Interstellar Extinction Towards OB Stars in the W3 Giant Molecular Cloud

Jessica Campbell
Supervised by Prof. Peter Martin

Astronomy & Astrophysics
UNIVERSITY OF TORONTO

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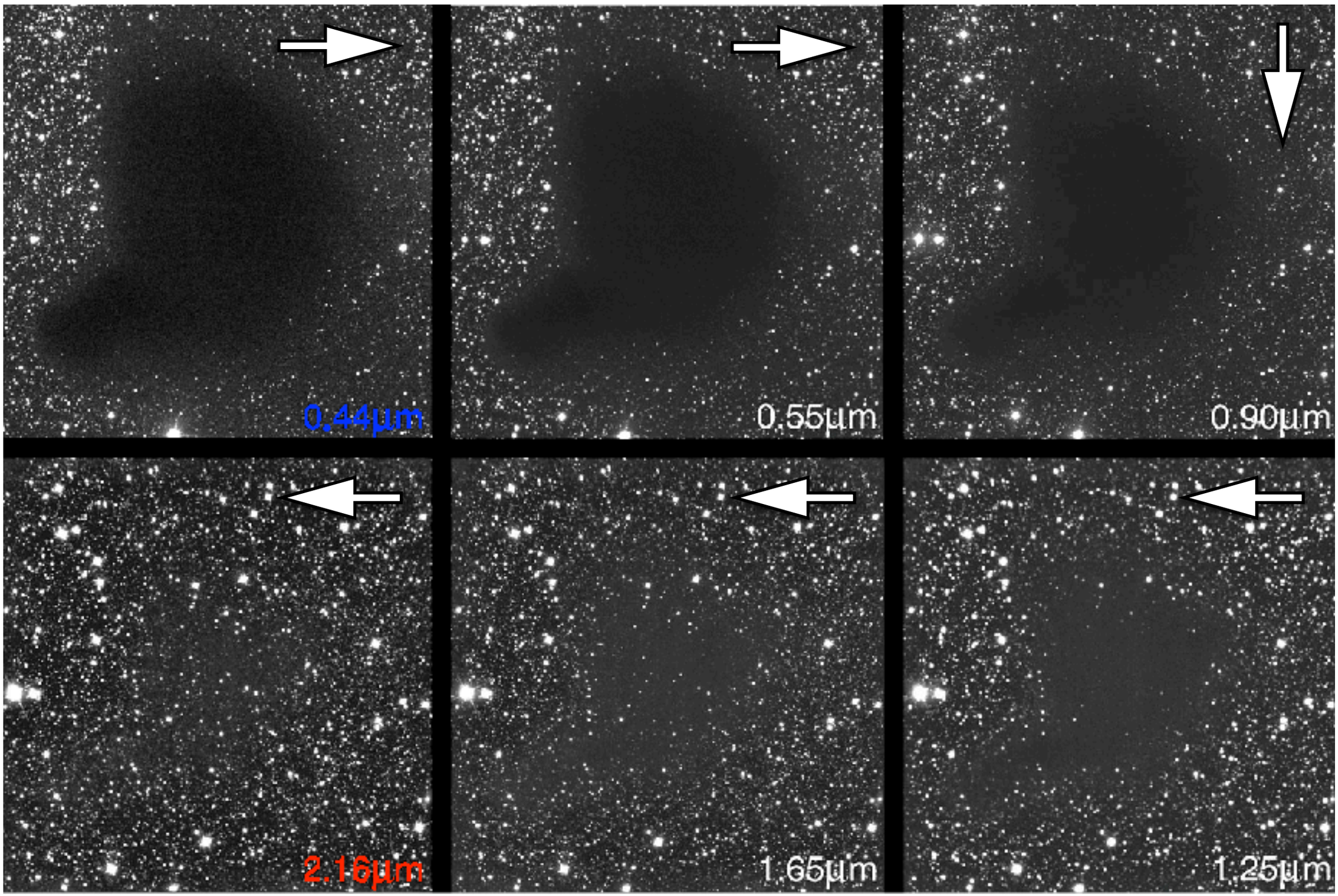
CITA
ICAT

Dust in the interstellar medium

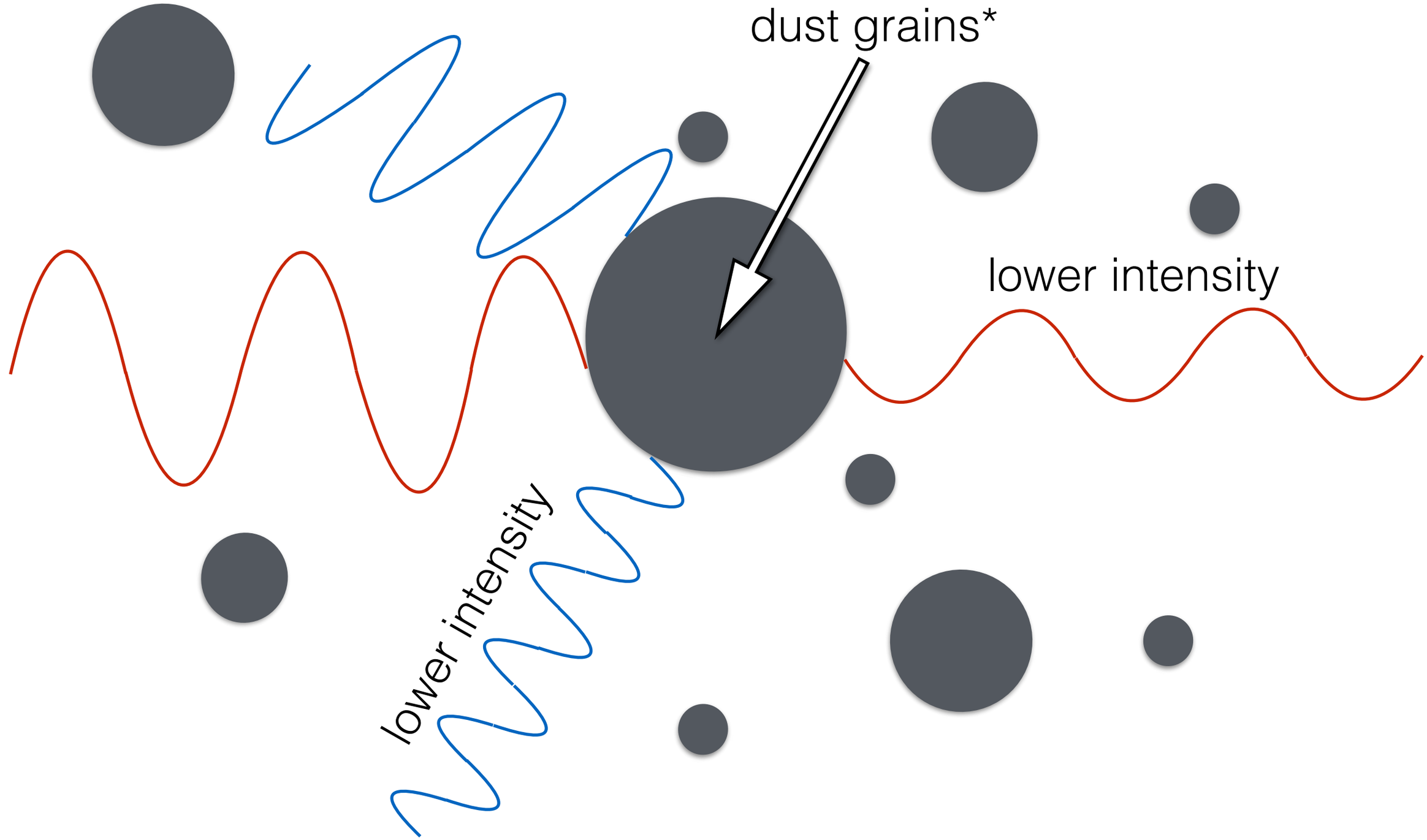
causes dimming and reddening of background sources



www.eso.org

Mie Theory of scattered light

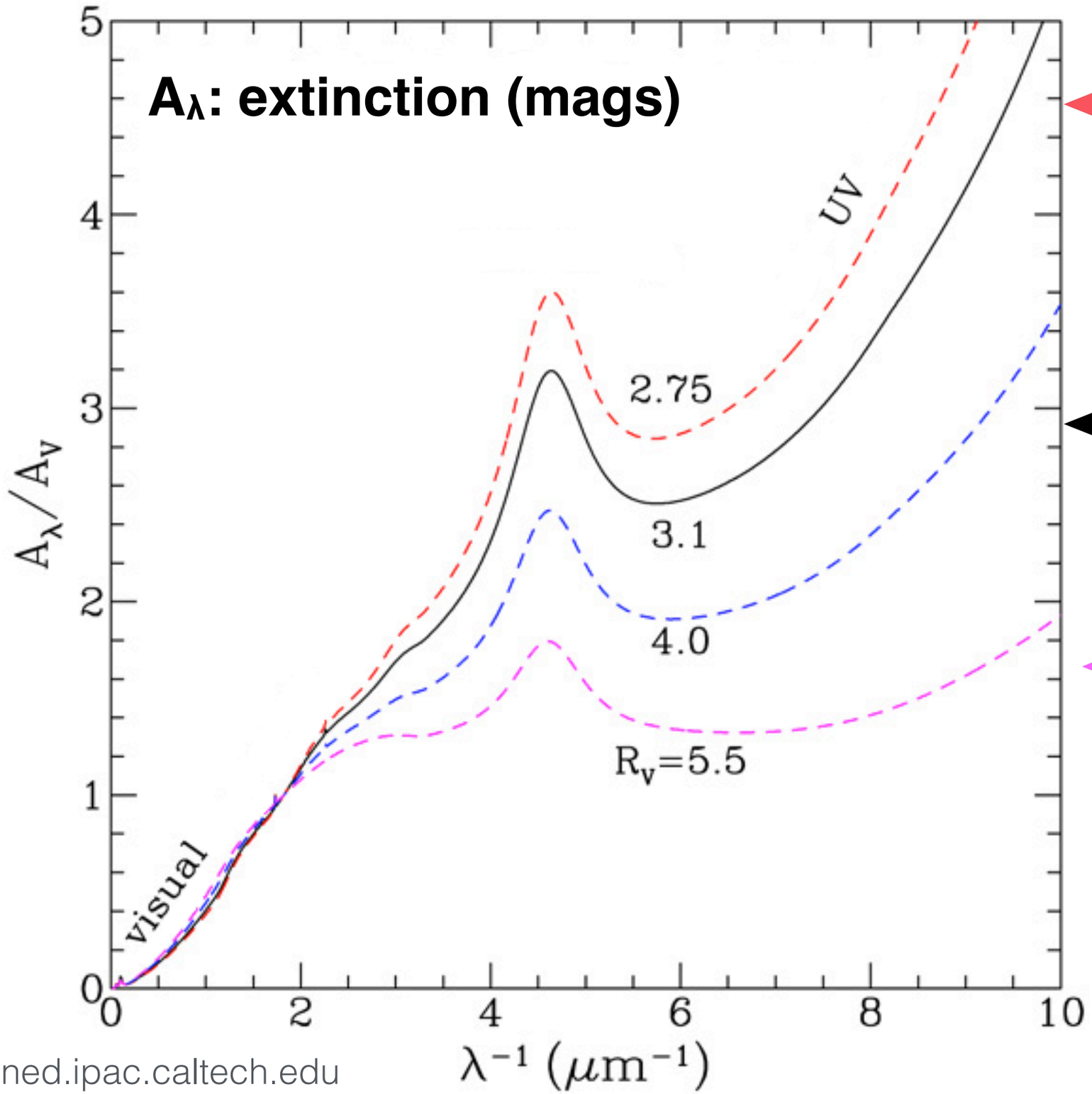
can explain this with scattering and absorption off dust[1]



* not actually spherical

The Interstellar Extinction Curve

describes the amount of scattering and absorption with λ



lower density ISM (smaller grains)[2,3]

"diffuse" ISM[4]

higher density ISM (larger grains)[1,2]

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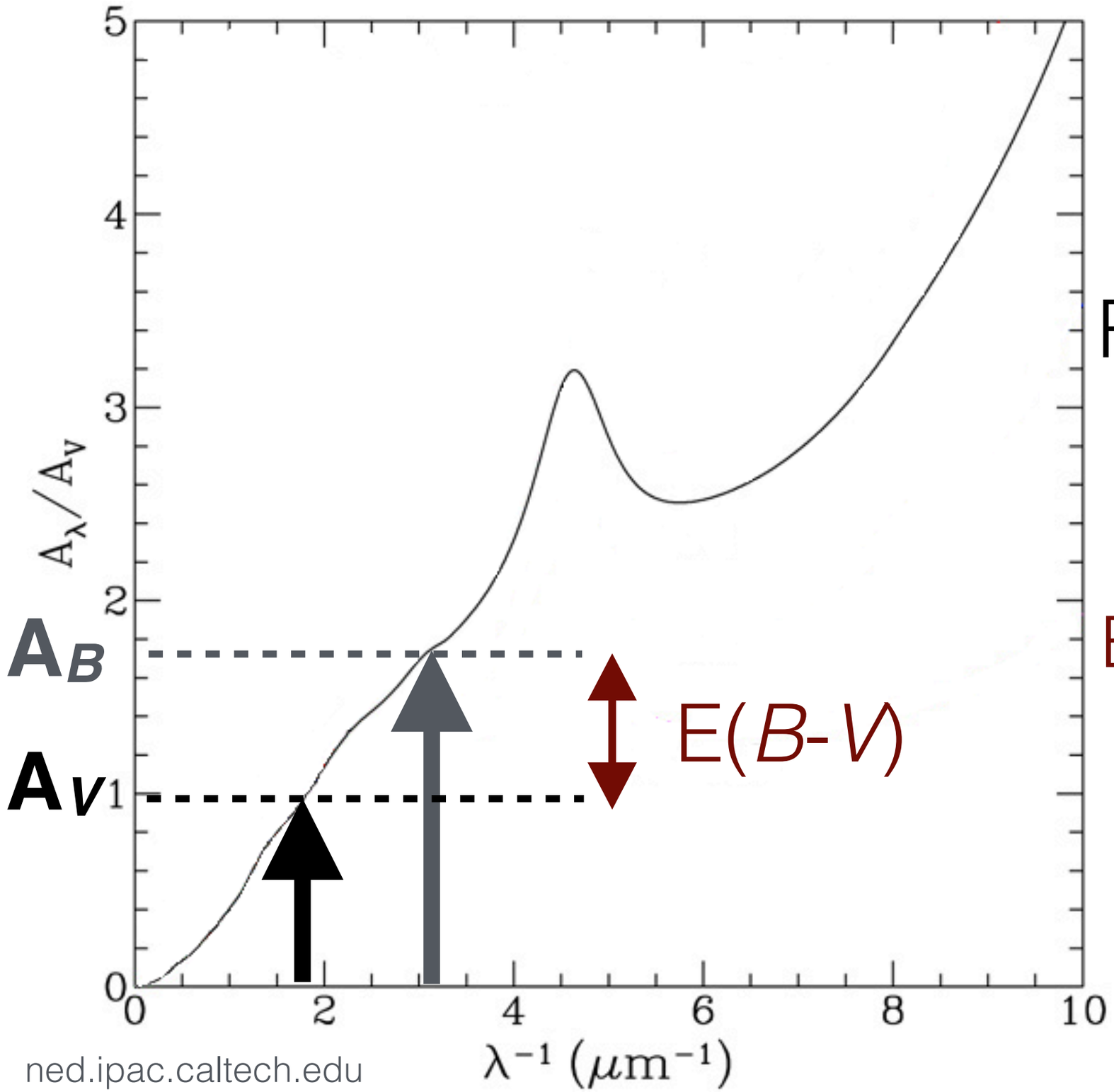
The CCM Model

characterizes extinction with a single parameter R_V[4]



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"ratio of total-to-selective extinction"

$$R_V = \frac{\mathbf{A_V}}{E(B\text{-}V)} = \frac{\mathbf{A_V}}{A_B - A_V}$$

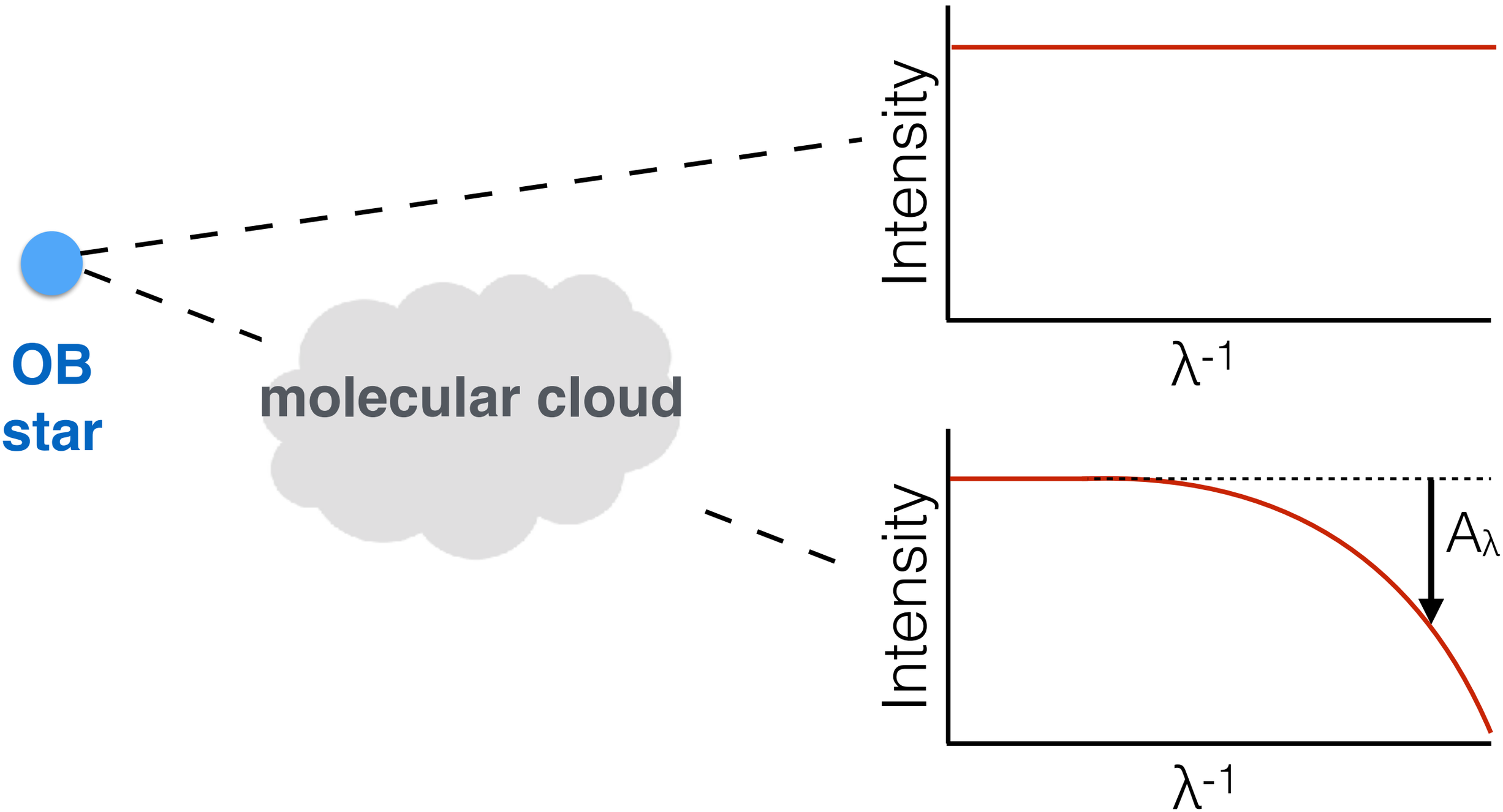
$$E(B\text{-}V) = (B\text{-}V) - (B\text{-}V)_0$$

observed colour

intrinsic colour

Intrinsic Colours of OB Stars ~ 0;

*can directly measure the line-of-sight extinction curve**

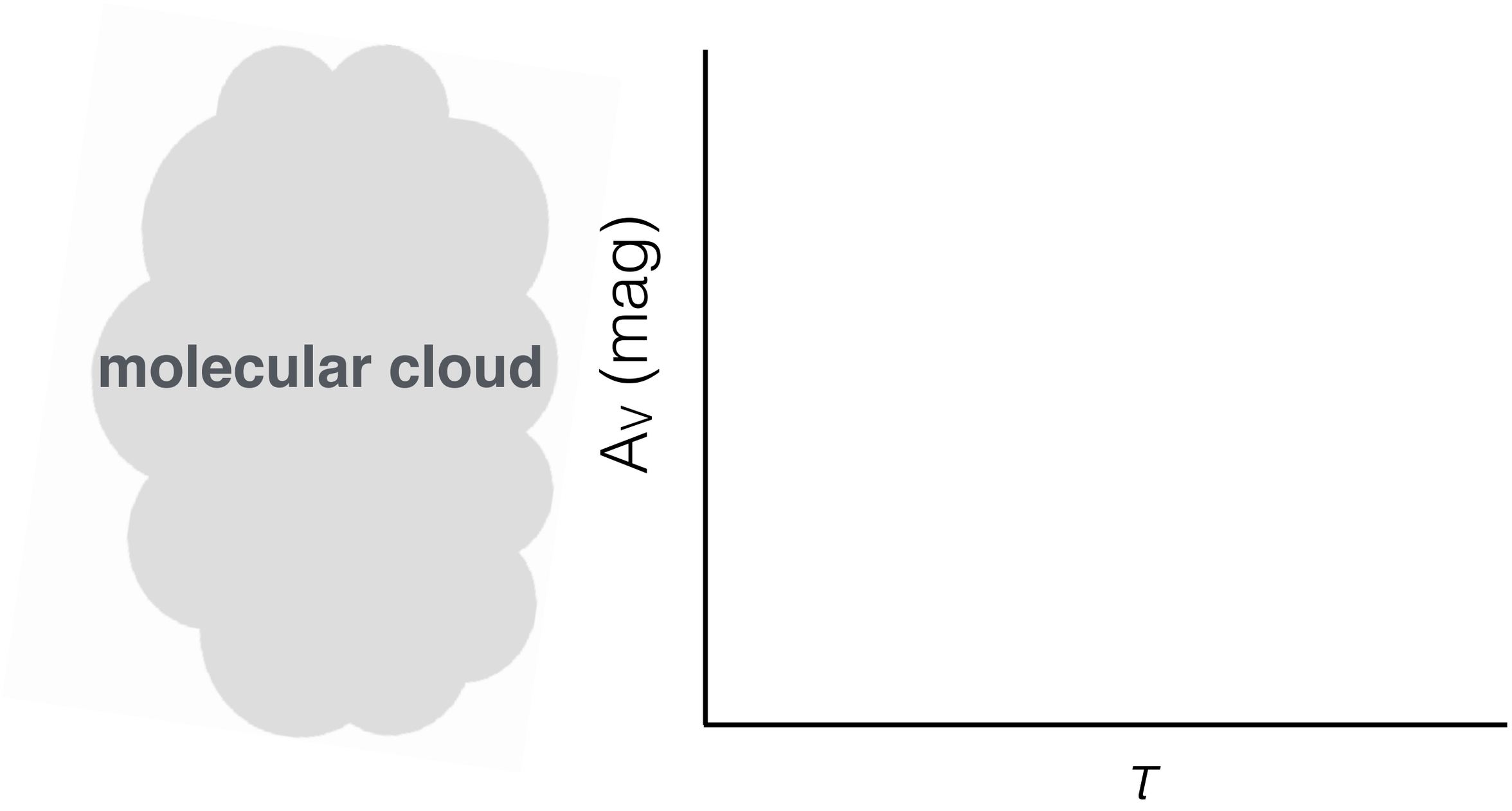


* caveat: IR excesses, emission/absorption lines etc. can bias extinction measurements

What is the empirical relationship between A_V and τ for de-reddening astrophysical observations in the molecular ISM via the W3 giant molecular cloud?

The search for an empirical relation

between extinction (A_V) and dust optical depth (τ)



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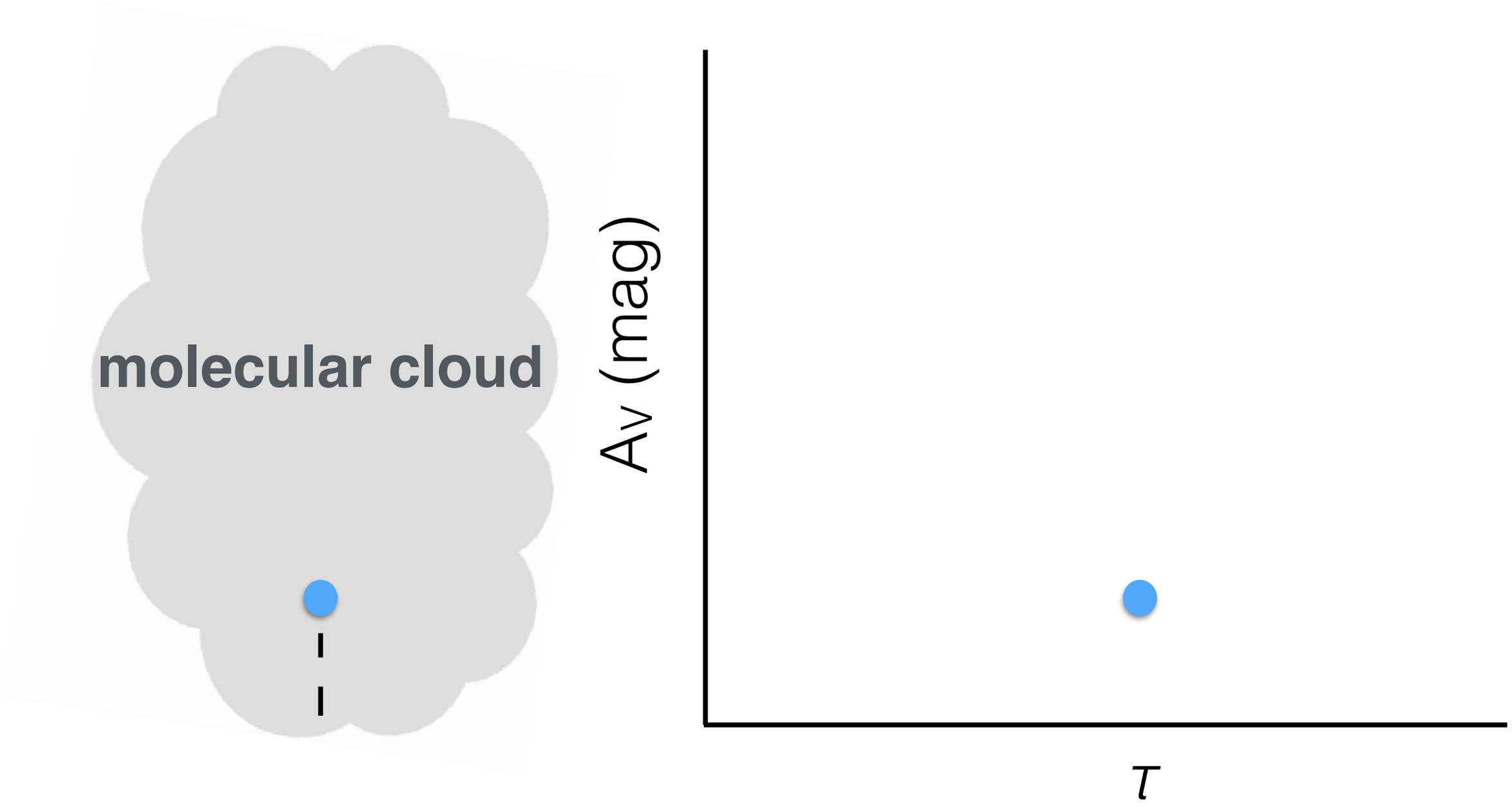

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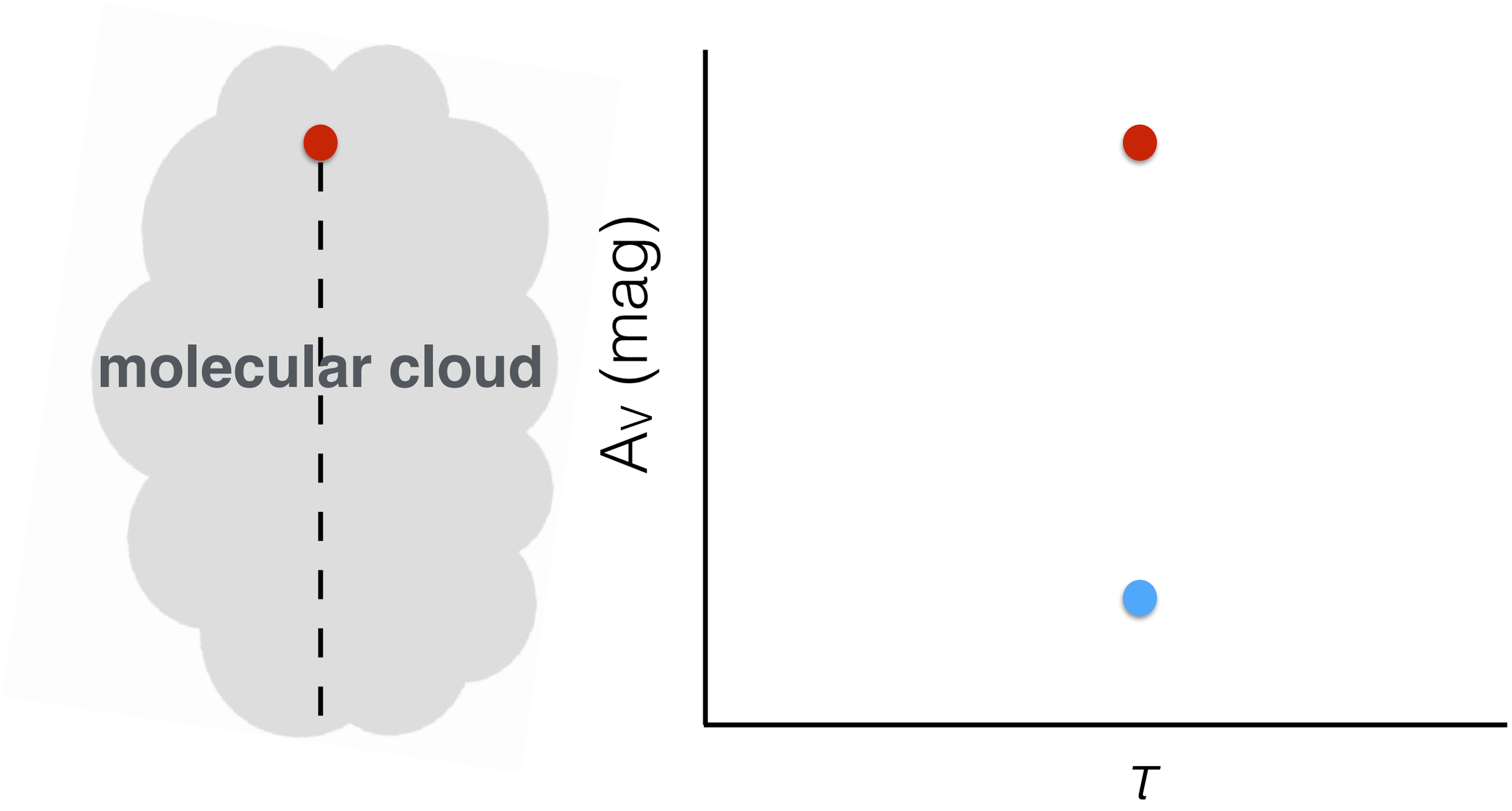

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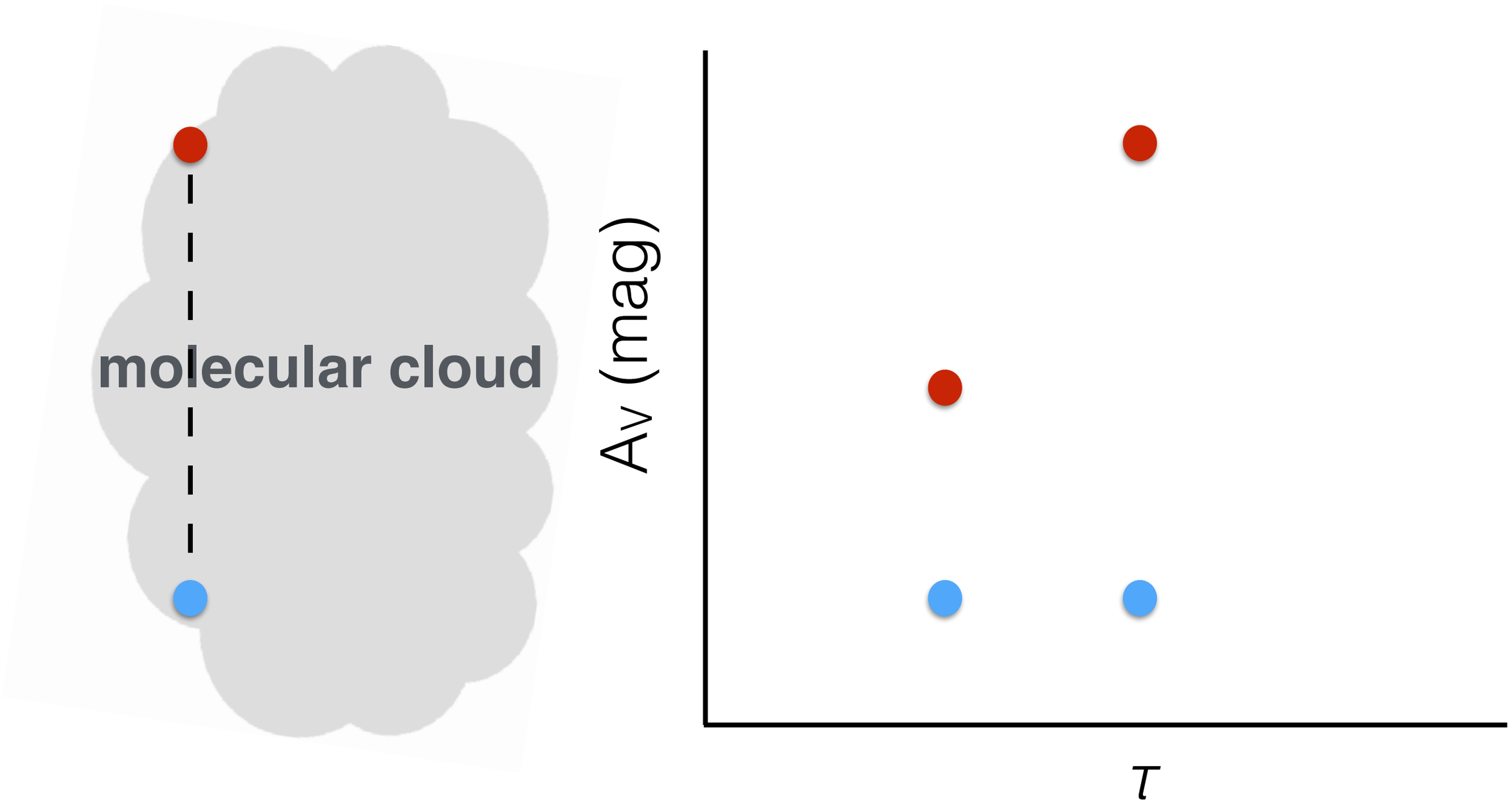

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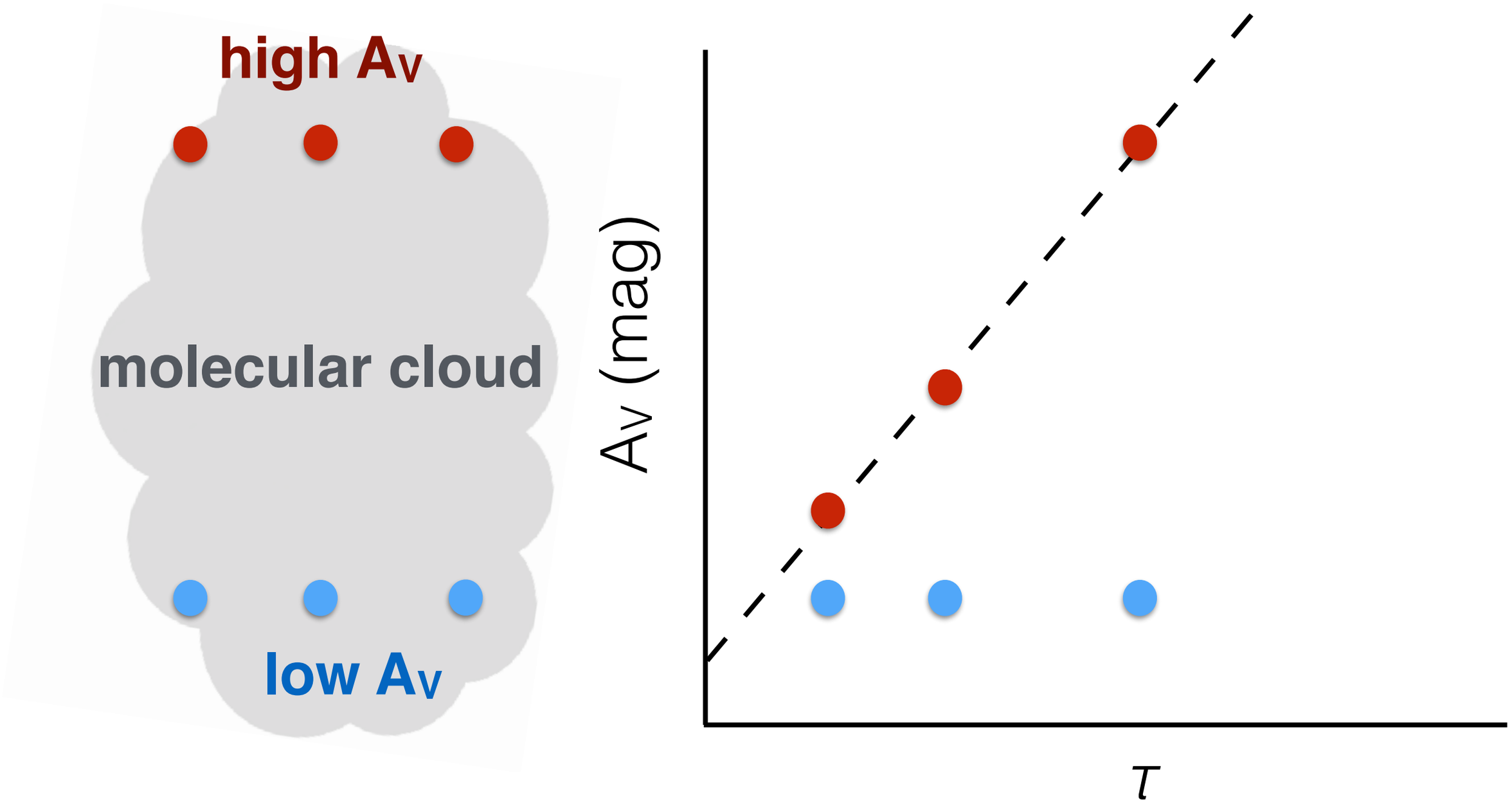
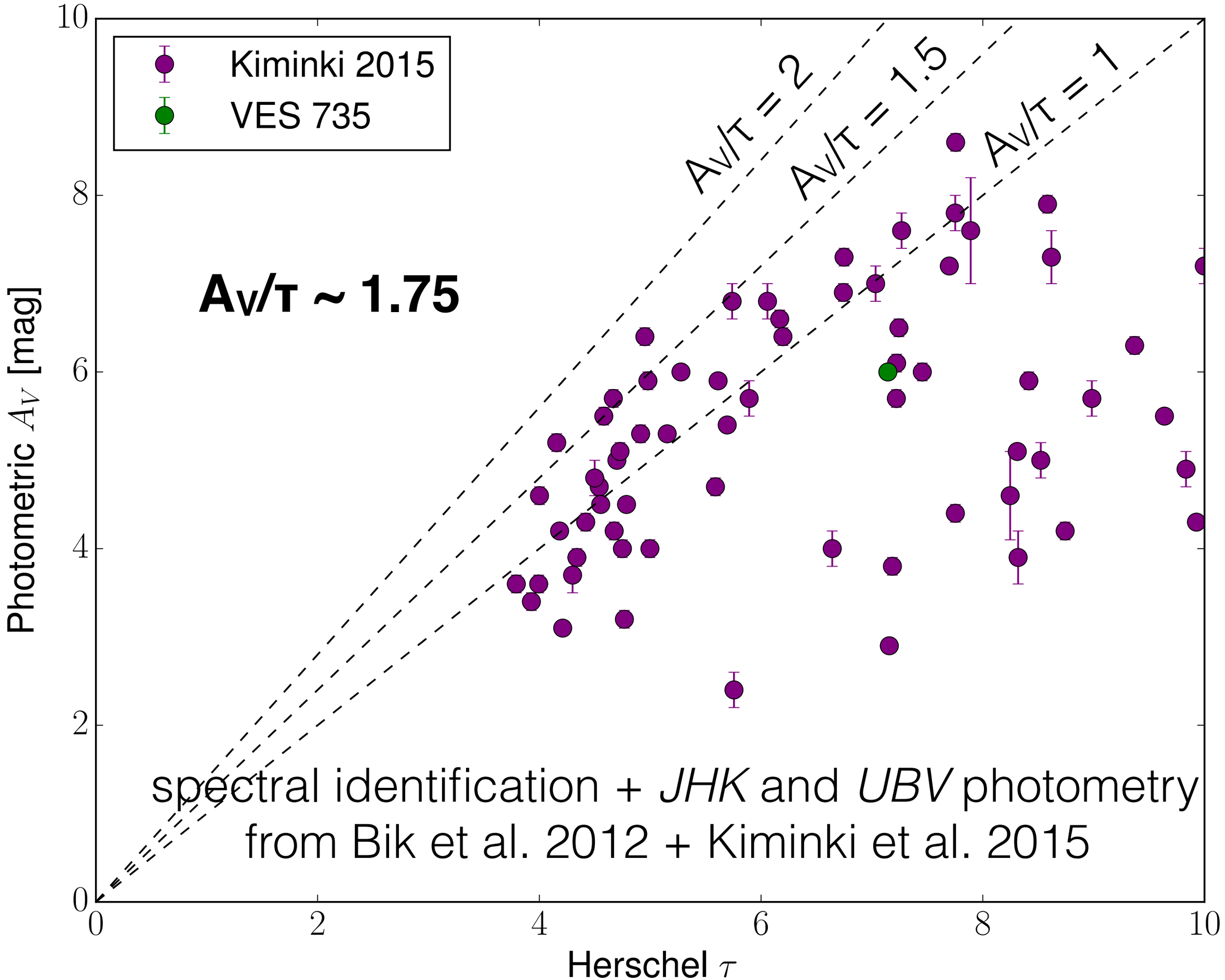



Kiminki 2015
VES 735
Av/τ = 2
Av/τ = 1.5
Av/τ = 1
Av/τ ~ 1.75
spectral identification + JHK and UBV photometry
from Bik et al. 2012 + Kiminki et al. 2015
Photometric A_V [mag]
Herschel τ
0
2
4
6
8
10

Expanding upon the OB stellar population for improving A_V/τ

Pan-STARRS

2MASS 2 MICRON ALL SKY SURVEY

THE INT PHOTOMETRIC Hα SURVEY IPHAS OF THE NORTHERN GALACTIC PLANE

CFH

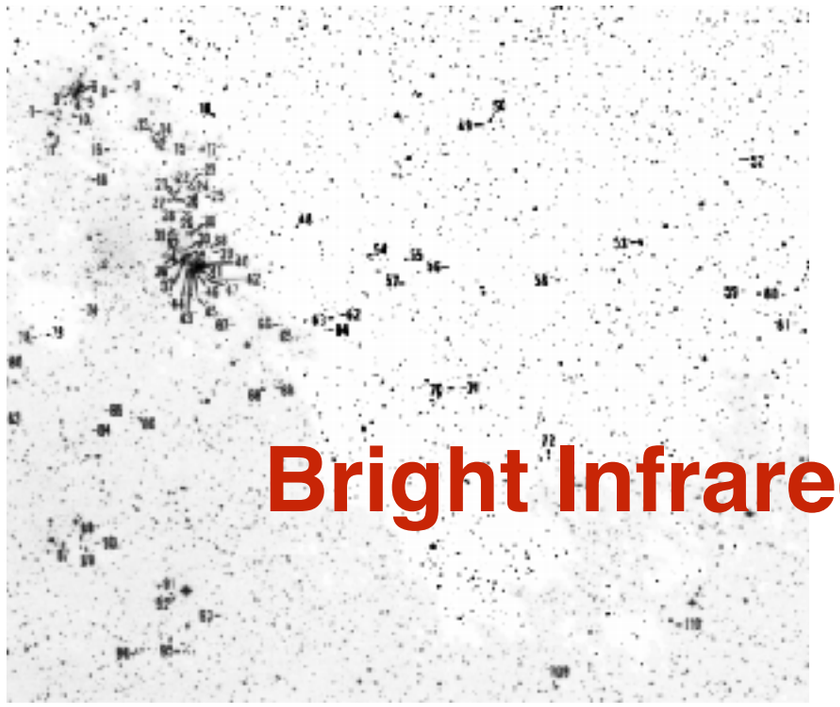
SPITZER SPACE TELESCOPE · NASA · JPL · CALTECH ·

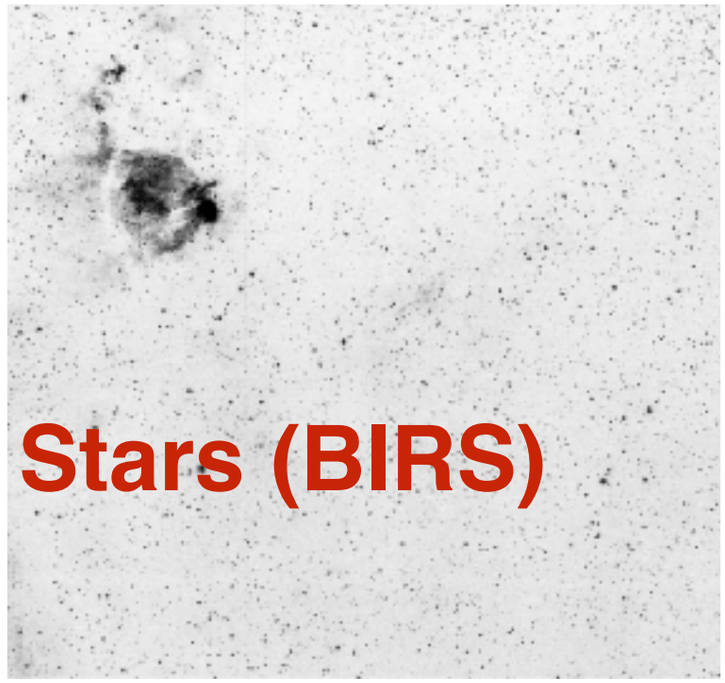
WISE

STAR FORMATION IN W3 AND W4: DISCOVERY OF 135 POSSIBLY EMBEDDED NEAR-INFRARED STARS

DEBRA MELOY ELMEGREEN
The Mount Wilson and Las Campanas Observatories, Carnegie Institution of Washington

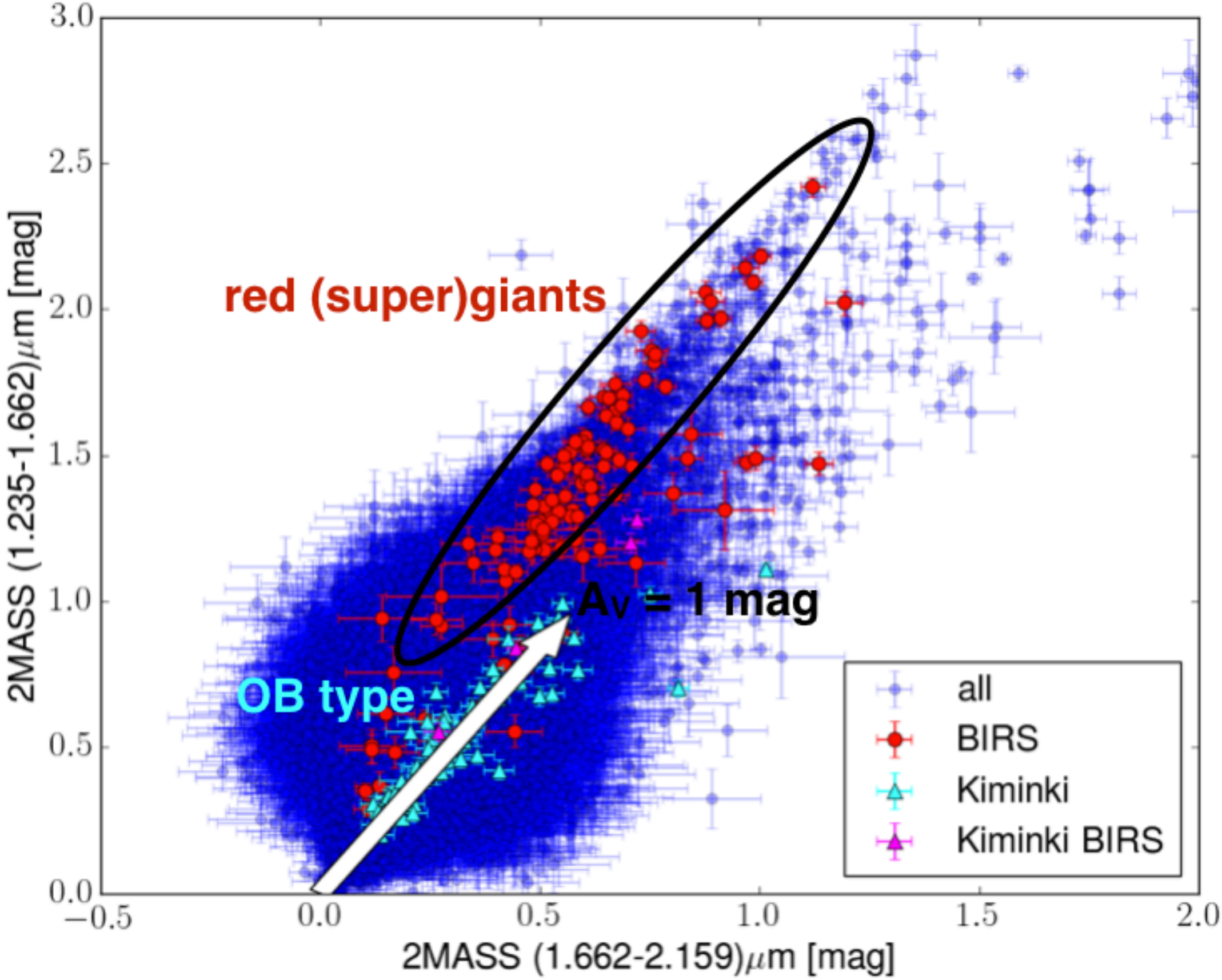
Received 1980 February 19; accepted 1980 March 26

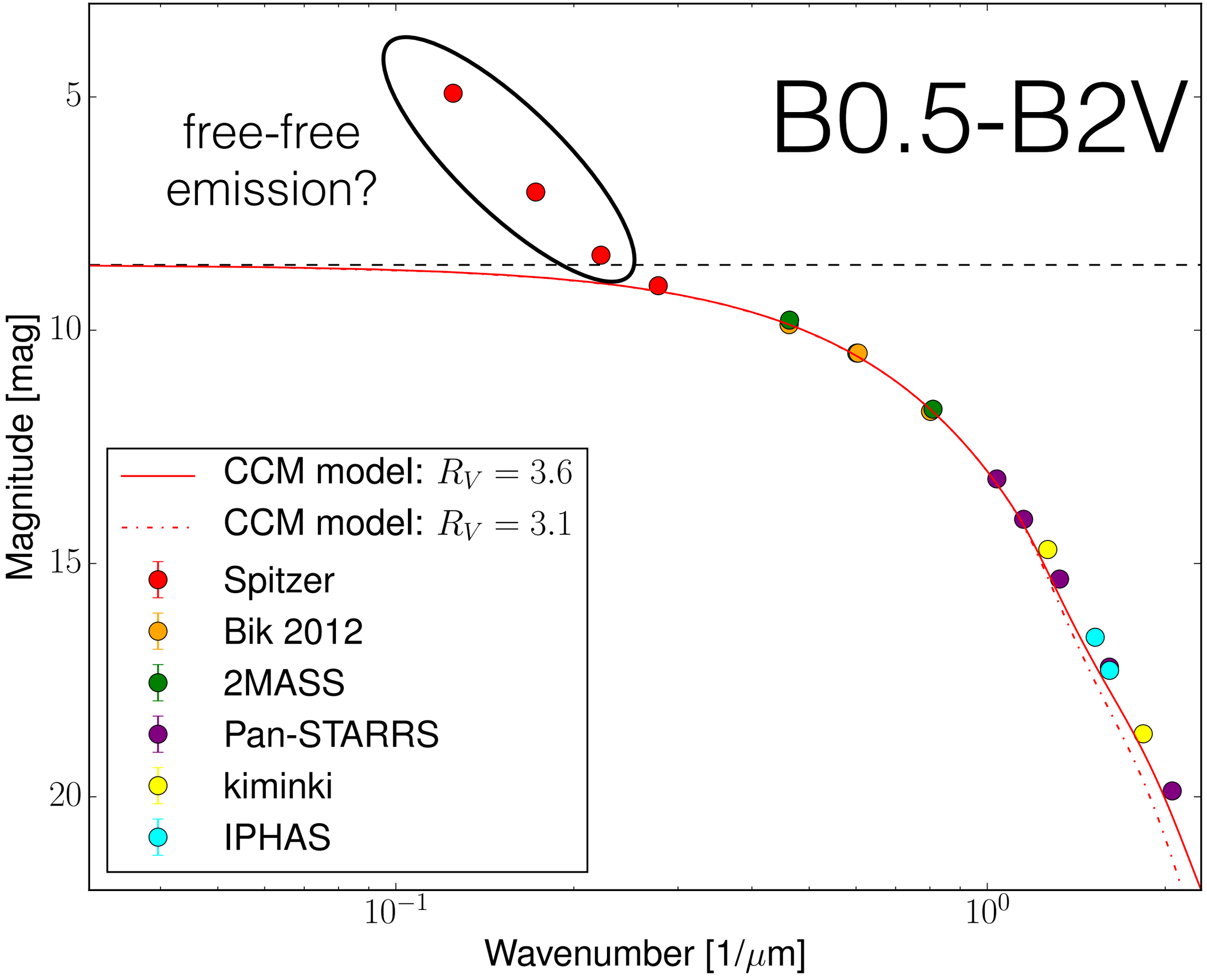




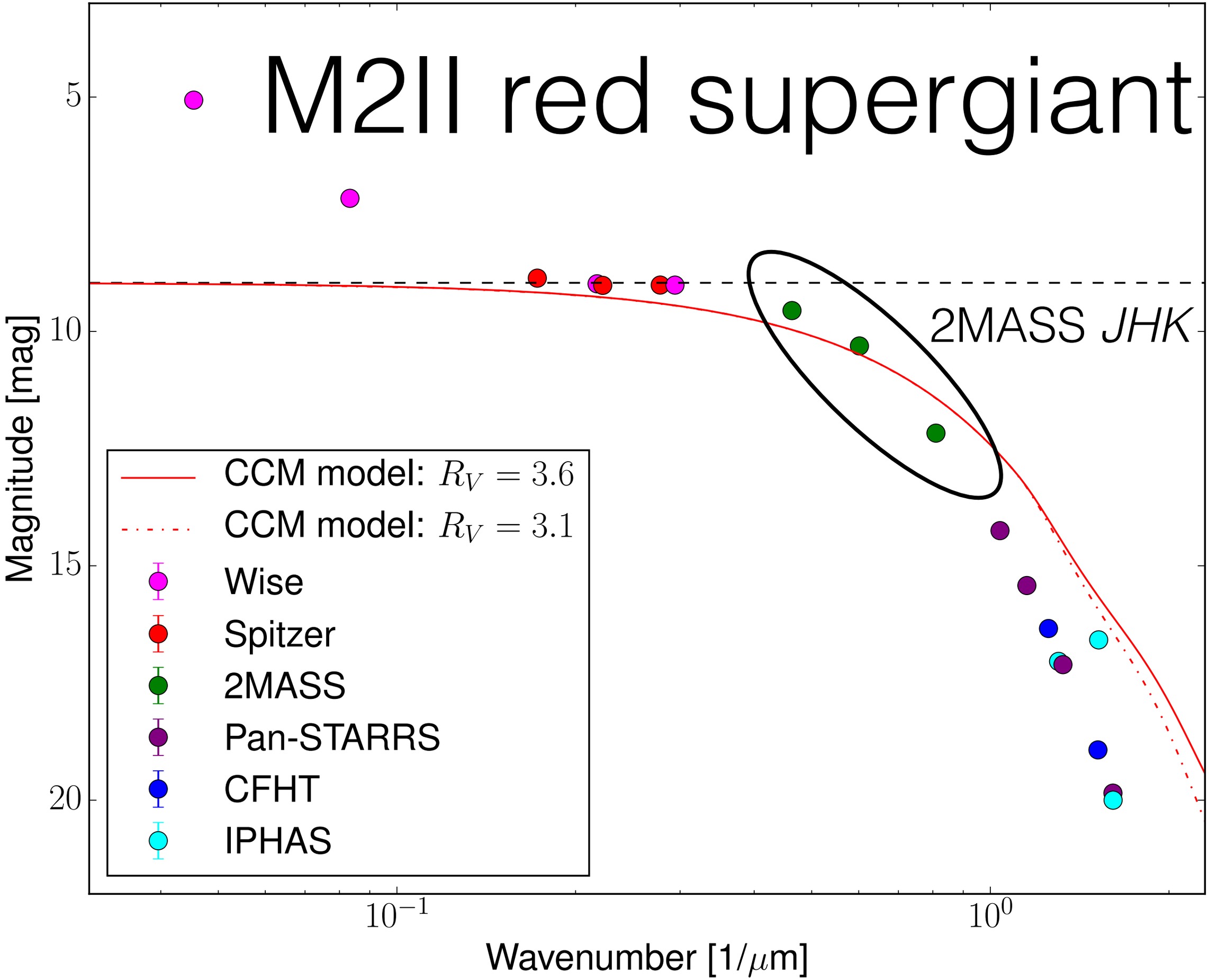
Bright Infrared Stars (BIRS)

2MASS (*J-H*) vs (*H-K*) colour-colour diagram




B0.5-B2V
free-free
emission?
CCM model: $R_V = 3.6$
CCM model: $R_V = 3.1$
Spitzer
Bik 2012
2MASS
Pan-STARRS
kiminki
IPHAS
Magnitude [mag]
Wavenumber [1/μm]
5
10
15
20
10^{-1}
10^{0}

M2II red supergiant



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