Multi-wavelength Variability and A New Broadband Spectral Phase of OJ 287

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OJ 287

- BL Lacertae object at z = 0.306
- Shows recurrent optical outbursts every ~12 years in optical data available since 1890 (Hudec et al. 2013)
- Claimed to be a precessing system of binary SMBH of masses 1.8×10^{10} $M_\odot$ and 1.3×10^{8} $M_\odot$ (Sillanpaa 1988, Lehto & Valtonen 1996)
- Broad emission lines observed around the claimed disk impact periods (Nilsson et al. 2010)

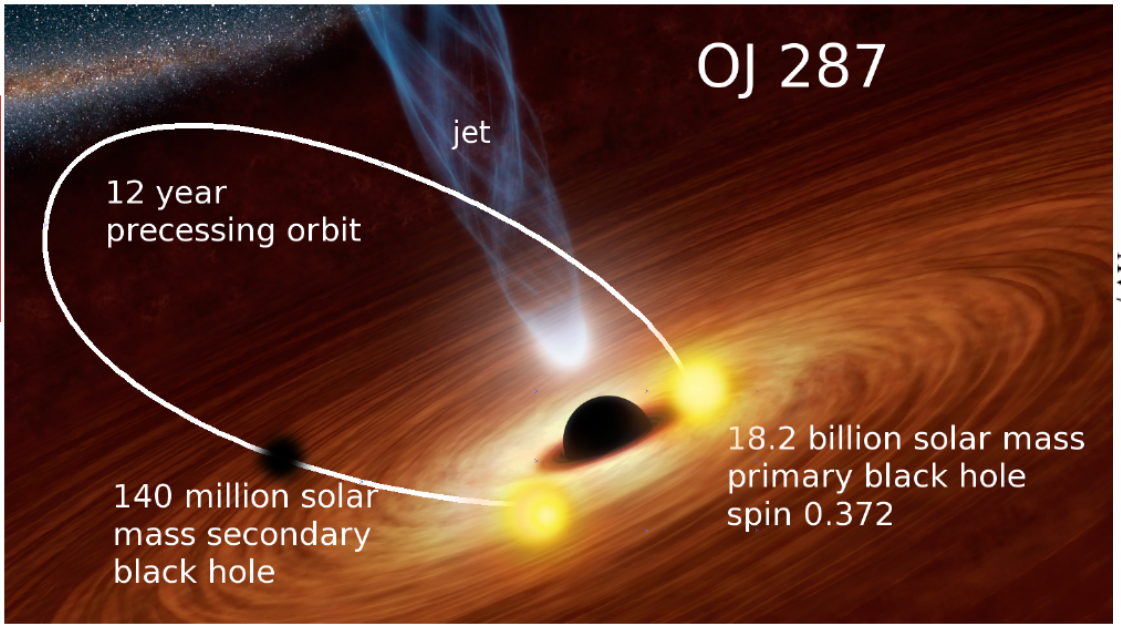
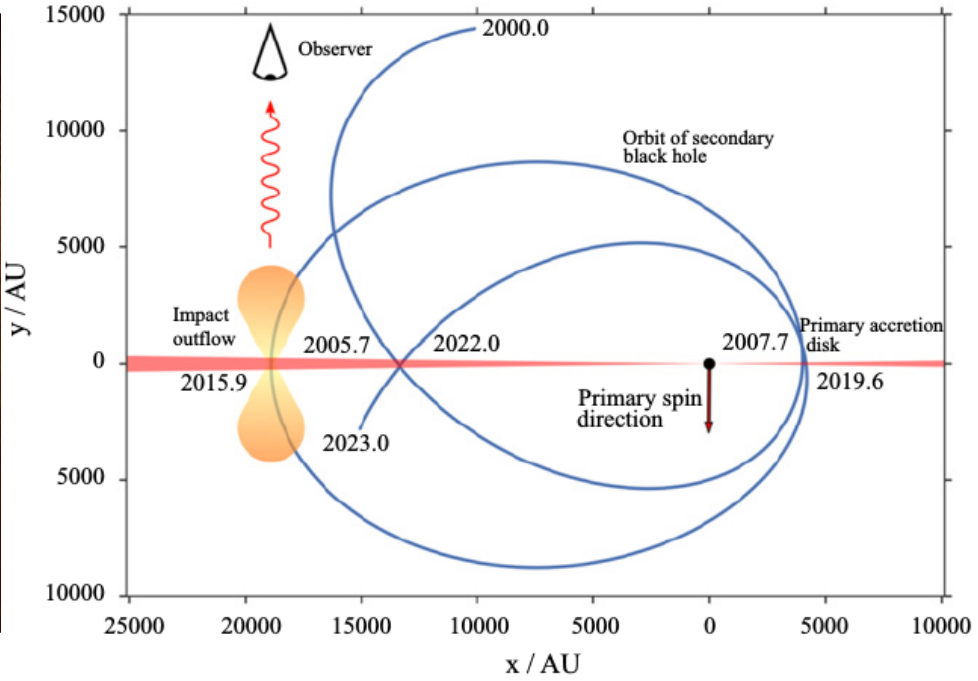


Image: Valtonen et al. 2017



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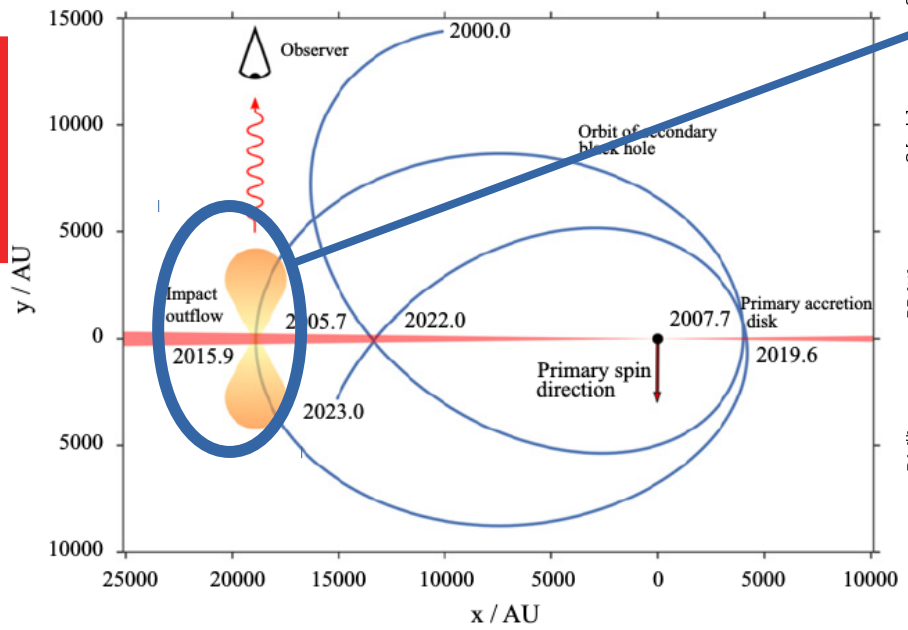
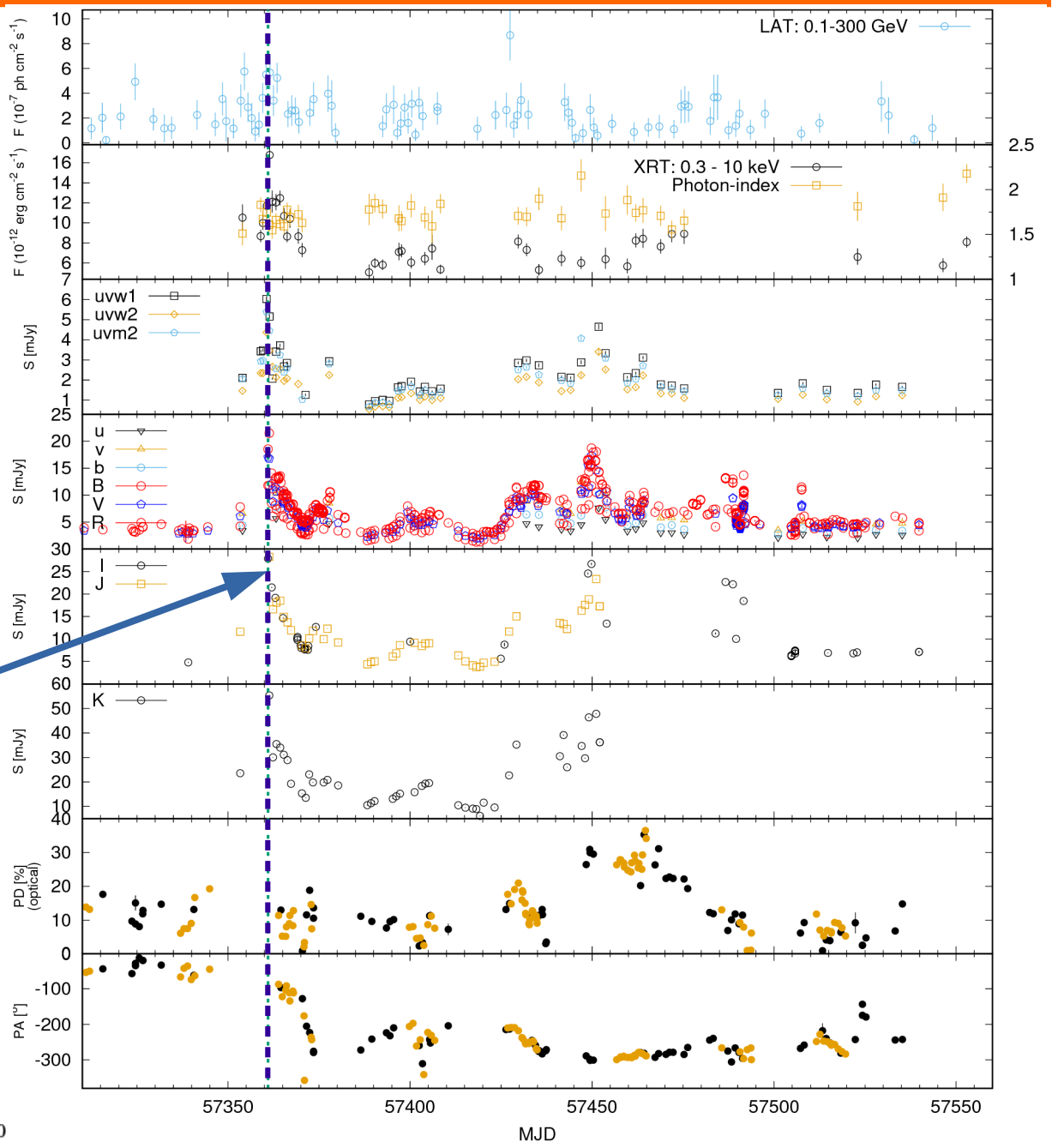
OJ 287: Binary SMBH Model & 2015 Outburst

➔ Binary SMBH model predicted begening of high activity 2015.96 ± 0.12 (MJD: 57373 ± 43.8)

➔ Claimed disk impact optical flare observed on MJD 57361

➔ High activity cross the entire electromagnetic spectrum





Kushwaha et al 2018a, MNRAS

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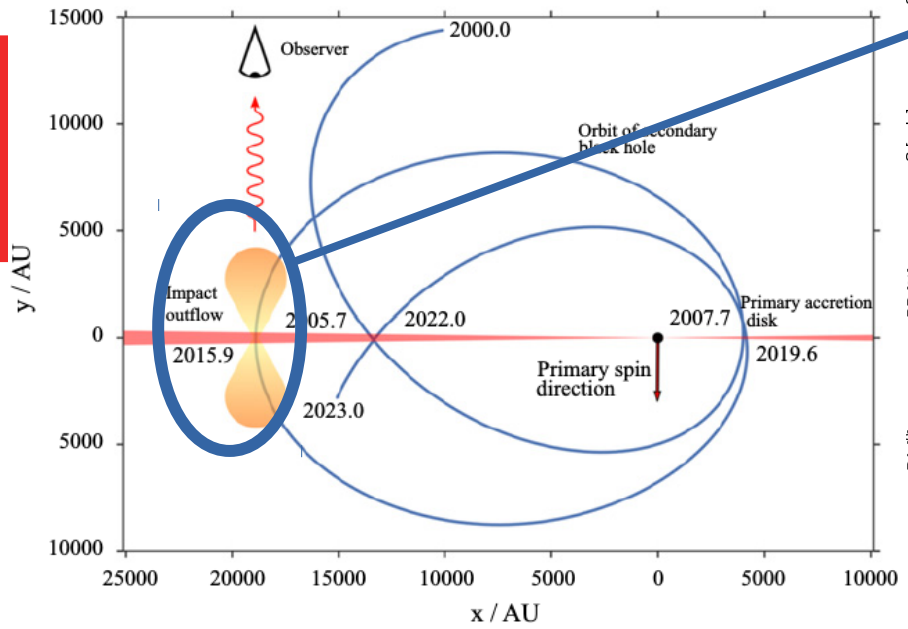

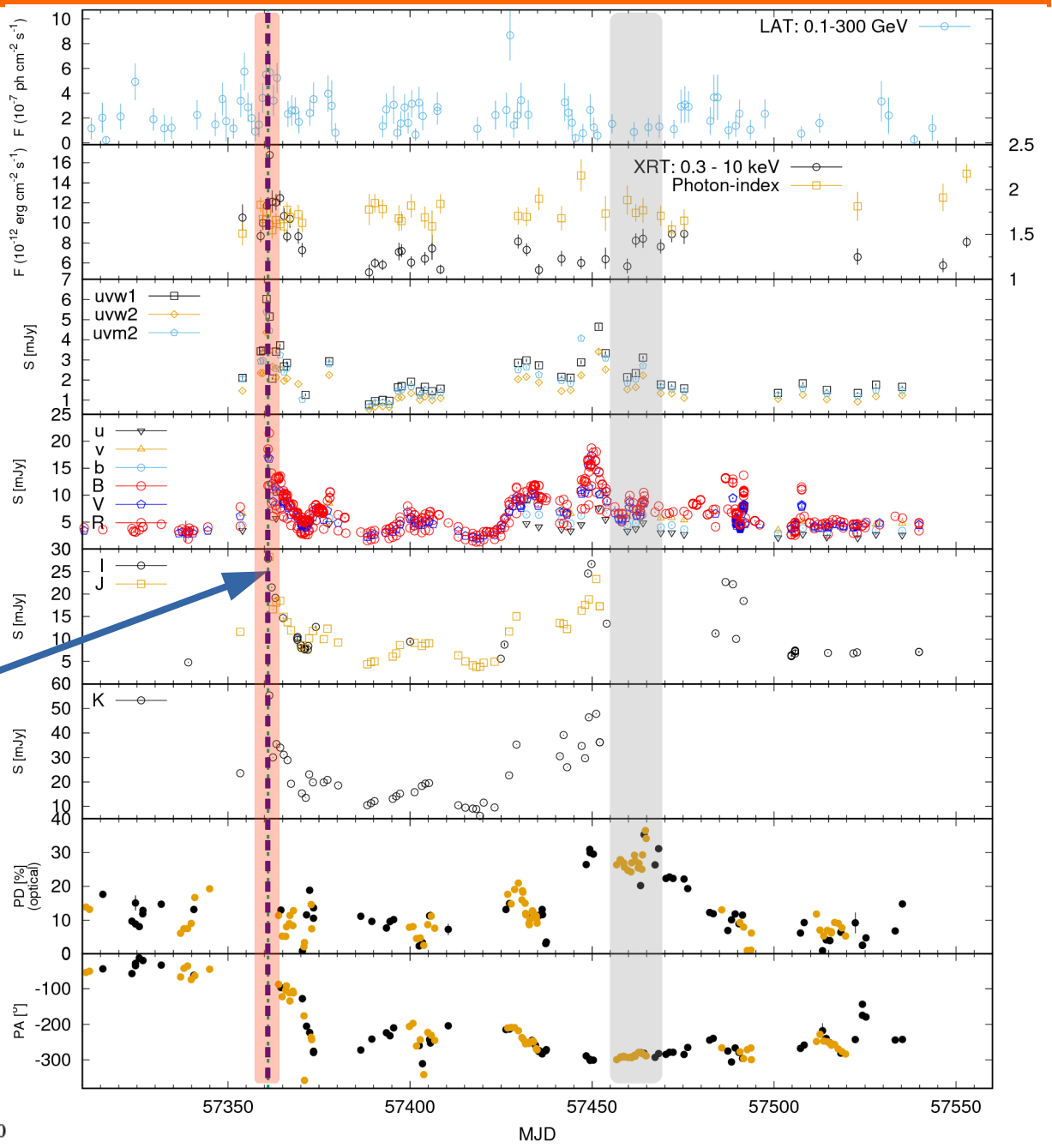

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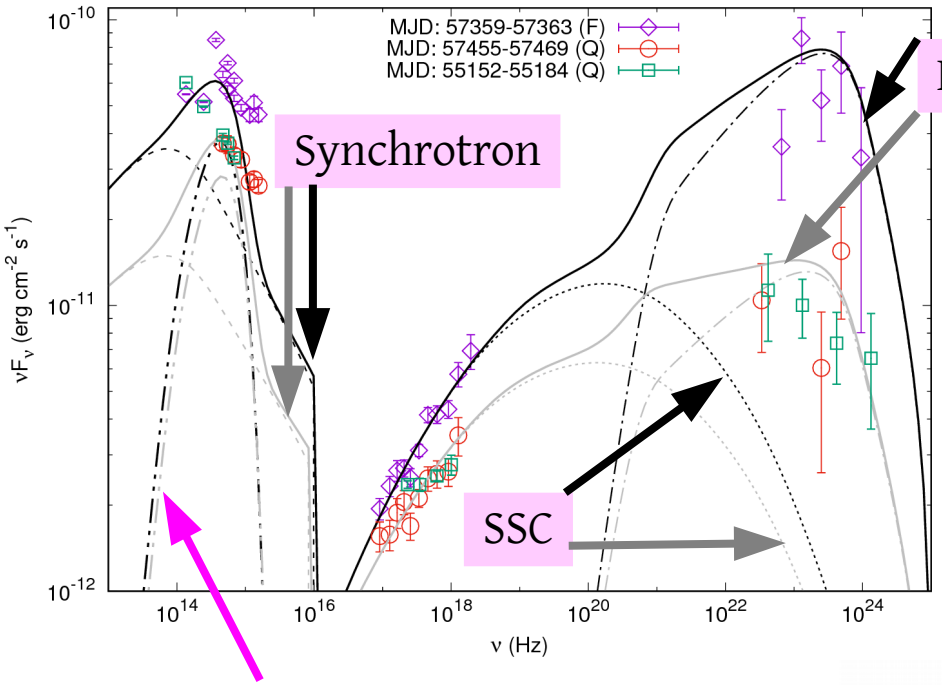
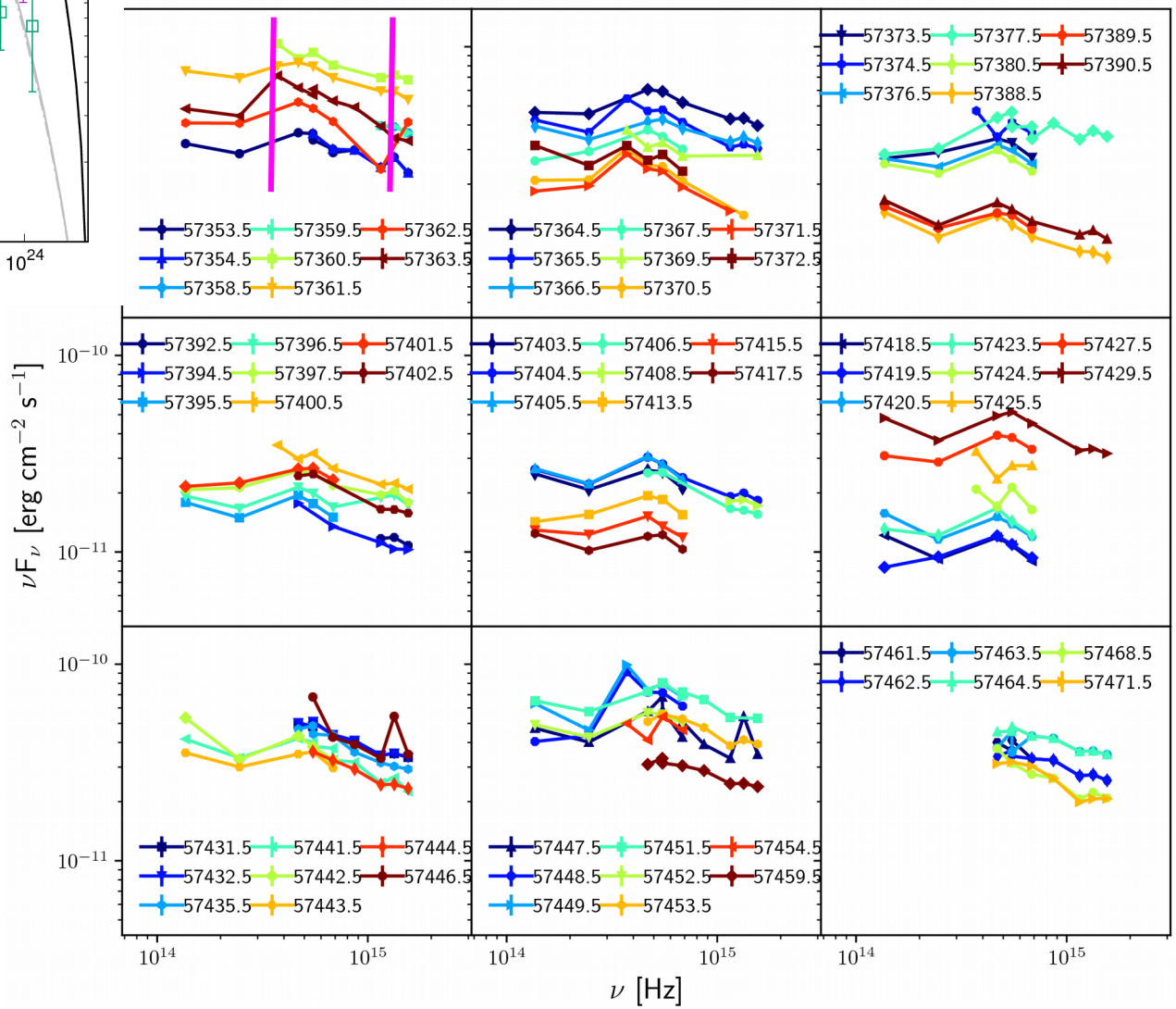
OJ 287 SED: Broadband & Optical-UV



Optical-UV SED on daily basis



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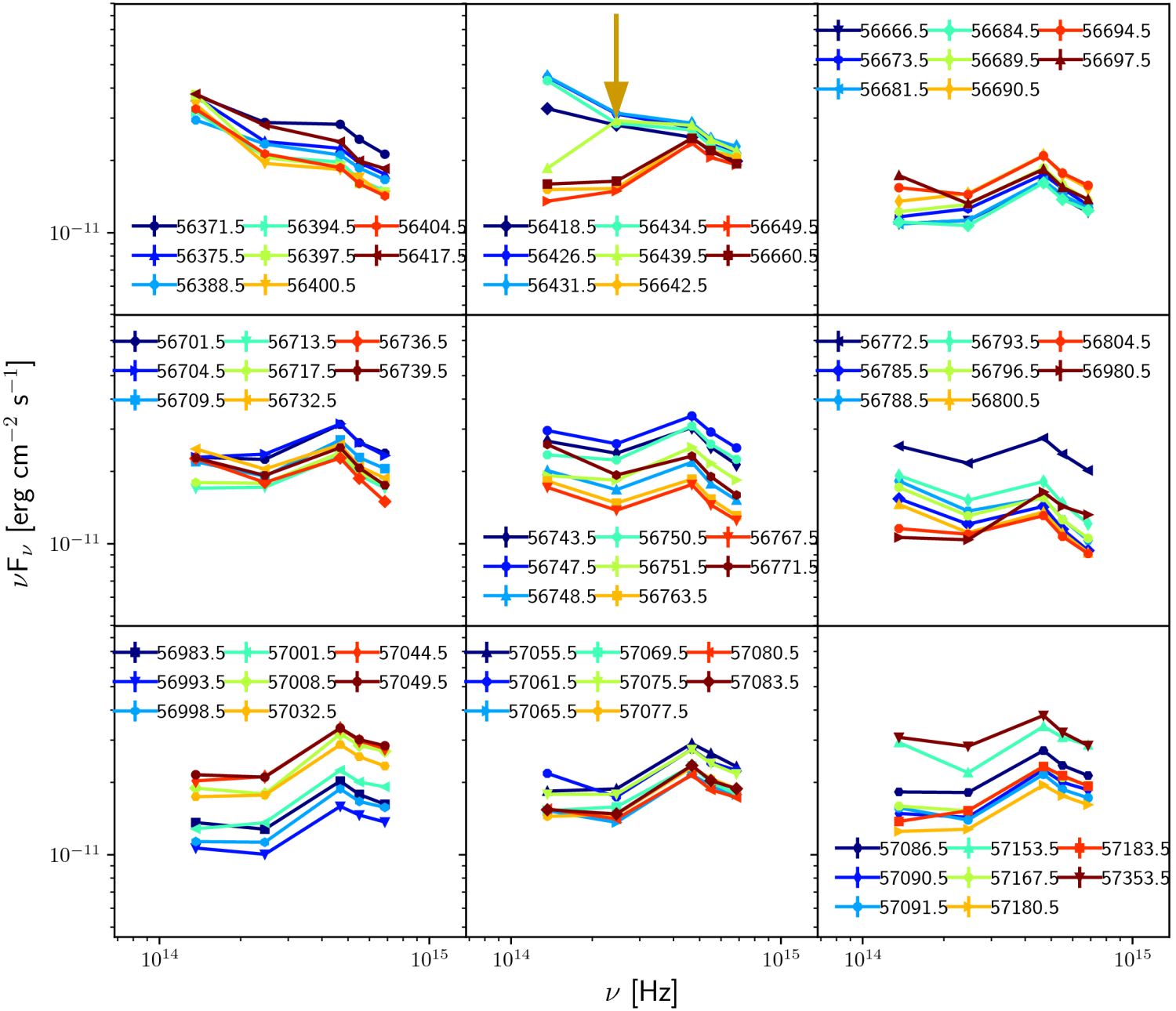
OJ 287: Optical SED (KJRVB bands)



Summary

➔ The claimed optical disk outburst was observed around the claimed time (Lehto & Valtonen 1996, Valtonen 2016)

➔ Outbrust was also seen at X-ray & Gamma-ray energies (Kushwaha eta al 2018)

➔ Spectral investigation of optical-UV emission show to bumps; one in NIR-optical region while other in optical-UV region (Kushwaha eta al 2018)

➔ The NIR-optical bump is consistent with the standard accretion disk (AD) description of Primary SMBH while the optical-UV bump appears consistent with contribution from broad line emisson

➔ The NIR-optical bump first appeard on MJD 56439, around the time of impact of secondary on AD of primary in BH frame.

➔ The gamma-ray spectra show shift in the SED peak and change in spectral shape and is consistent with IC scattering of BLR field (optical-UV bump)