

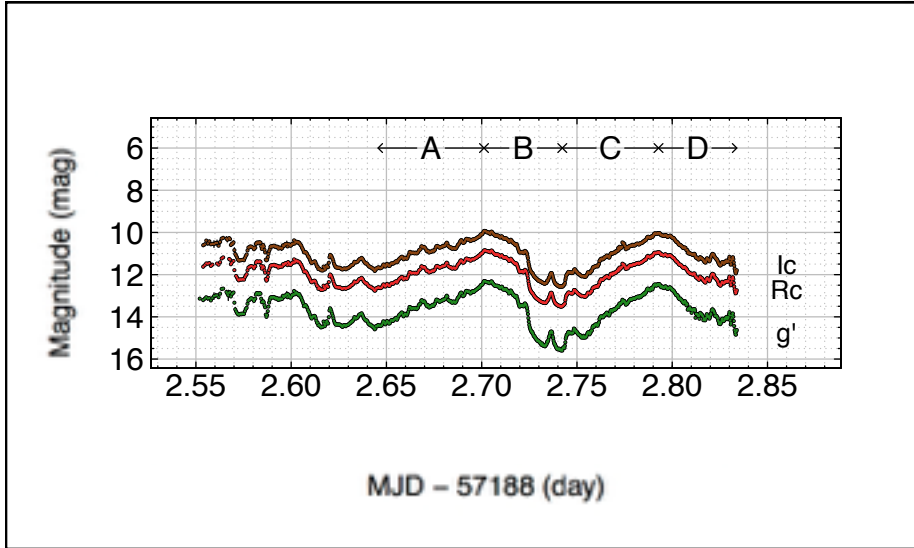
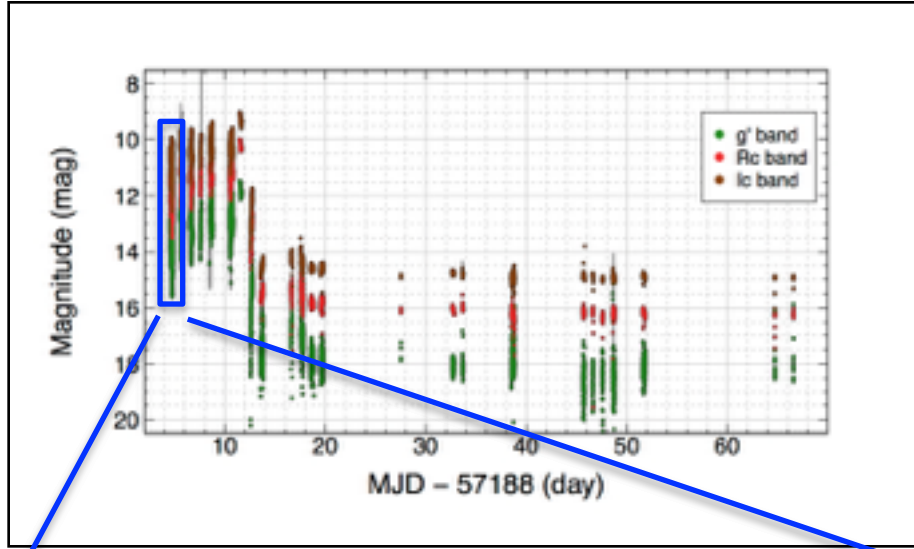


# Two optical emission components with different variability in V404 Cygni

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Tokyo Institute of Technology

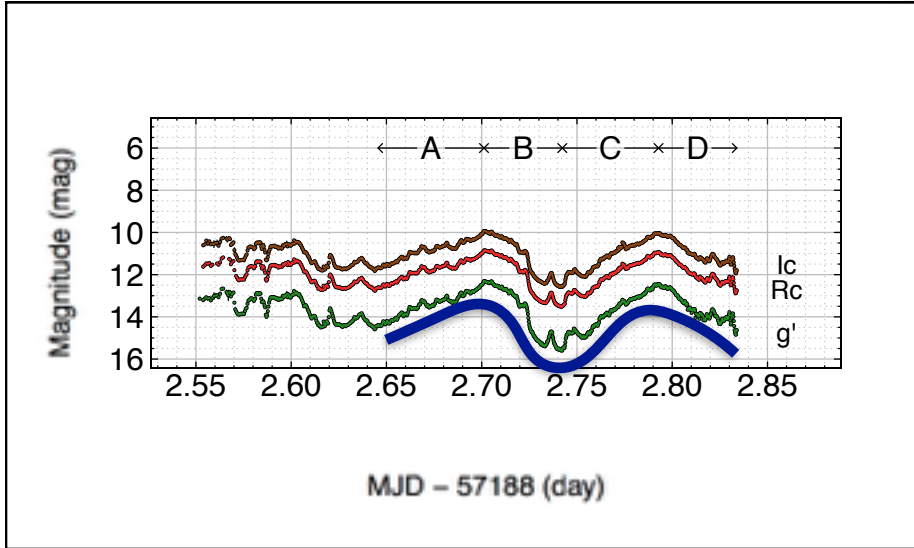
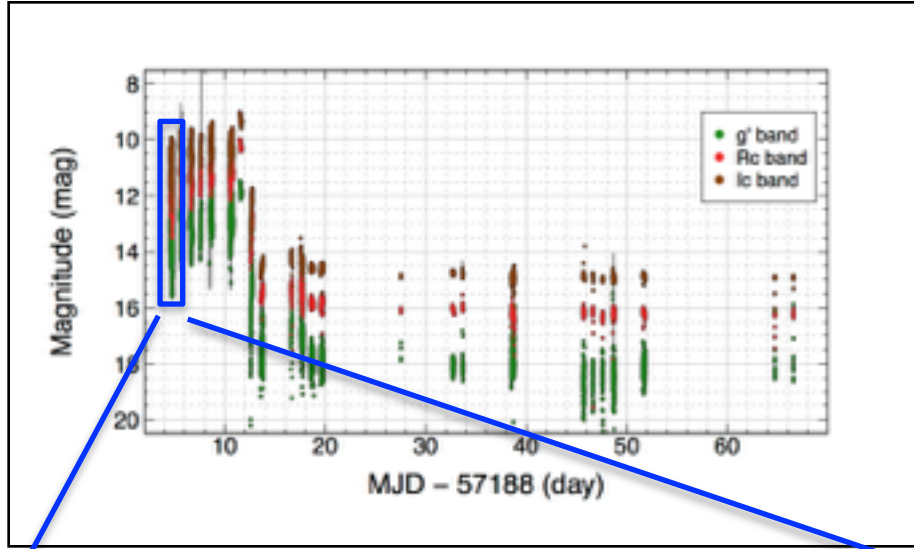


- All of the optical bands (g', Rc, and Ic) seems to be **perfectly correlated**
- Composing two distinct variations; **slow-big swings & small wiggles**
  - Slow-big swinging component show very large variations (~ 3 mag) on a timescale about an hour
  - Fast-small wiggling component have variations smaller than 1 mag on a timescale about some minutes



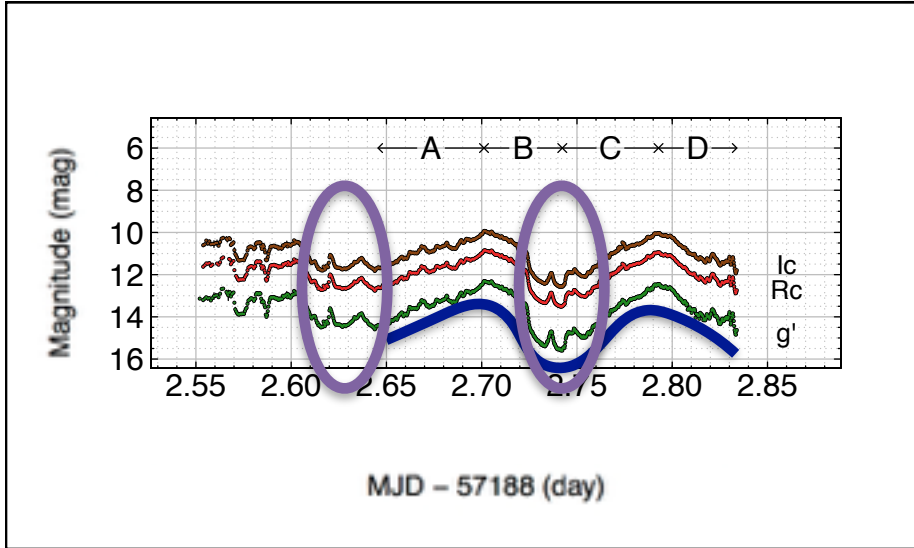
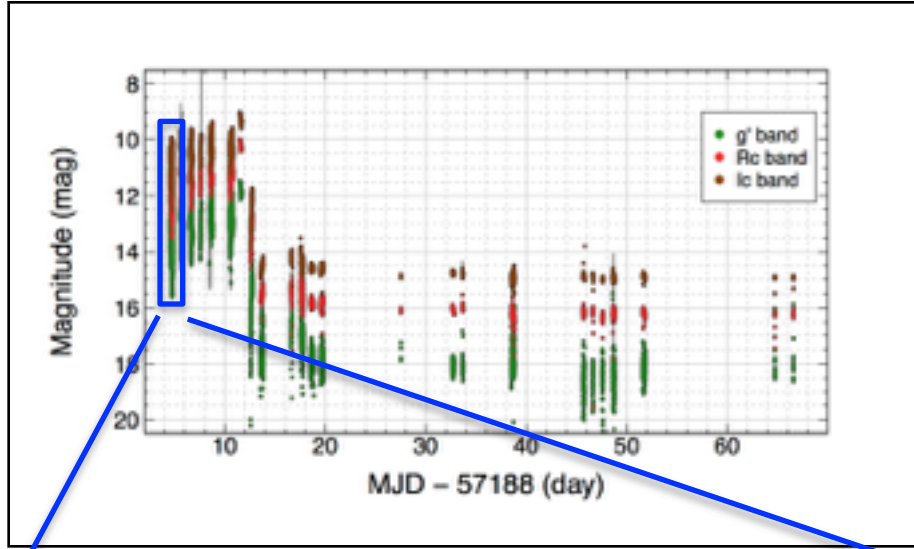


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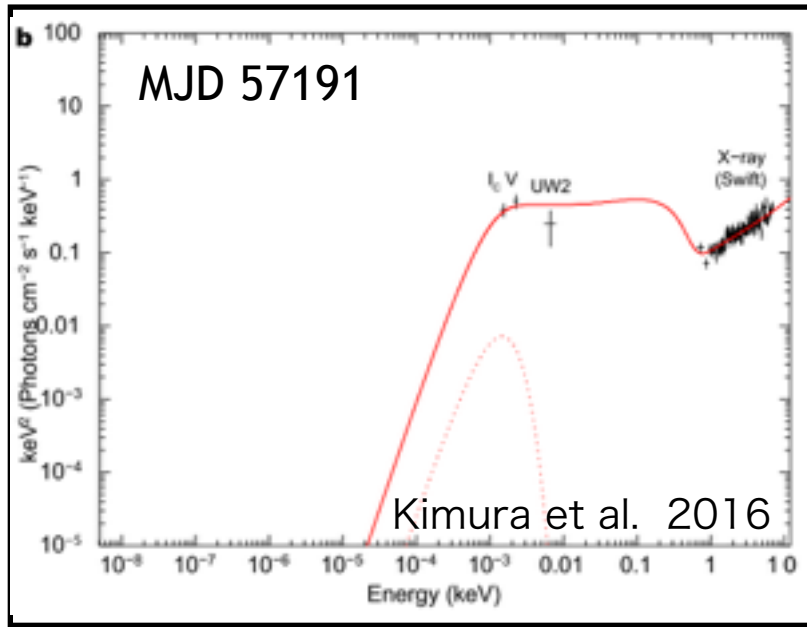


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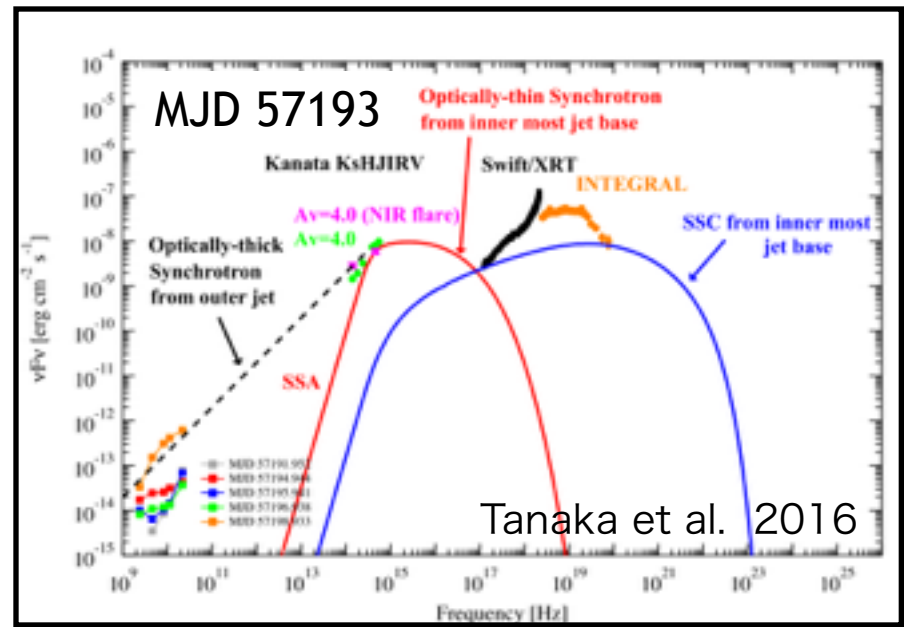


## - Irradiated disk ?



Mariko Kimura, Keisuke Isogai et al. (2016)  
 T. Muñoz-Darias, J. Casares et al. (2016), ...

## - Jet ?



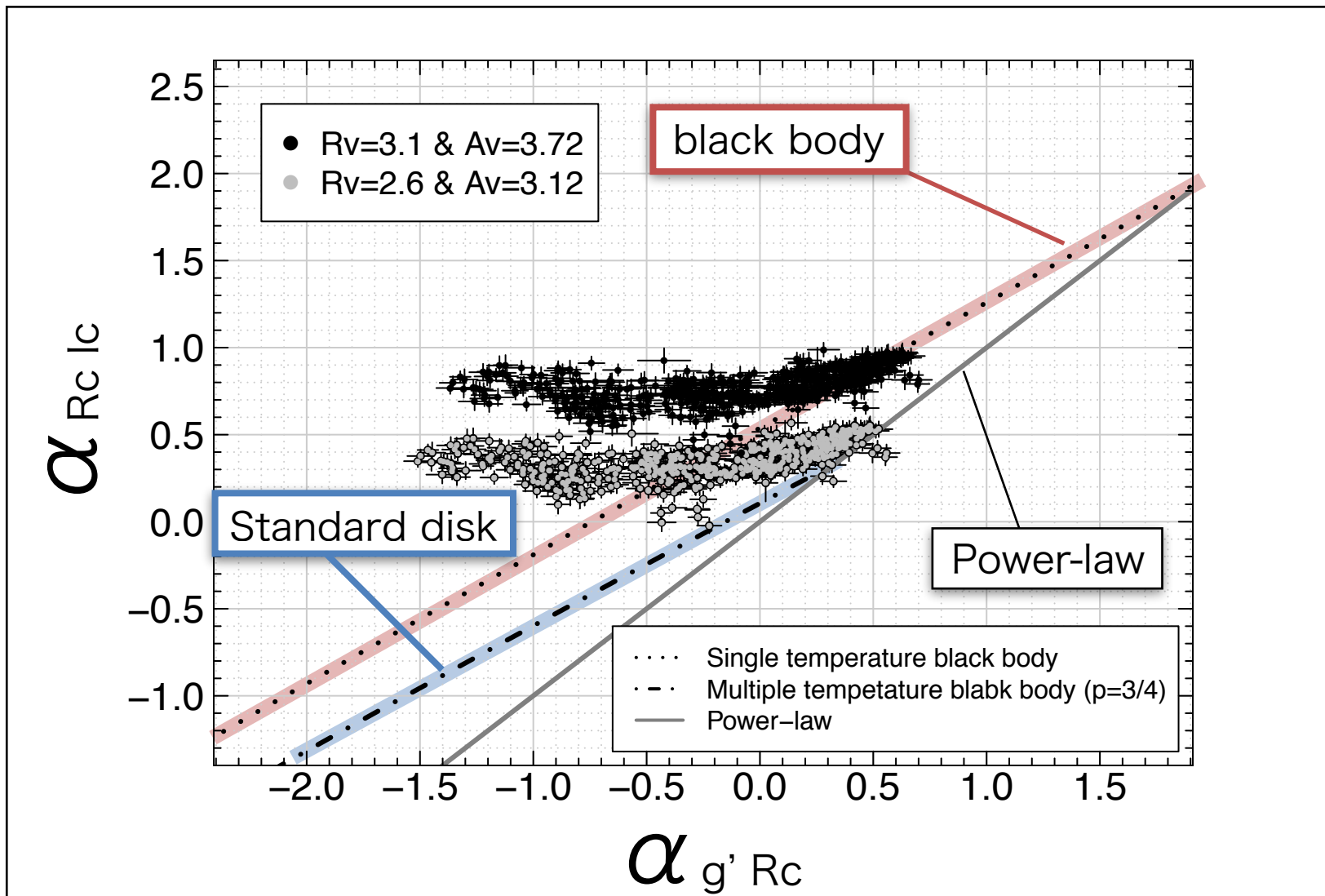
Y. T. Tanaka, R. Itoh et al. (2016)  
 J. Martí, P. L. Luque-Escamilla et al. (2016), ...

## - Combine of them ? Shahbaz et al. (2016), Lipunov et al. (2016), ...

Clarifying the emission mechanism from phenomenological analysis



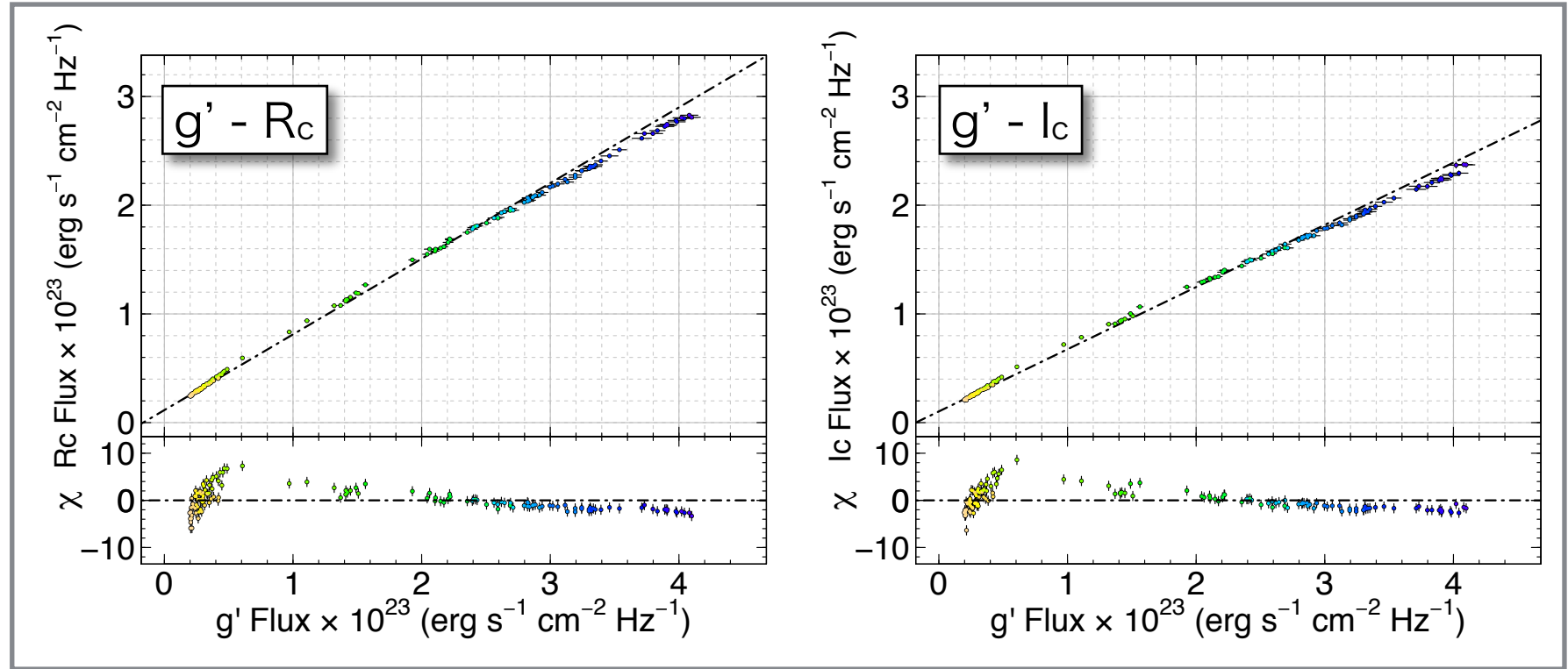
- Fast-small wiggling component
  - is the standard disk ( $T_{in} \sim 2.5 \times 10^4$  K,  $R_{in} \sim 6.0 \times 10^{10}$  cm)
  - or the single black body ( $T \sim 9.5 \times 10^3$  K,  $R \sim 1.2 \times 10^{12}$  cm)
- Slow-big swinging component
  - exhibits a power-law spectrum ( $\alpha \sim 0.6-1.2$ )
  - emitted from the irradiated accretion disk or the jet
- The optical variation is **the mixture of these components**





Flux-Flux plot : Correlation diagram between different energy bands

The slope of the locus (k) is proportional to the spectral index( $\alpha$ ):  $\log(k) \propto \alpha$

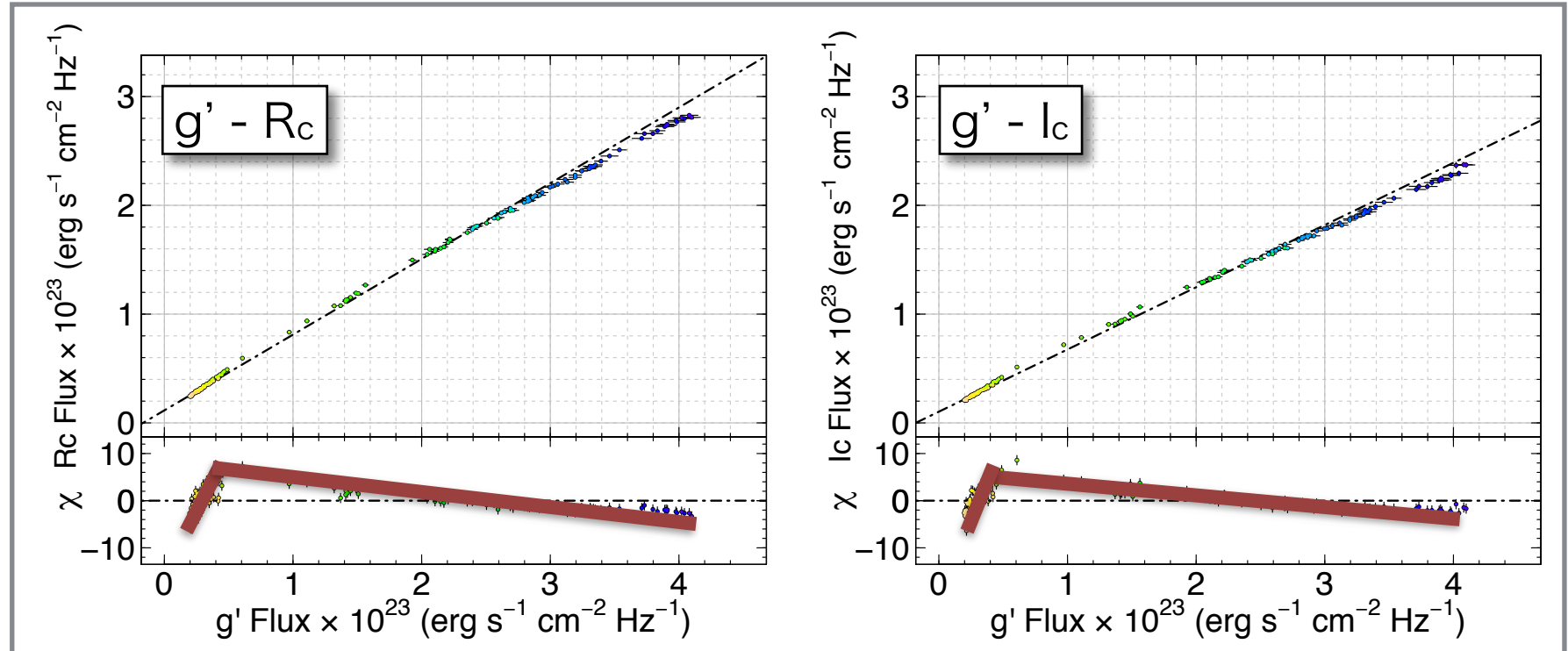






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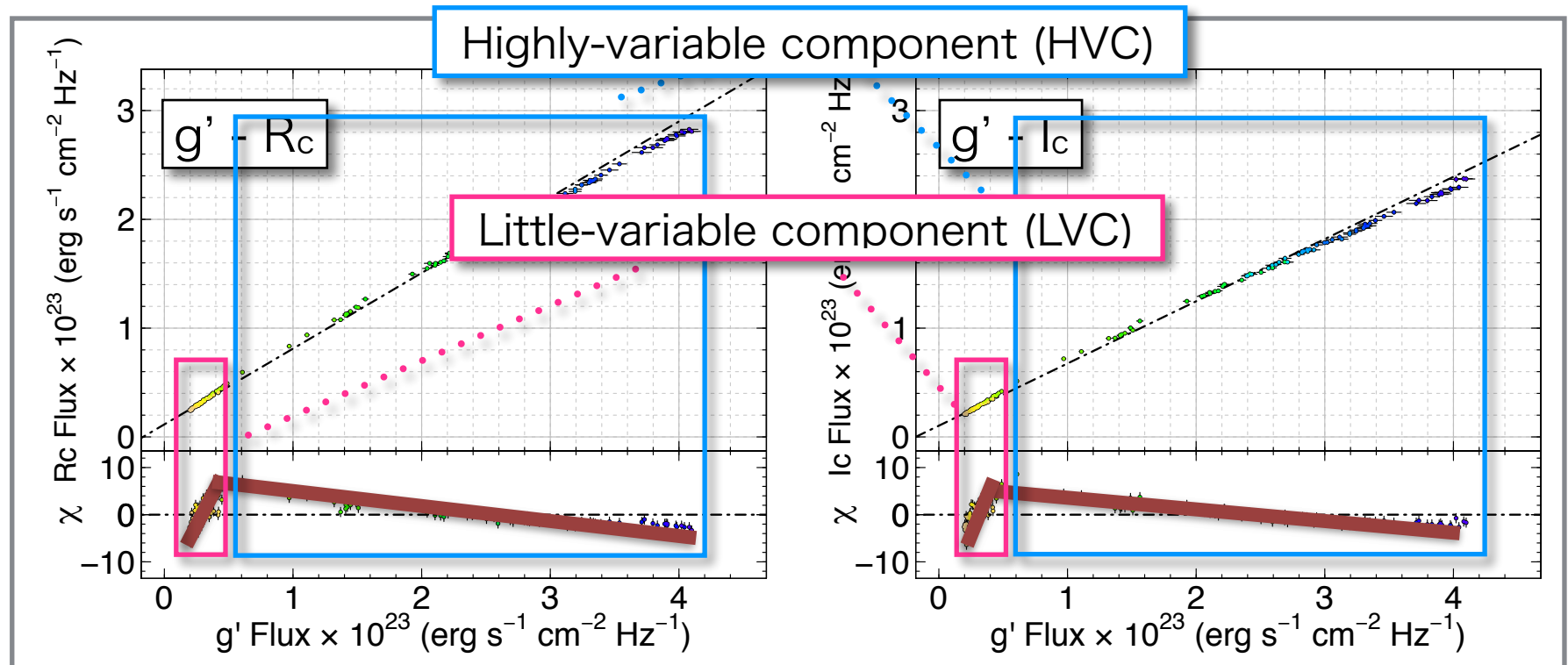


Clear break point in the locus → Existence of two components



Flux-Flux plot : Correlation diagram between different energy bands

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Clear break point in the locus  $\rightarrow$  Existence of two components

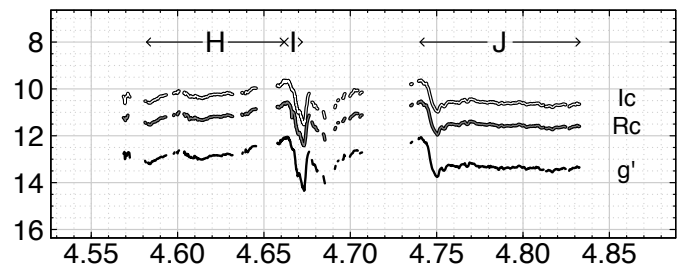
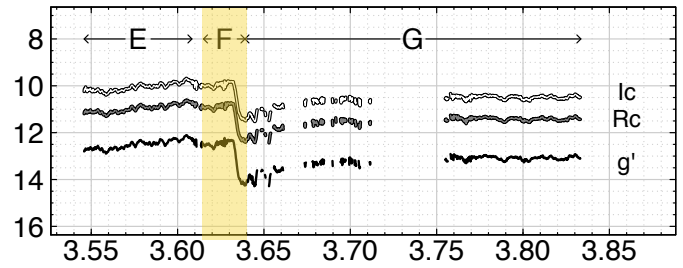
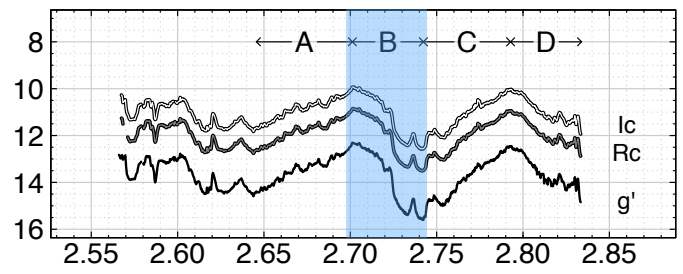
**LVC = small wiggles & HVC = Large swings**



Flux-Flux plot : Correlation diagram between different energy bands

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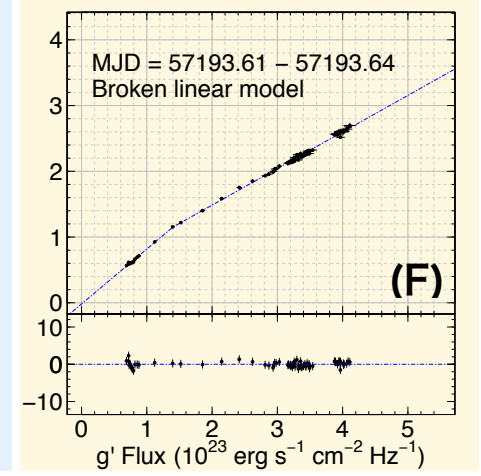
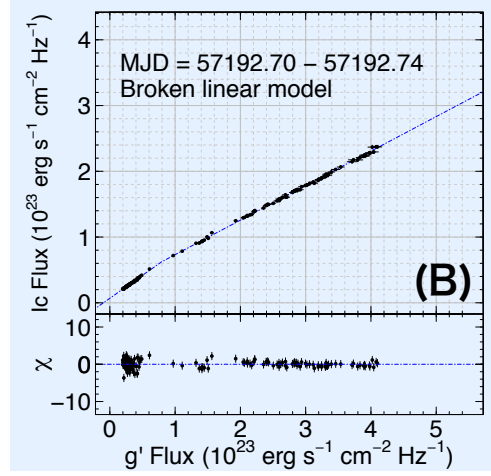
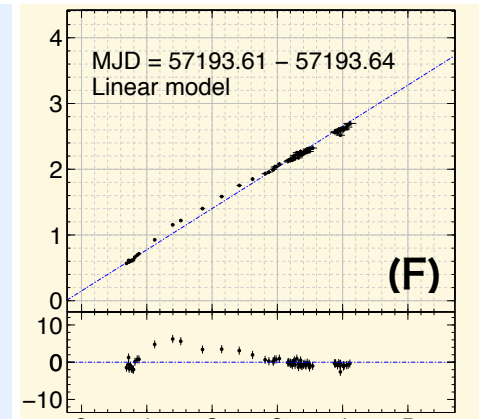
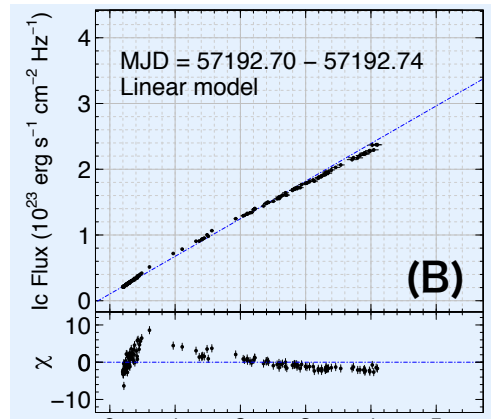
MJD 57192 – 57194

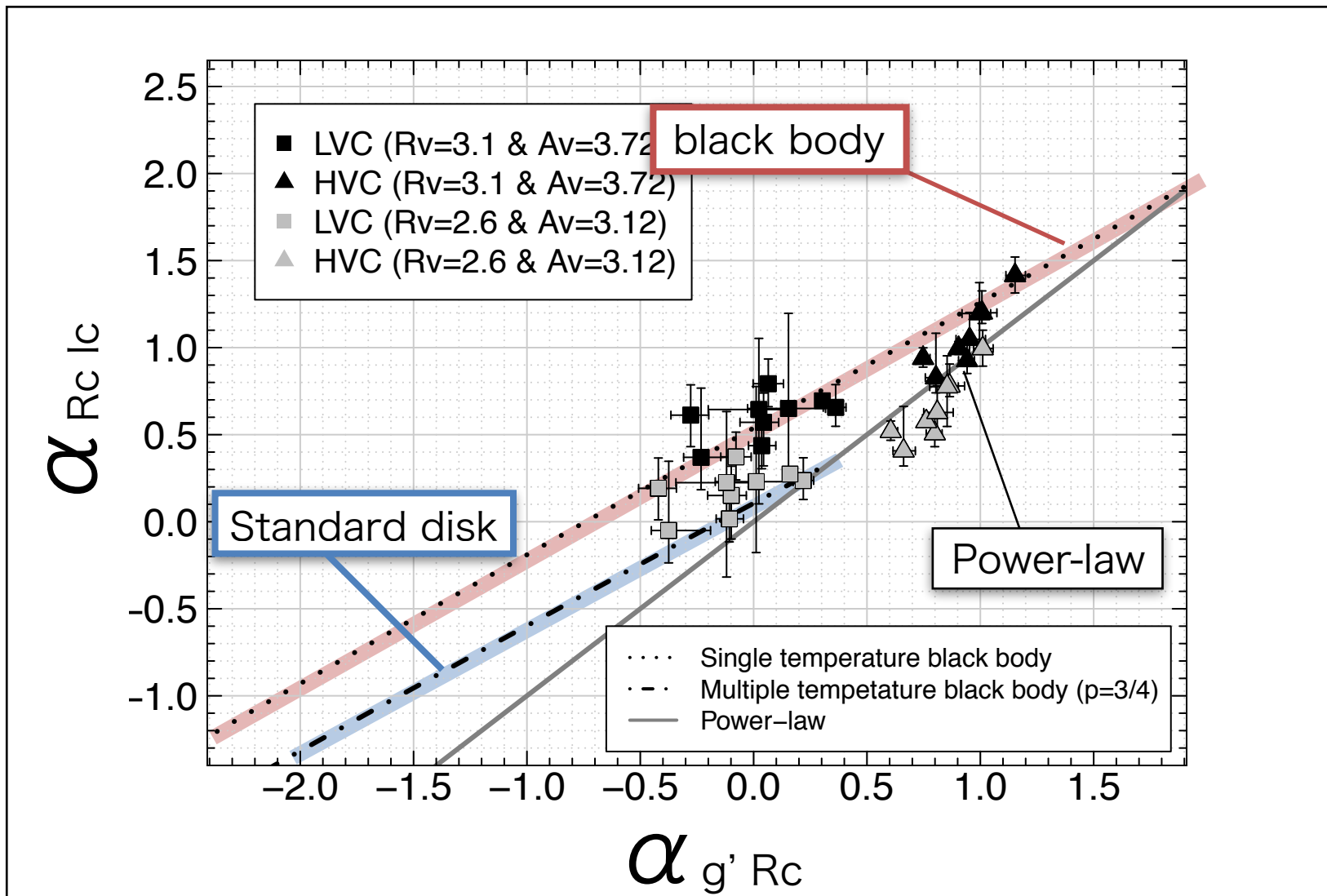


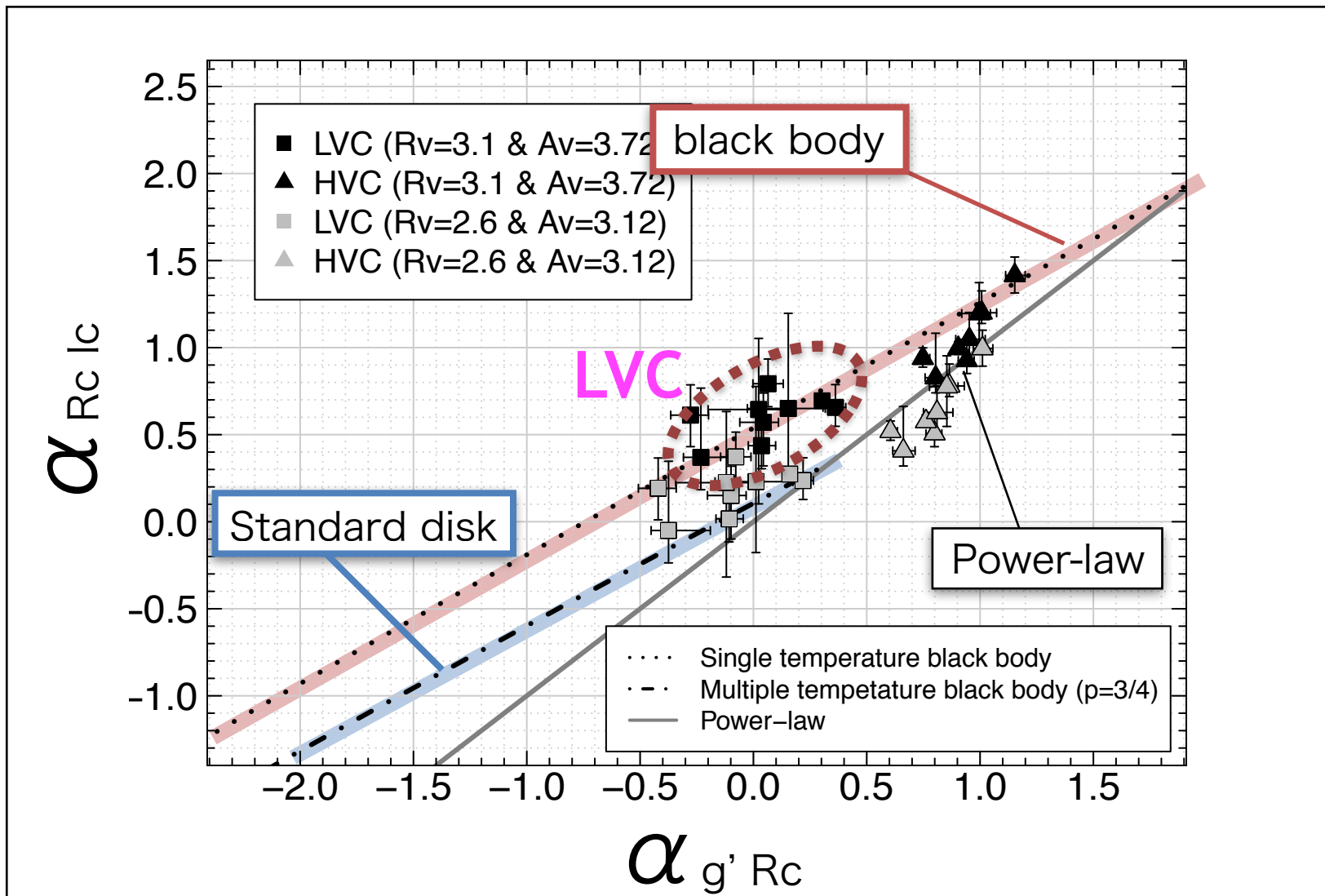
MJD - 57190 (days)

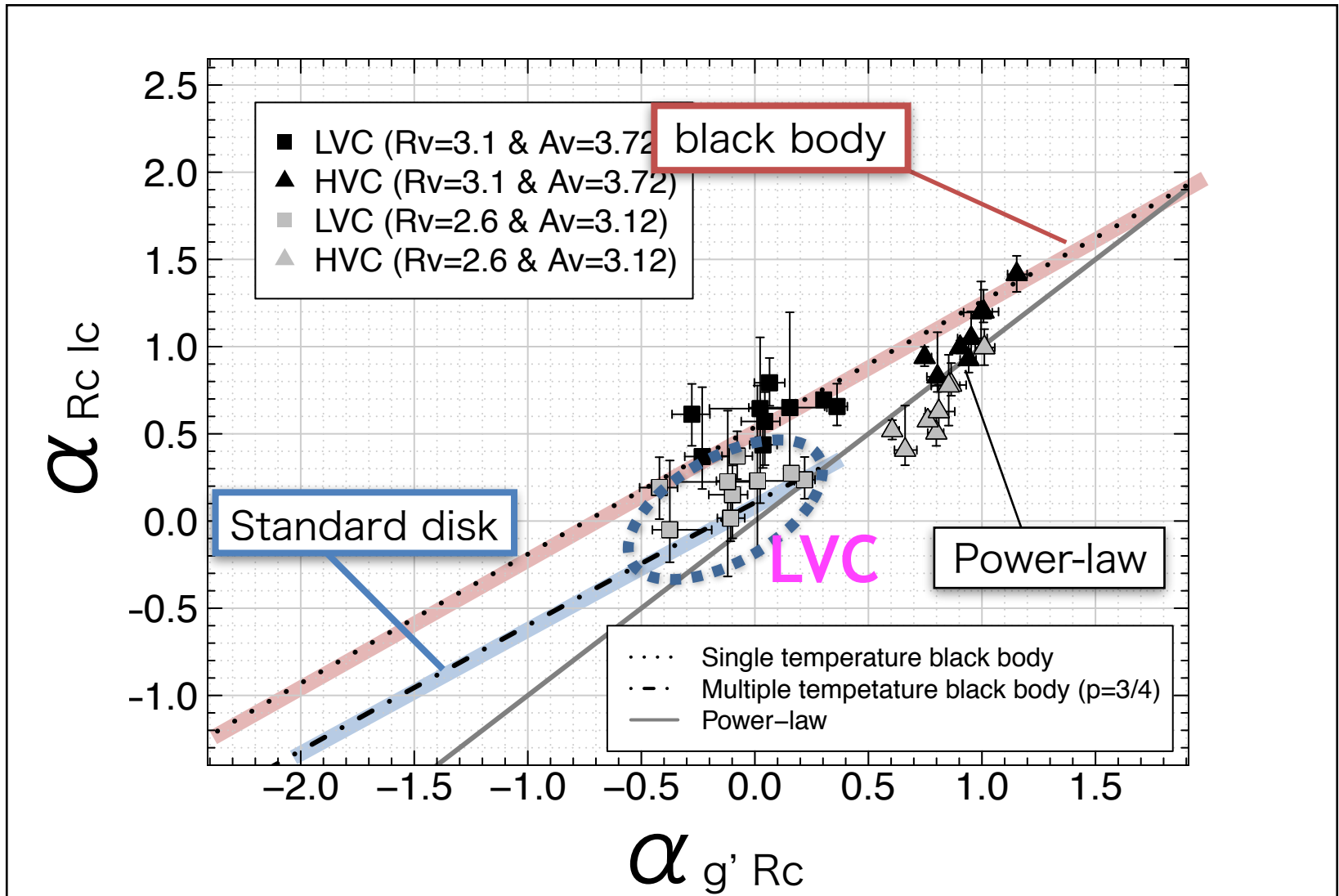
Linear

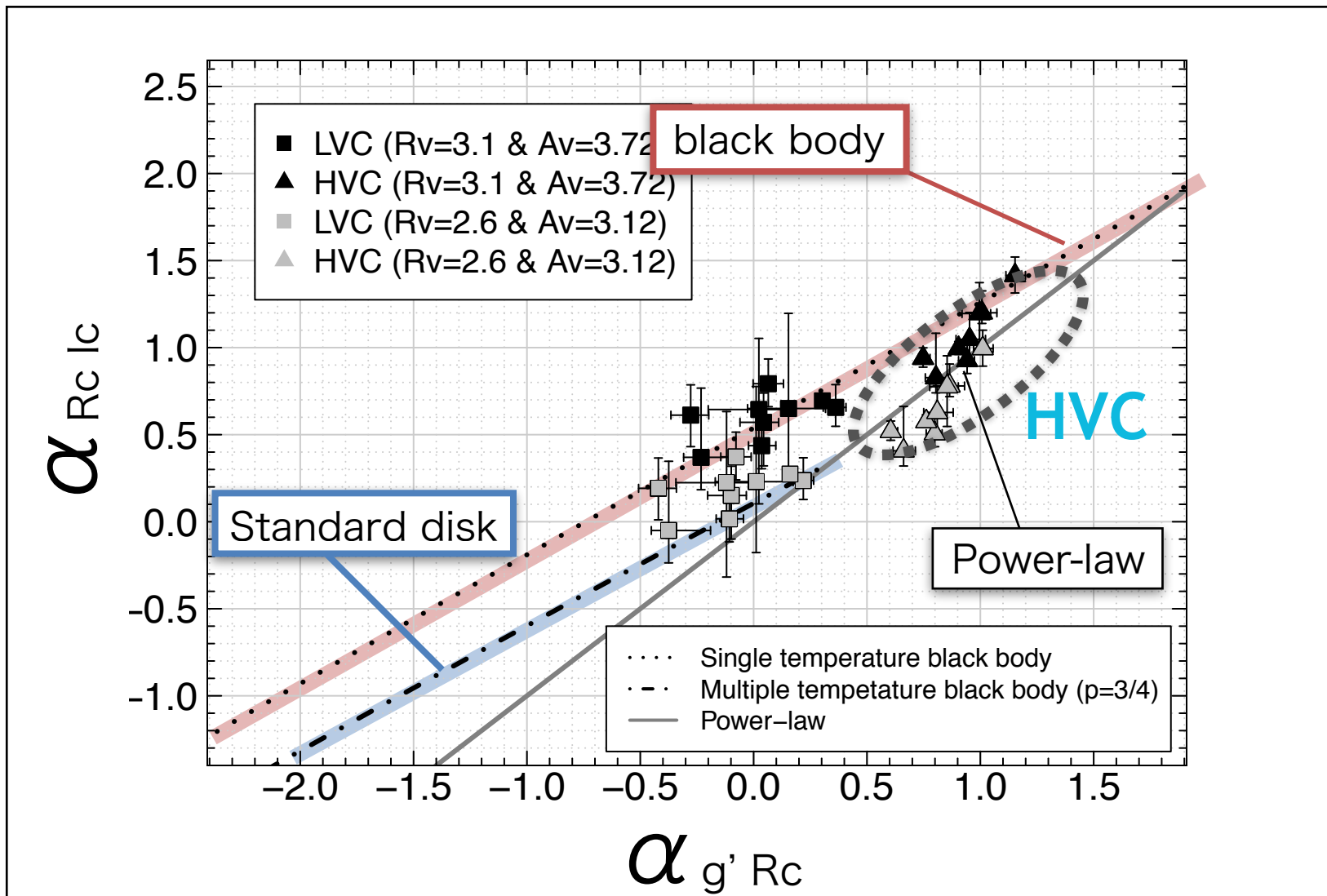
Broken linear





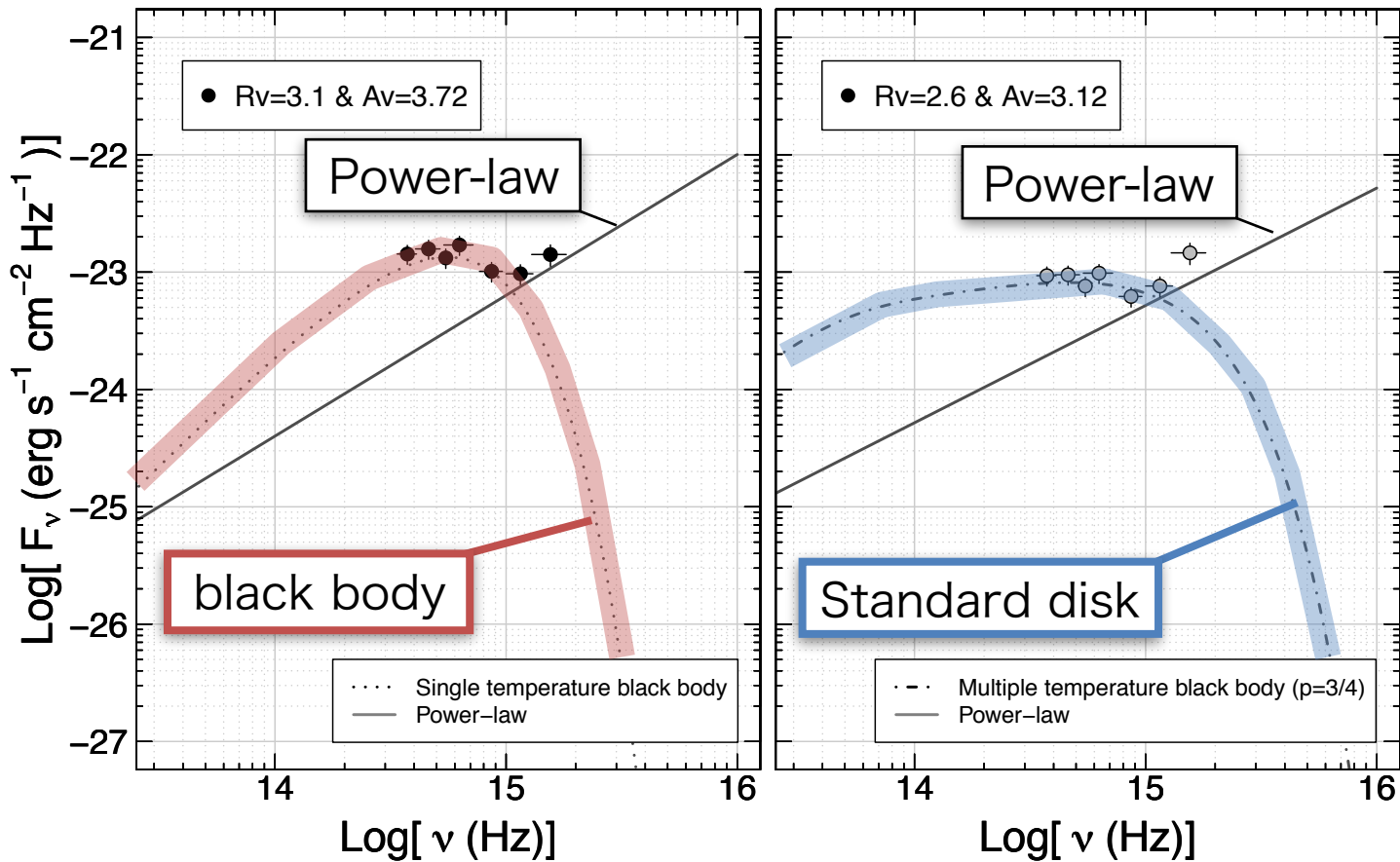








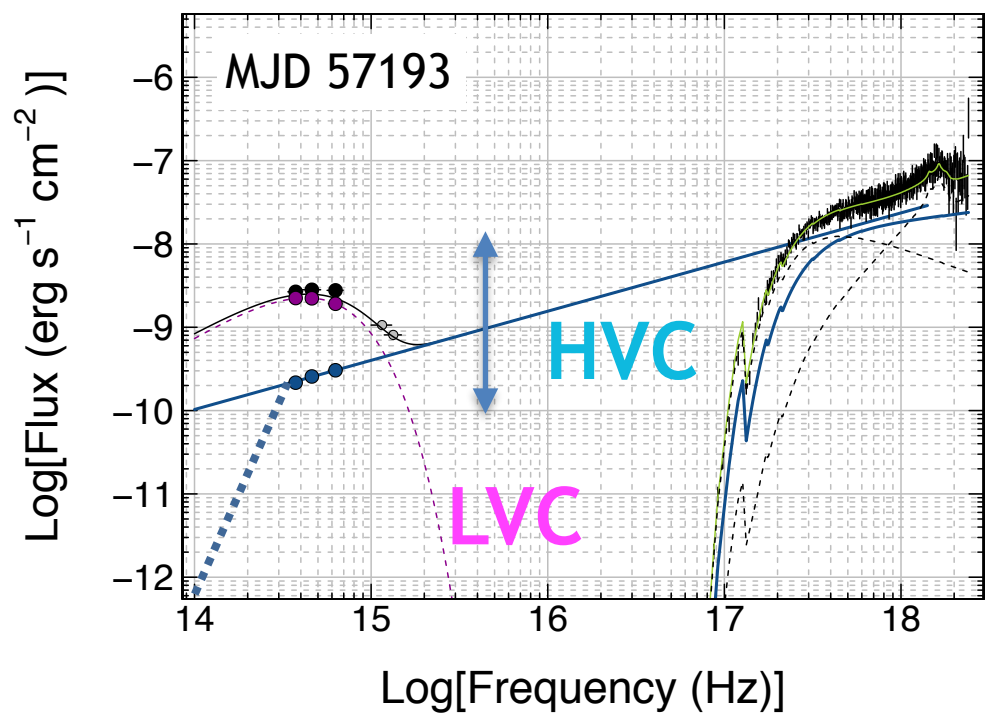
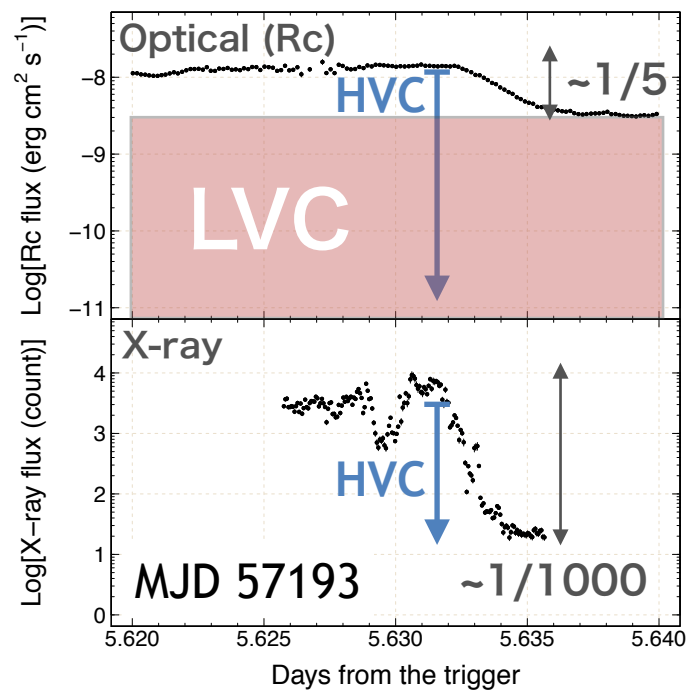
Opt-UV SED for V404 Cyg can be reconstructed with our model







Two component model can explain the correlating variation in optical and X-ray **with different amplitude**



In the optical band, variation amplitude was suppressed by LVC



We performed time domain analysis of the optical variation in V404 Cyg

- **Decomposed the optical variation** to two distinct components:
  - little-variable component (LVC) and highly-variable component (HVC)
- Derived characteristics of these components
  - LVC : **the standard disk or the single black body**
  - HVC : **the power-law spectrum** ( $\alpha \sim 0.6-1.2$ )
- Spectral energy distribution (SED) from optical to UV
  - The SED can be interpreted as **the sum of LVC and HVC**
  - The UV excess can be explain by HVC
- The Correlated variation in optical and X-ray
  - The existence of LVC suppress the variation amplitude