Tidal disruption events (as neutrino sources)

MU days

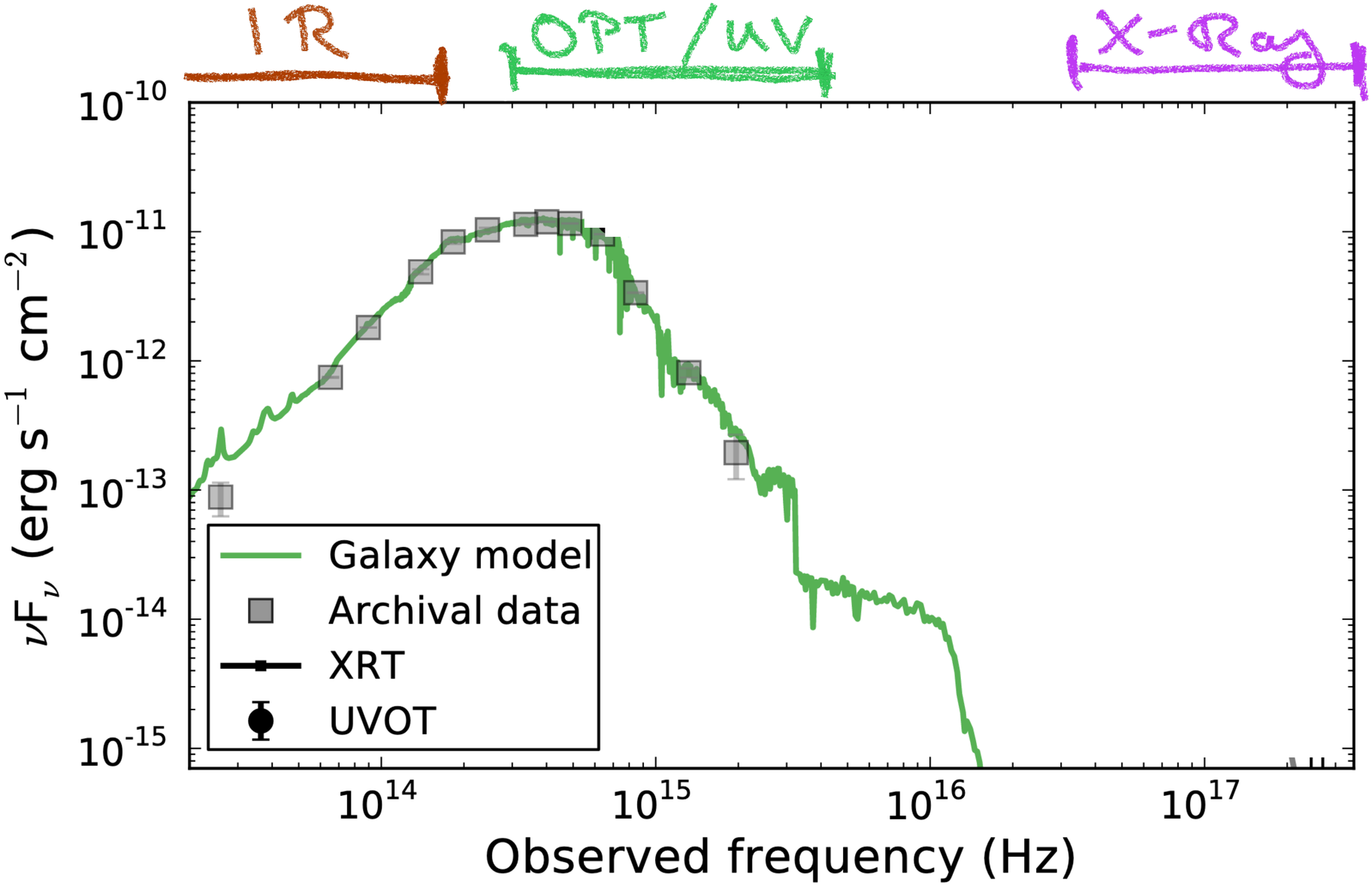
Simeon Reusch / 2021 November 25

Collaborators: Robert Stein, Marek Kowalski, Anna Franckowiak, Walter Winter + many more

What are tidal disruption events?

T D E

What are Tidal Disruption Events (TDEs)?



ASASSN-14li: van Velzen et al. (2016, Science)

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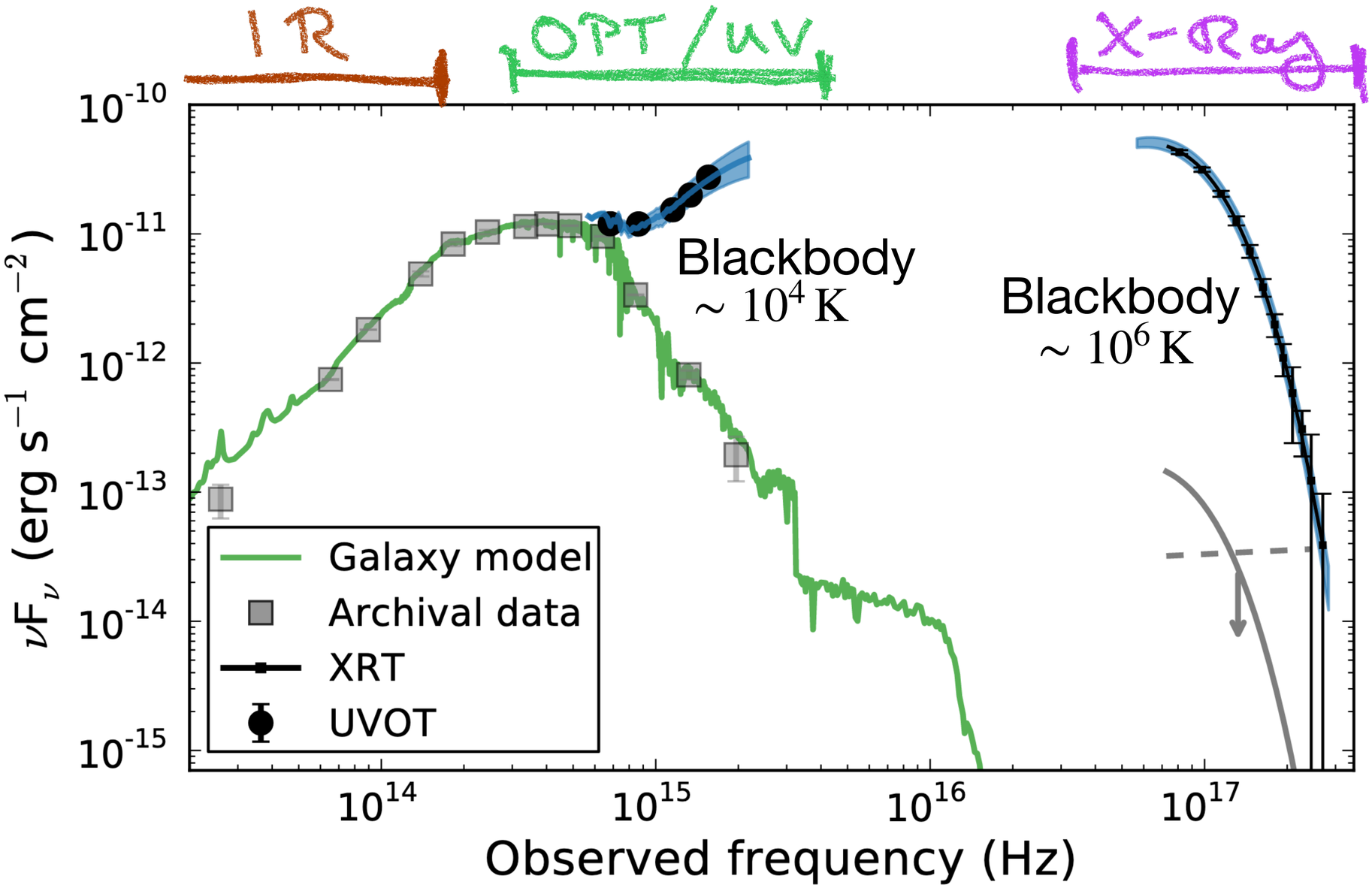

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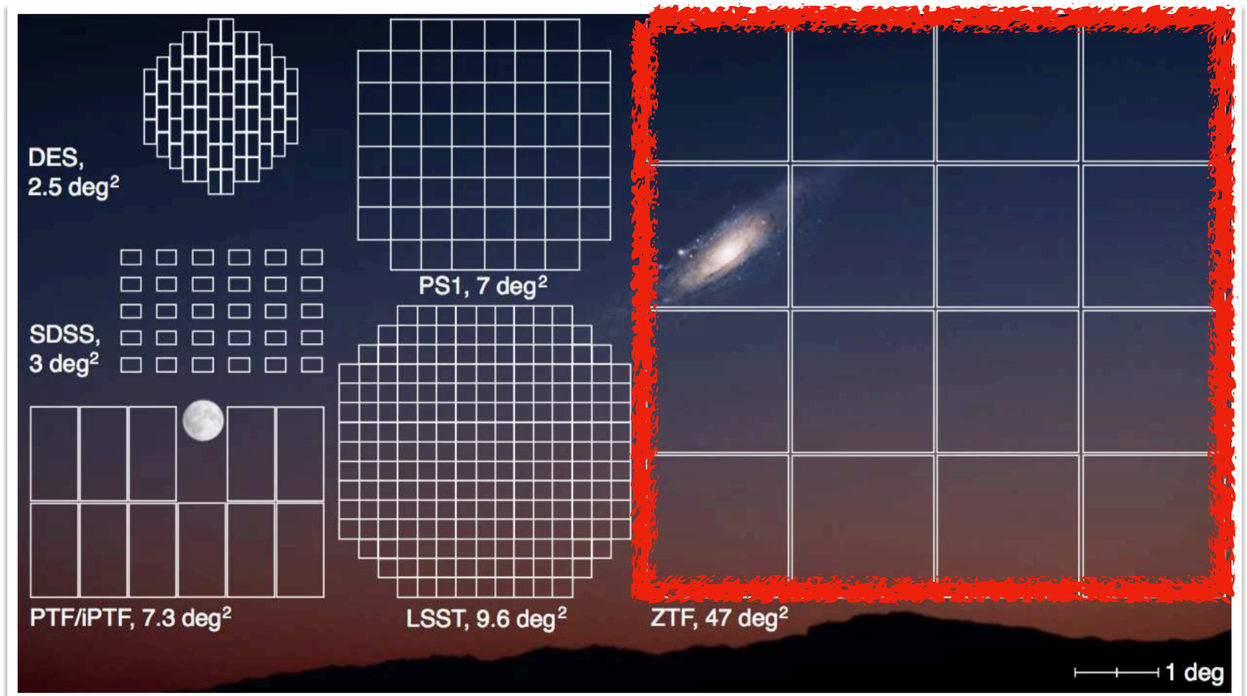
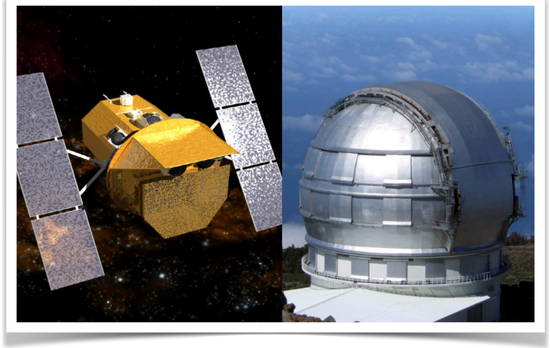
Our high-energy neutrino follow-up program

IceCube @ South Pole



Zwicky transient facility observations

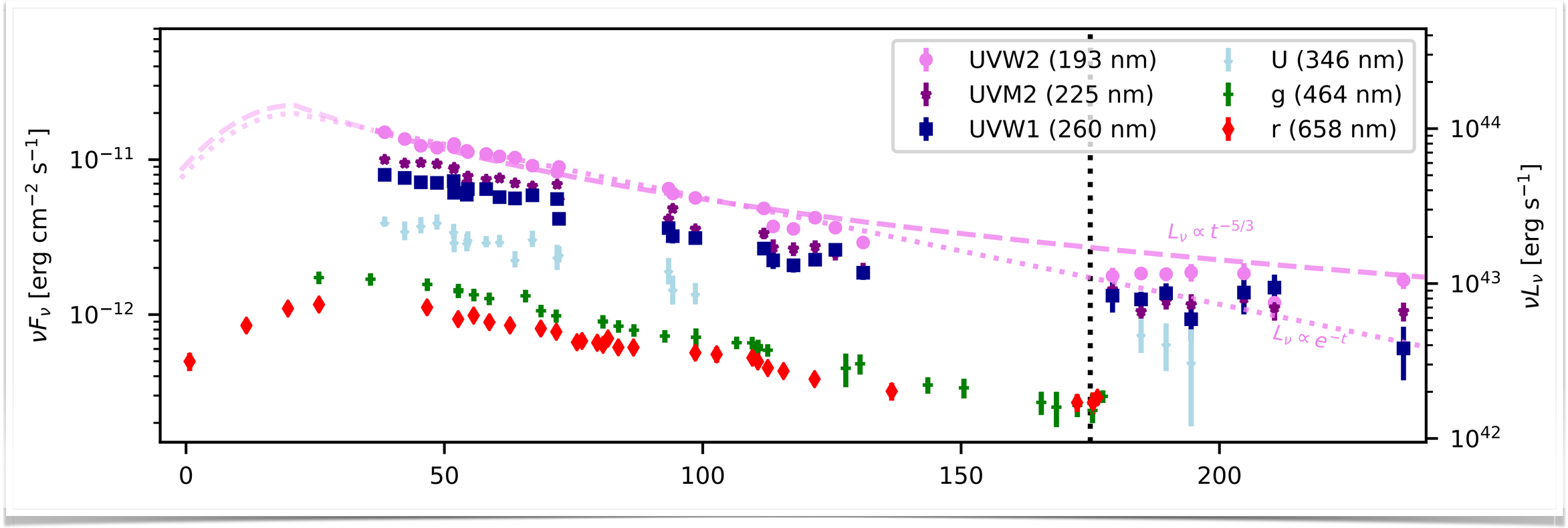


Additional observations

AMPEL filtering

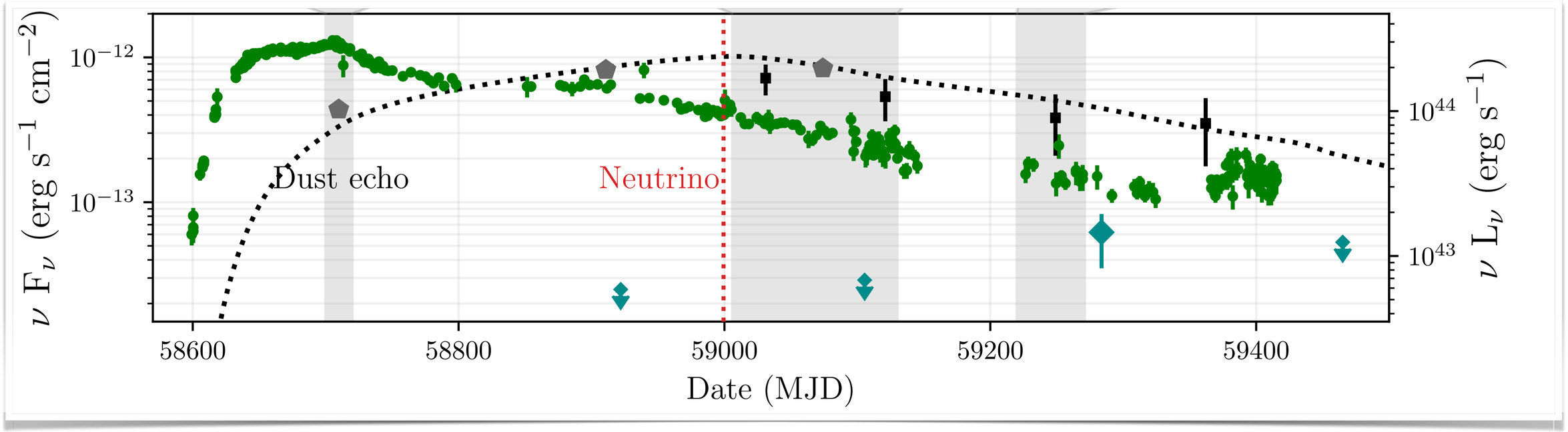
Images: IceCube Collaboration; Joel Johansson

AT2019dsg: First TDE-neutrino association



Stein et. al. (2021, Nature Astronomy)

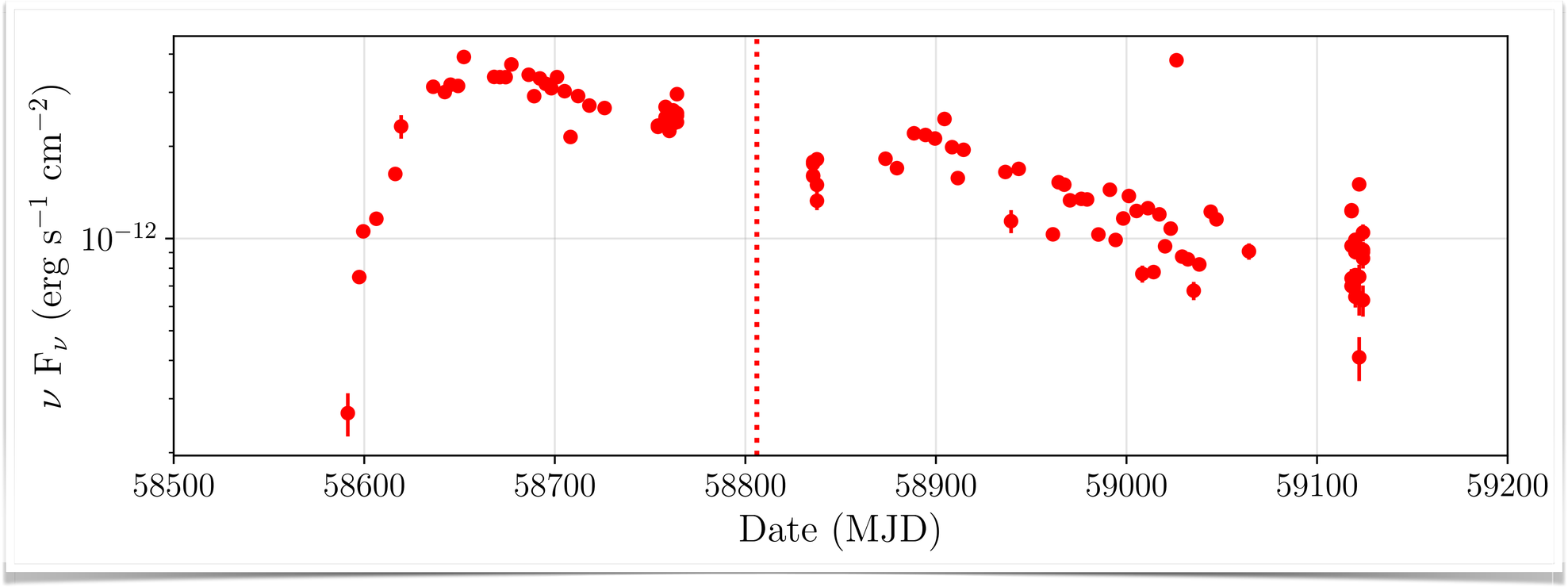
AT2019fdr: Second TDE-neutrino association



Reusch et. al. (2021, on arXiv)

Finding two such associations by chance: $p = 3.4 \times 10^{-4}\ (3.4\,\sigma)$

AT2019aalc: A third association



Systematic search for coincidence between IceCube public alerts and optical flares that show post-peak neoWISE infrared flares

van Velzen et. al. (2021, submitted)

Conclusion

These three associated events could produce a significant part of the IceCube high-energy neutrino flux (>7%)

“Normal” AGN outshine TDEs by a two orders of magnitude, we should be dominated by those

—> very efficient neutrino production in TDEs?

The universe will (hopefully) tell us more

Continue realtime follow-up!

Systematic stacking analysis ongoing

ULTRASAT+Rubin observatory looming on the horizon 🎉

Image: Rubin Observatory