

SALT3-NIR: Taking the Type Ia Supernova Cosmology Workhorse to Longer Wavelengths

**Justin Pierel, STScI
February 8, 2022**



STScI | **SPACE TELESCOPE
SCIENCE INSTITUTE**

Why SNIa Cosmology in the NIR?

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Image Credit: Avelino+2019

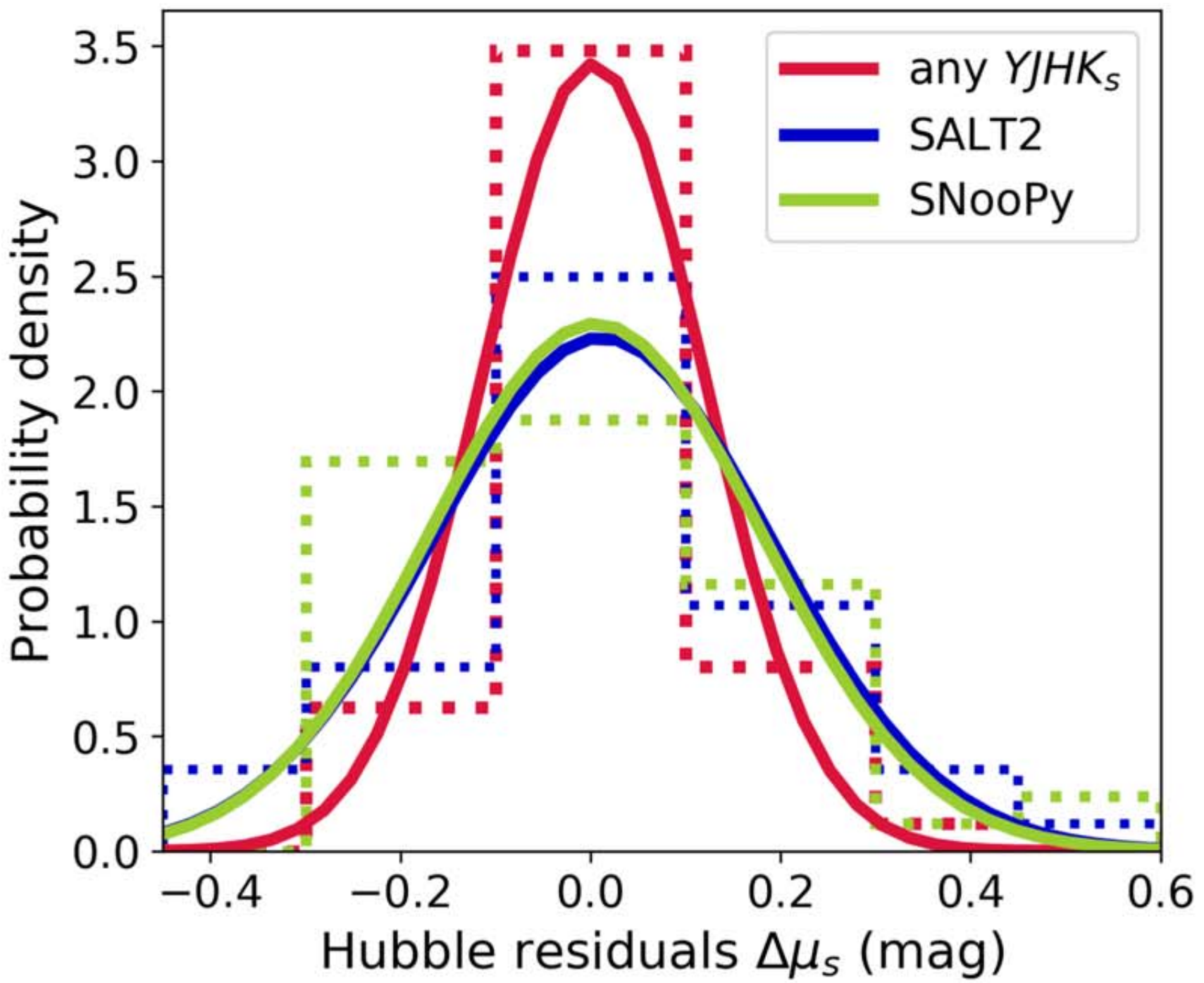
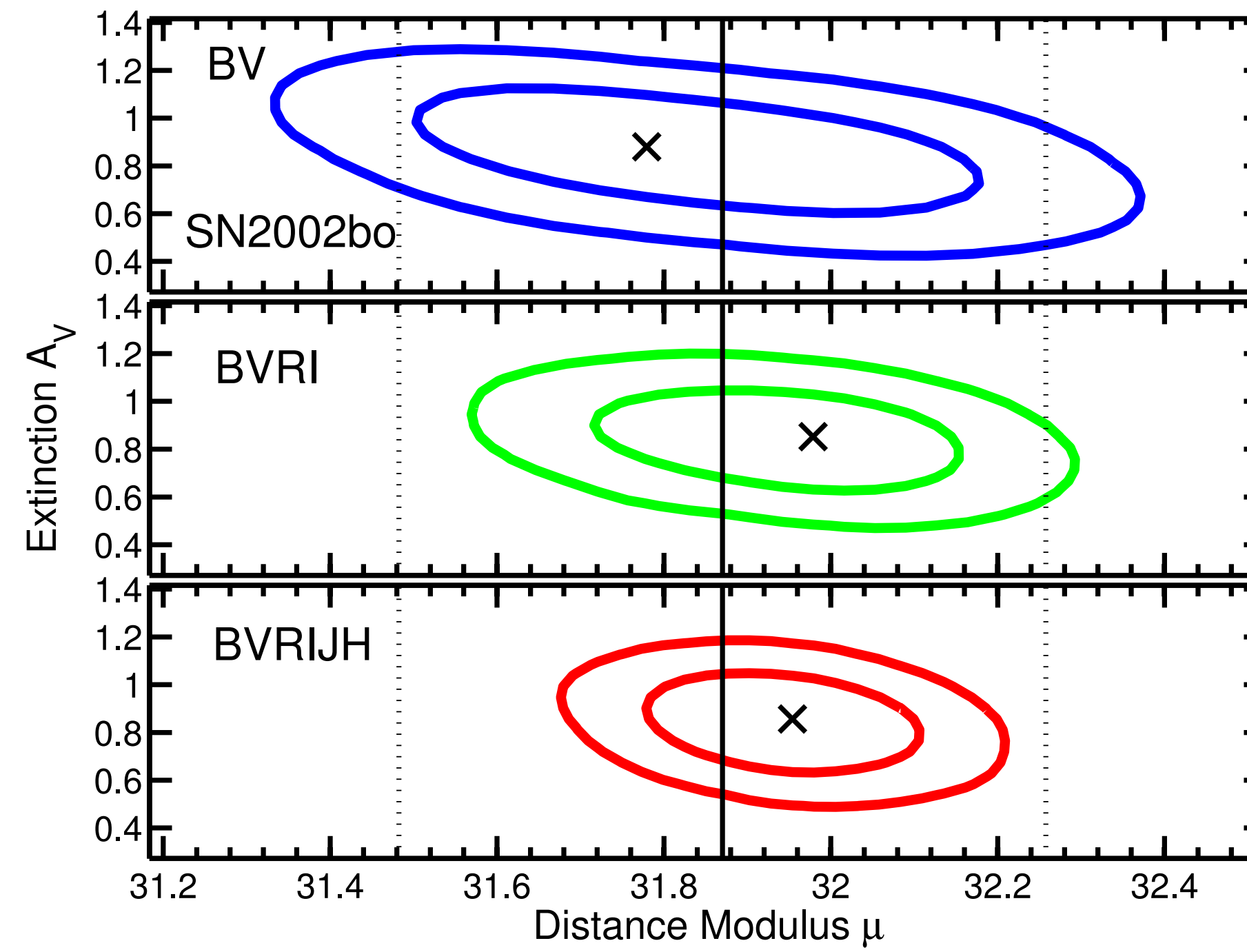


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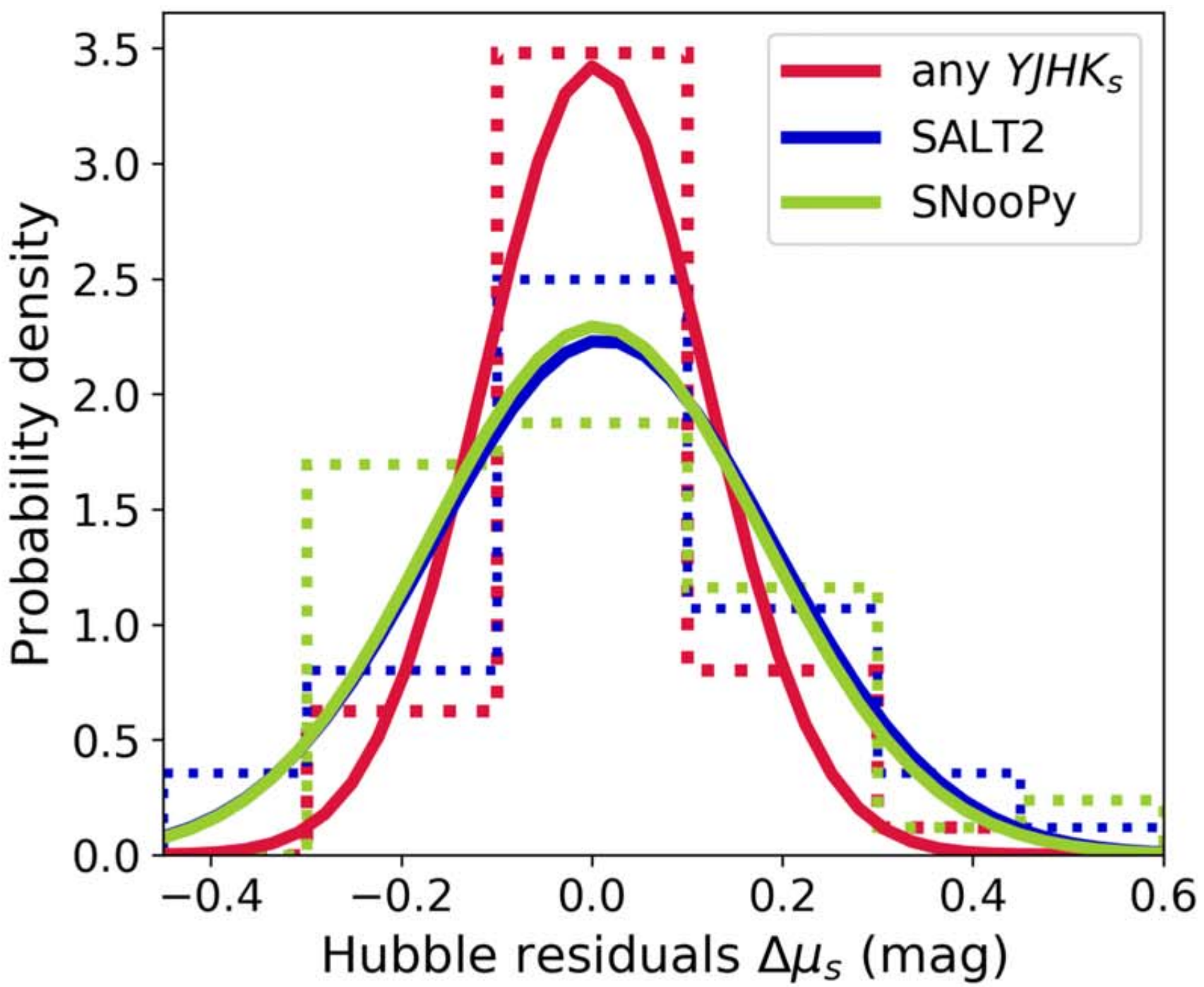
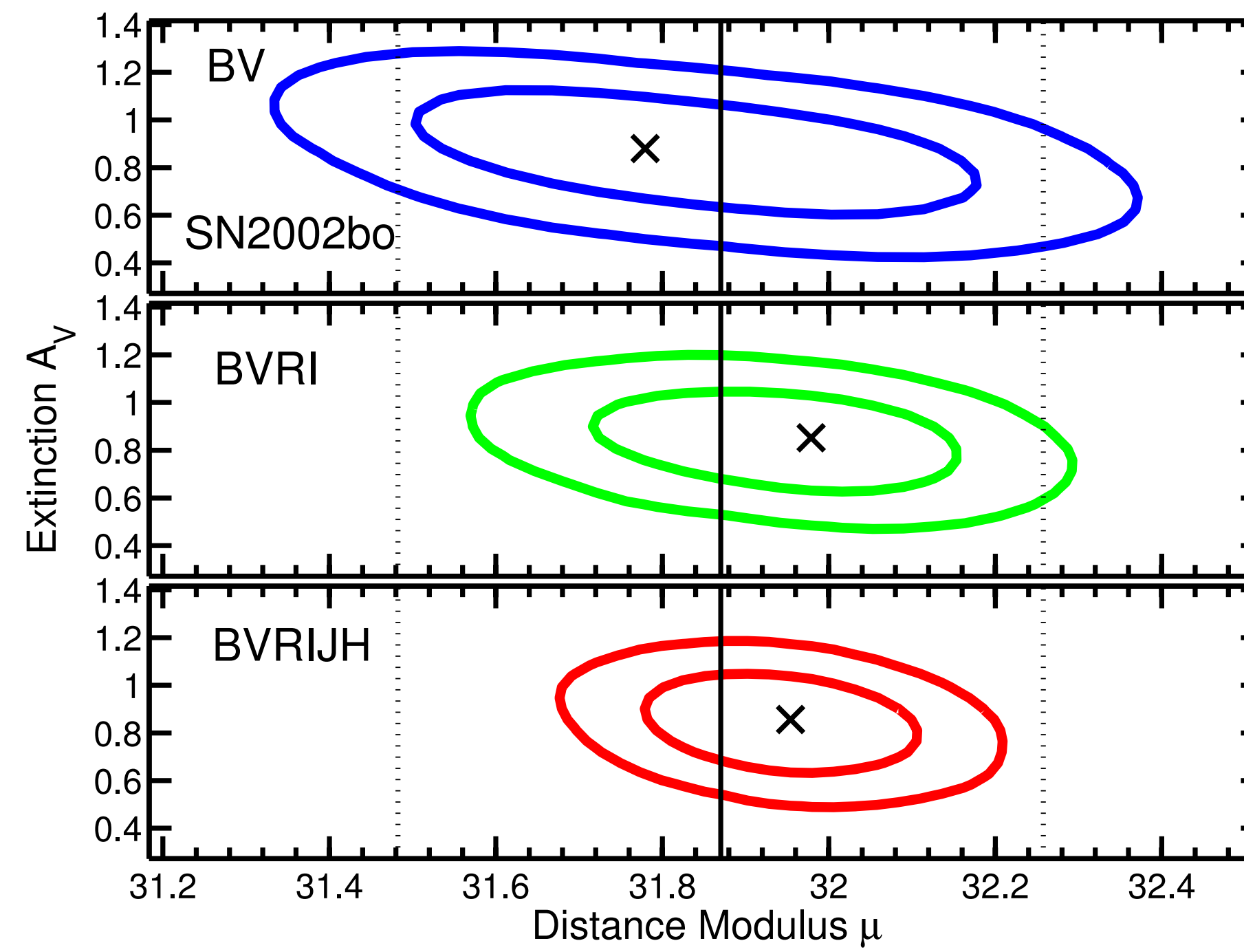


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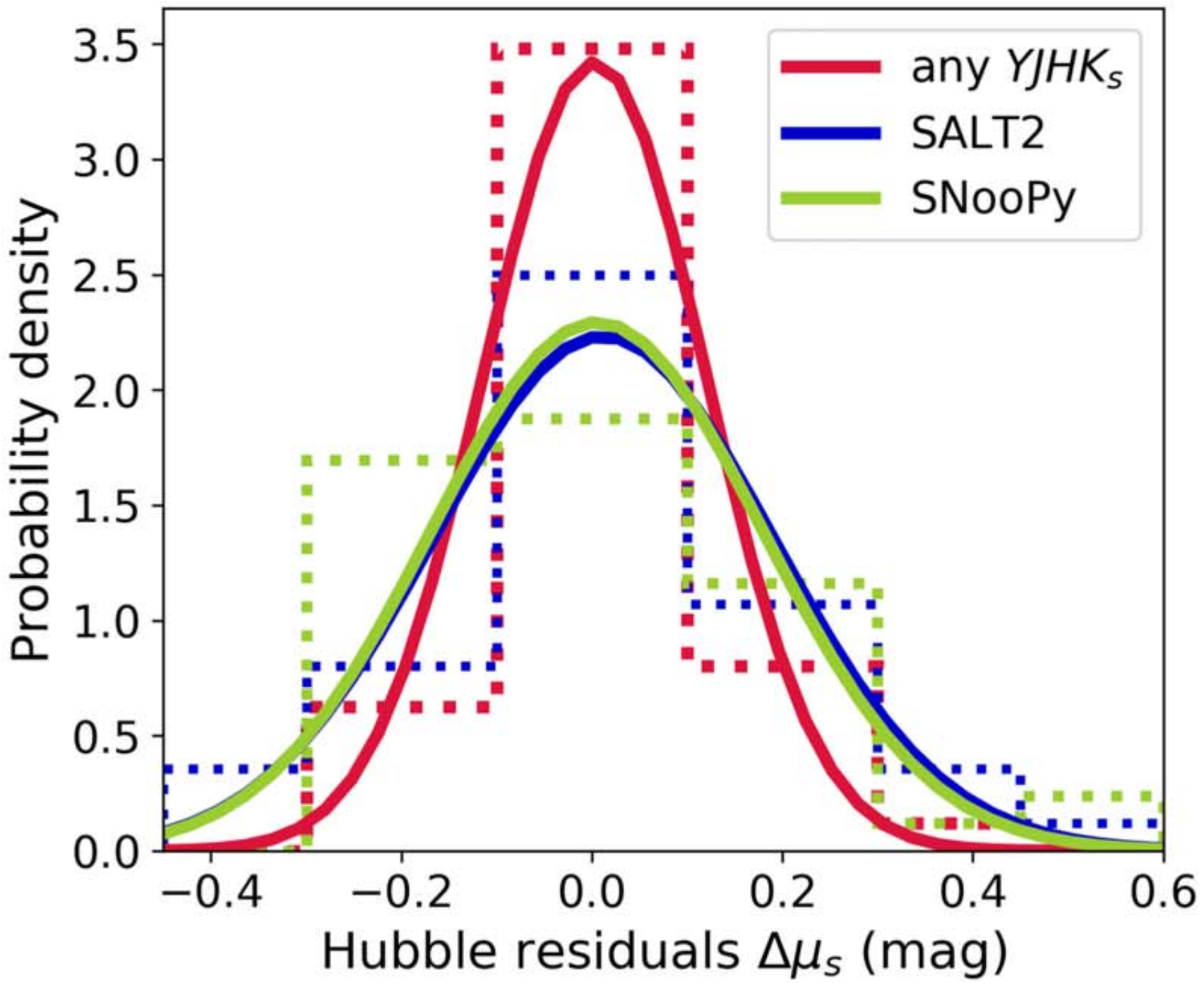


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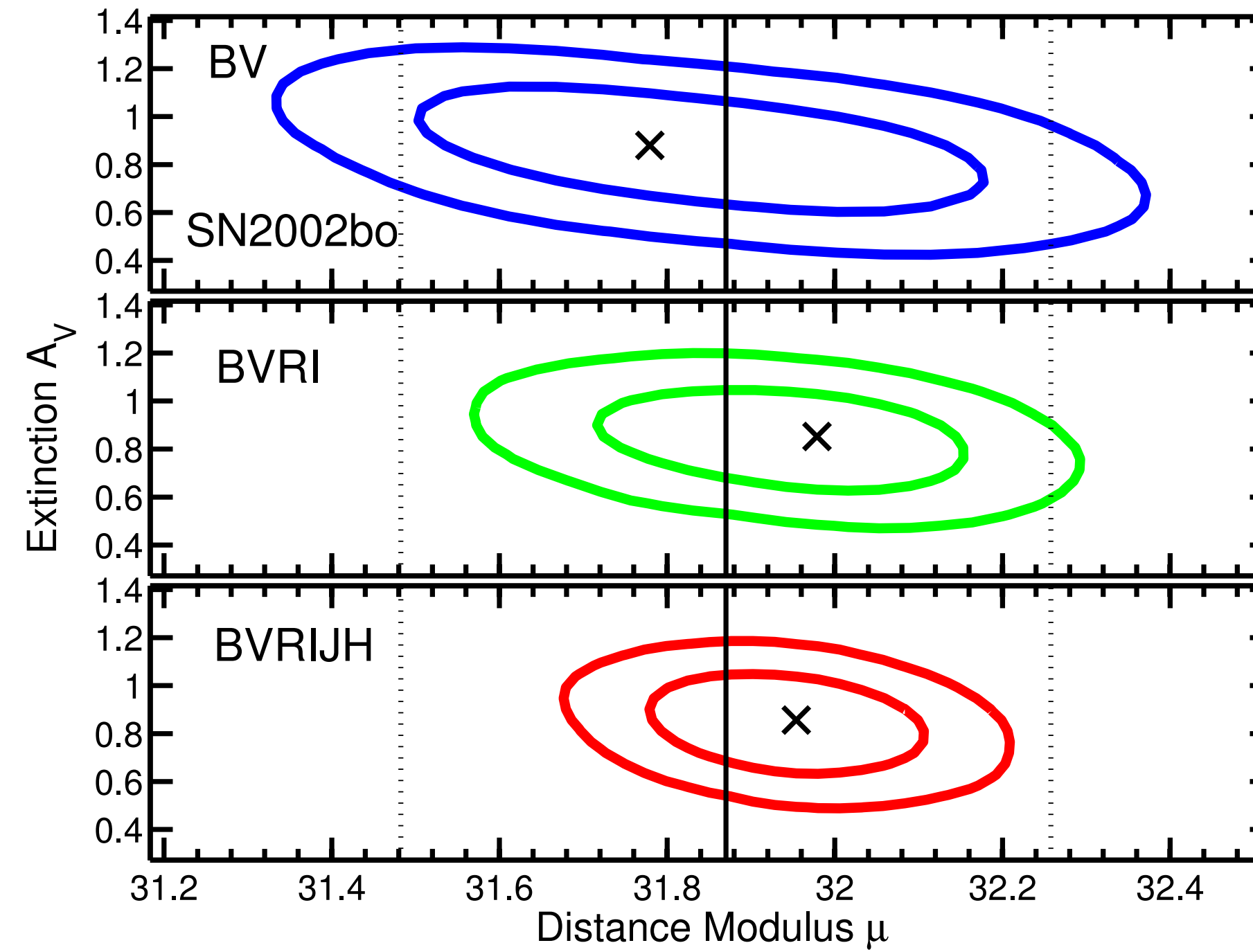
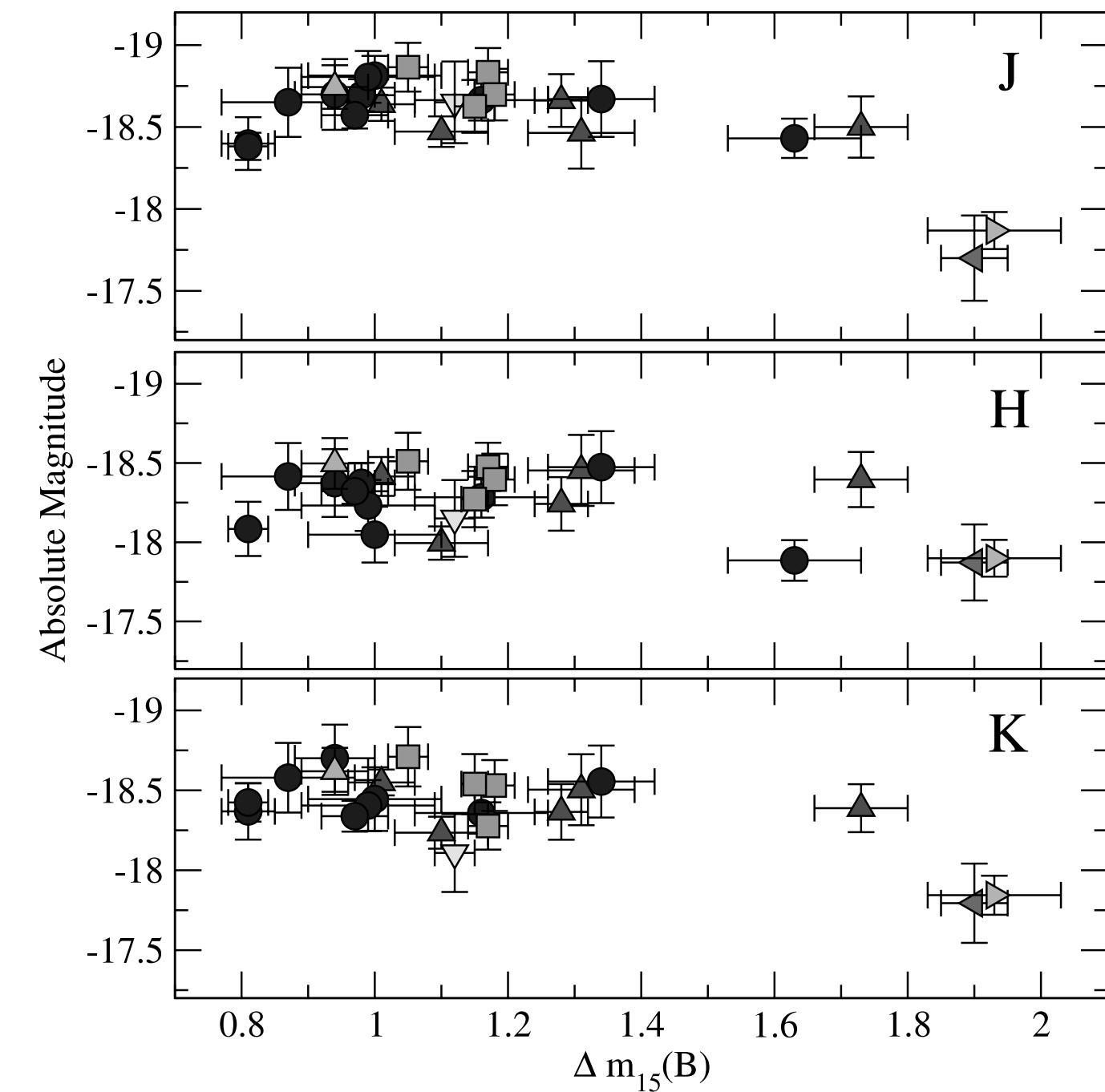


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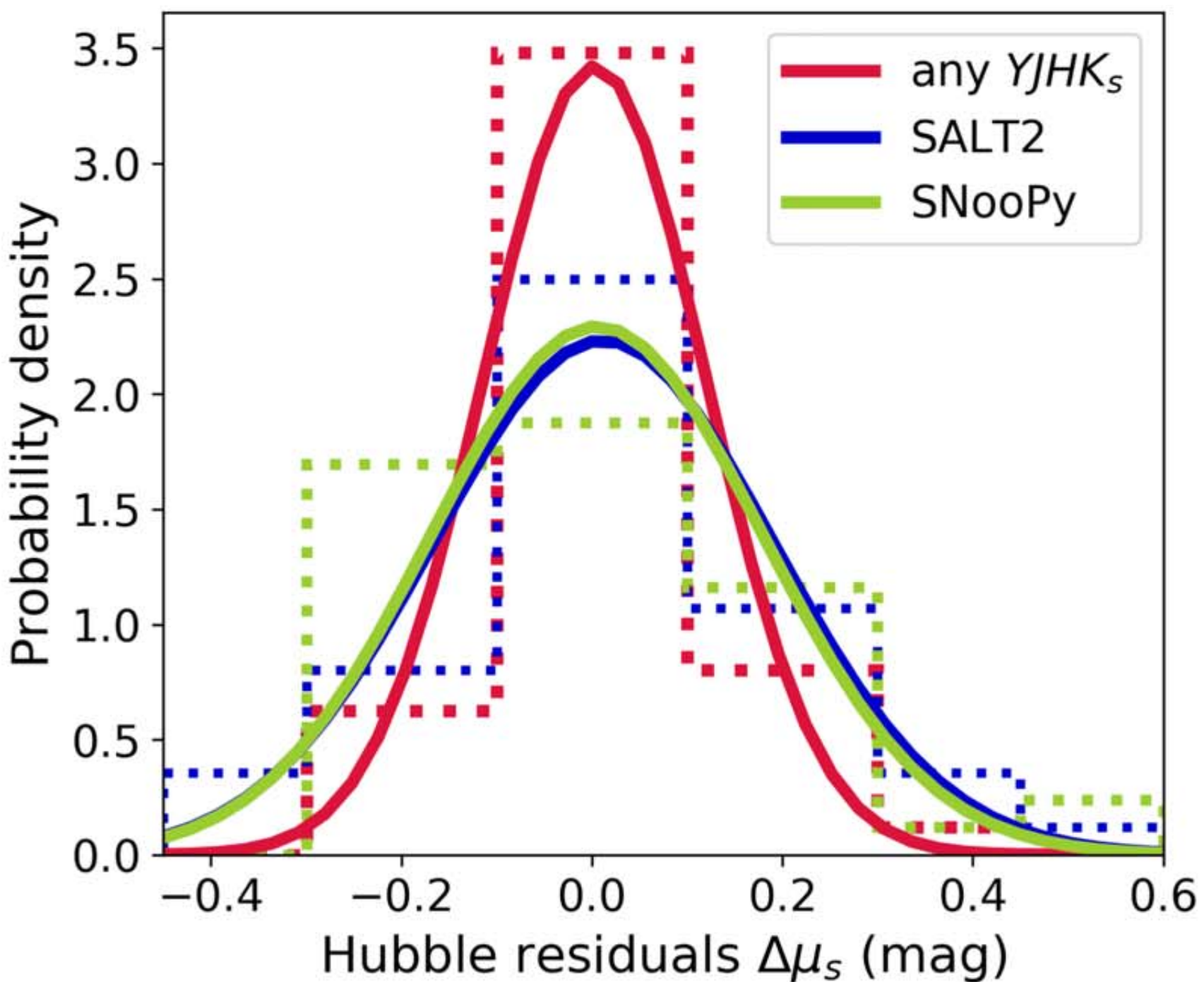


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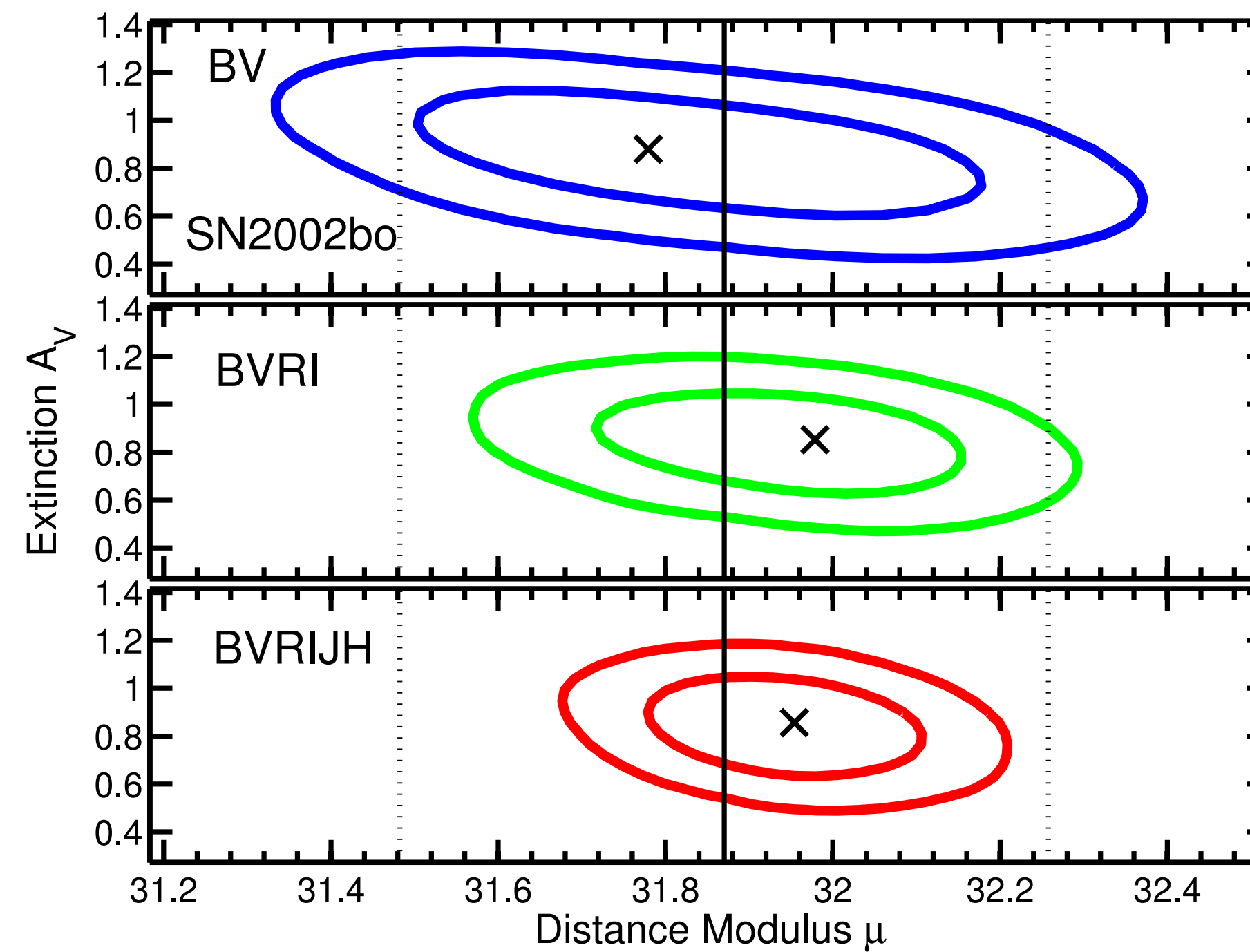
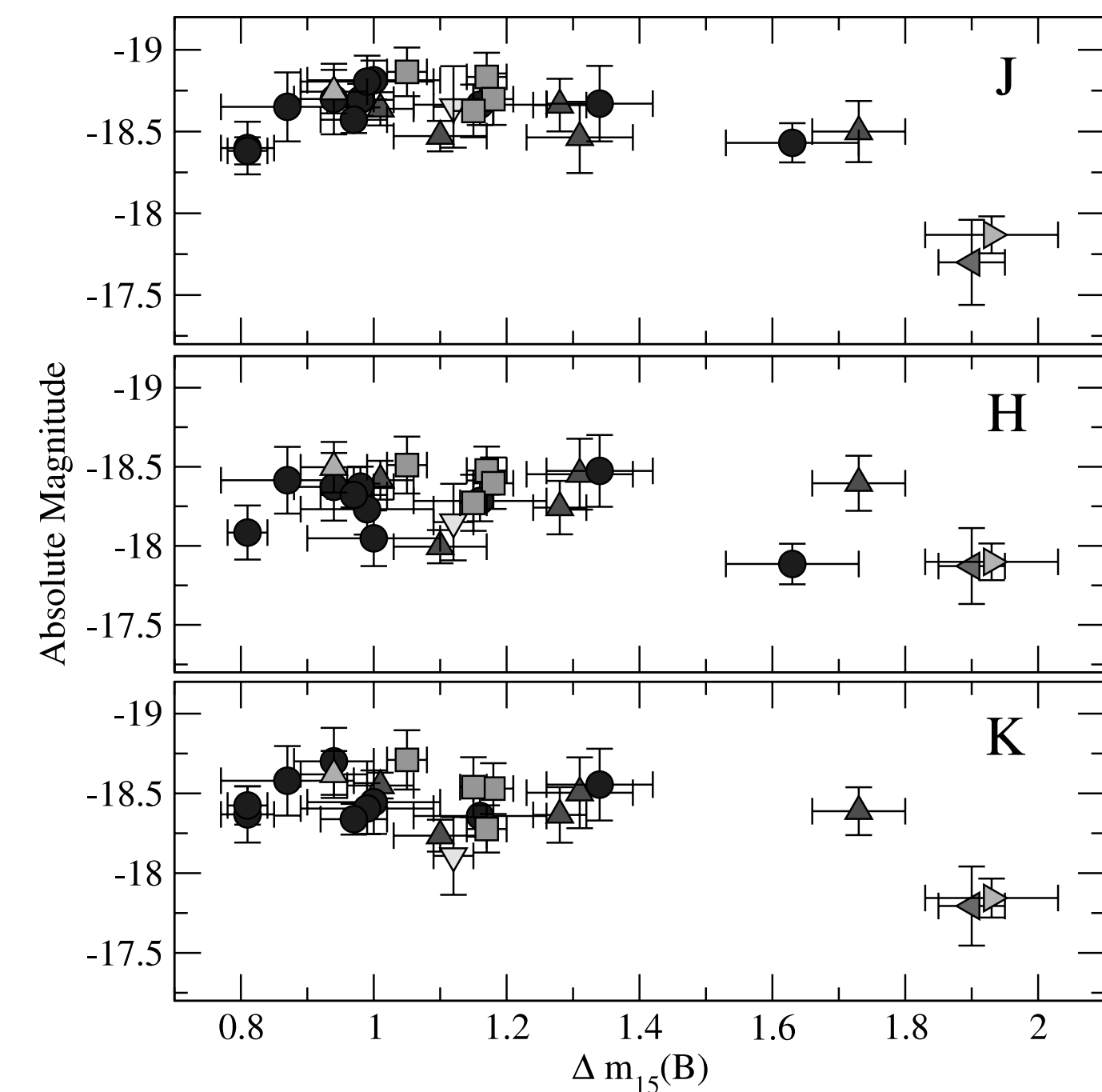


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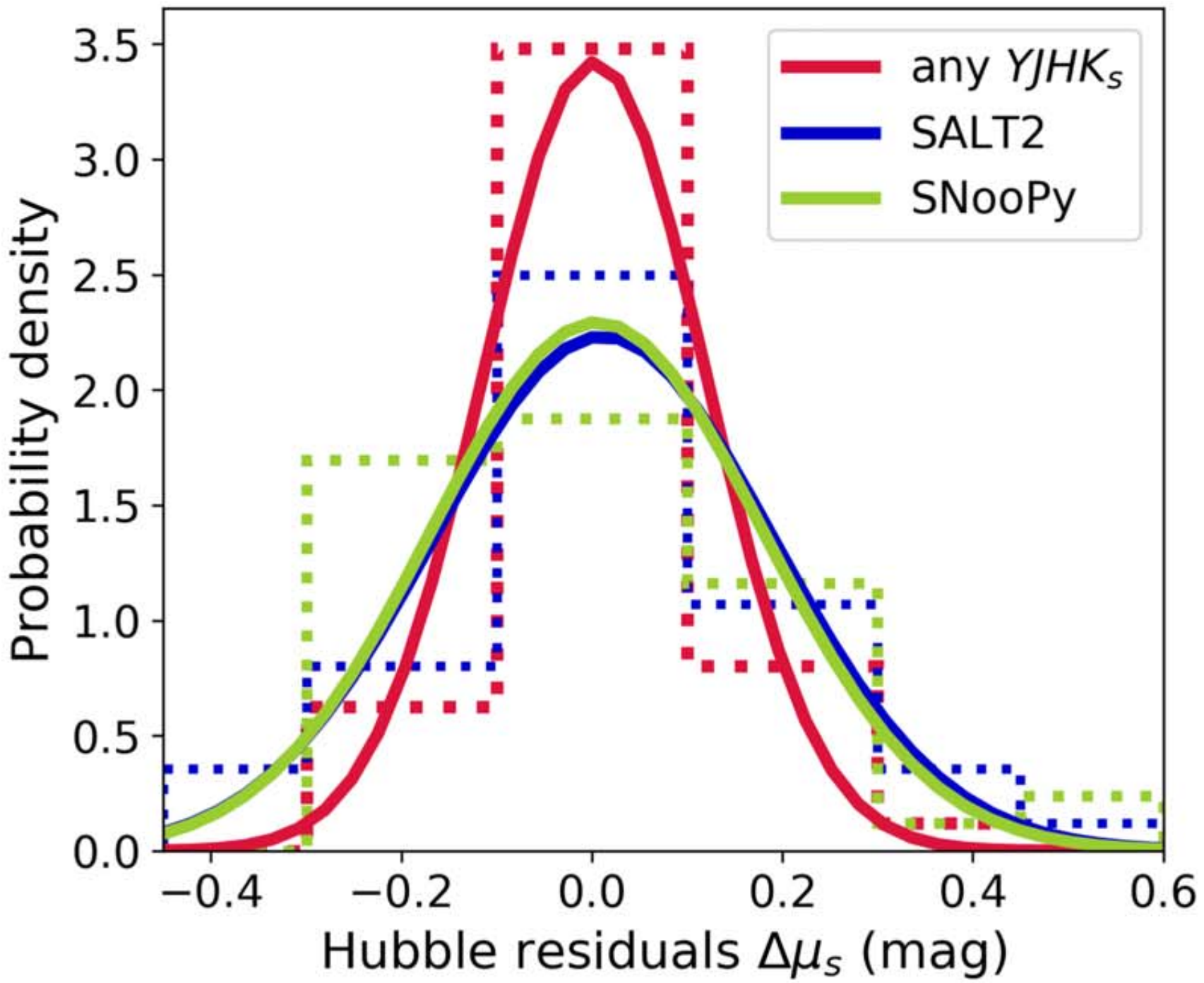


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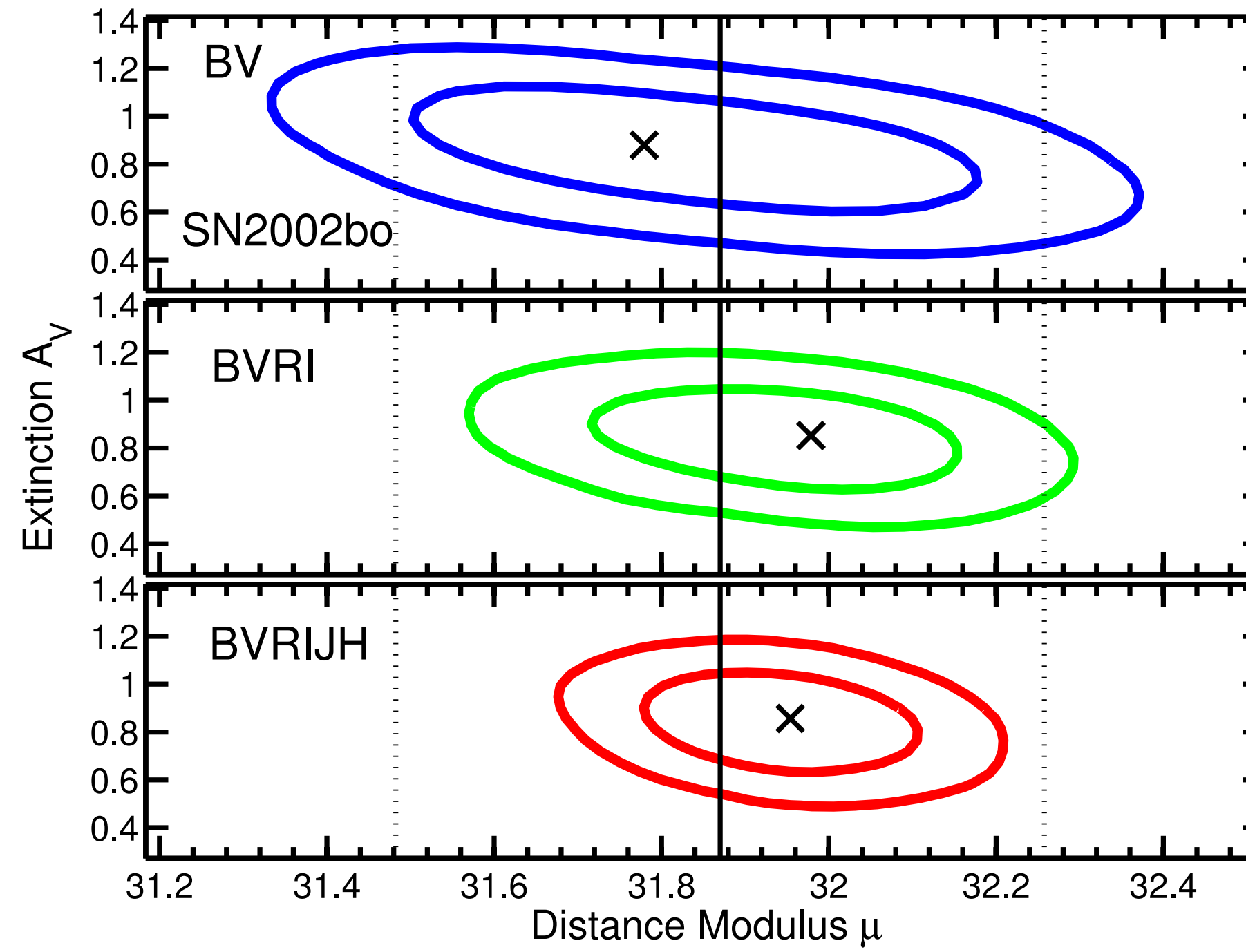
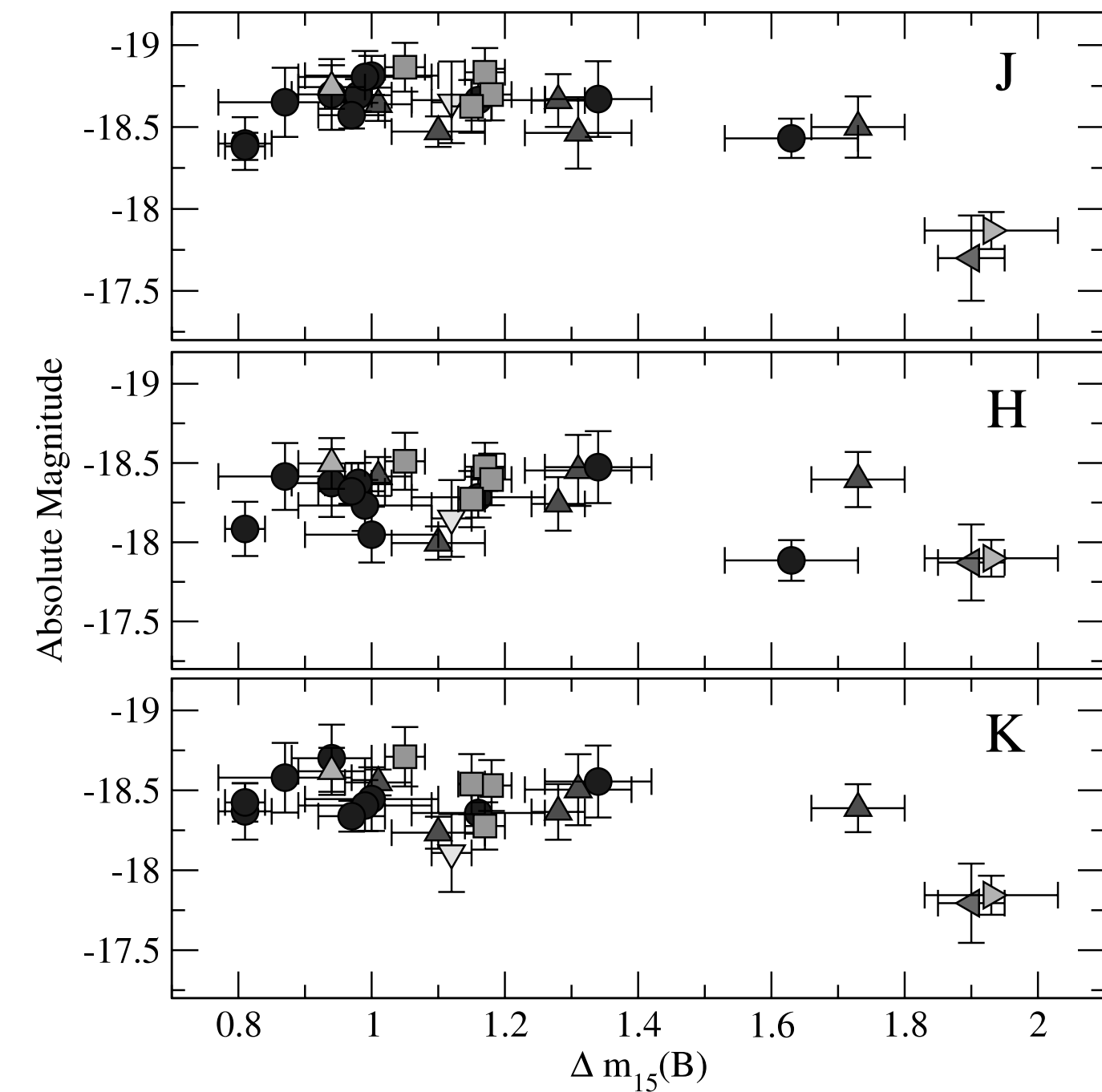
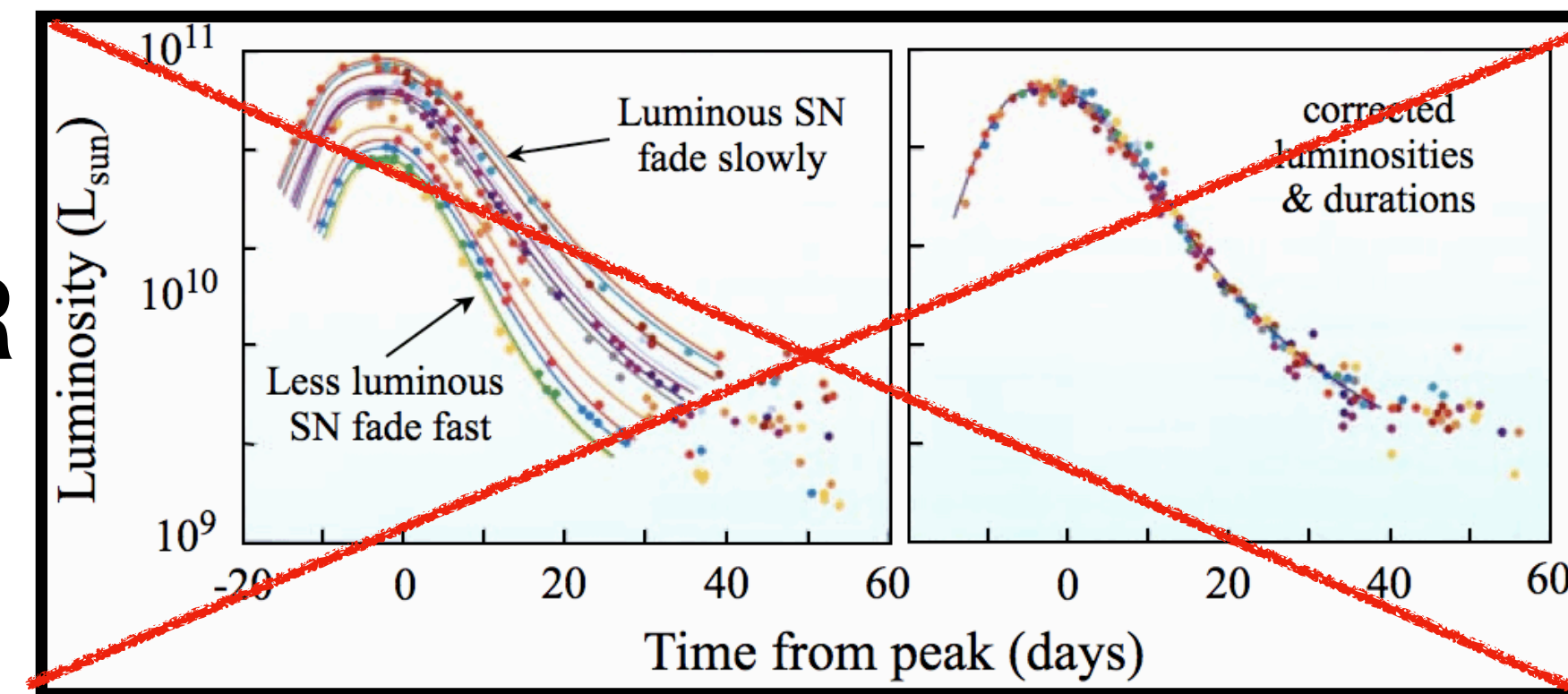


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Spectral Adaptive Light-curve Template

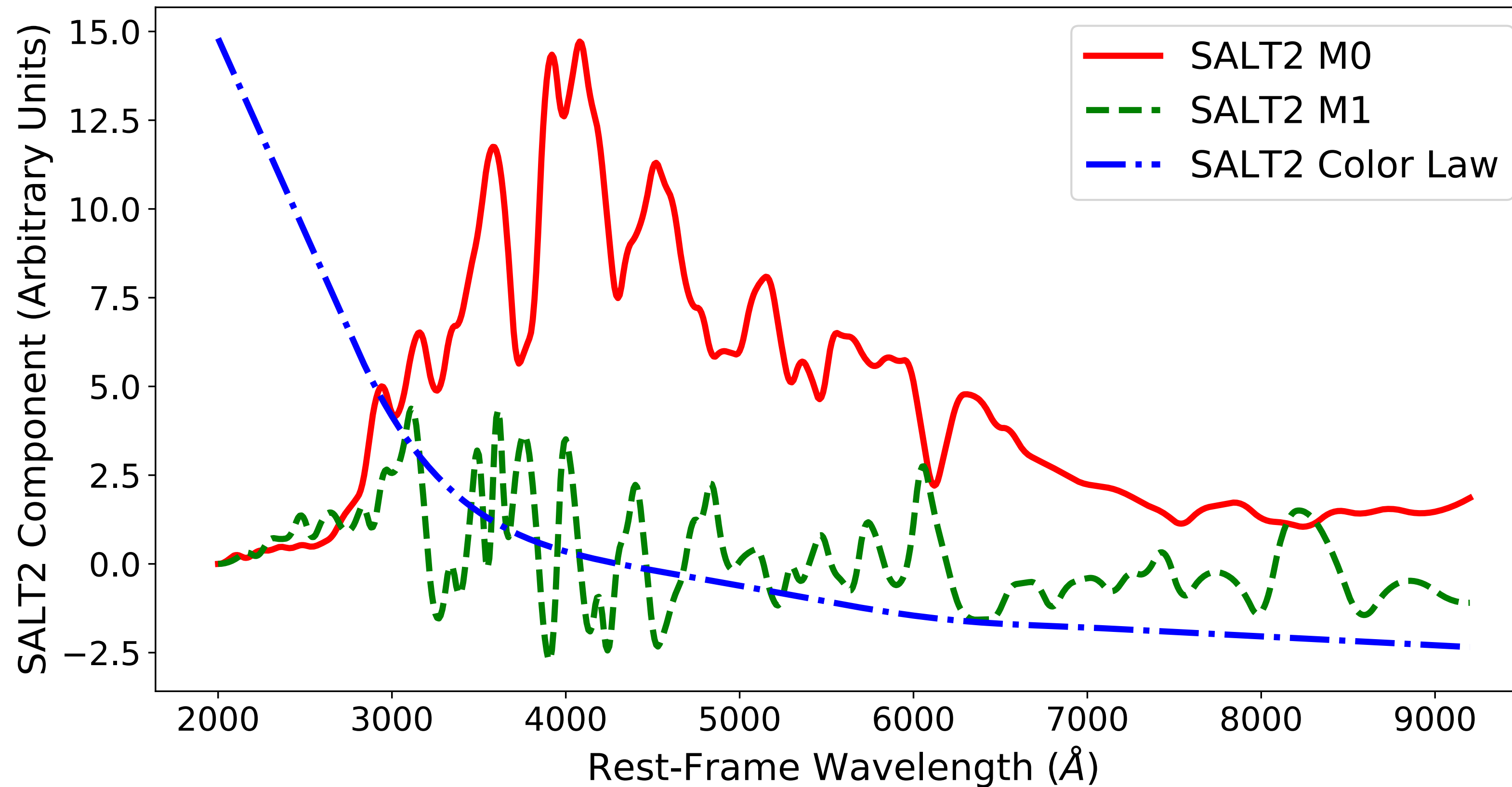


Image Credit: Pierel+2021

$$F(t, \lambda) = x_0 [M_0(t, \lambda) + x_1 M_1(t, \lambda)] \exp [c \times CL(\lambda)]$$

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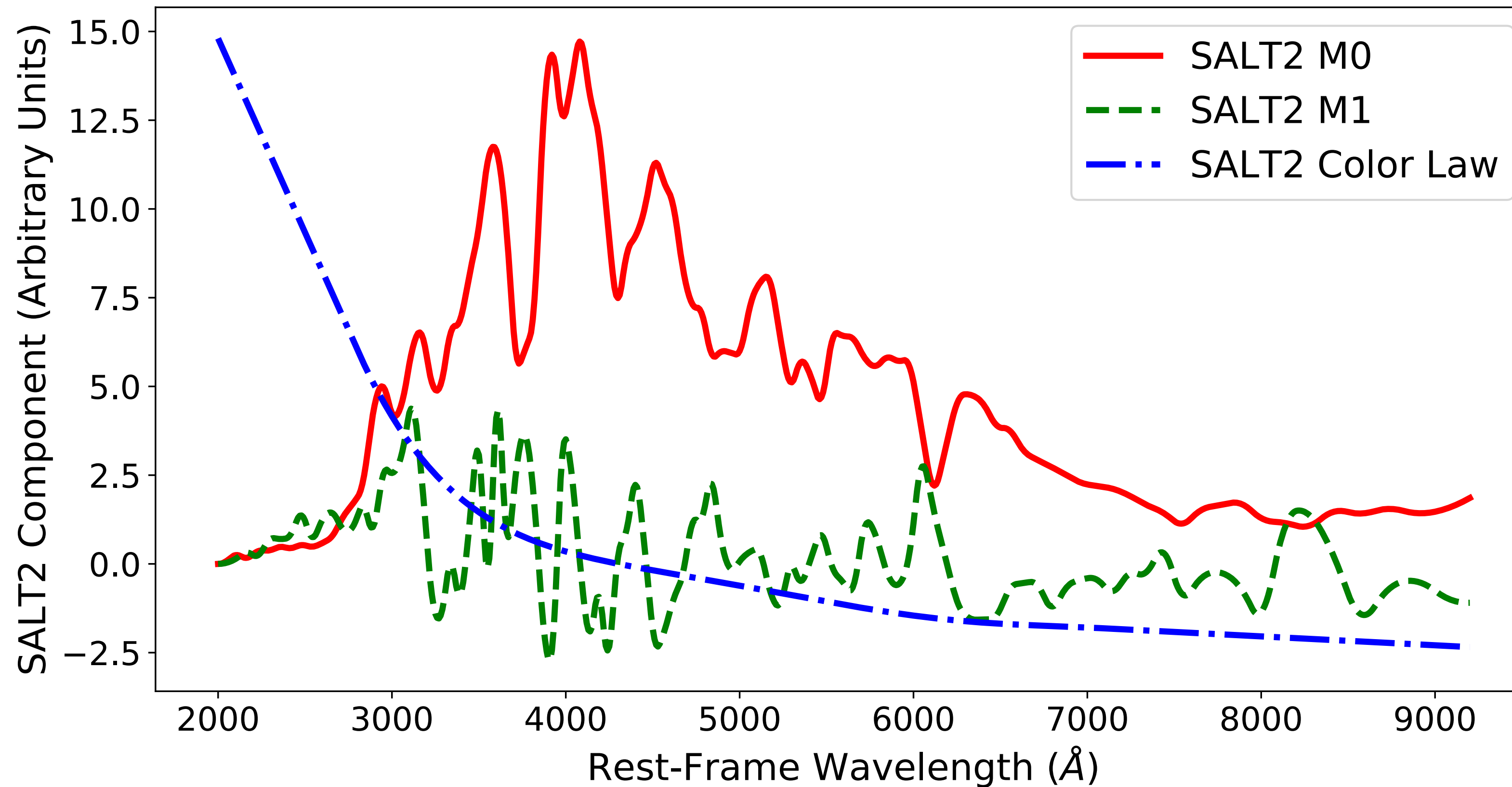


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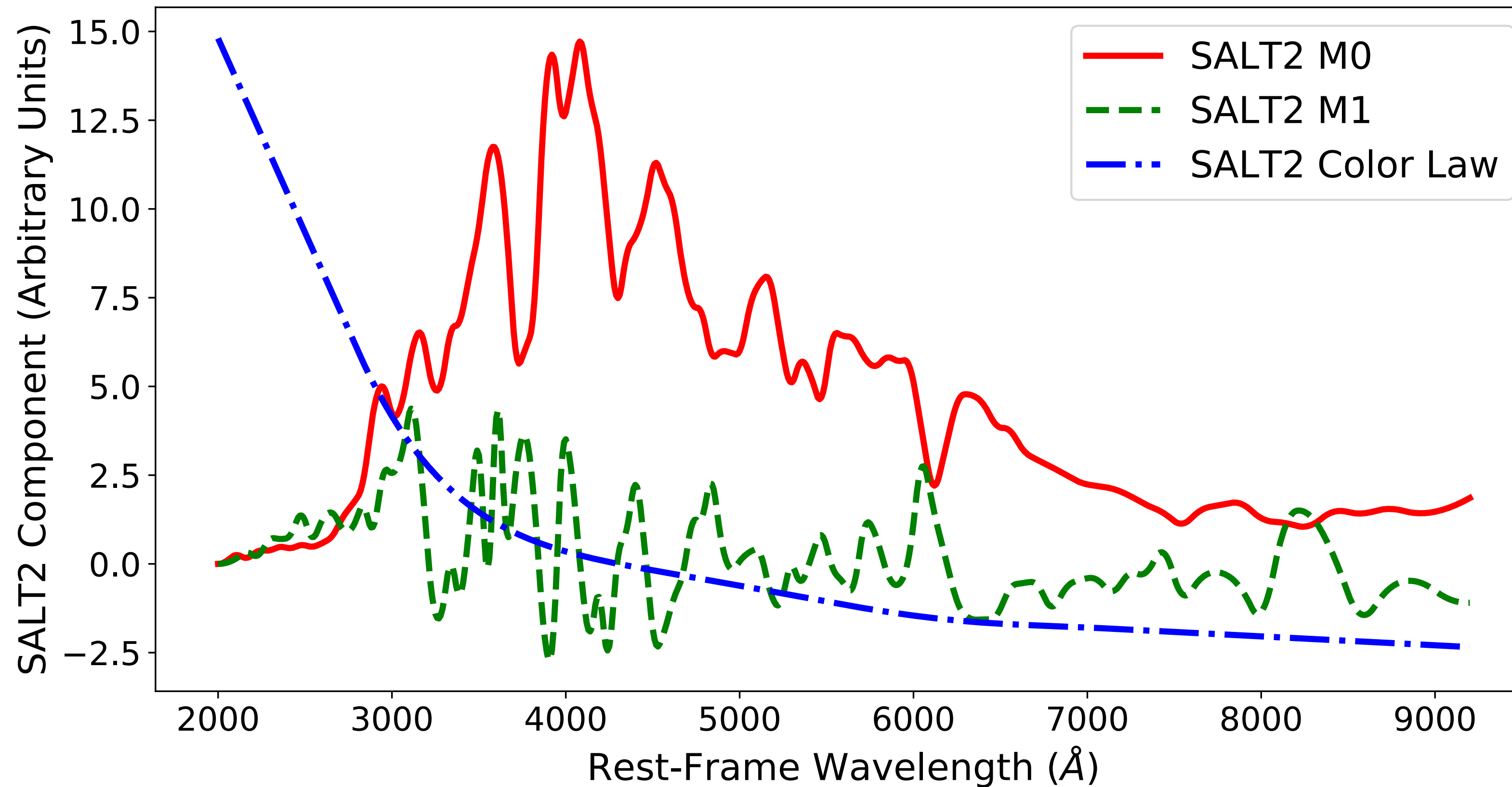


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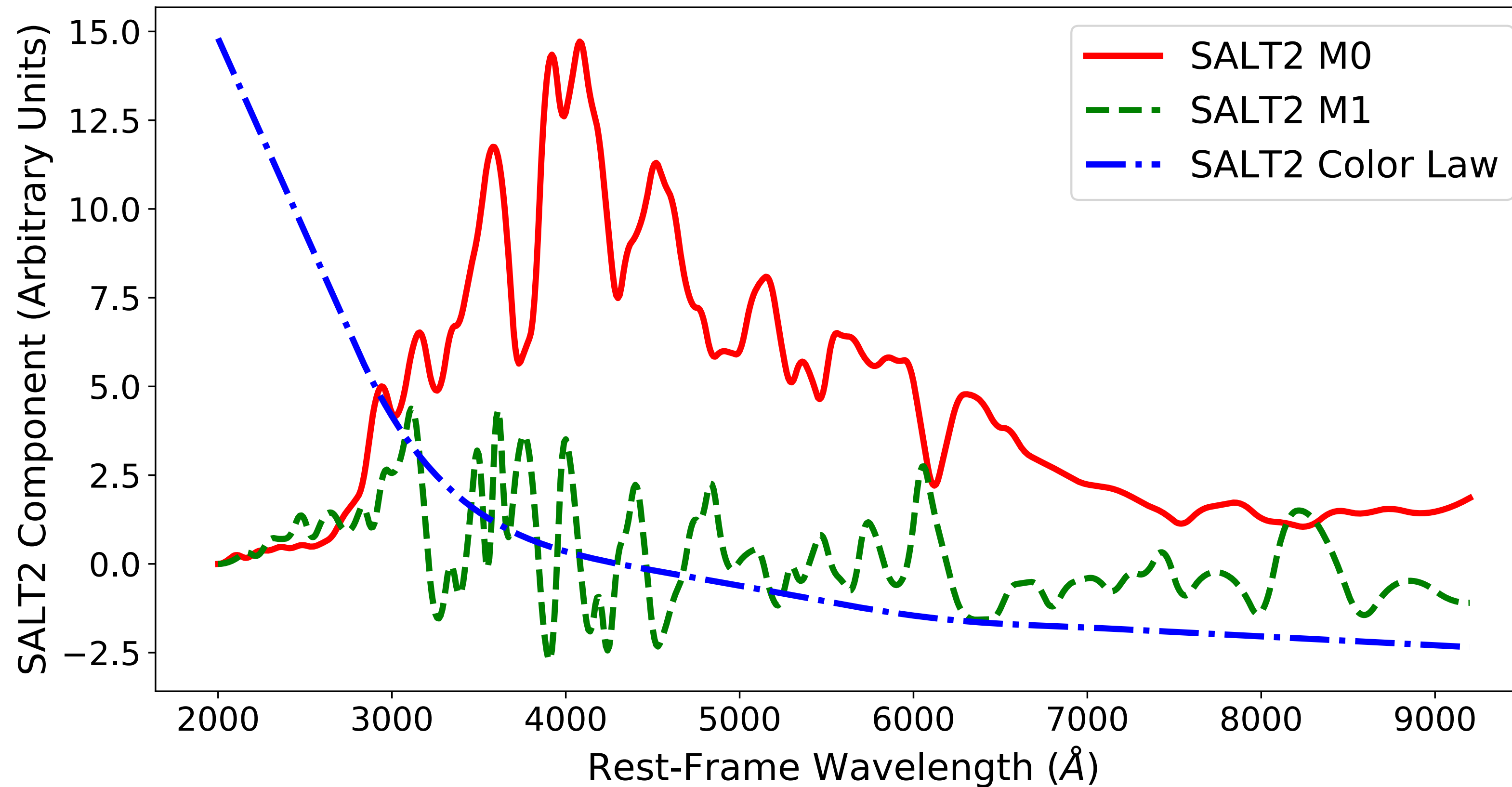
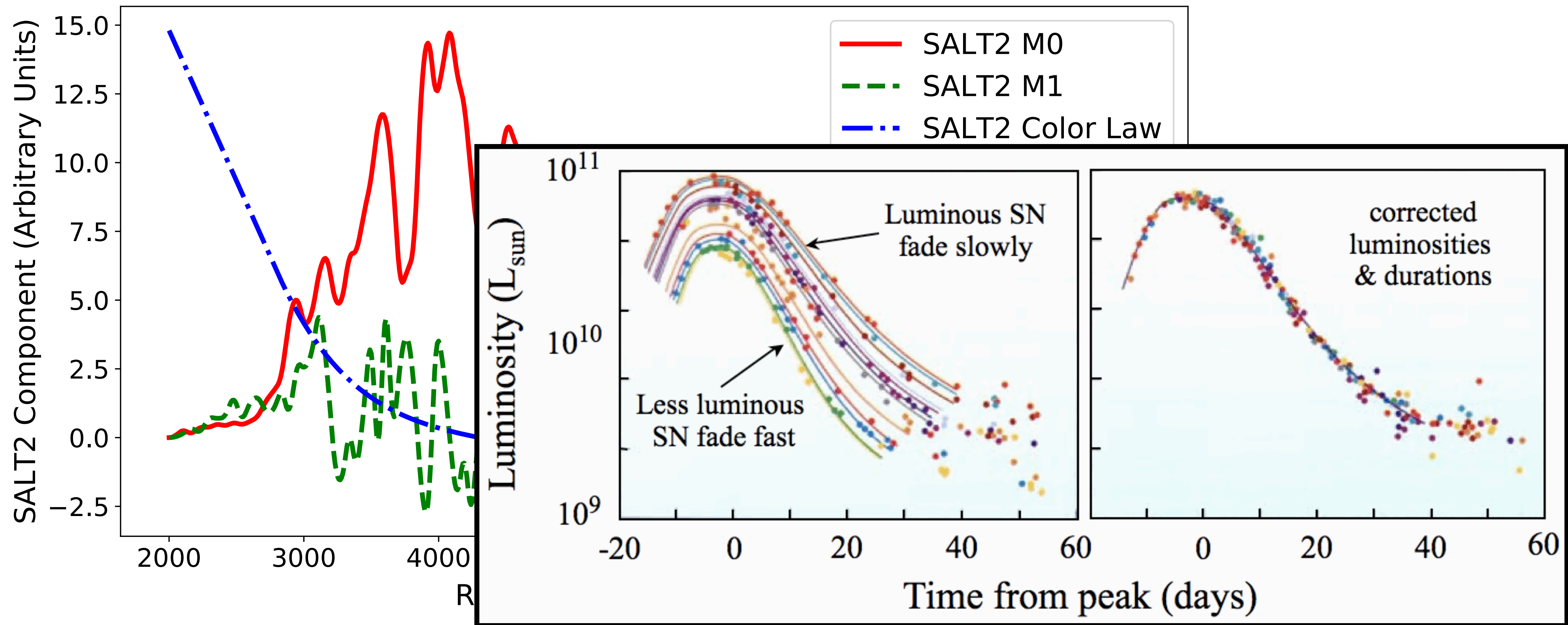


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SALT3 (Kenworthy+2021)

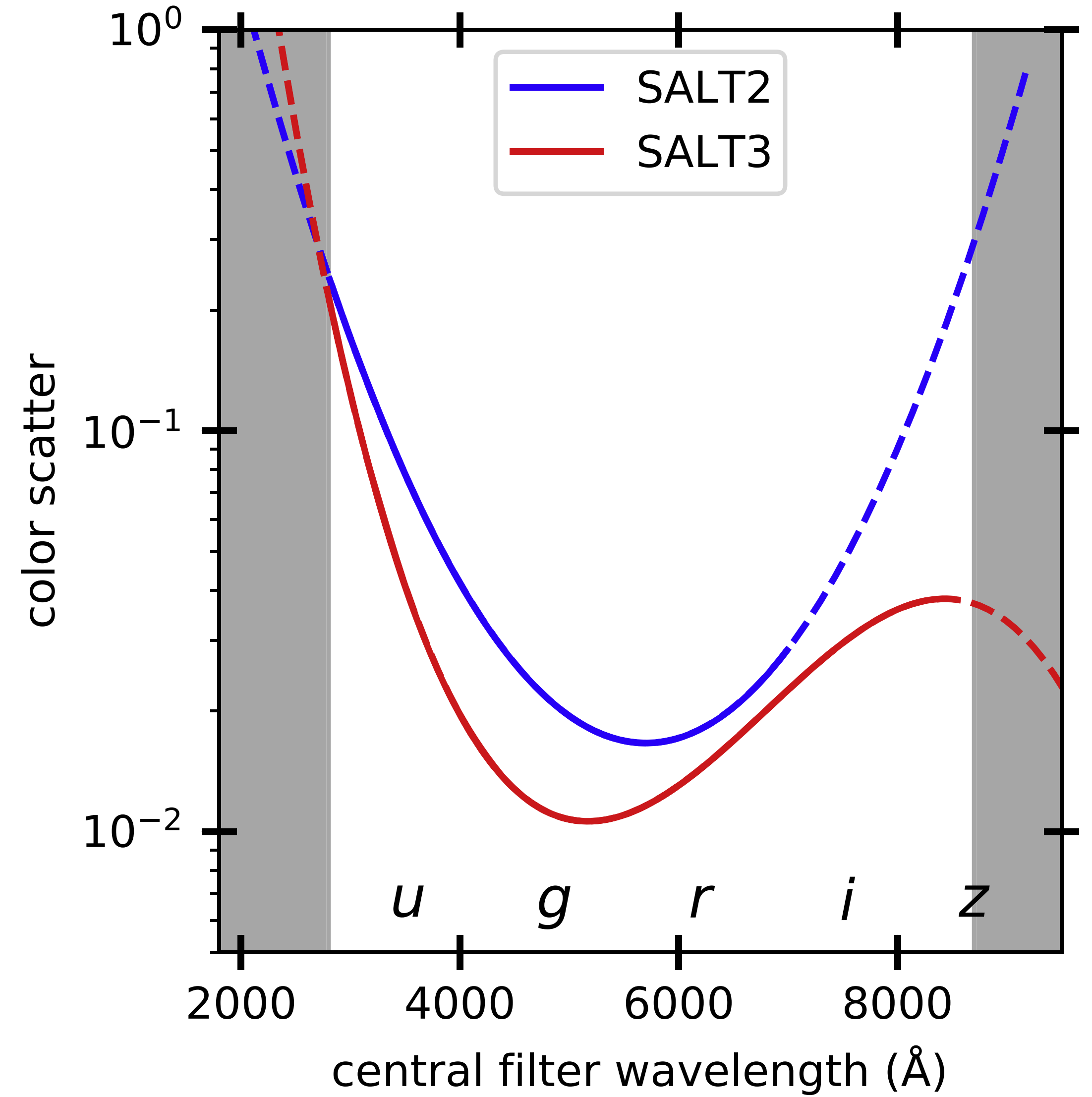
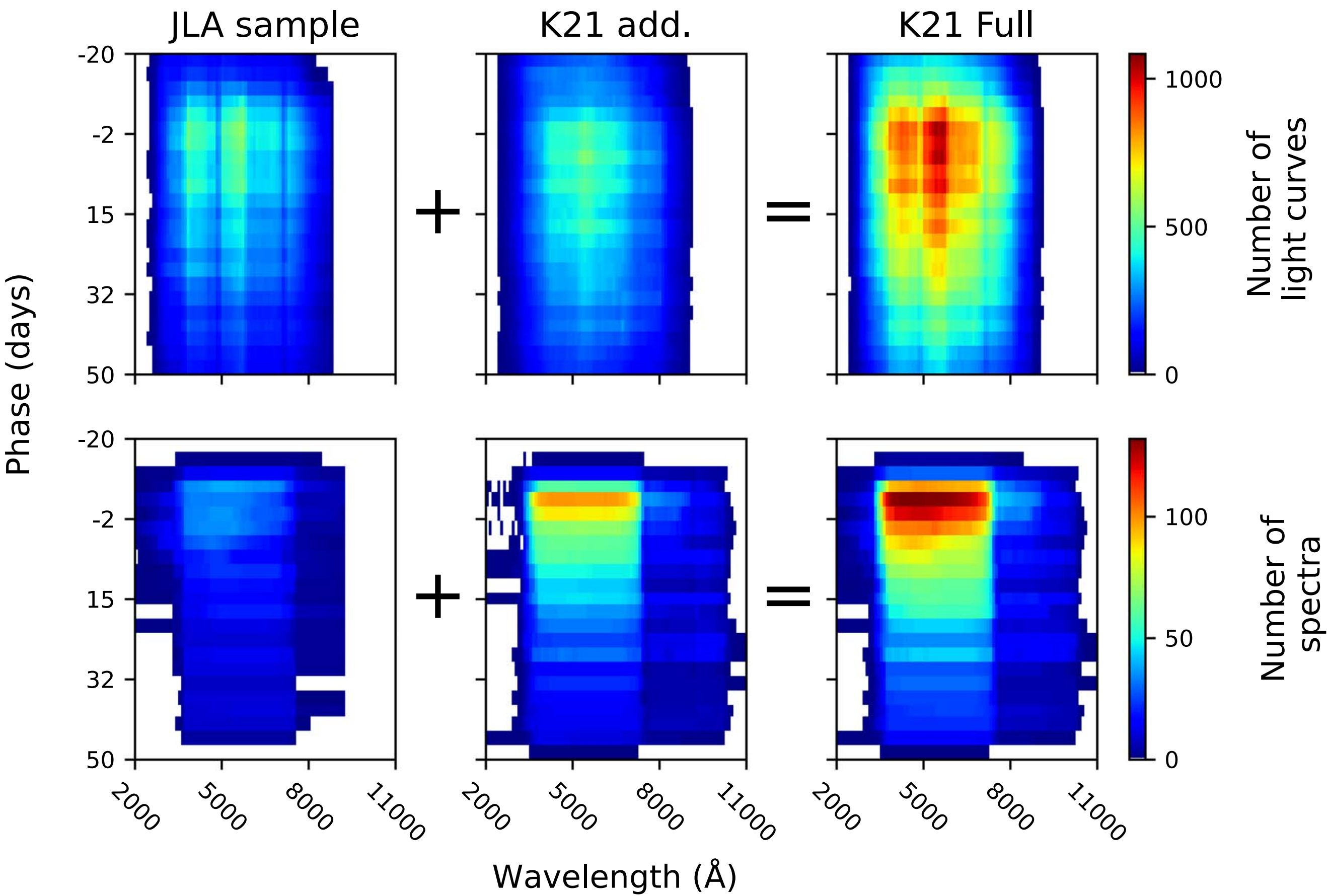


Image Credit: Kenworthy+2021

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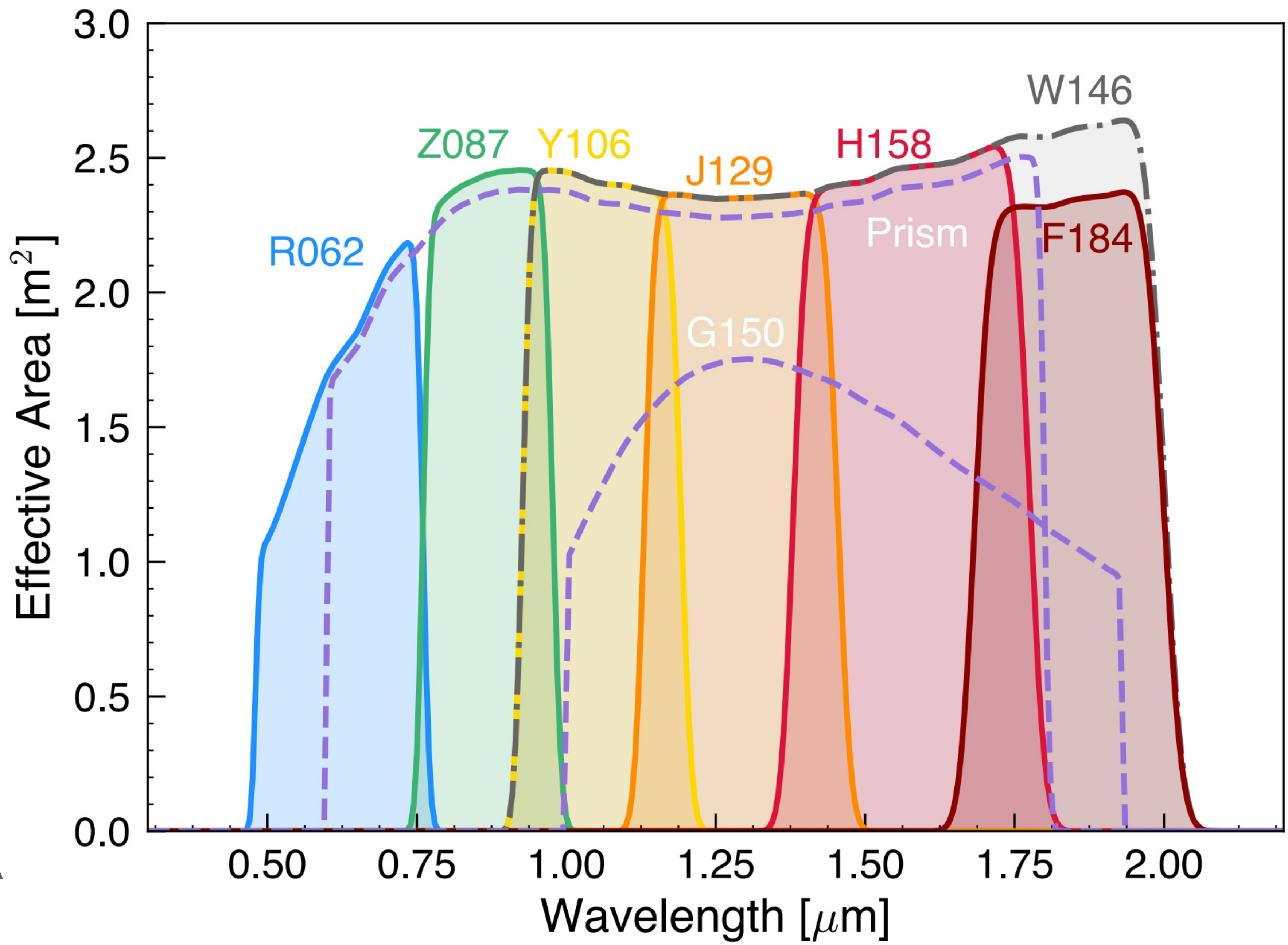


Image Credit: NASA

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SALT3 Coverage

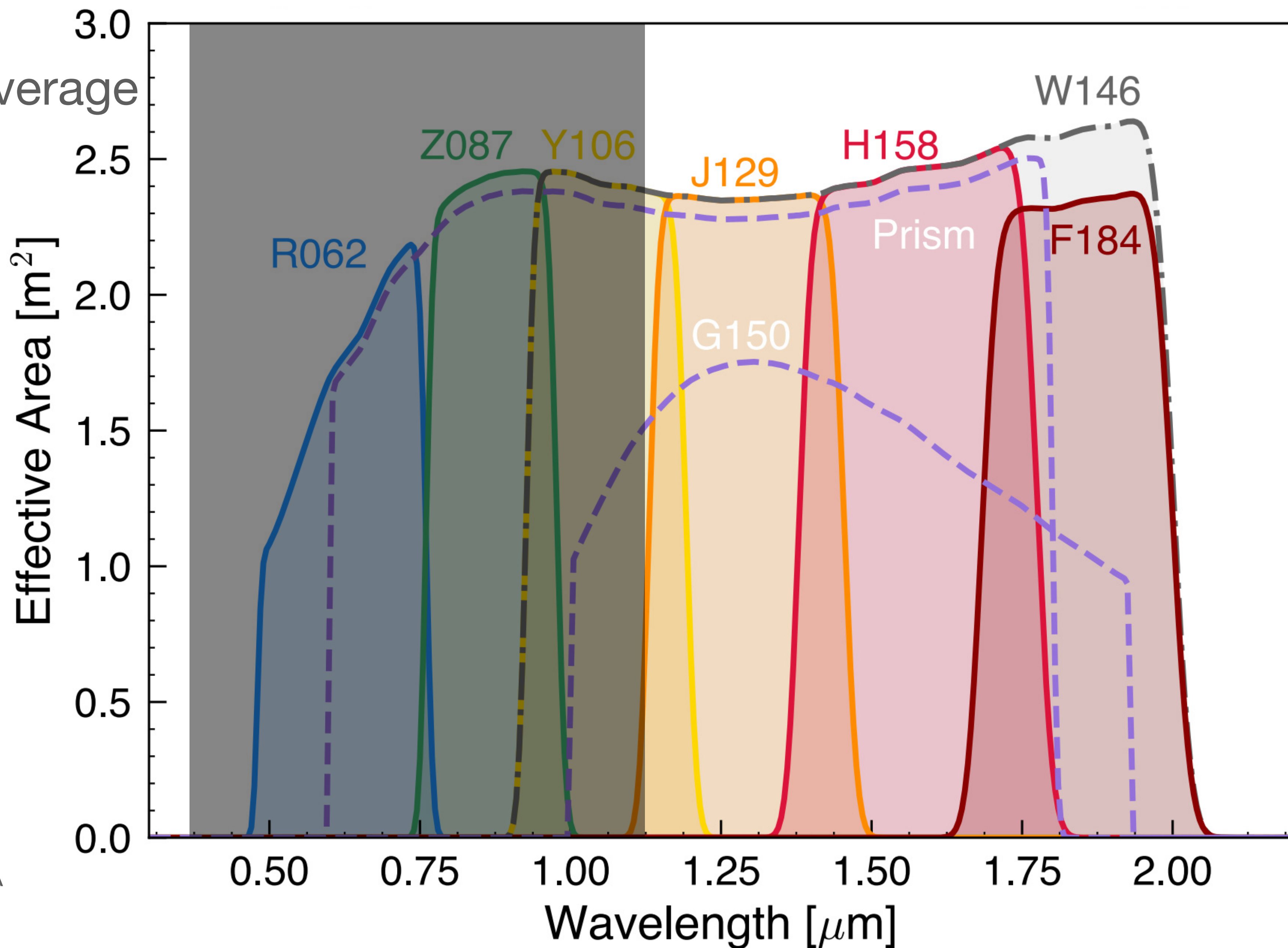


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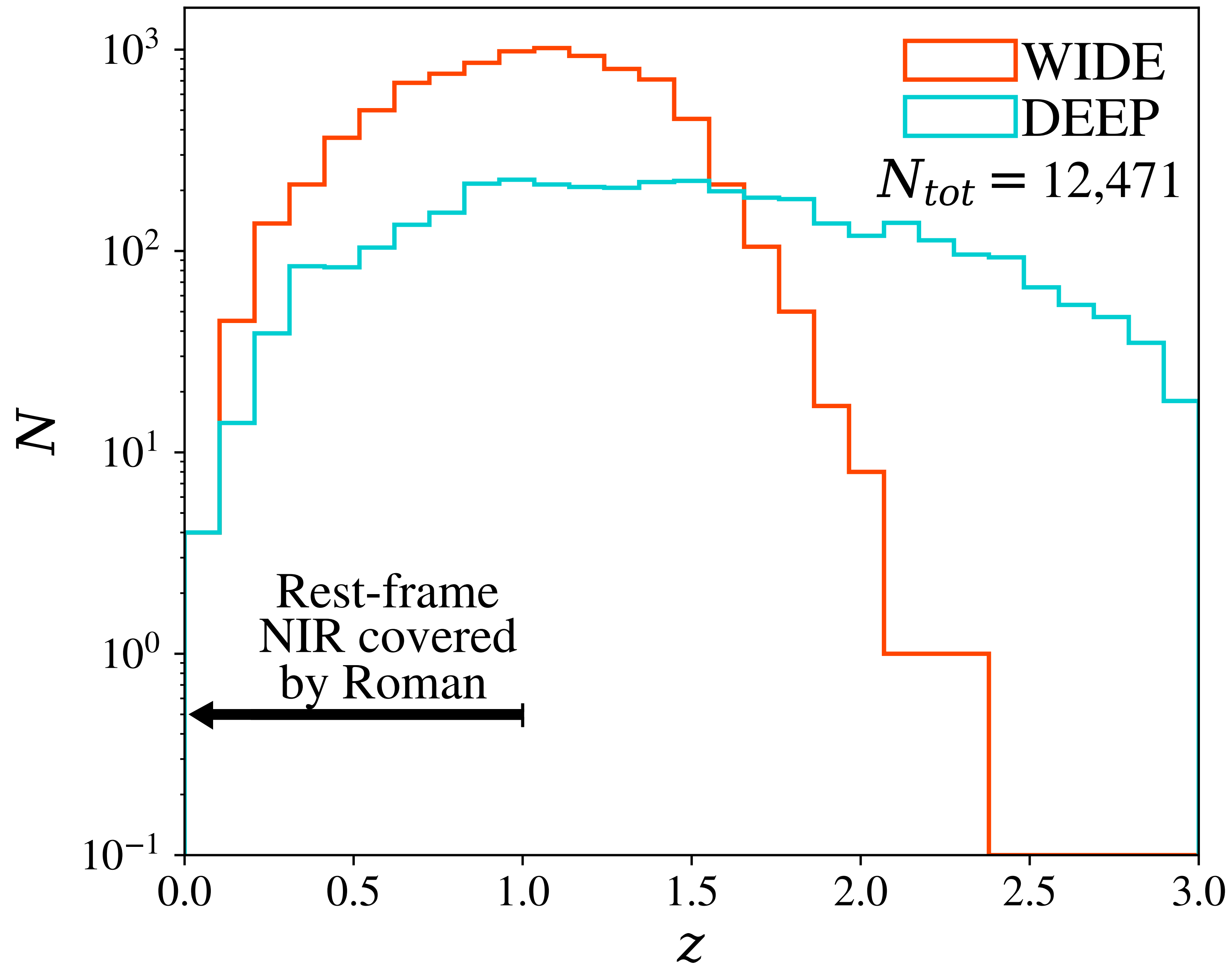
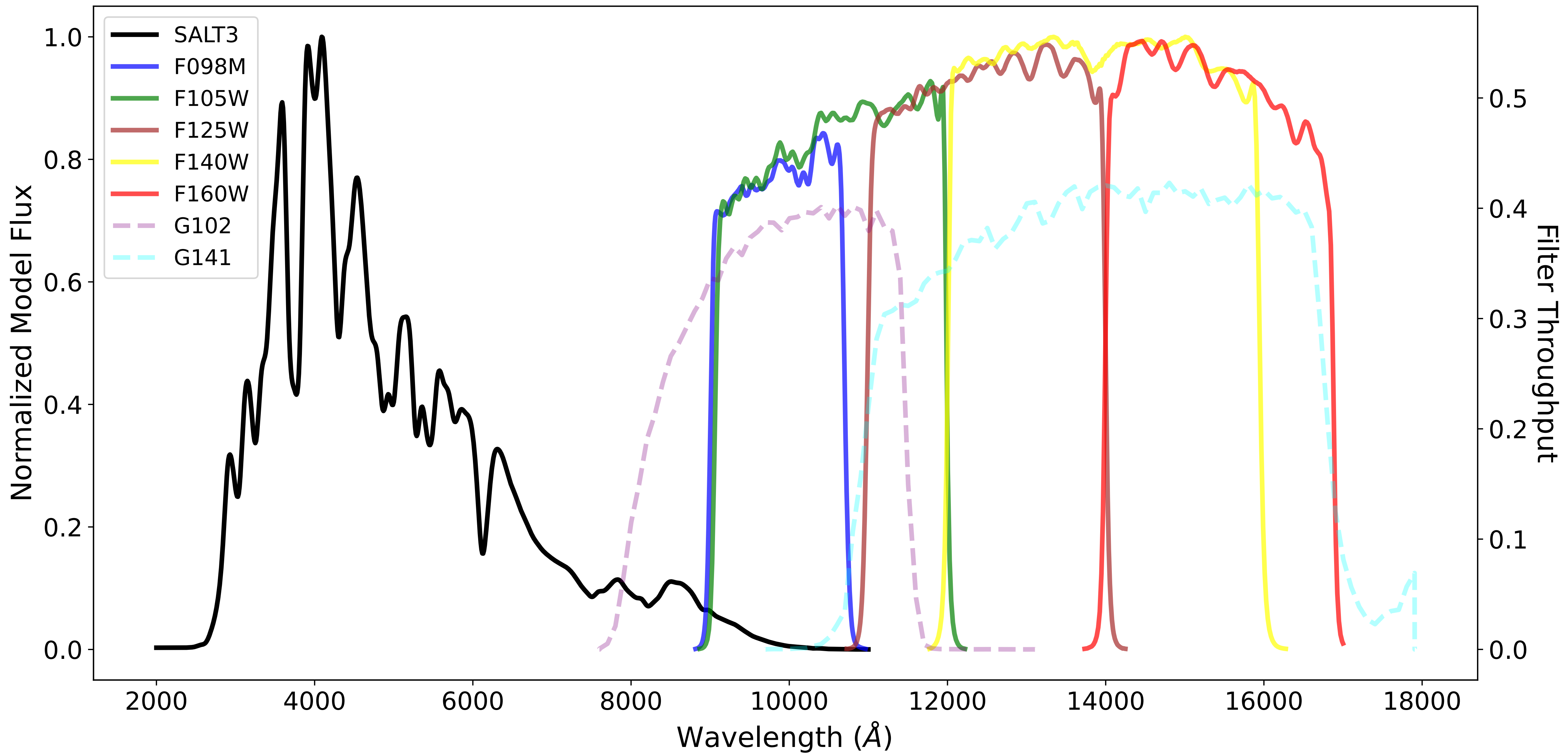


Image Credit: Rose+2021

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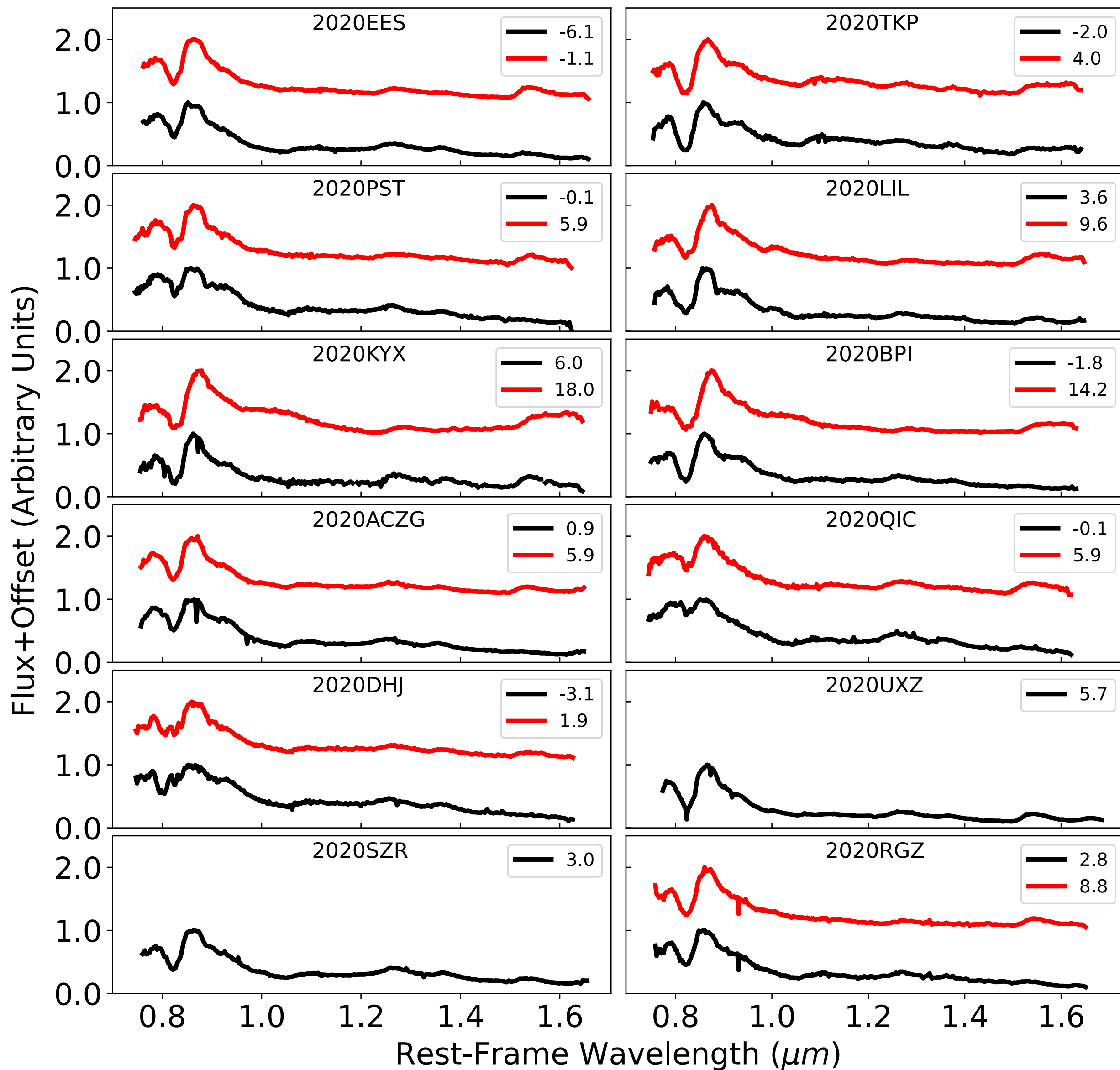
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SIRAH (HST Cycles 27 & 28)



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RAISIN (HST Cycles 20 & 23)

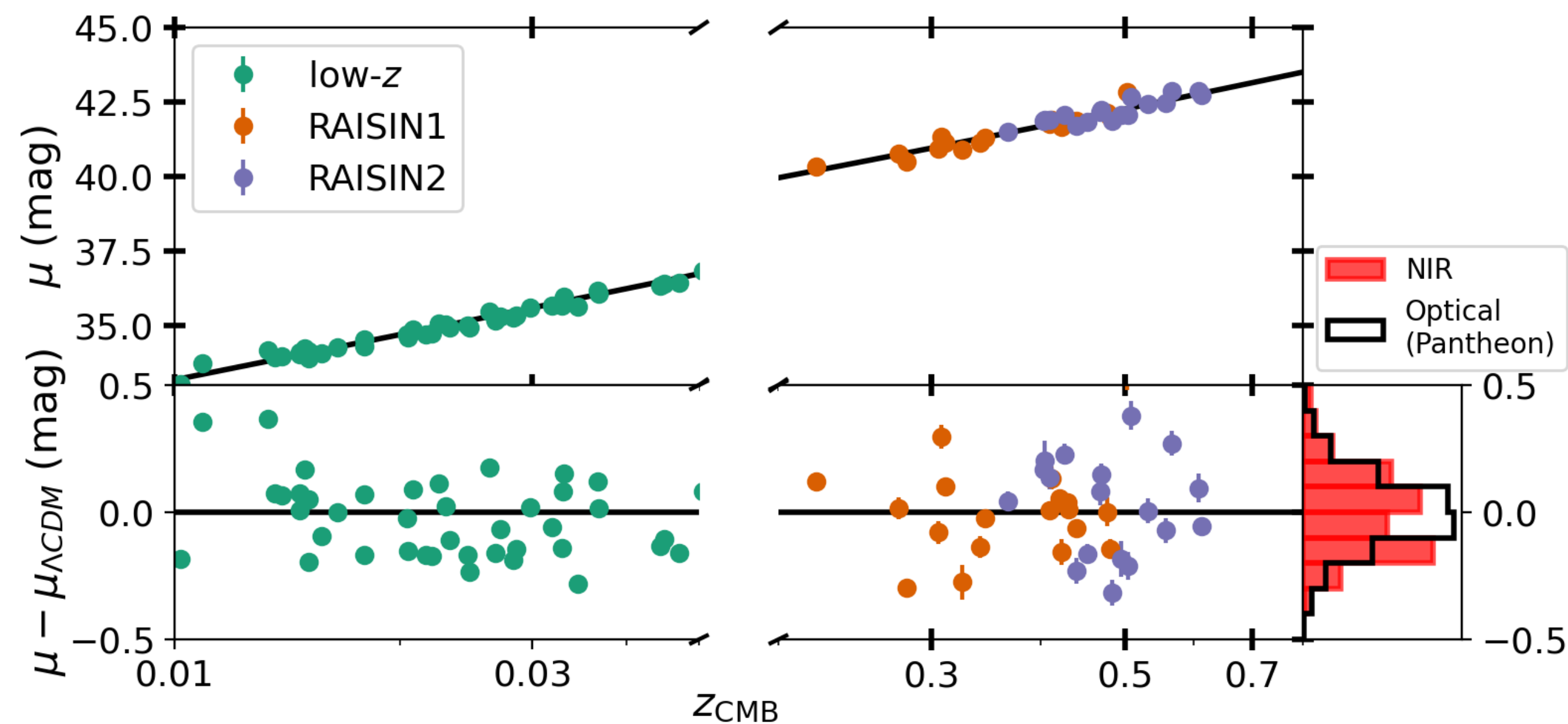
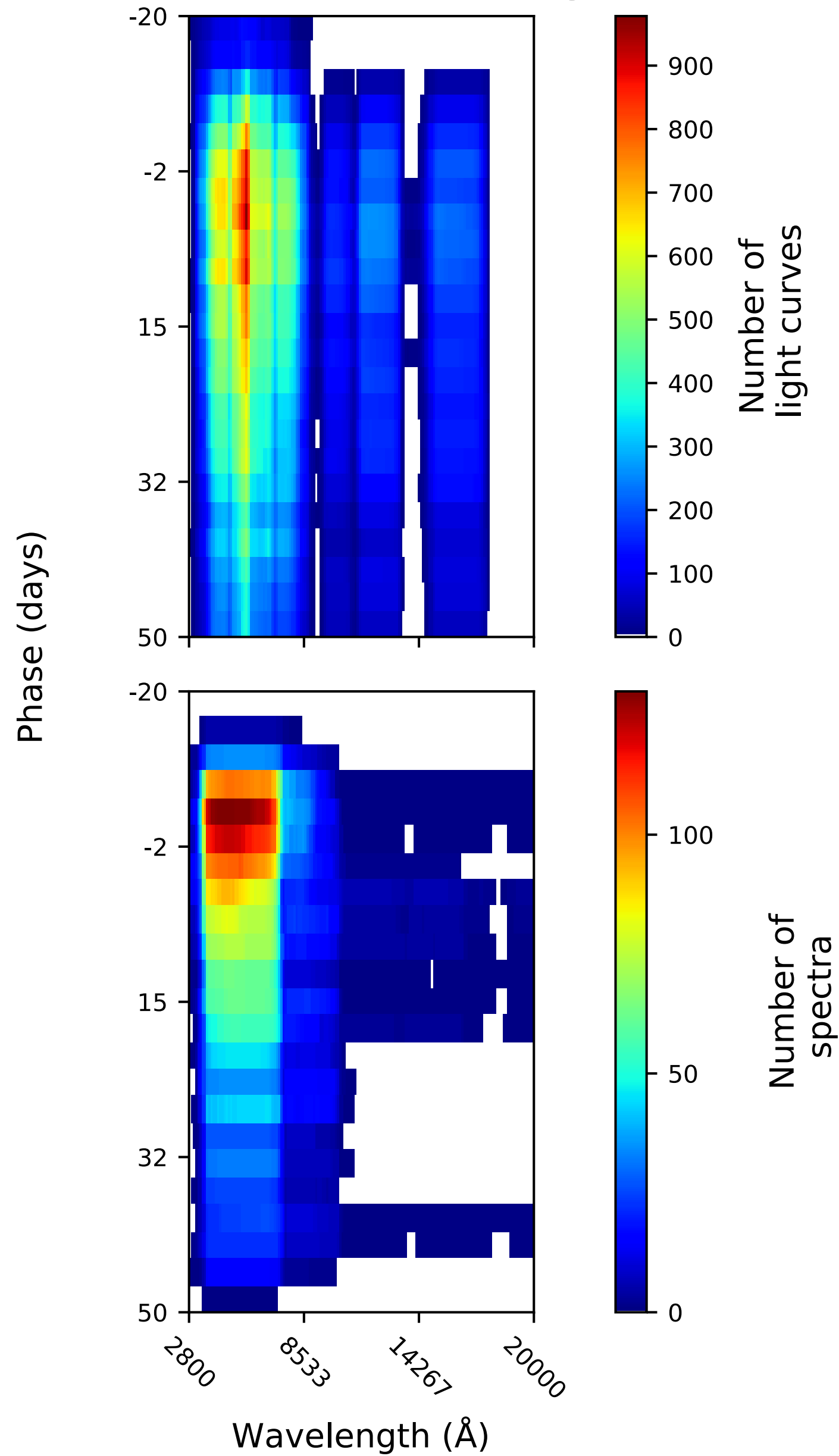
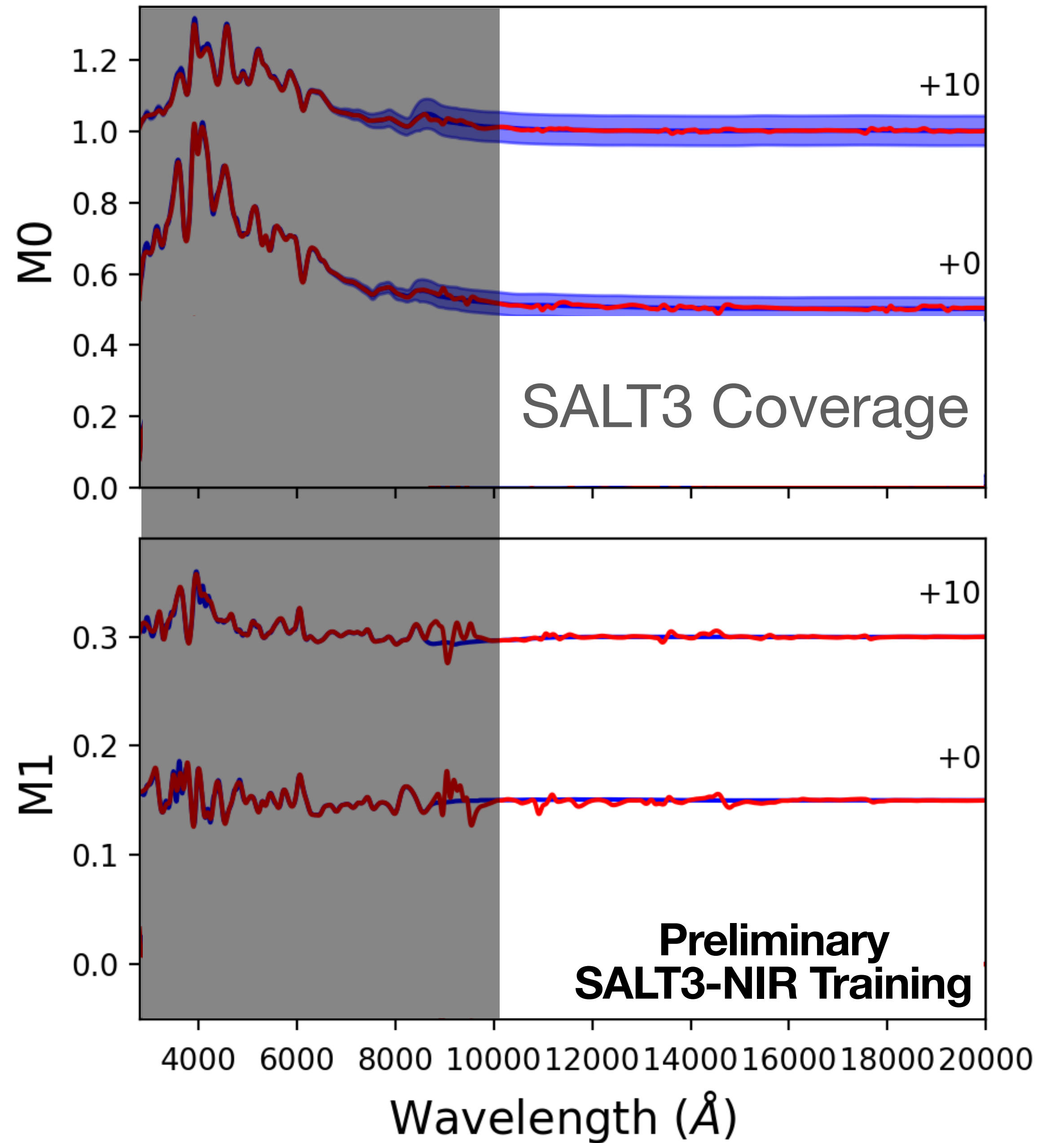


Image Credit: Jones+2022

Updated Training Sample



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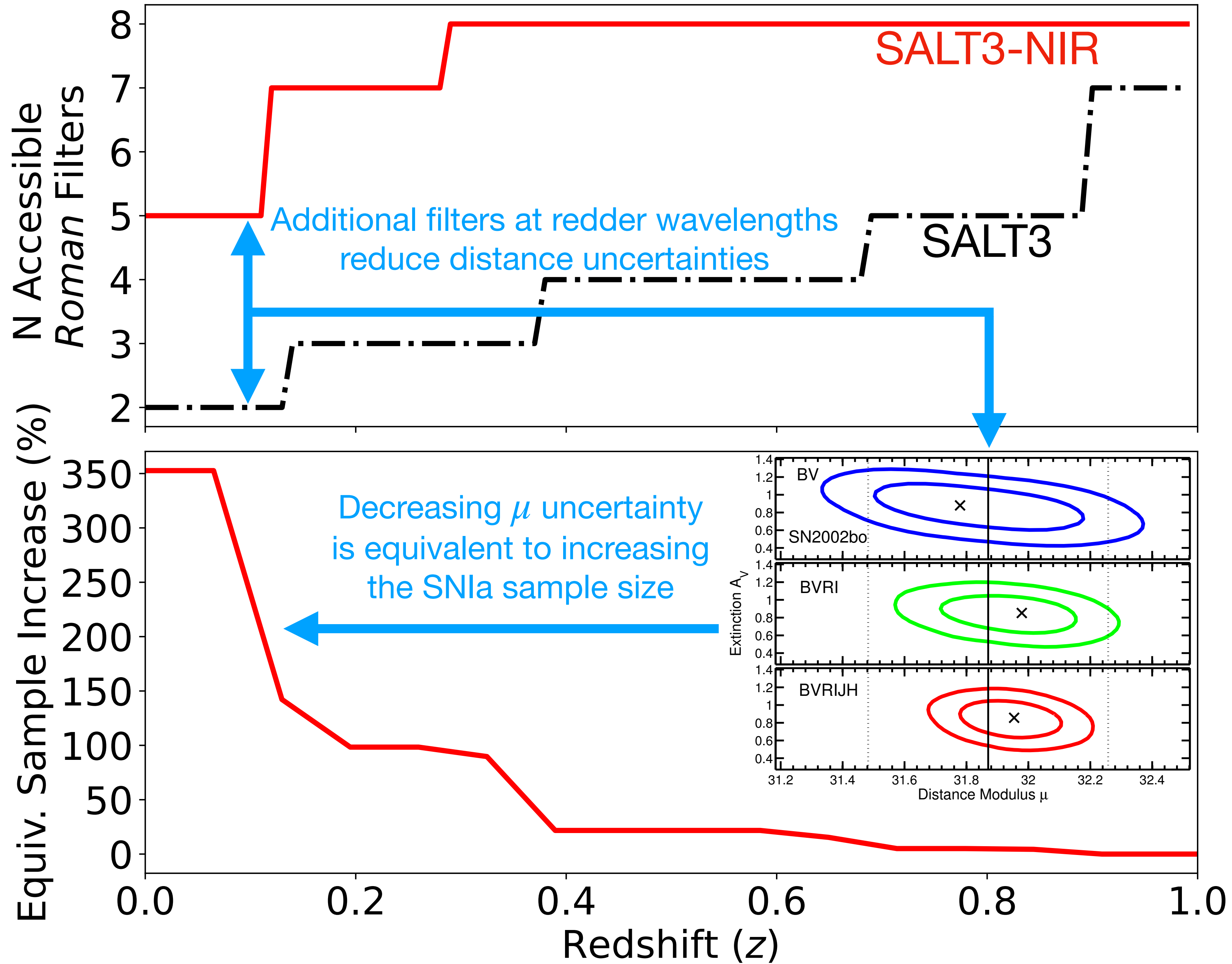
**Preliminary
SALT3-NIR Training**

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Summary

- The NIR is an exciting frontier for SNIa cosmology
- Training an Optical+NIR SNIa spectral model (**SALT3-NIR**) is possible for the first time
- **SALT3-NIR** can help optimize the Roman HLTDS even further
- **SALT3-NIR** fully leverages the Roman wavelength coverage at low redshift