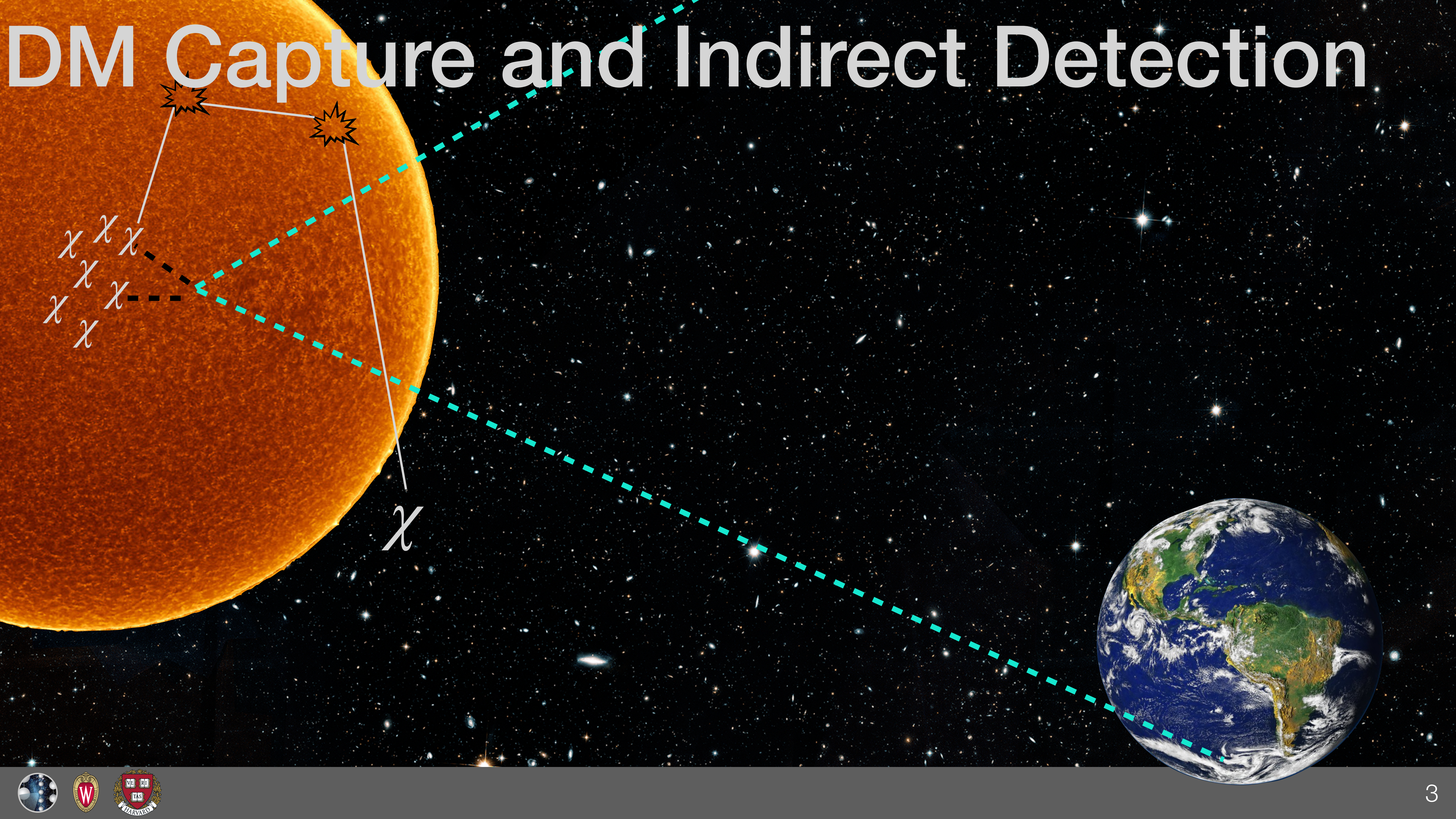
Jeffrey Lazar for the IceCube Collaboration
XIX International Workshop on Neutrino Telescopes
22 Feb., 2021



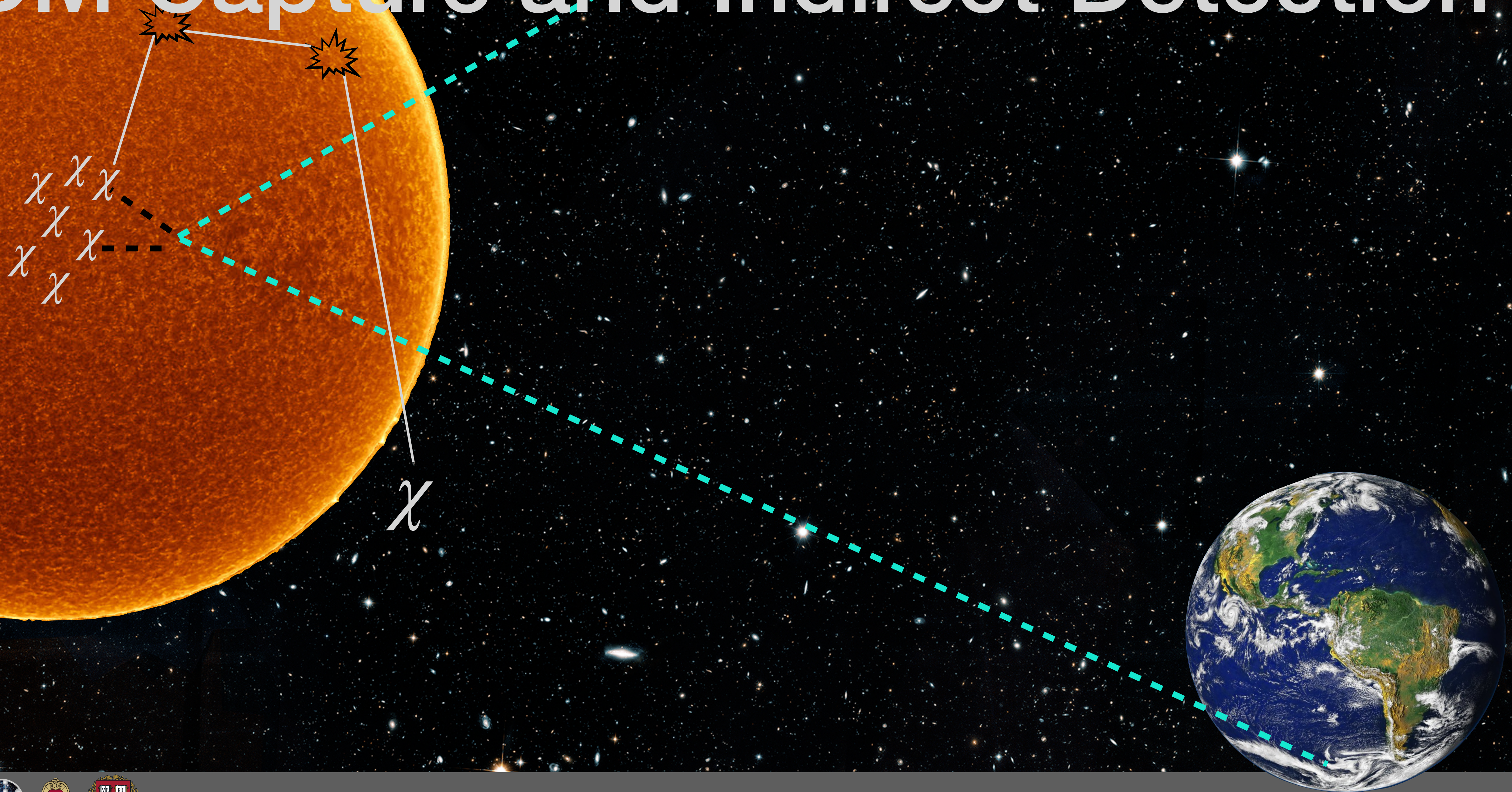
Dark Matter

- What do we know ?
 - It interacts gravitationally
 - It comprises about 85% of present matter content of the Universe
 - It is cold, *i.e.* non-relativistic
- What questions remain ?
 - What it is made of ?
 - Does it have additional interactions ?
- Many candidates: **WIMPs**, axions, primordial black holes, ...





DM Capture and Indirect Detection



Two Ways to Measure $\sigma_{N\chi}$

Annihilation rate

$$\dot{N} = C_C - C_A N^2 - C_E N = 0$$

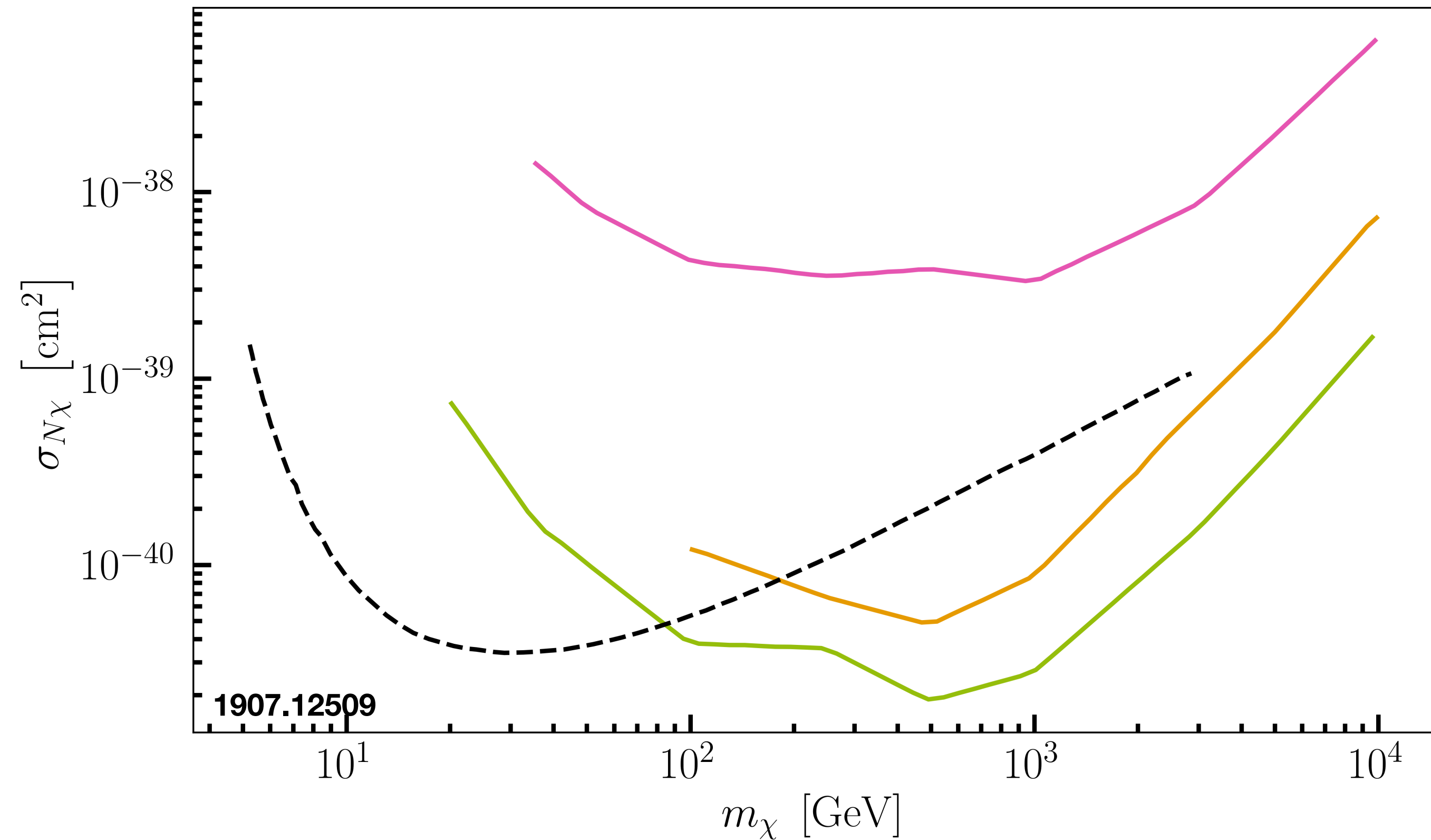
Capture rate: Proportional to $\sigma_{\chi N}$

Annihilation rate: Sets rate of WIMP conversion to neutrinos

Evaporation rate: Negligible for WIMP masses above a few GeV

$$\Rightarrow \frac{\Gamma_A}{2} = C_C \propto \sigma_{\chi N}$$

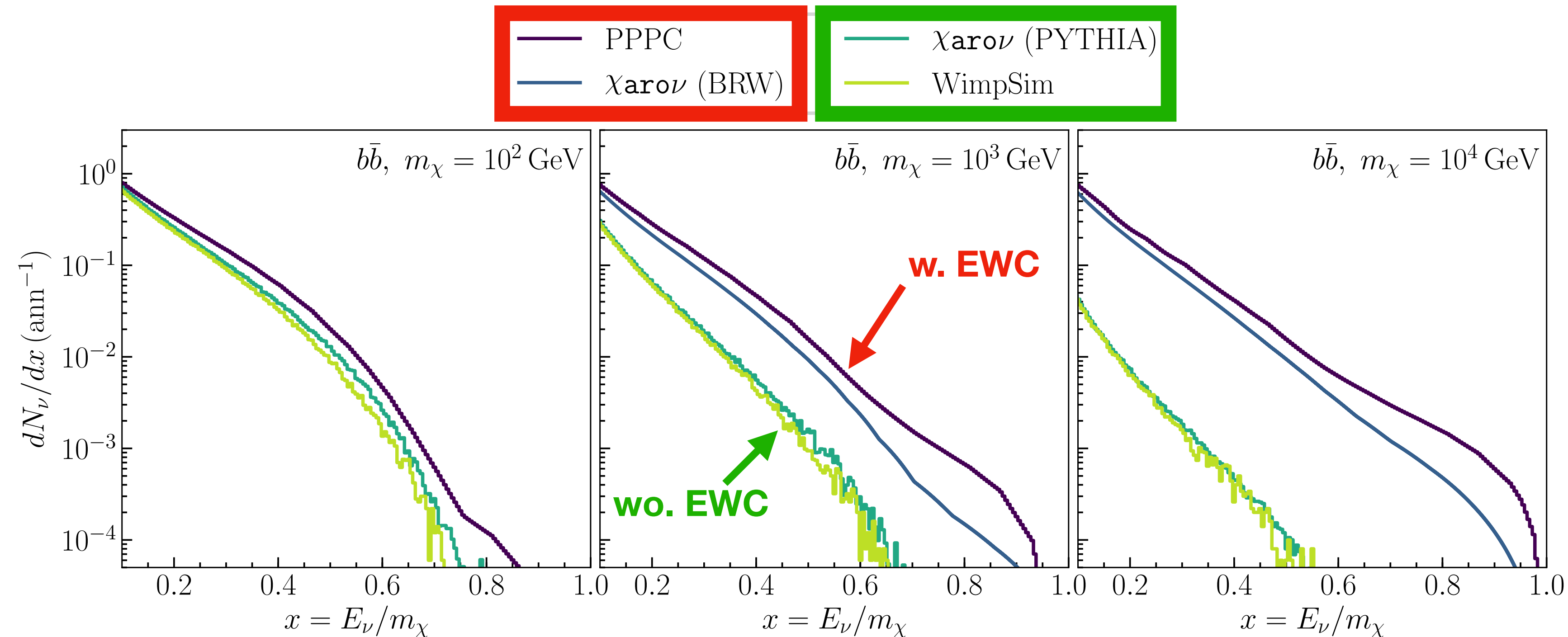
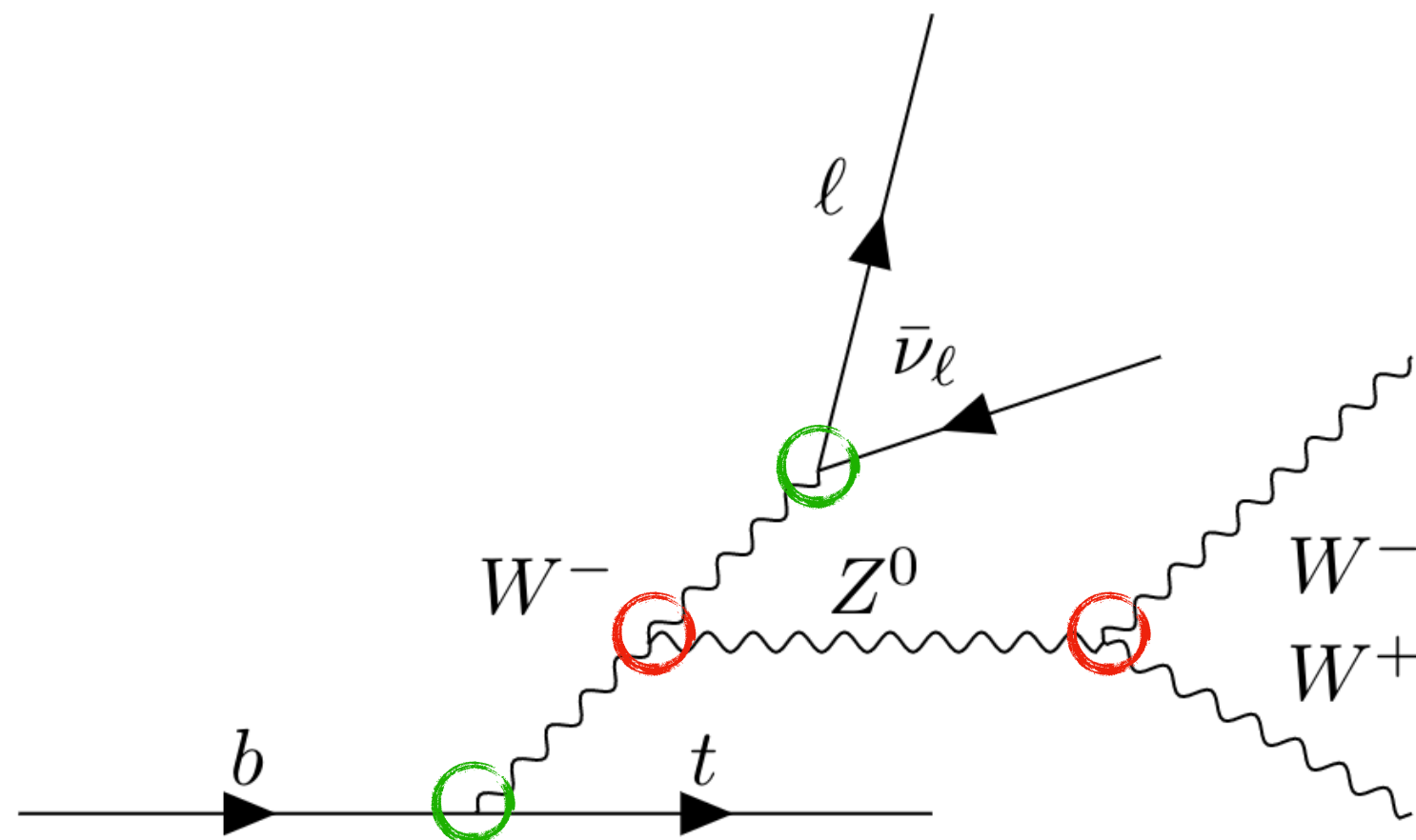
--- PICO — IC
 — $b\bar{b}$ — W^+W^- — $\tau^+\tau^-$



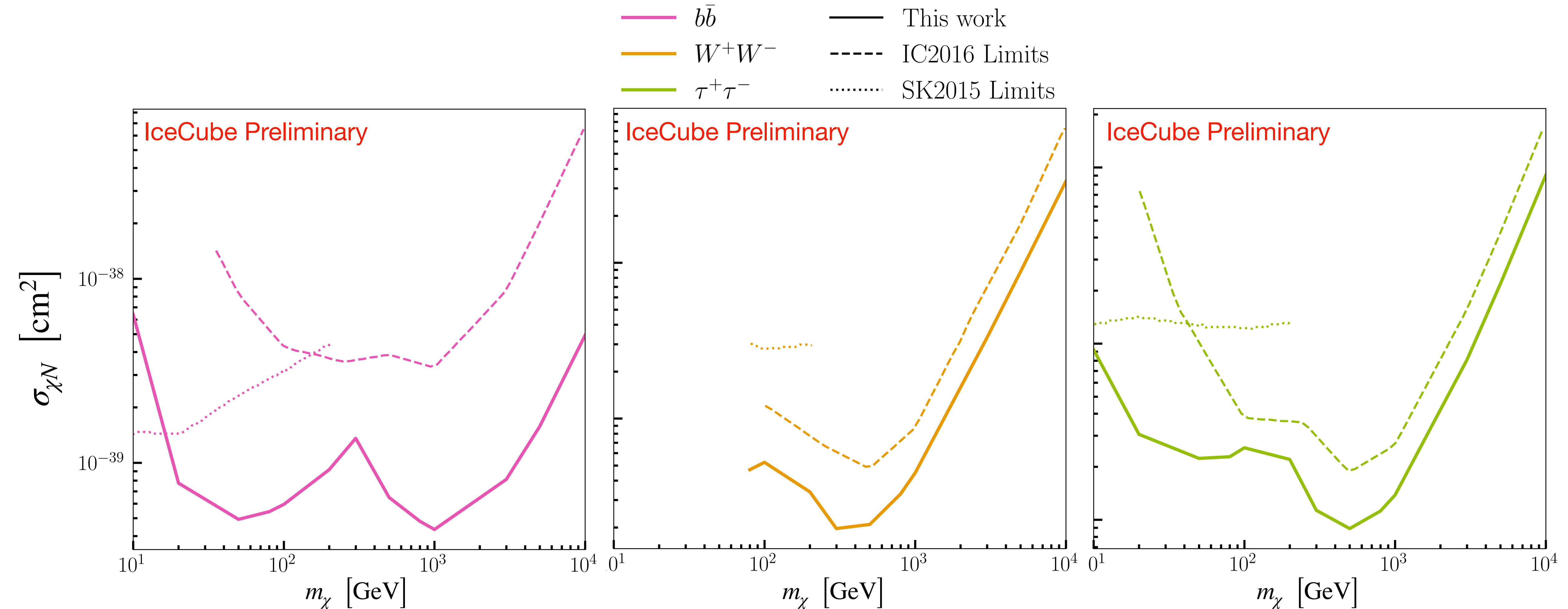
Current limits on WIMP-nucleon cross section from IceCube and PICO

$\chi\text{ar}\nu$

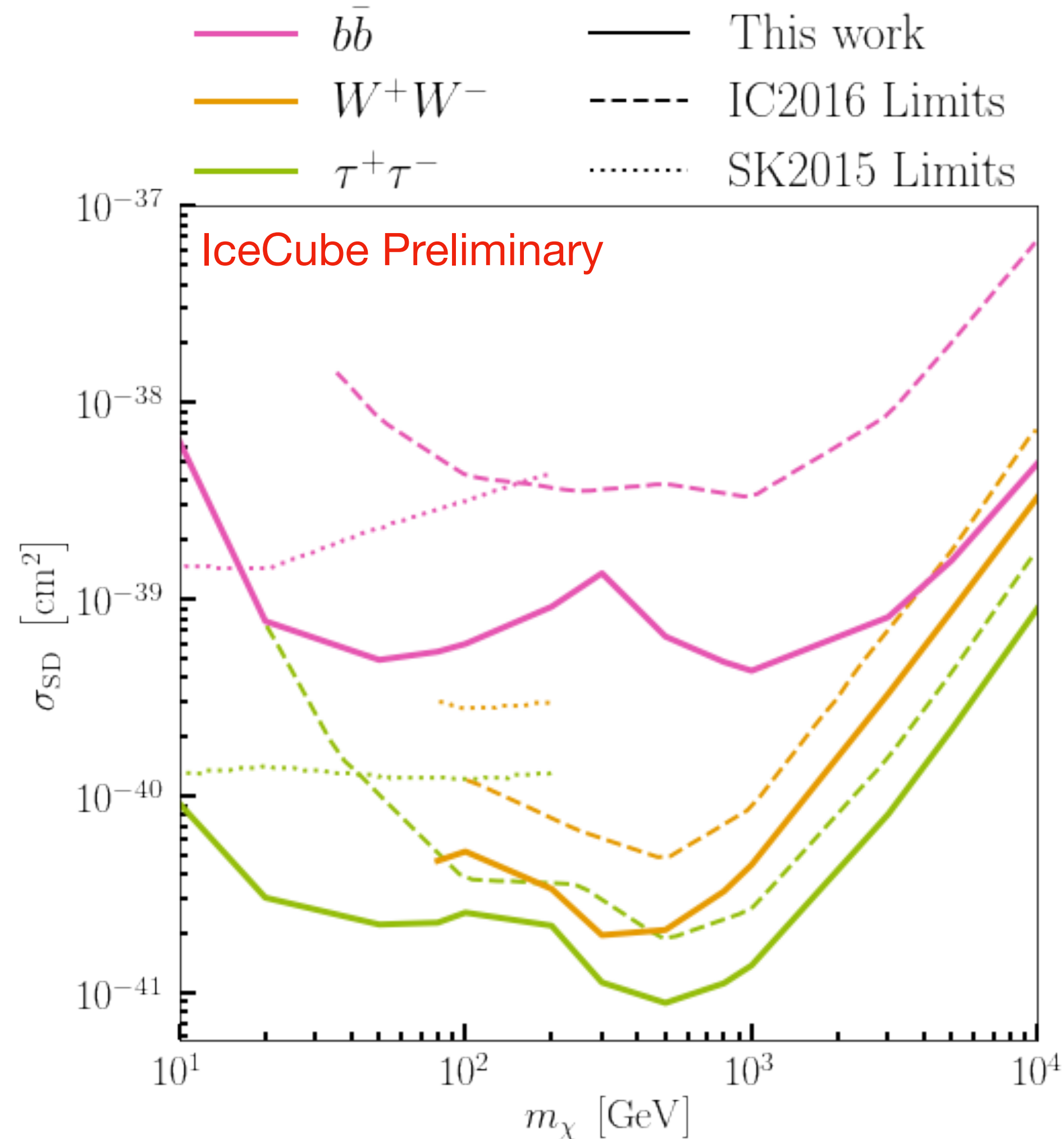
- Software package for calculating neutrino yields from DM annihilation/decay. [arXiv:2007:15010](https://arxiv.org/abs/2007.15010)
- Couples PYTHIA8 to a updated calculation of EW correction (BRW calculation). [arXiv:2007:15001](https://arxiv.org/abs/2007.15001)



Ten Years IC+DeepCore Sensitivity



Ten Years IC+DeepCore Sensitivity



- World-leading sensitivities for almost entire range
- Currently working to further improve ~100 GeV range
- See [Josh Villarreal's talk](#) on Thursday to find out more

