X-ray Universe 2011

Suzaku Wide-band Spectral Analysis on Short/Long Time Scales of Cygnus X-1

~ PhD thesis of University of Tokyo ~ http://ads.nao.ac.jp/NOTES/2011PhDT.....1Y.html

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# Wide-band Suzaku Spectra of Cyg X-1



#### Suzaku Obs. of Cyg X-1 from '05 to '09



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#### Suzaku Spectra of 25 obs.



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# Comparison bet. spectra of $\Delta t > days$



Energy (keV)

# Intensity-sorted spectroscopy

- 1. With XIS, judging high/low phase on  $\Delta t = 1$
- 2. Sorting the data according to 1.
- 3. Extracting high/low spectra.



1.0

0.8

0.6

0.4

0.2

Time (s)





#### Comparison bet. Spectra with $\Delta t \sim 1$ s



#### What the ratio shows

- Hollows below E < 2 keV
- Spectra becomes softer as the source gets brighter.



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#### What the ratio shows

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Energy (keV)







Energy (keV)



Energy (keV)









#### Hard X-ray spectral analysis in $\Delta t < 4$ s



#### What the ratio shows

- Hollows over E > 100 keV
- Slightly softer as it gets brighter.





## Summary

- The decomposition of Disk + Hard Compton + Soft Compton, is consistent with the spectral variability.
- As Cyg X-1 gets brighter within 1s, the spectral cutoff at ~ 100 keV decreases, which can be interpreted as Te decreases, return to the average instantly after the peak.



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#### **Future Prospects**

# Beautiful Suzaku wide-band spectra

