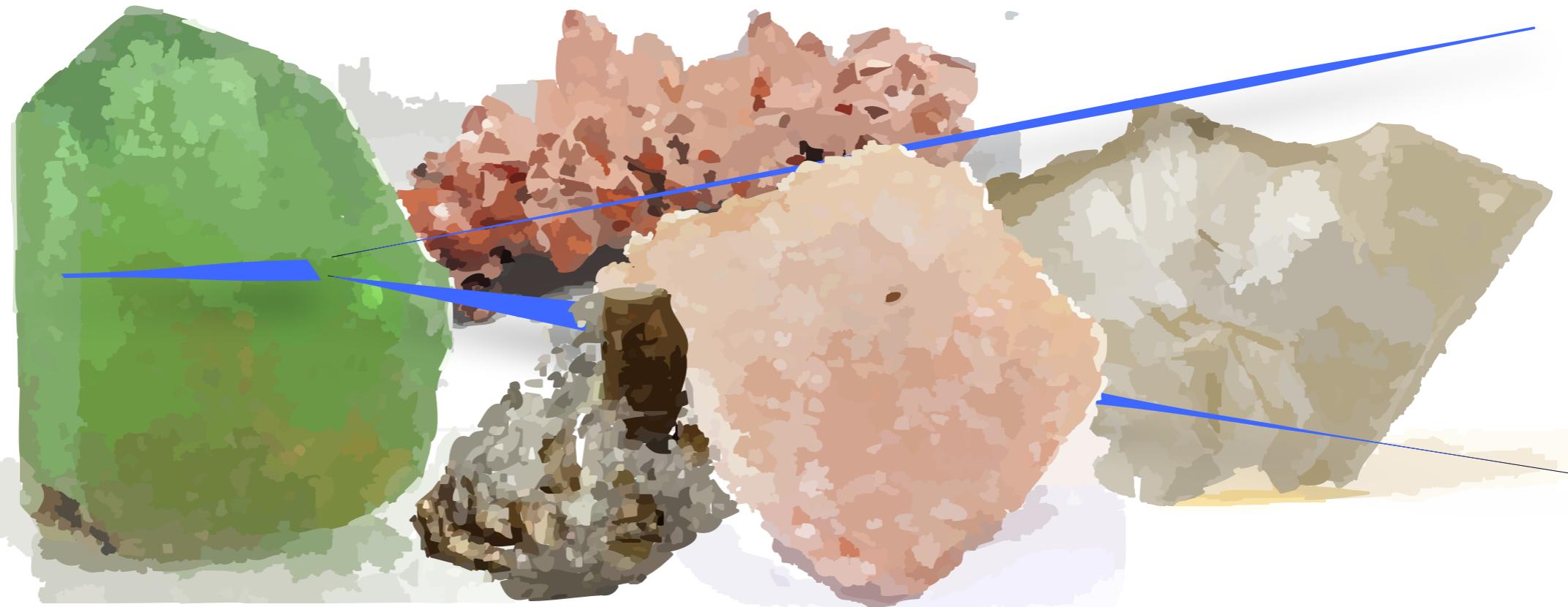


# Mineral Detectors for Dark Matter

IFPU, Trieste



[kavanagh@ifca.unican.es](mailto:kavanagh@ifca.unican.es)

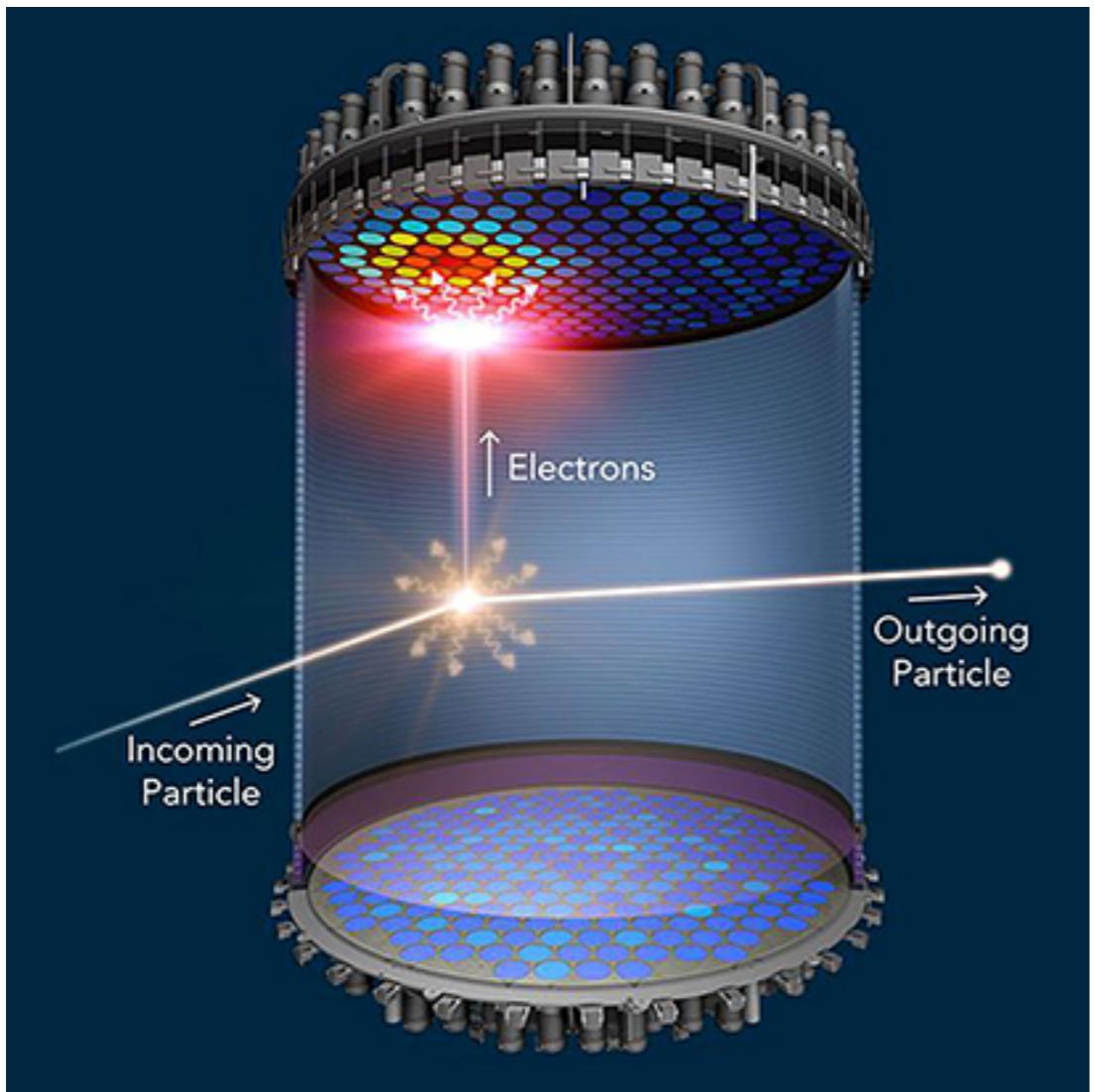


@BradleyKavanagh

Bradley J Kavanagh  
IFCA, Santander, Spain  
(CSIC-Universidad de Cantabria)  
17th October 2022

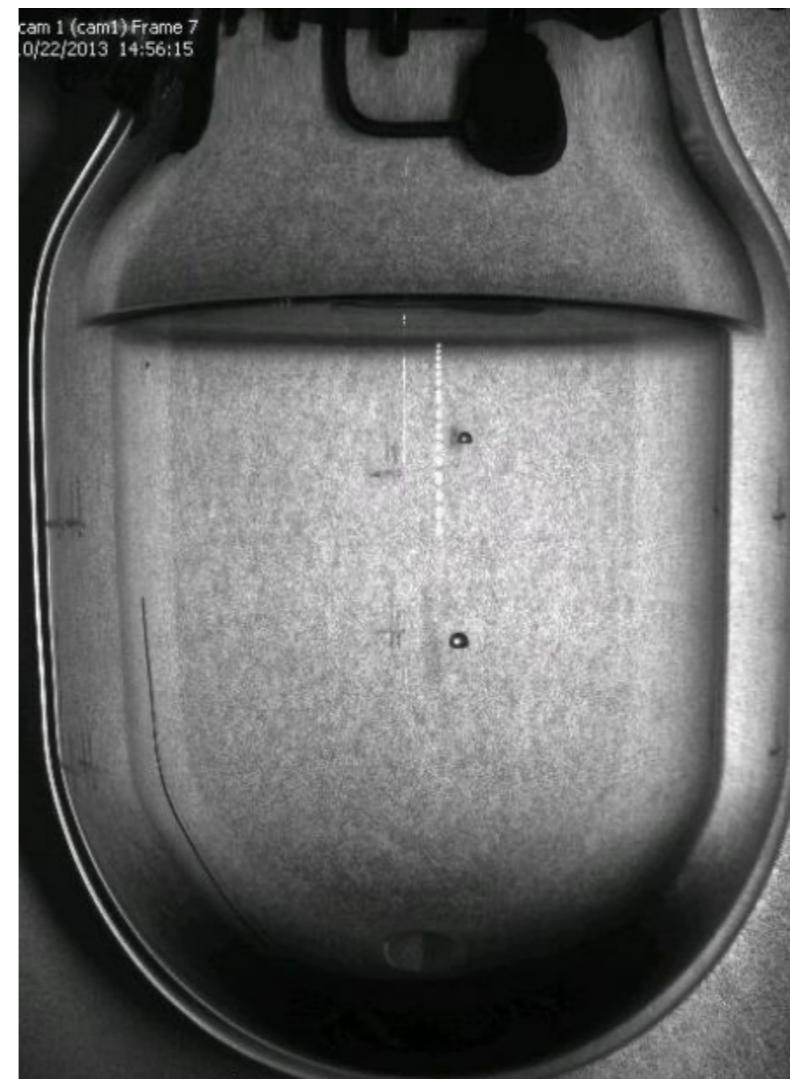


# Direct detection experiments



Xenon Experiment

[\[Image Credit\]](#)



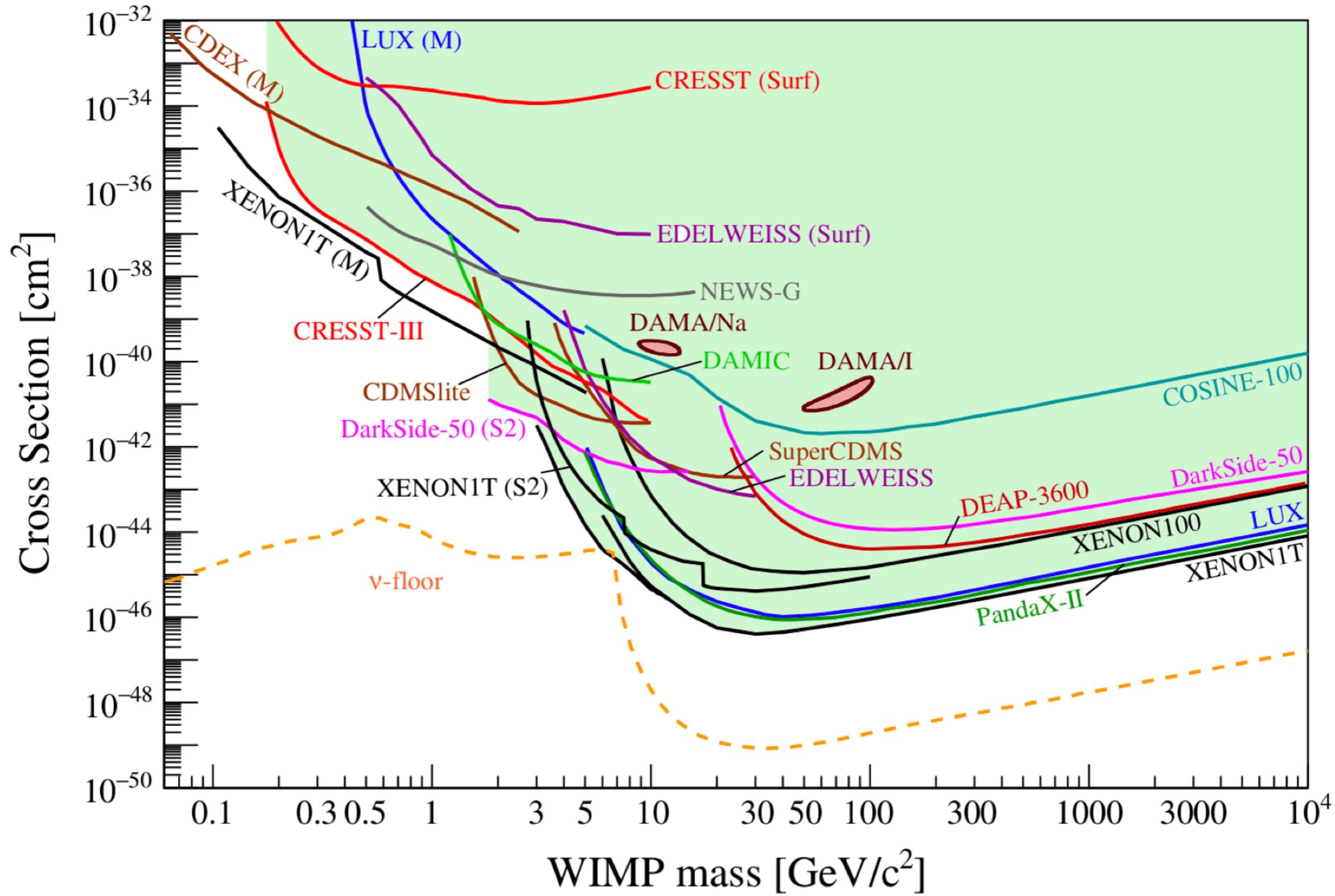
PICO-2L

[\[Image Credit\]](#)



# Direct detection landscape

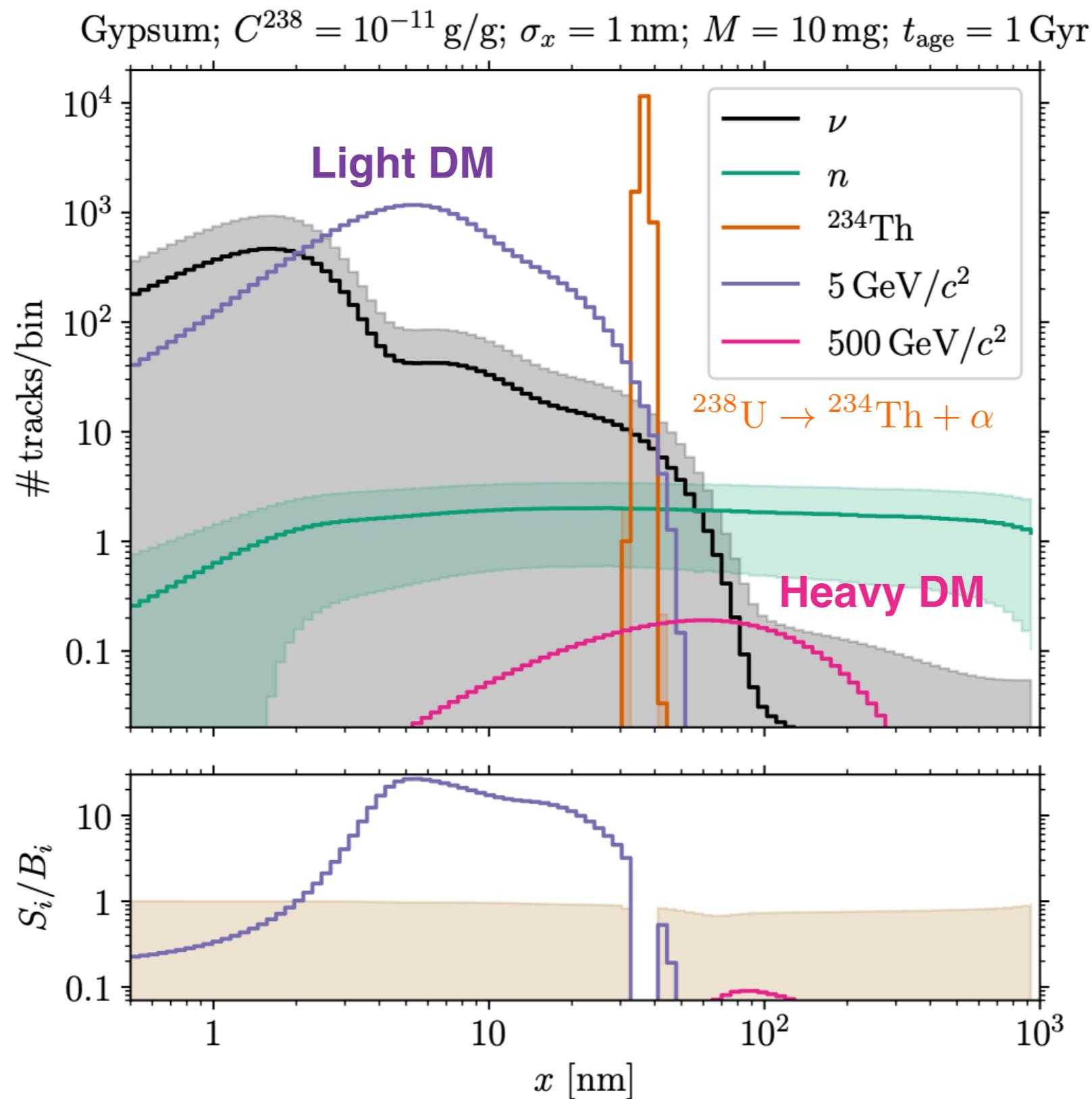
[Billard et al., 2104.07634]





# Damage track spectrum

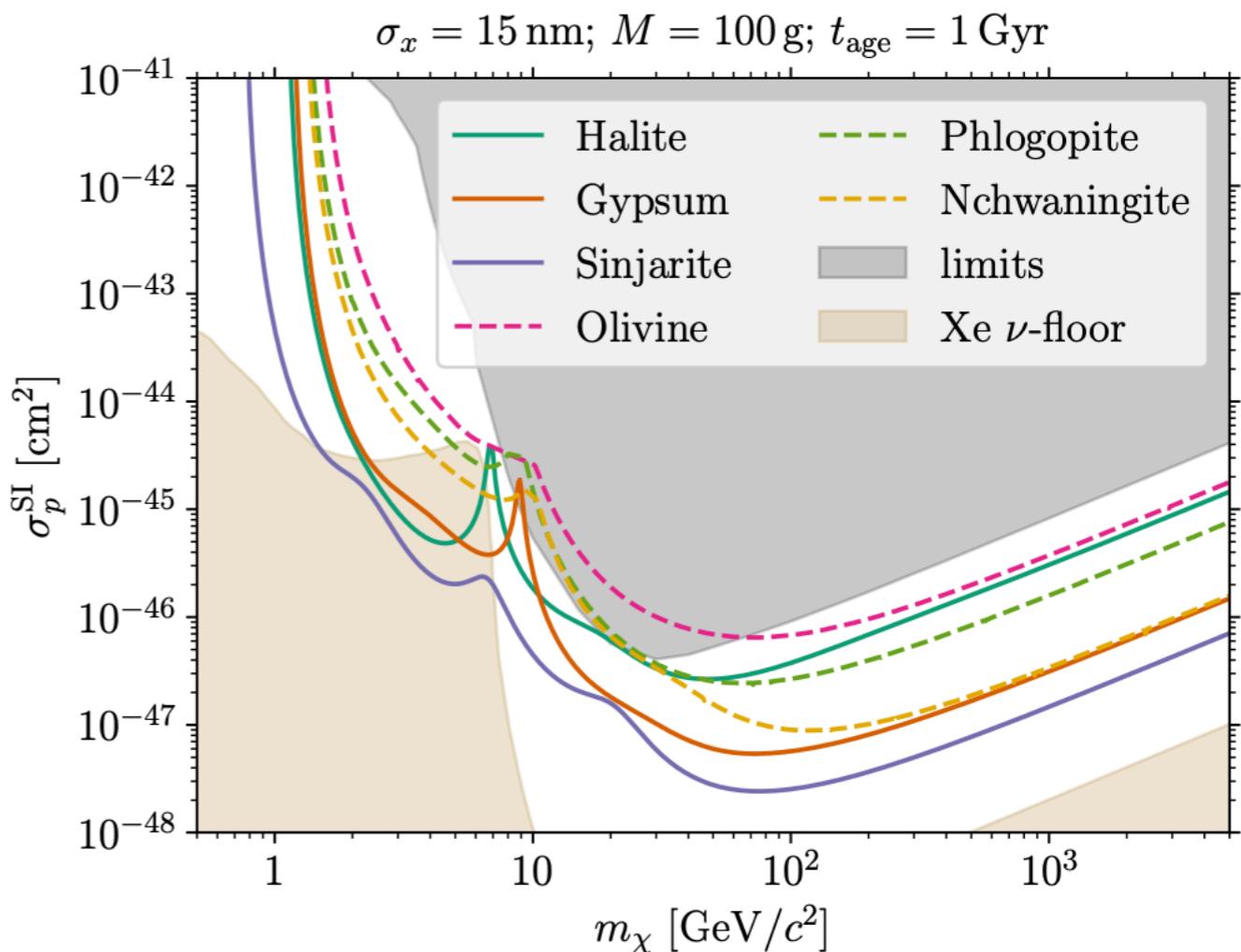
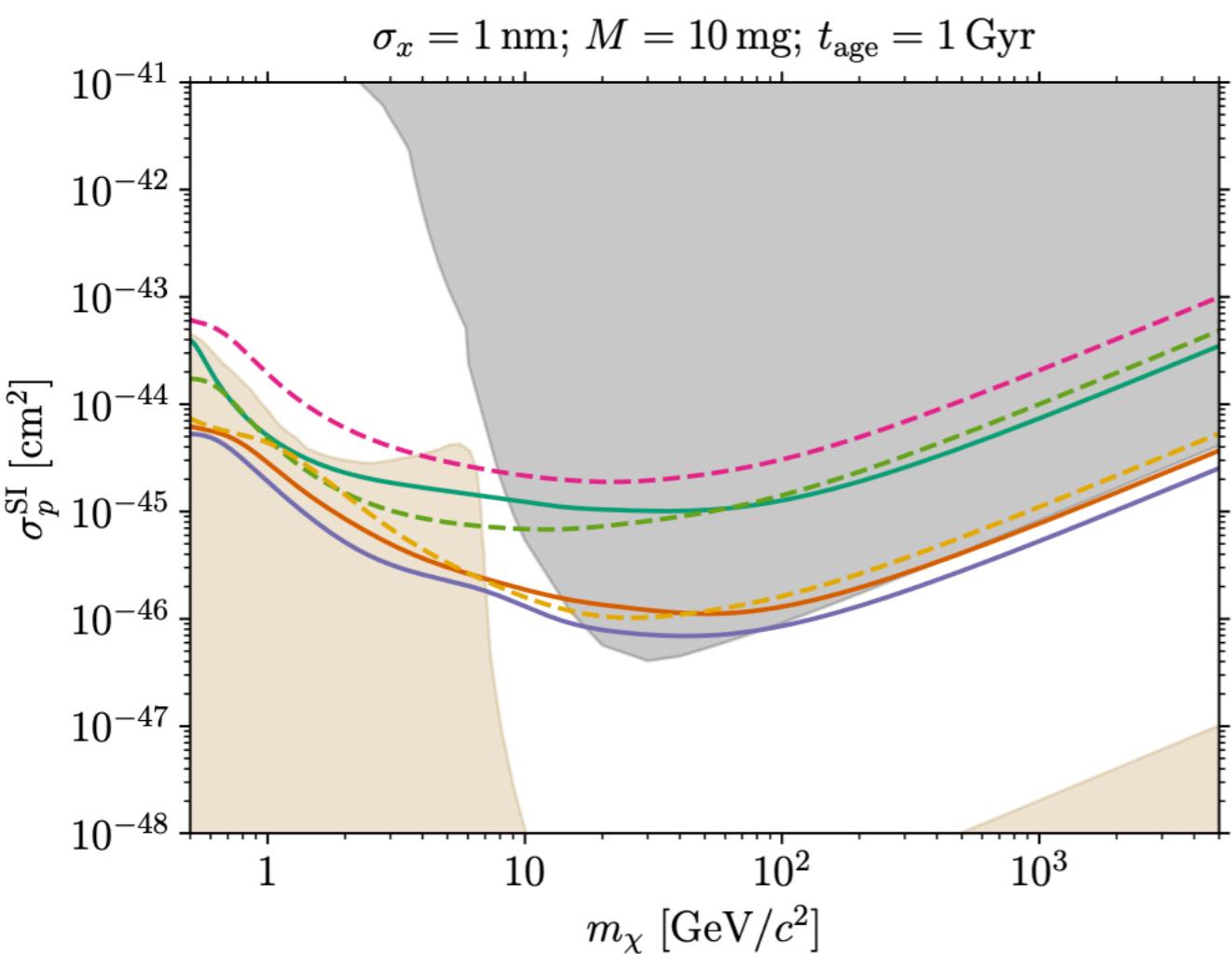
[Baum et al., 2106.06559]





# Projected Limits

Low resolution,  
High exposure

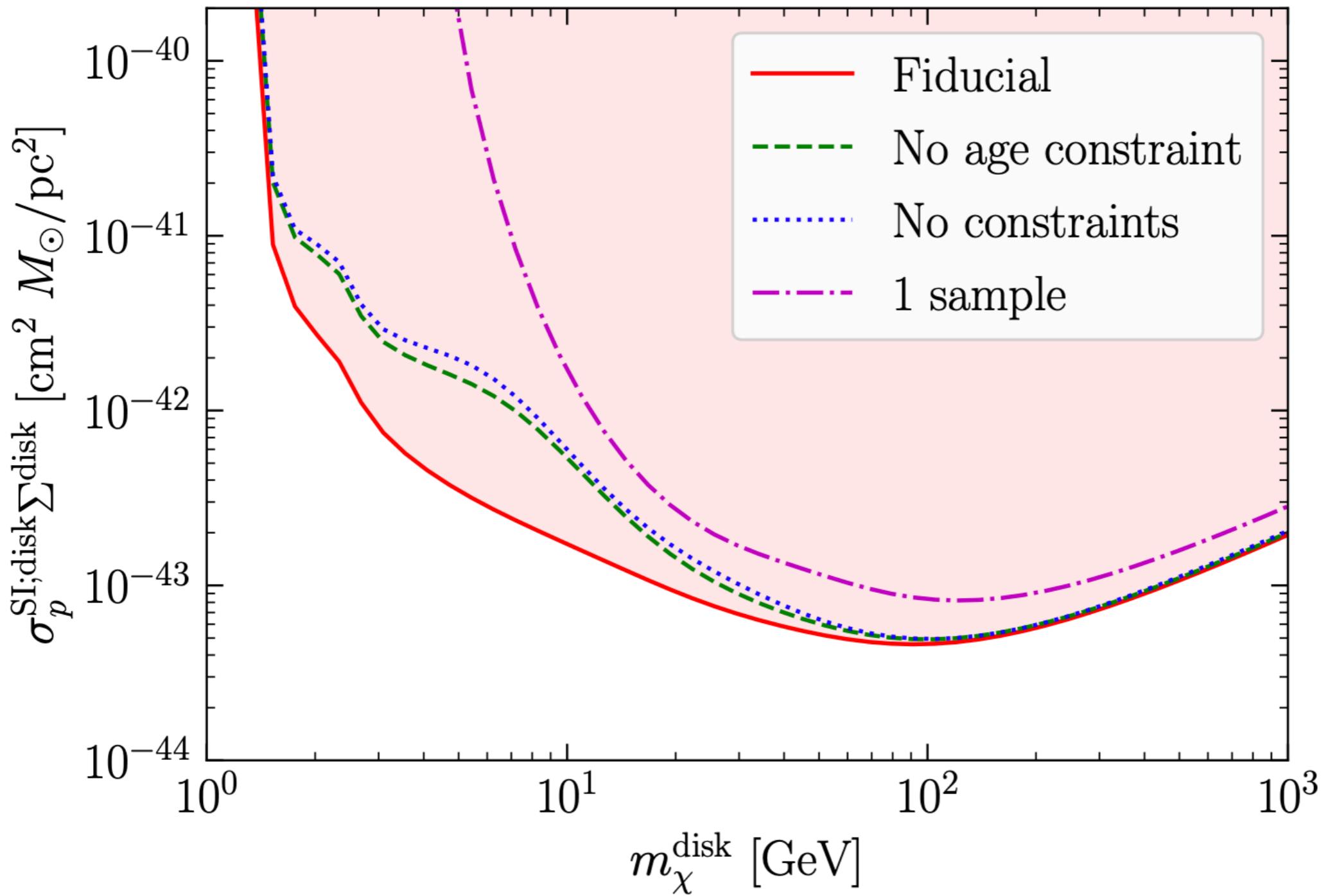


[Baum et al., 2106.06559]



# Where minerals shine

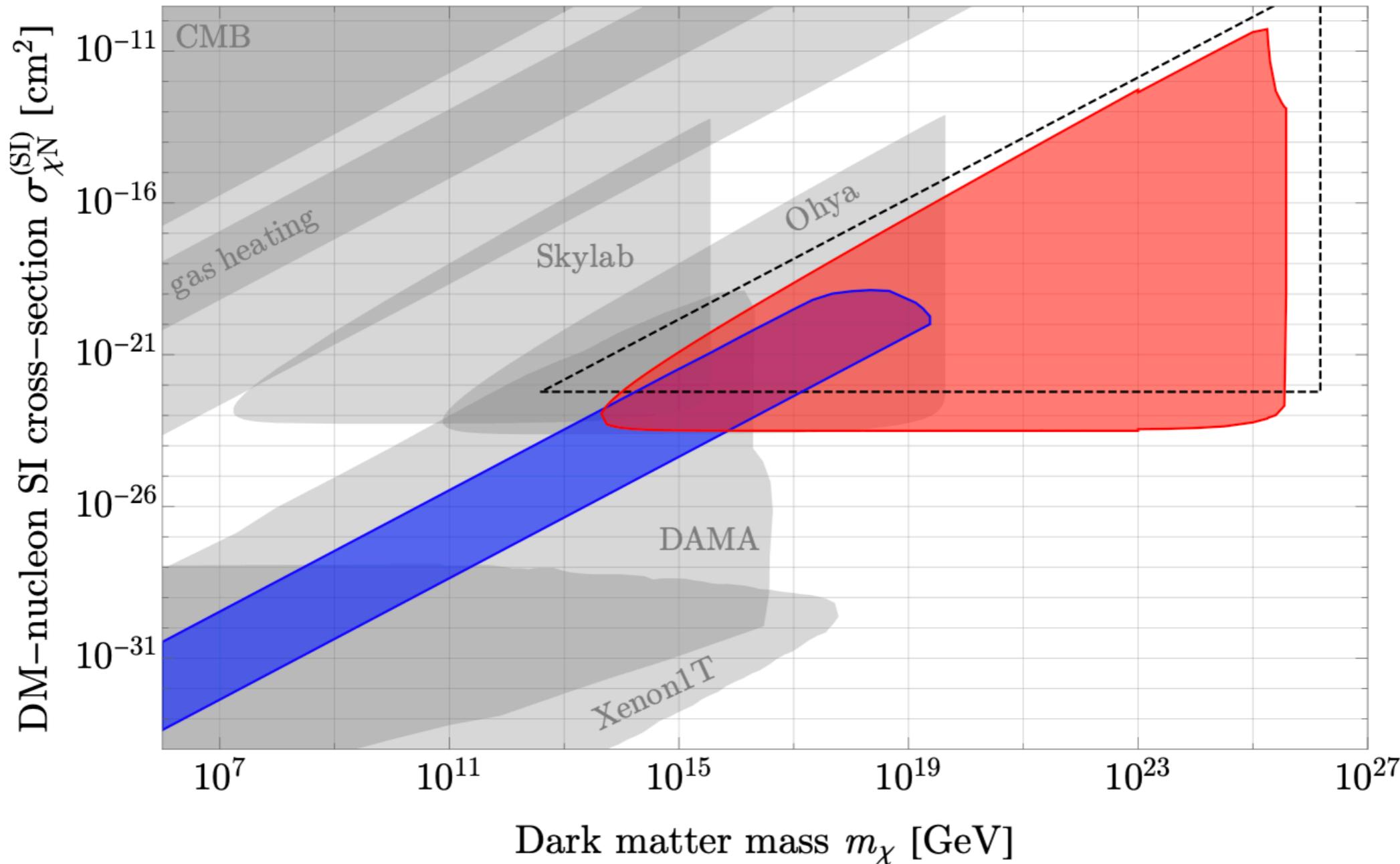
Time-varying  
DM signals



[E.g. Baum et al., 2107.02812]



# Where minerals shine



[E.g. Acevedo et al., [2105.06473](#)]



# References

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## Classics (the “Mica” era)

Search for Supermassive Magnetic Monopoles Using Mica Crystals - <https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.56.1226>

Limits on Dark Matter Using Ancient Mica - <https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.74.4133>

Probing the structure of the cold dark matter halo with ancient mica - <https://arxiv.org/abs/astro-ph/9711039>

Macro Dark Matter - <https://arxiv.org/abs/1410.2236>

## Dark Matter paleo-detectors revisited

Searching for Dark Matter with Paleo-Detectors - <https://arxiv.org/abs/1806.05991>

Paleo-detectors: Searching for Dark Matter with Ancient Minerals - <https://arxiv.org/abs/1811.06844>

Digging for Dark Matter: Spectral Analysis and Discovery Potential of Paleo-Detectors - <https://arxiv.org/abs/1811.10549>

A counter-top search for macroscopic dark matter - <https://arxiv.org/abs/1905.10025>

Ultra-Heavy Dark Matter Search with Electron Microscopy of Geological Quartz - <https://arxiv.org/abs/2105.03998>

Old Rocks, New Limits: Excavated Ancient Mica Searches For Dark Matter - <https://arxiv.org/abs/2105.06473>

New Projections for Dark Matter Searches with Paleo-Detectors - <https://arxiv.org/abs/2106.06559>

Galactic Geology: Probing Time-Varying Dark Matter Signals with Paleo-Detectors - <https://arxiv.org/abs/2107.02812>

Scattering searches for dark matter in subhalos: neutron stars, cosmic rays, and old rocks - <https://arxiv.org/abs/2109.04582>

*What about setting up a ‘master’ reference list?*

# Codes

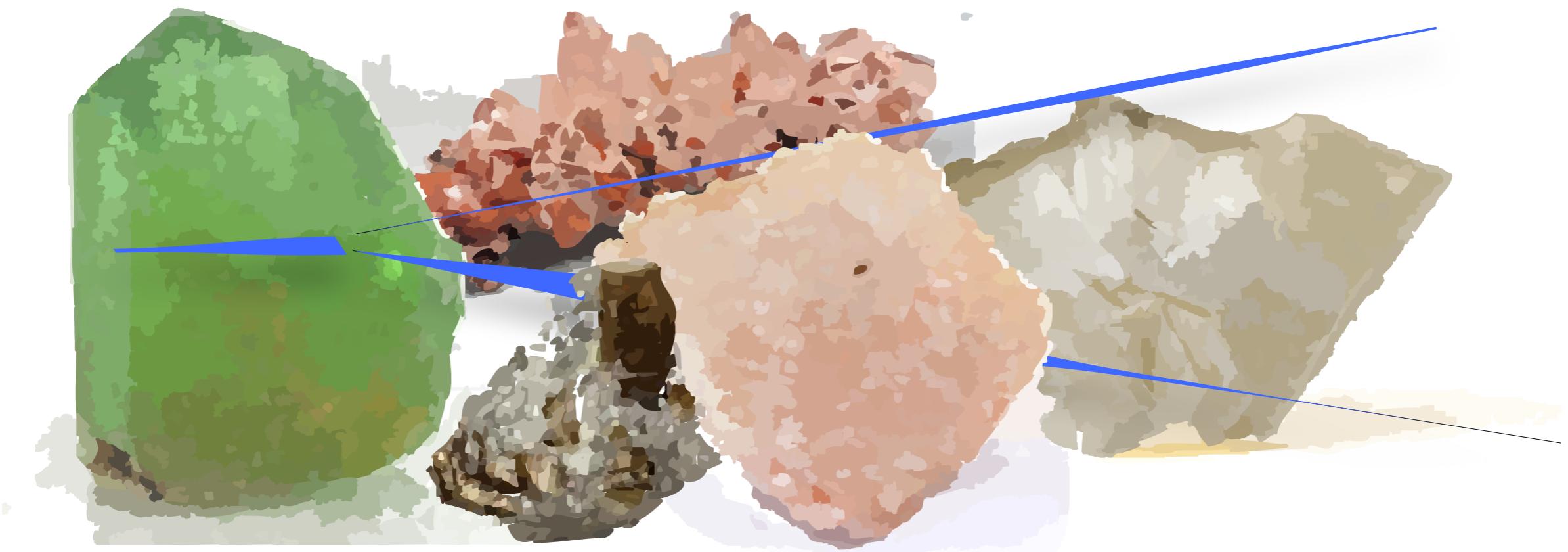
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Paleopy - <https://github.com/tedwards2412/paleopy>

PaleoSpec - <https://github.com/sbaum90/paleoSpec>

PaleoSens - <https://github.com/sbaum90/paleoSens>



Thank you!