

physics of extragalactic plasma elements

through high cadence radio polarisation monitoring of blazars

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für Radioastronomie

the RadioPol program:



APEX



30 m IRAM



100 m Effelsberg

part of the **f-gamma** program:

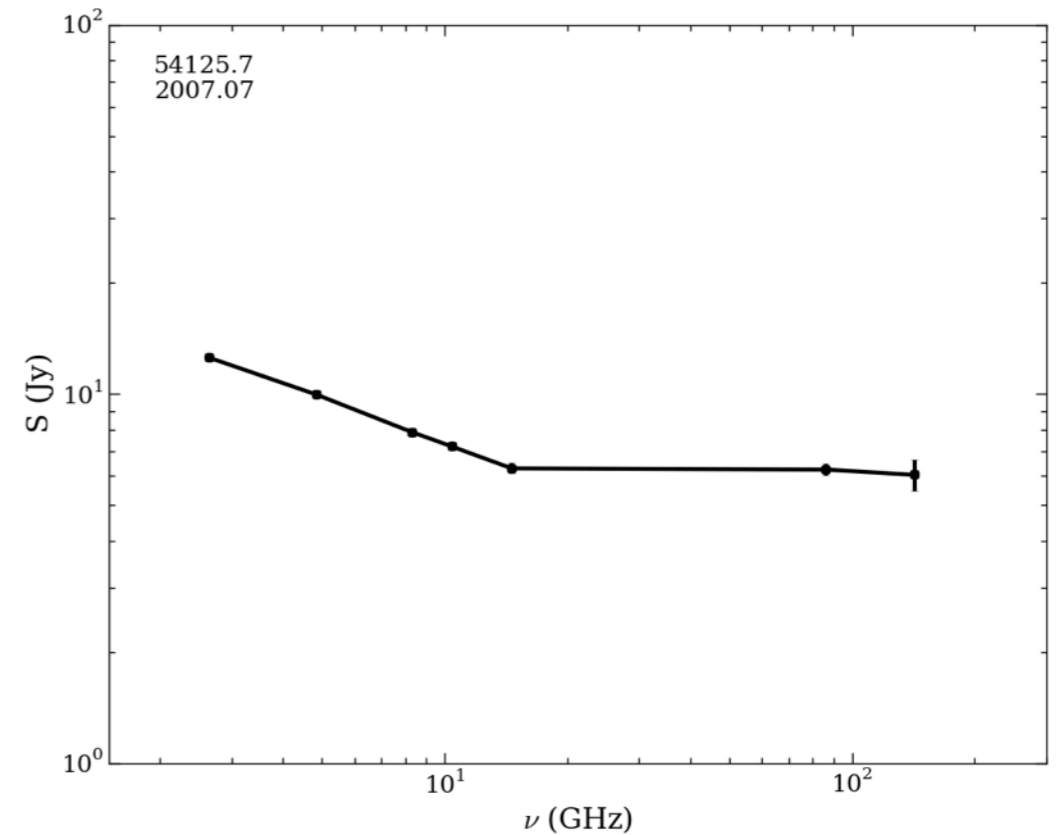
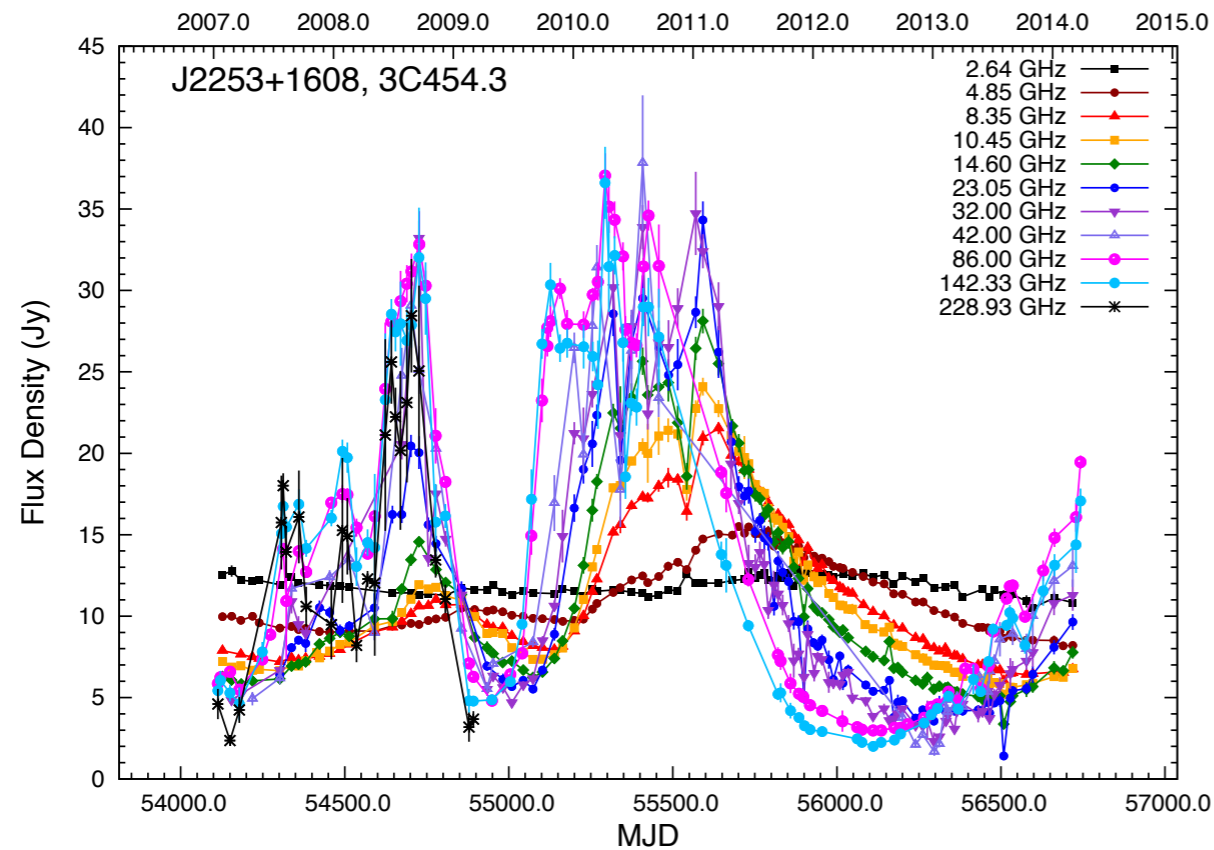
- almost 90 mostly *Fermi* sources
- 2.64 - 142 GHz at 10 frequency steps **circularly polarized** feeds
- LP at **2.64, 4.85, 8.35, 10.45** and 14.6
- CP at 2.64, **4.85, 8.35, 10.45, 14.6, 23.05**
- mean cadence 1.3 months
- uncertainty **0.1 FPU**

Angelakis et al. 2010, astro-ph.CO/1006.5610

Fuhrmann et al. 2007, 2007, AIP Conf. Series, Vol. 921, 249–251



the **RadioPol** program:



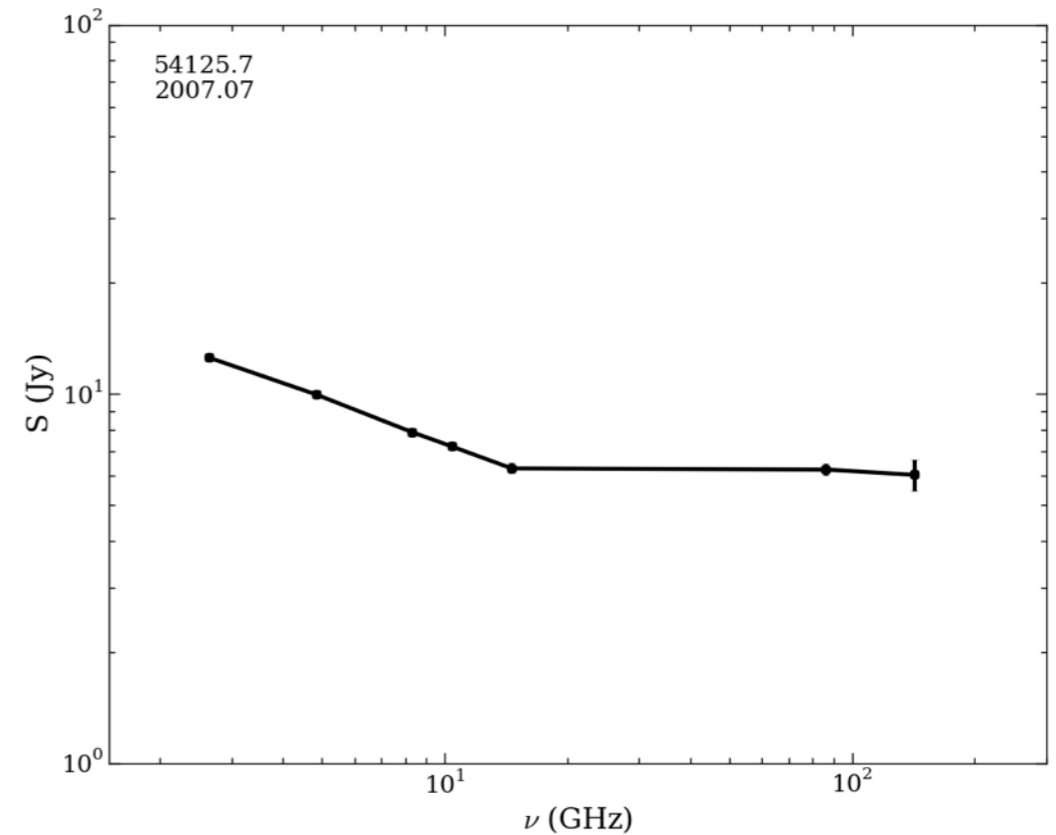
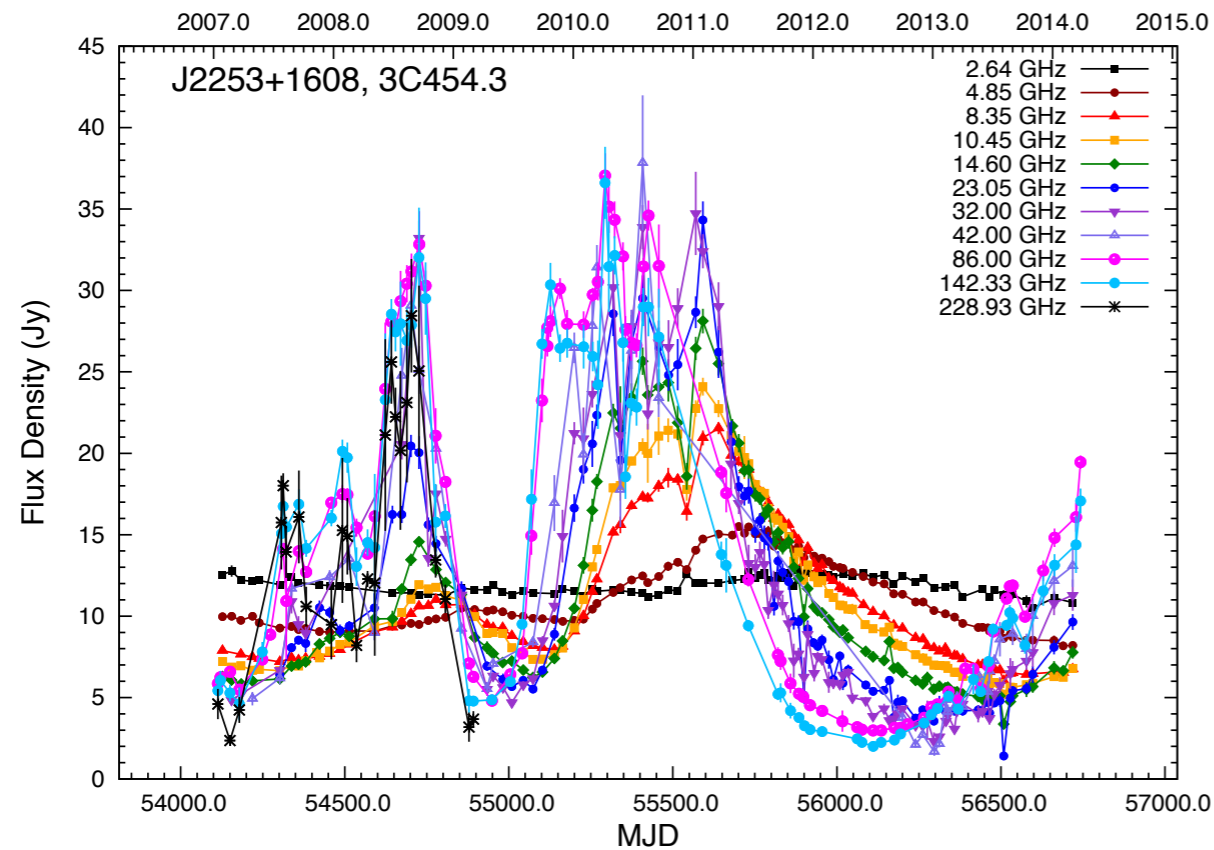
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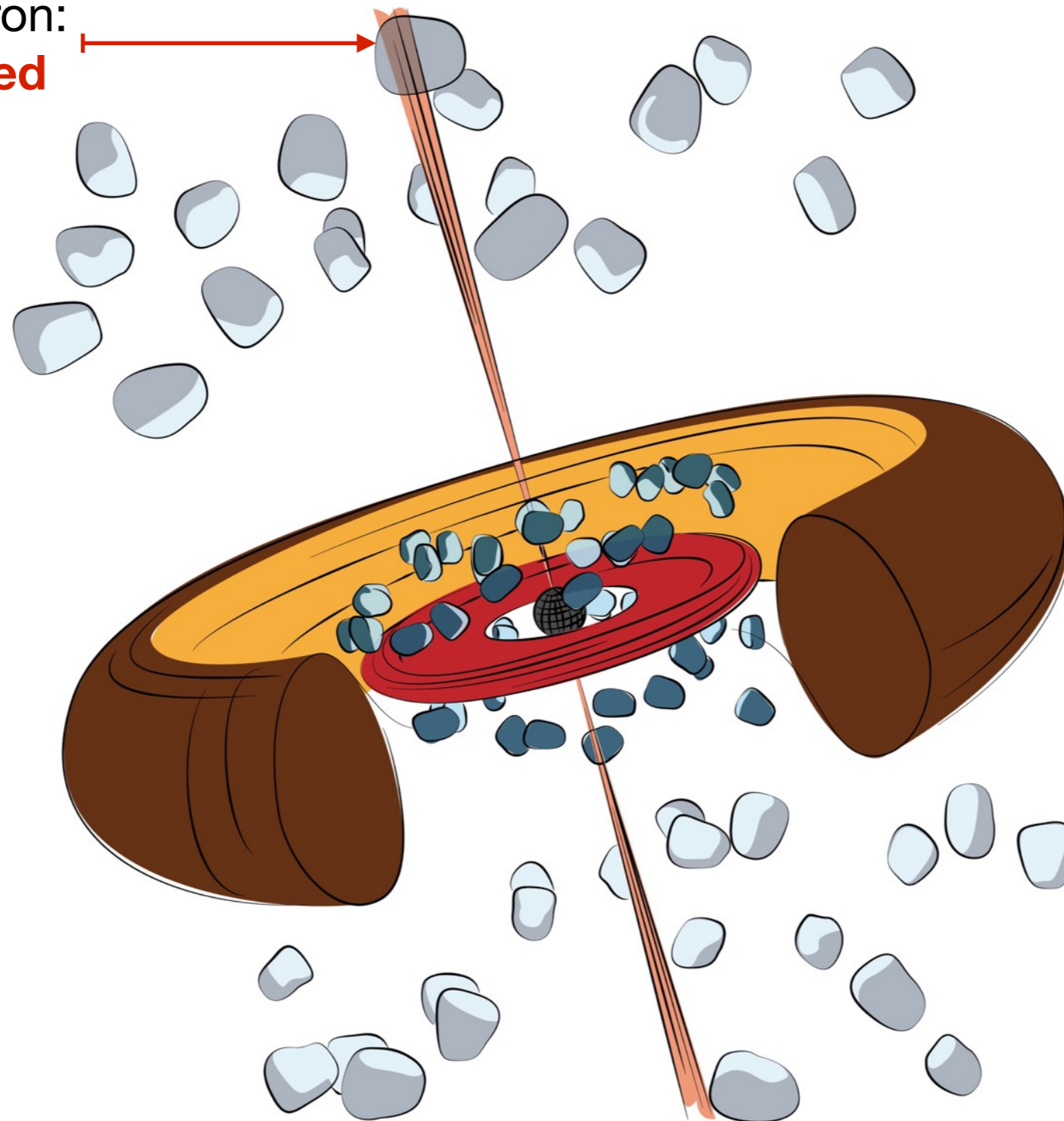
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incoherent synchrotron:
intrinsically polarised



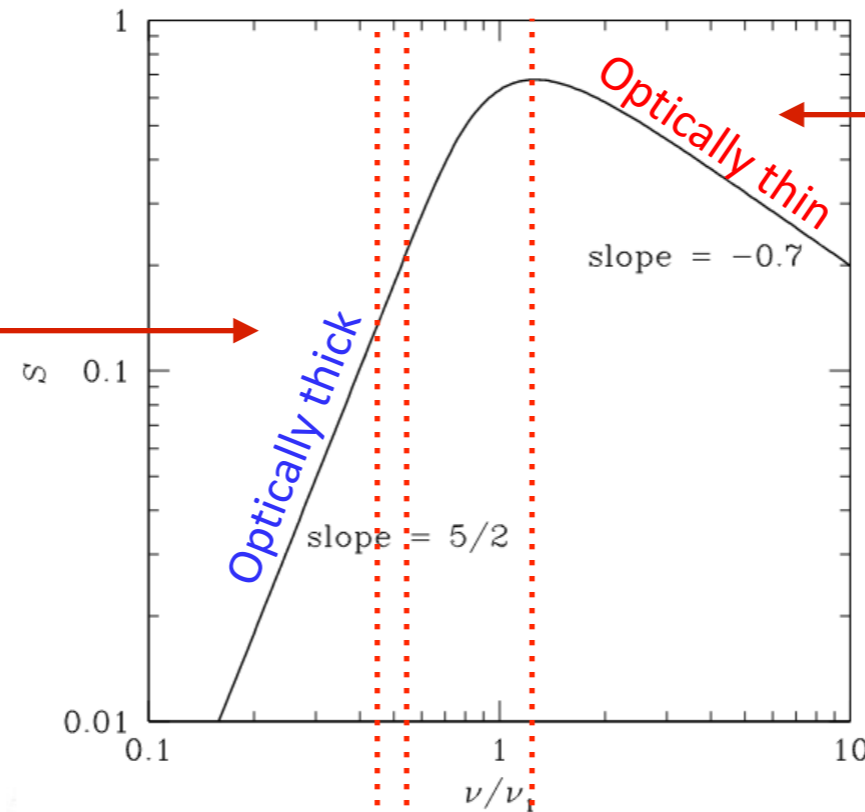
credit: [S. Kiehlmann](#)

relativistic magnetised plasma laboratories



EVPA parallel to projected B -field

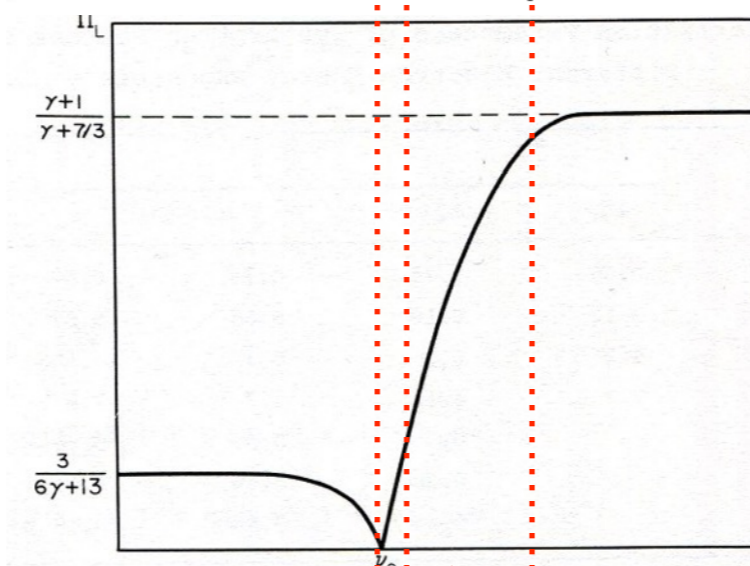
EVPA perpendicular to projected B -field



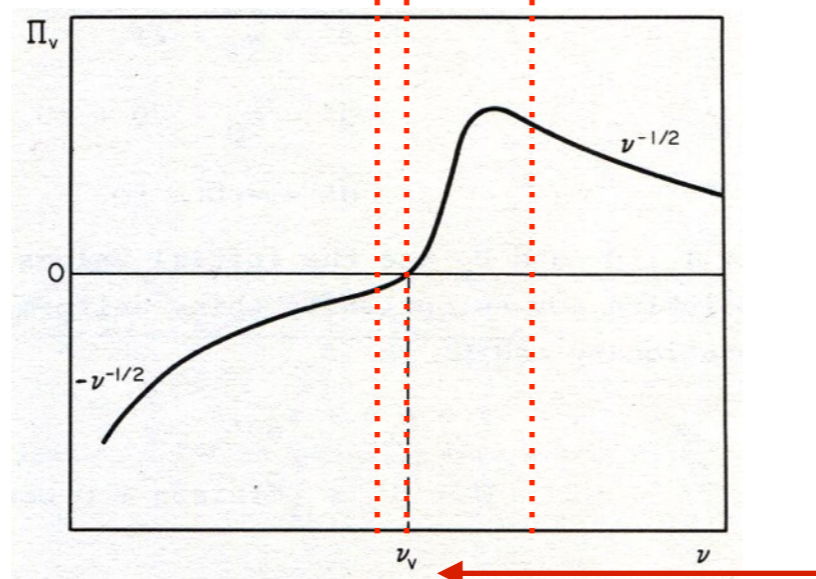
$\alpha = +2.5, m_l \approx 11\%$

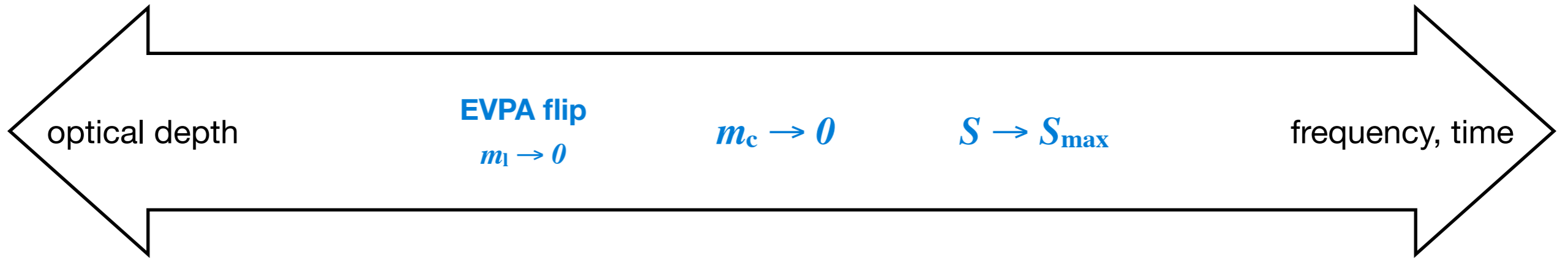
$\alpha \approx -0.7, m_l \approx 72\%$

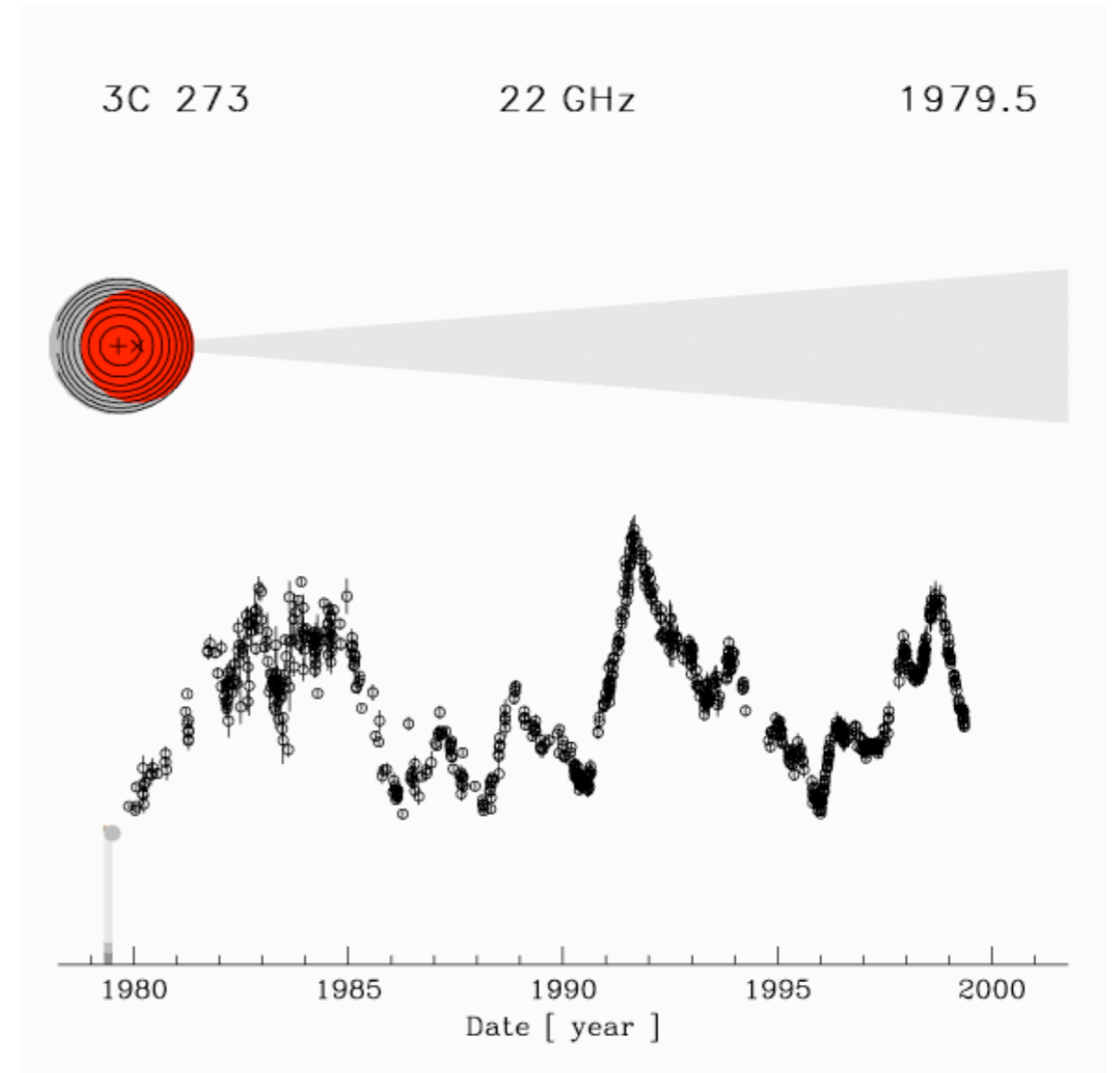
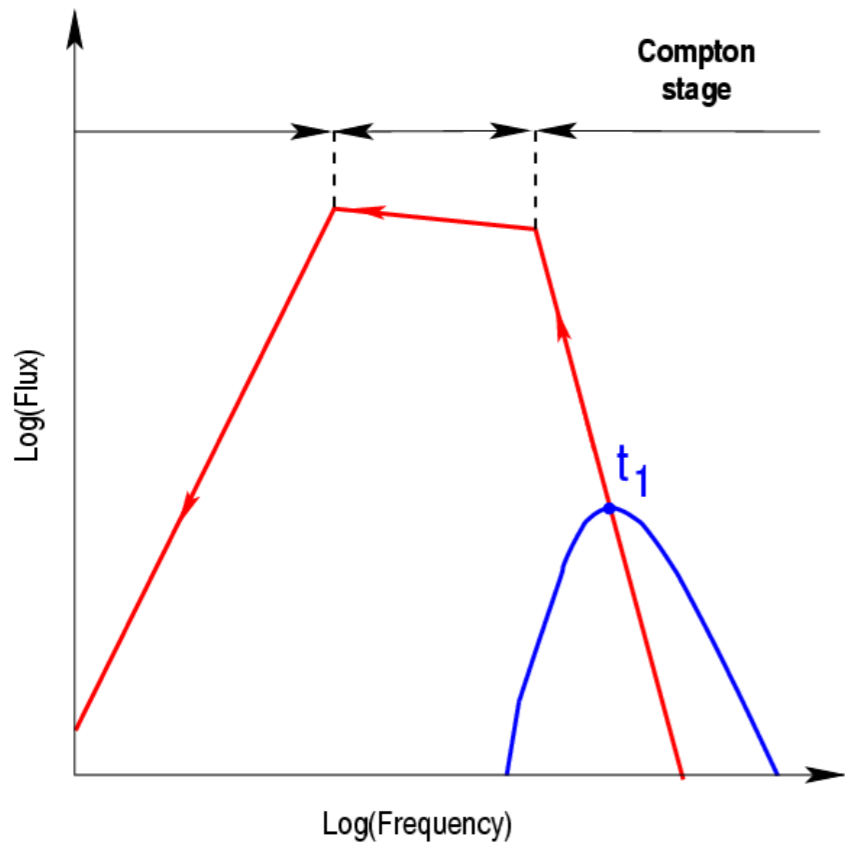
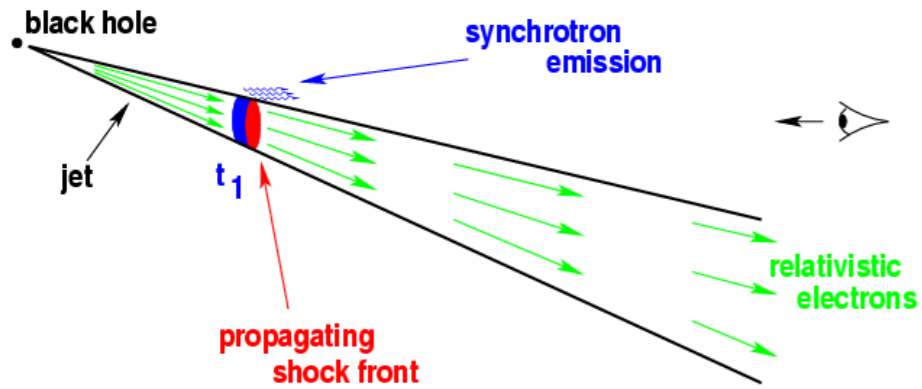
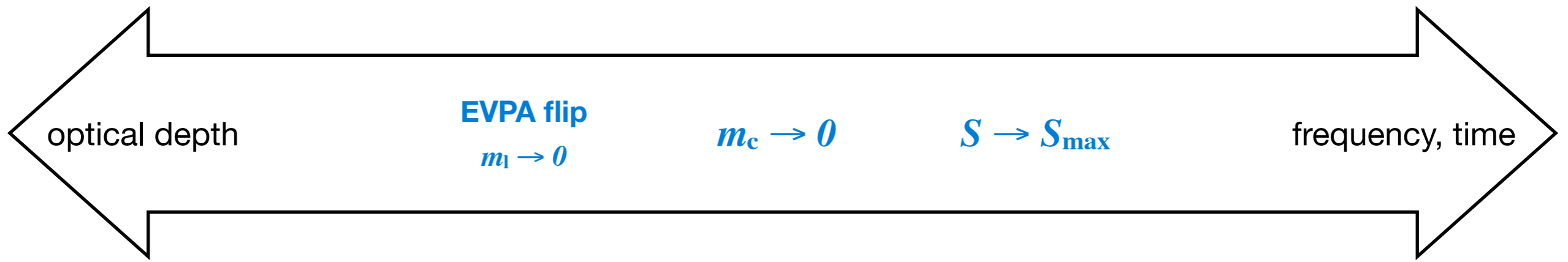
linear component:
 $\nu_Q = 0.44 \nu_m \rightarrow \tau \approx 7$



circular component:
 $\nu_V = 0.49 \nu_m \rightarrow \tau \approx 5$

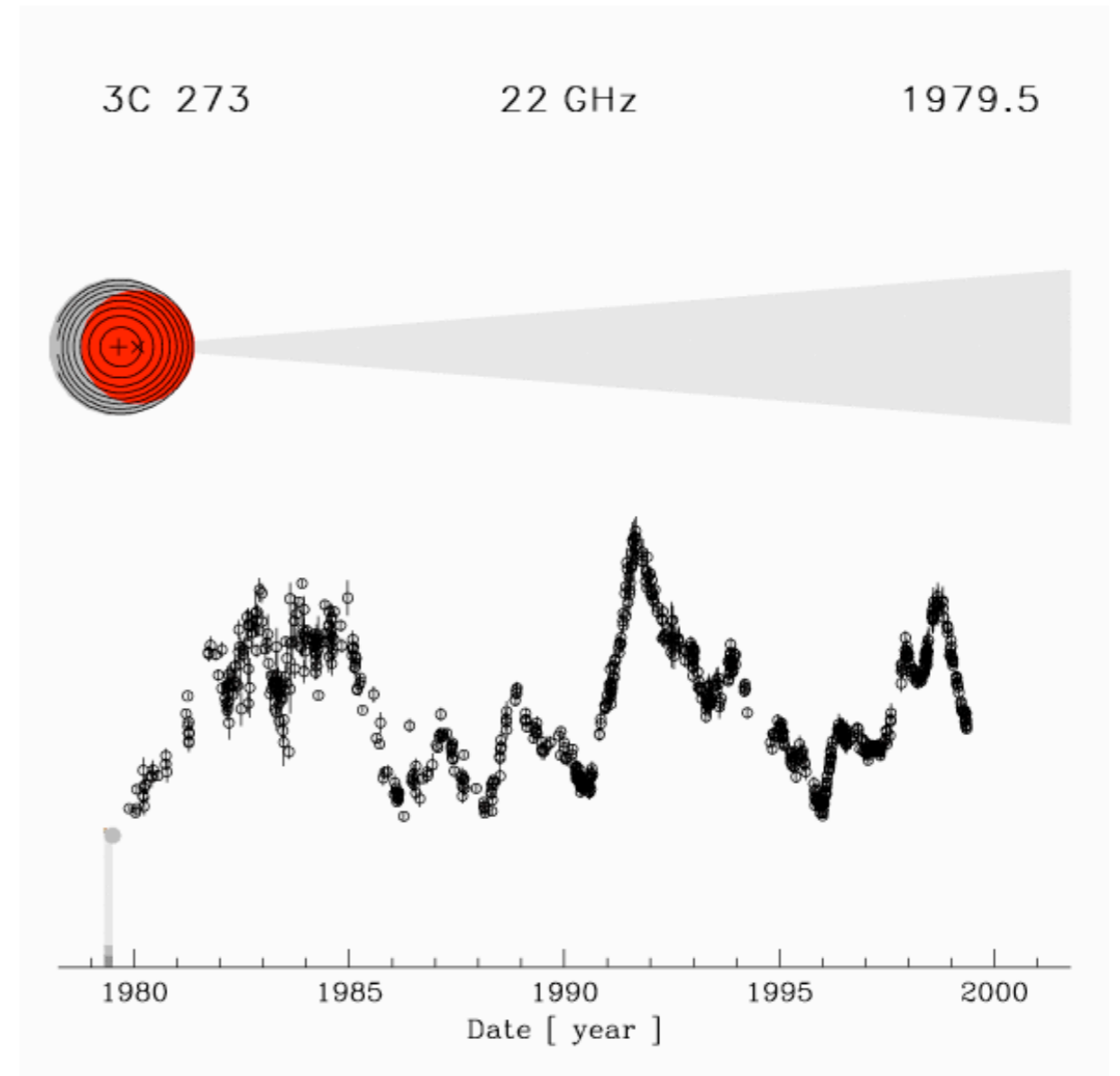
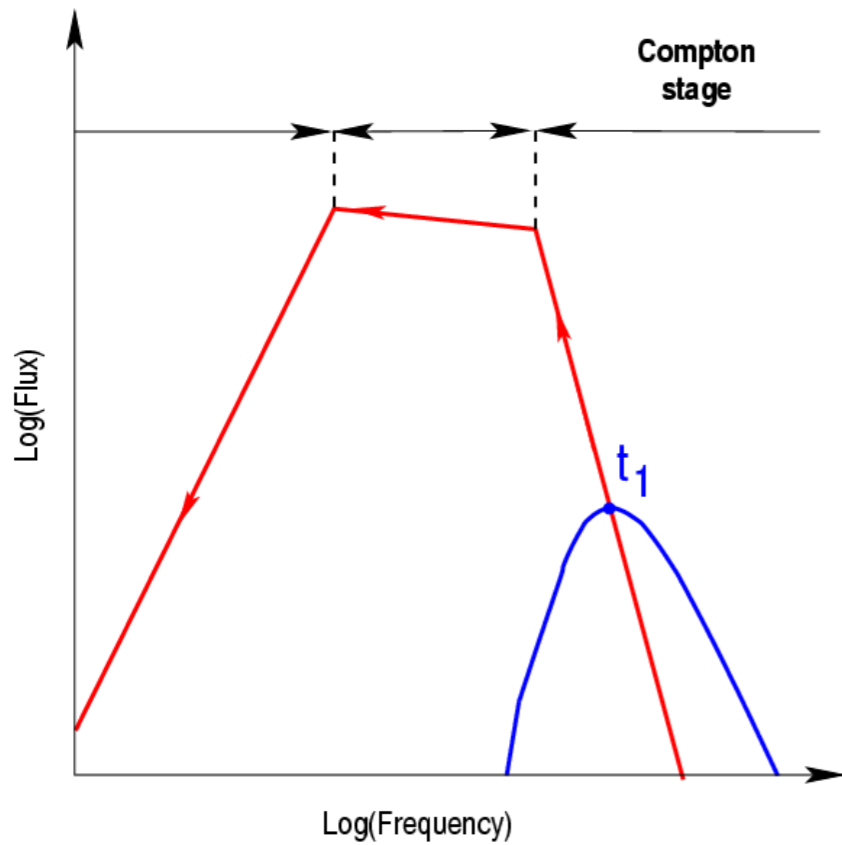
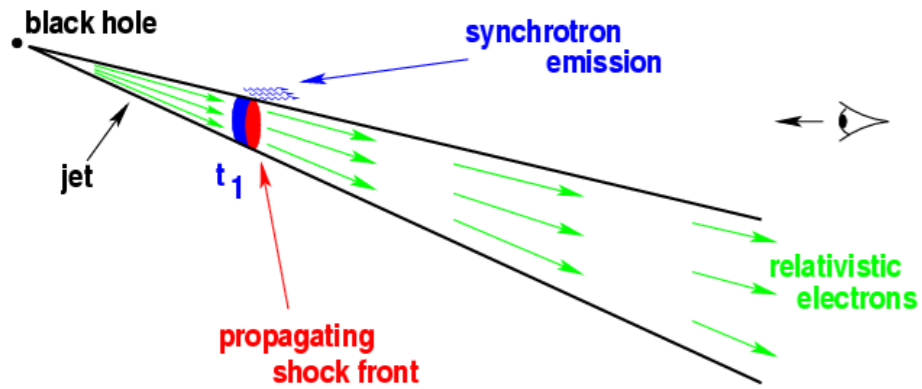
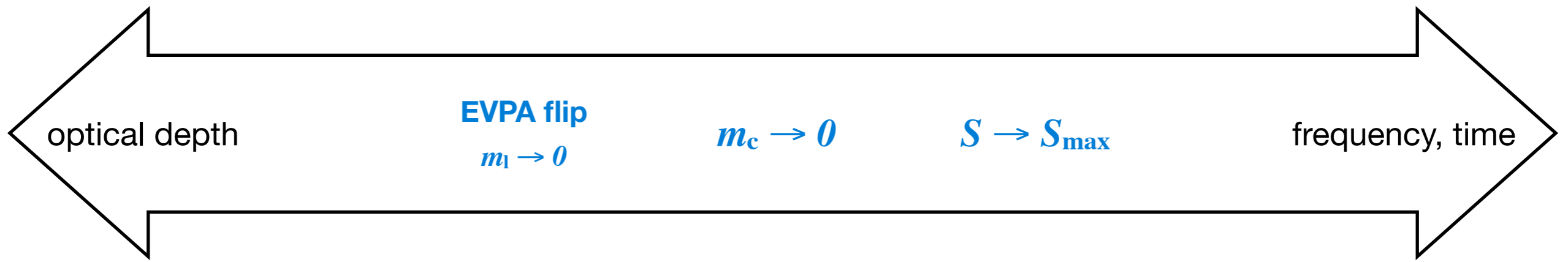






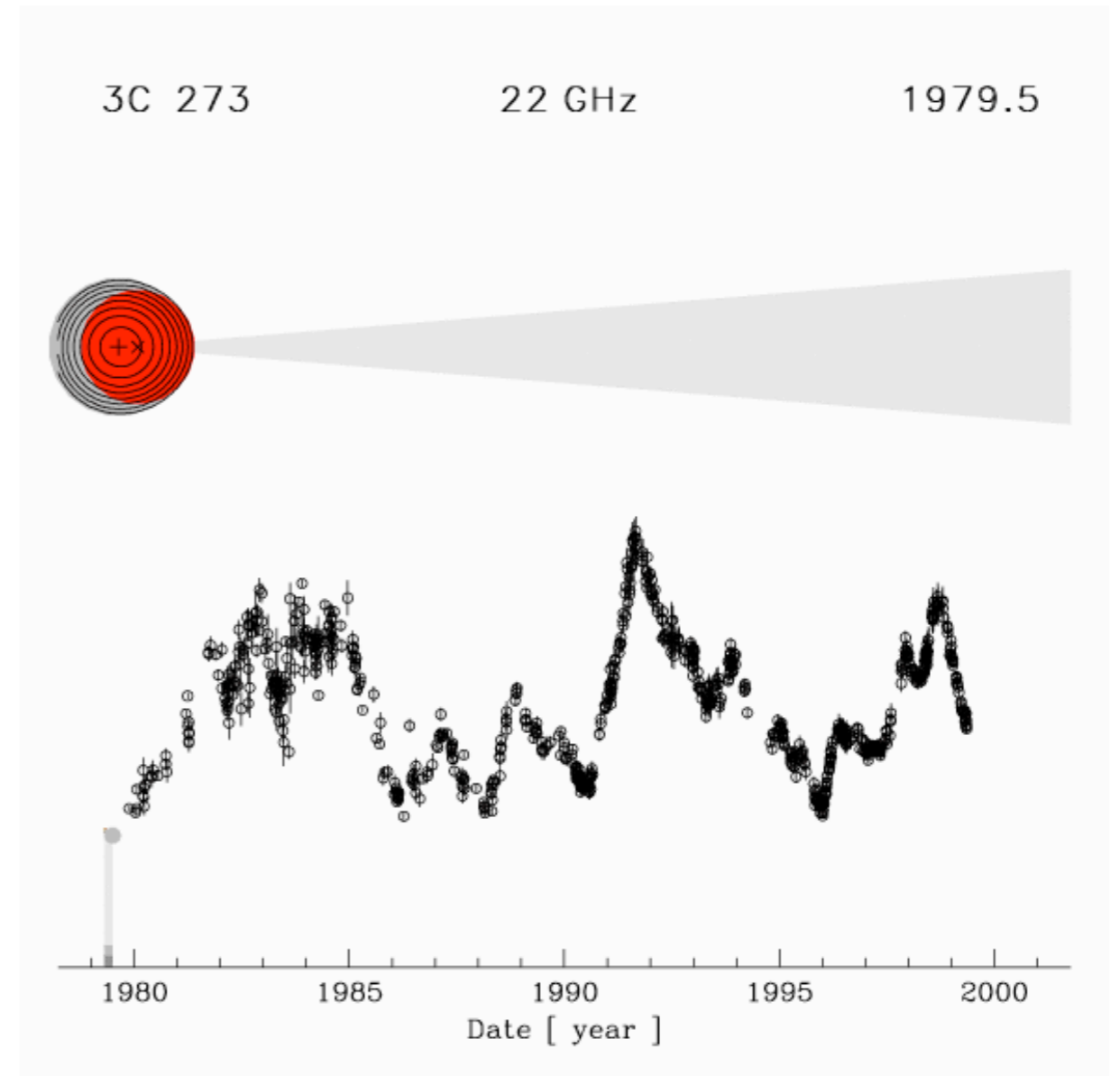
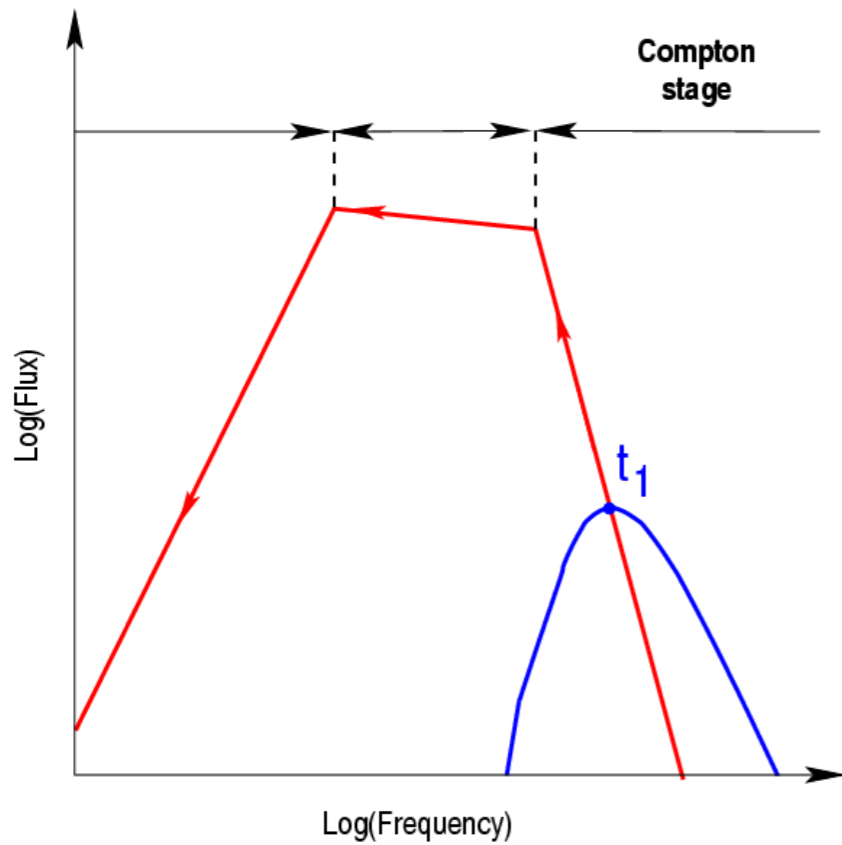
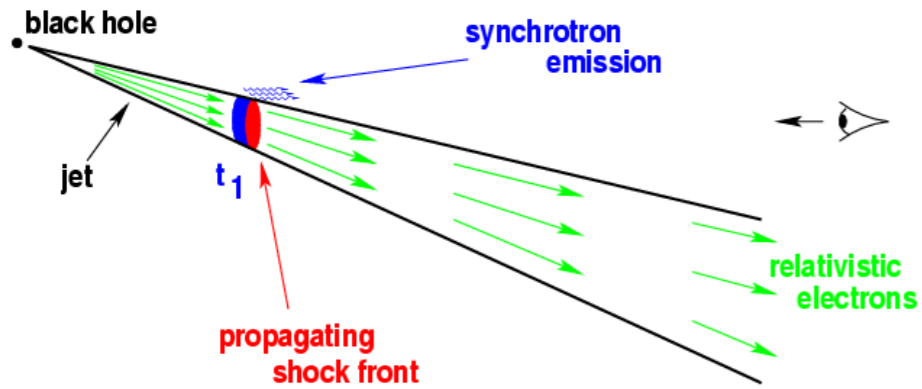
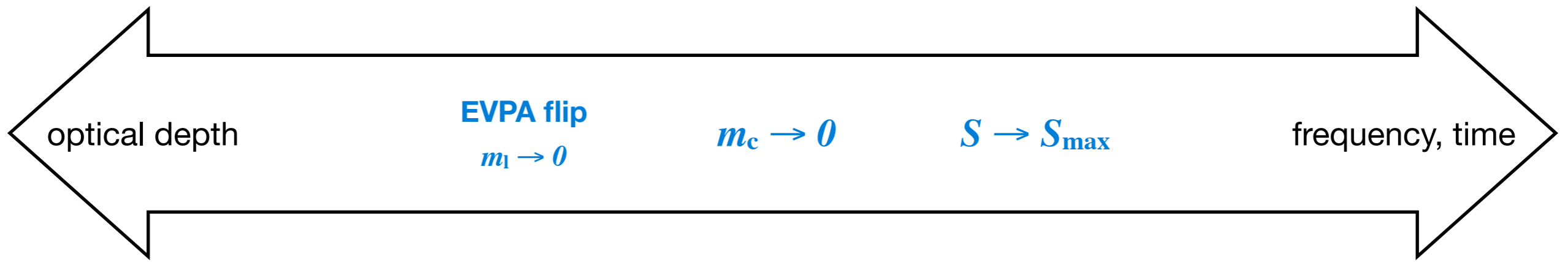
M. Turler et al. 2000; Marscher & Gear, 1985ApJ...298..114M
<http://www.isdc.unige.ch/~turler/jets/>





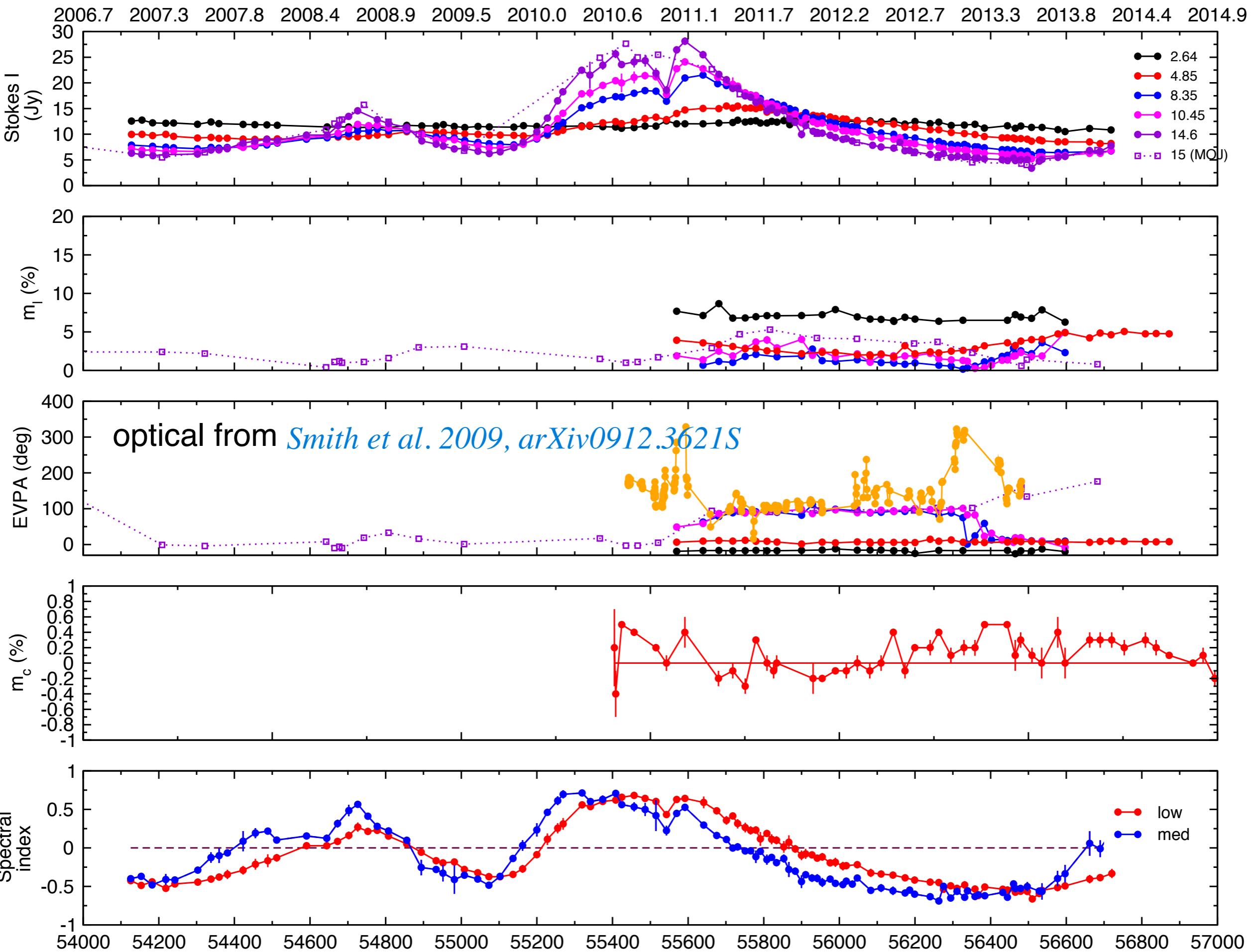
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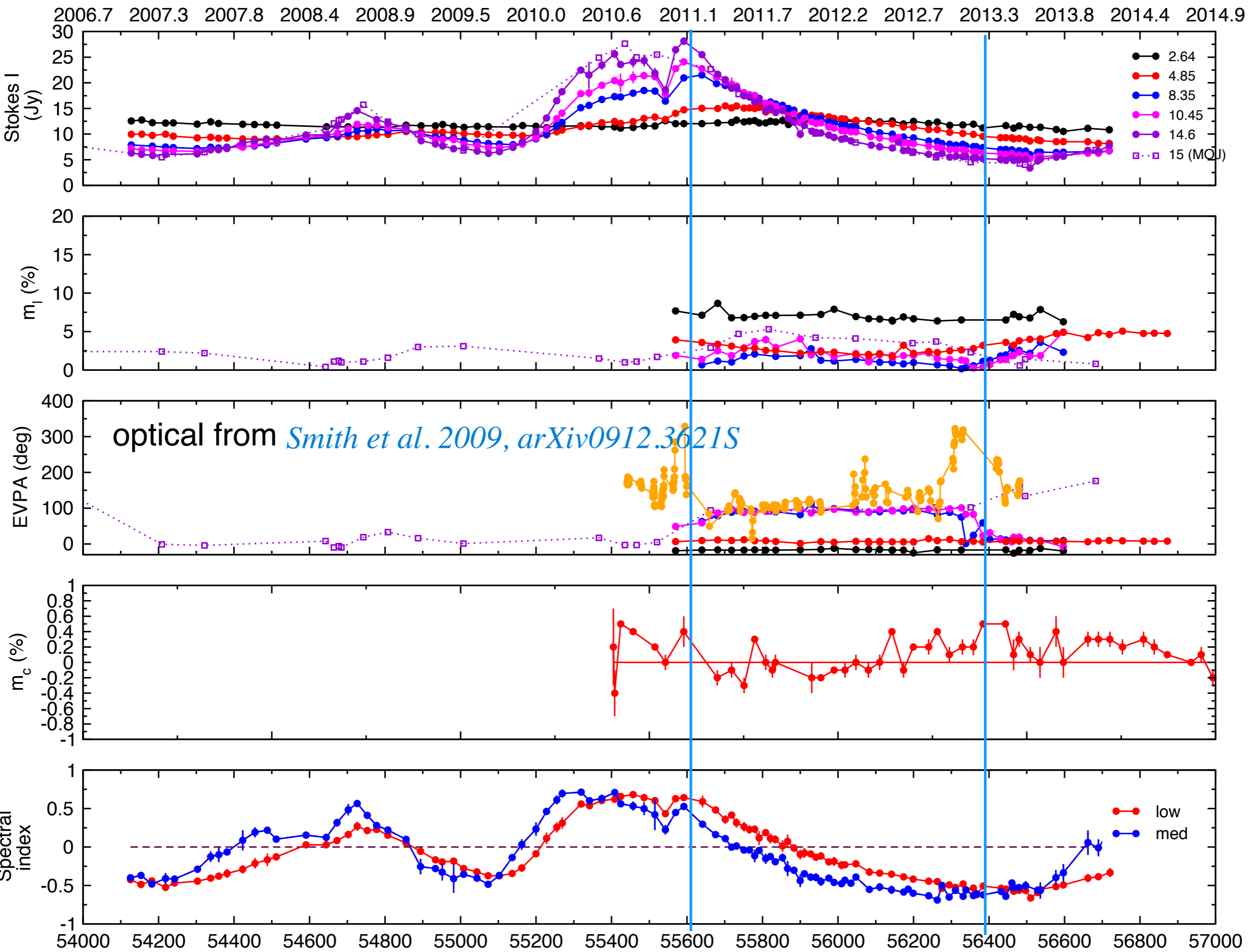


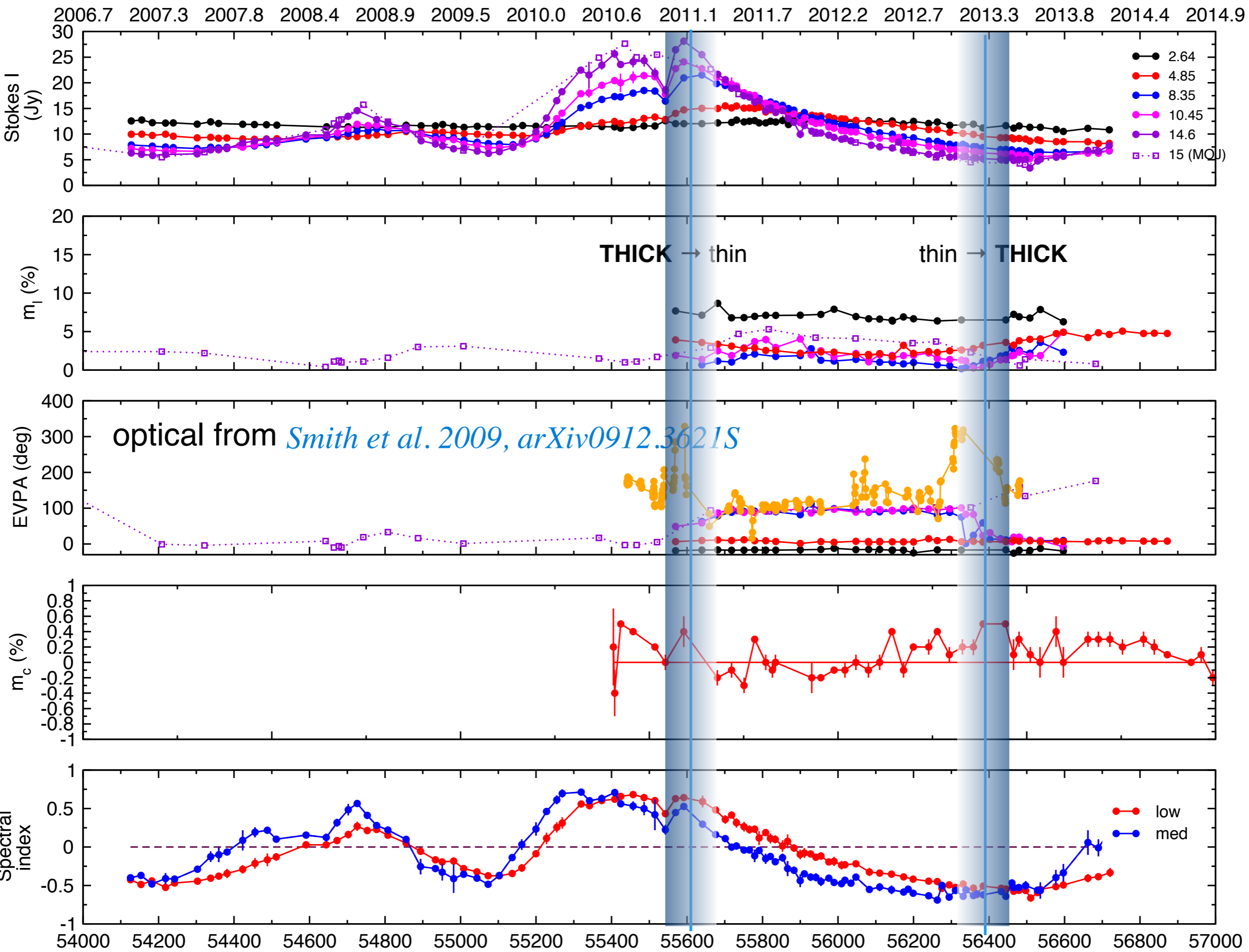


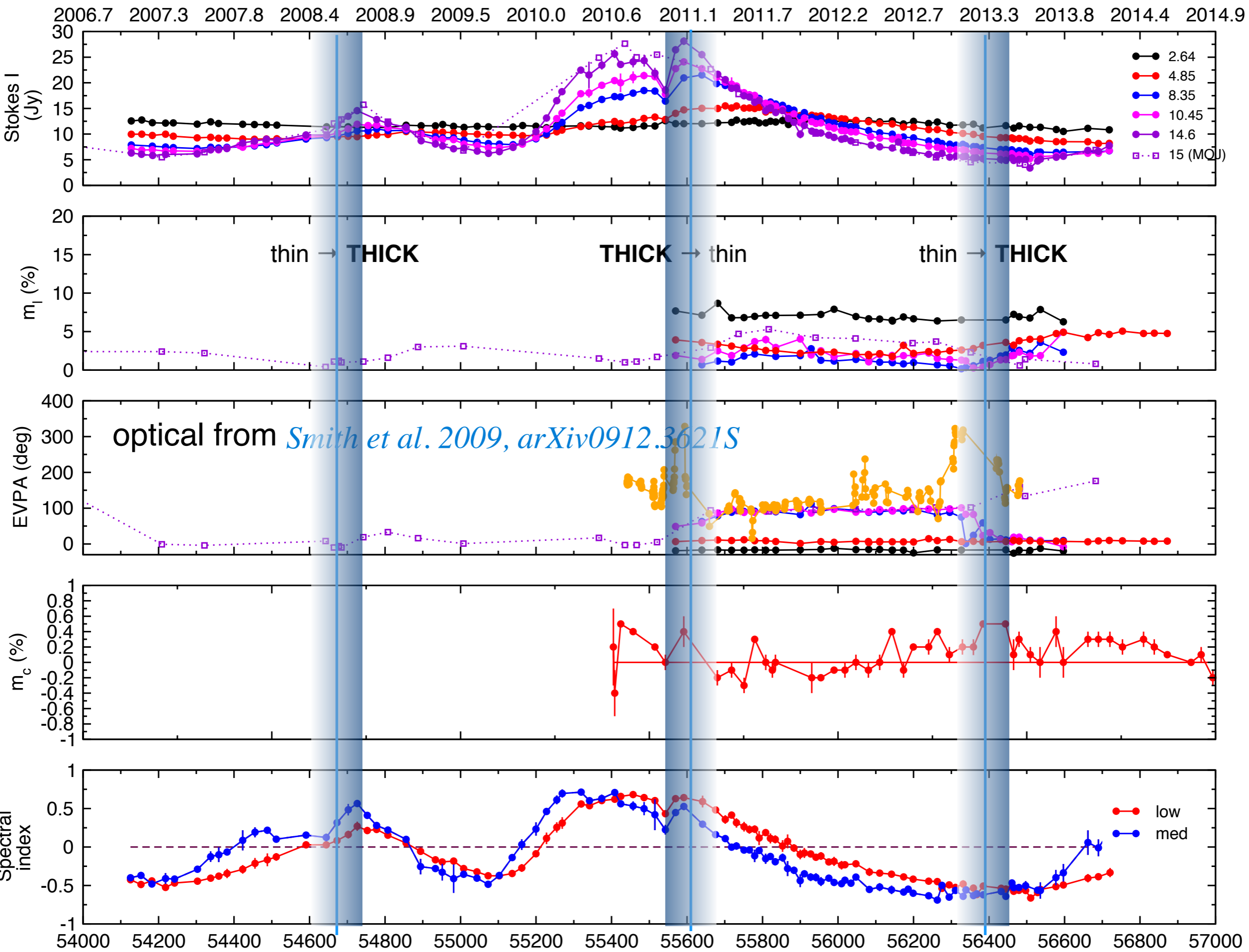
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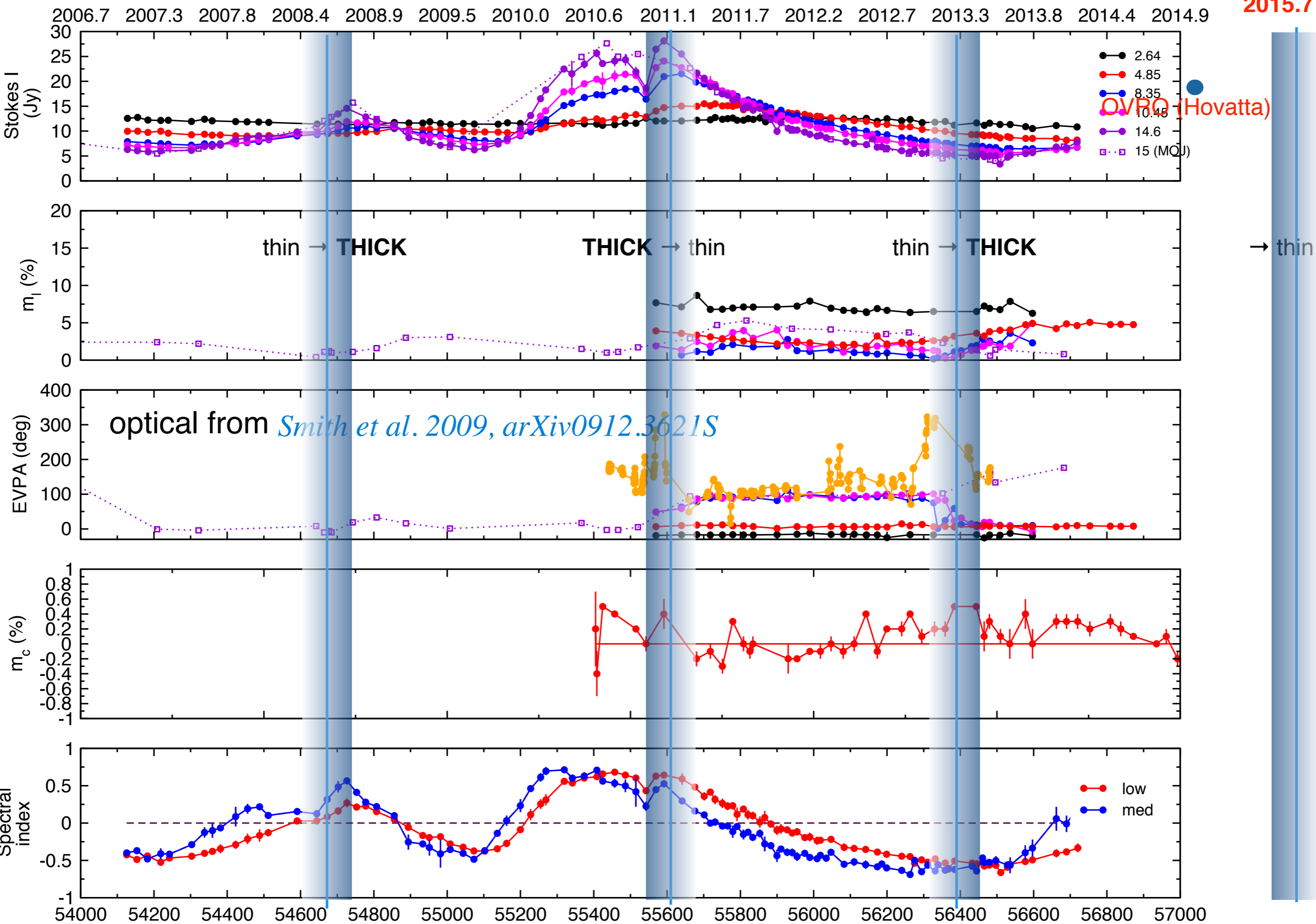






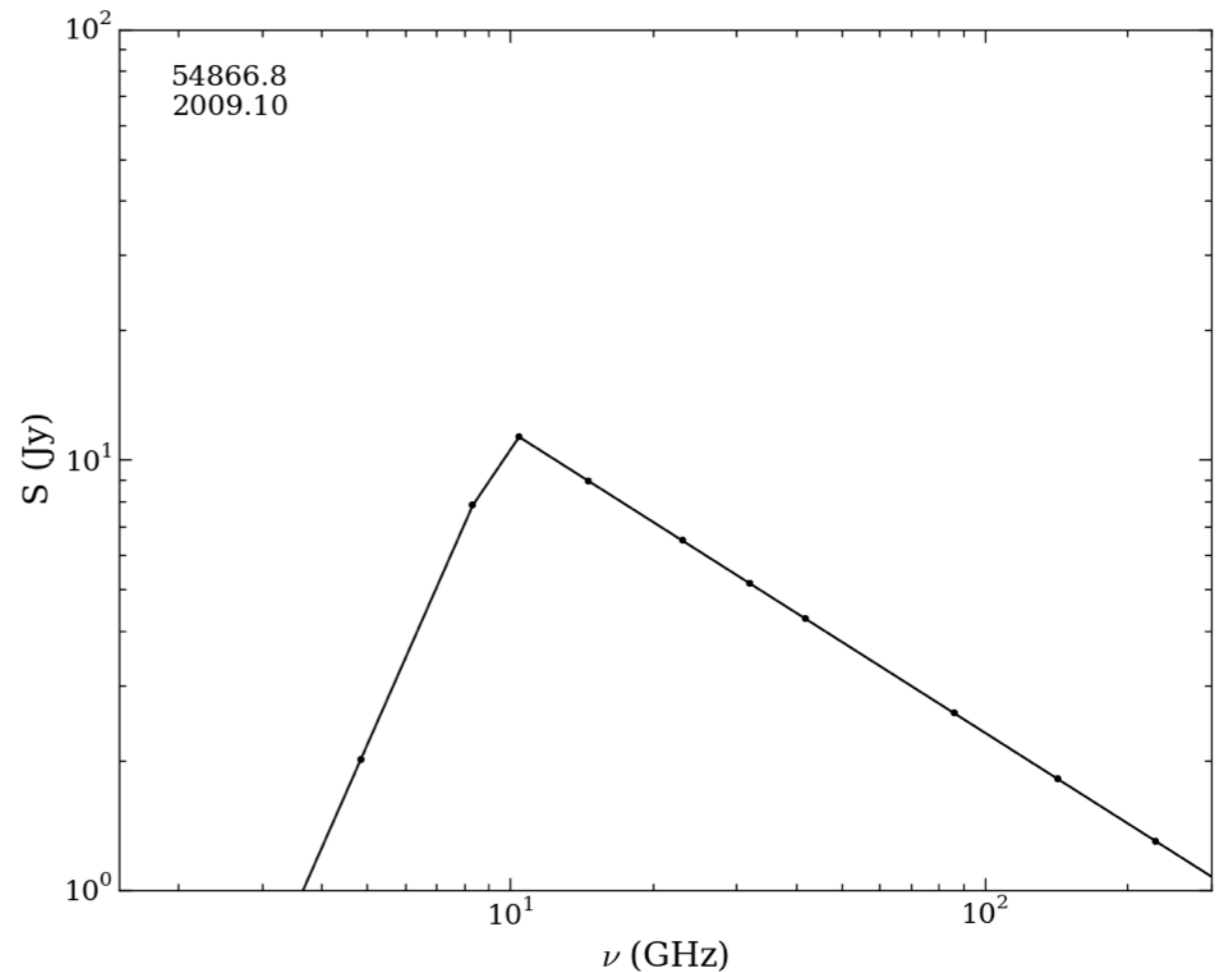
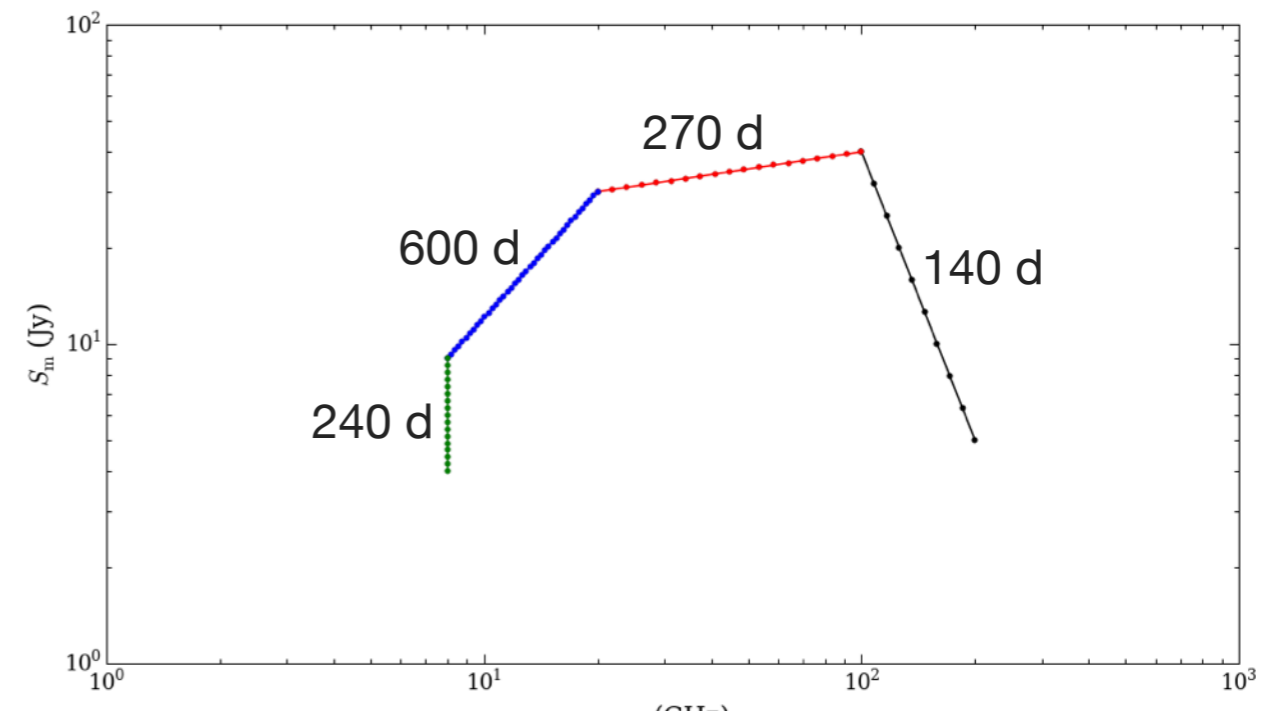






our setup:

- component 1
 - adiabatic ~ 150 d and fast adiabatic ~ 240 d
- components 2: follows the entire path after 1000 d
- quiescent of ~ 0.05 Jy
- B uniformity: $=0.2$ (20%)
- identical power
- B -field is unidirectional for the 2 components at the fiducial angle of -10°

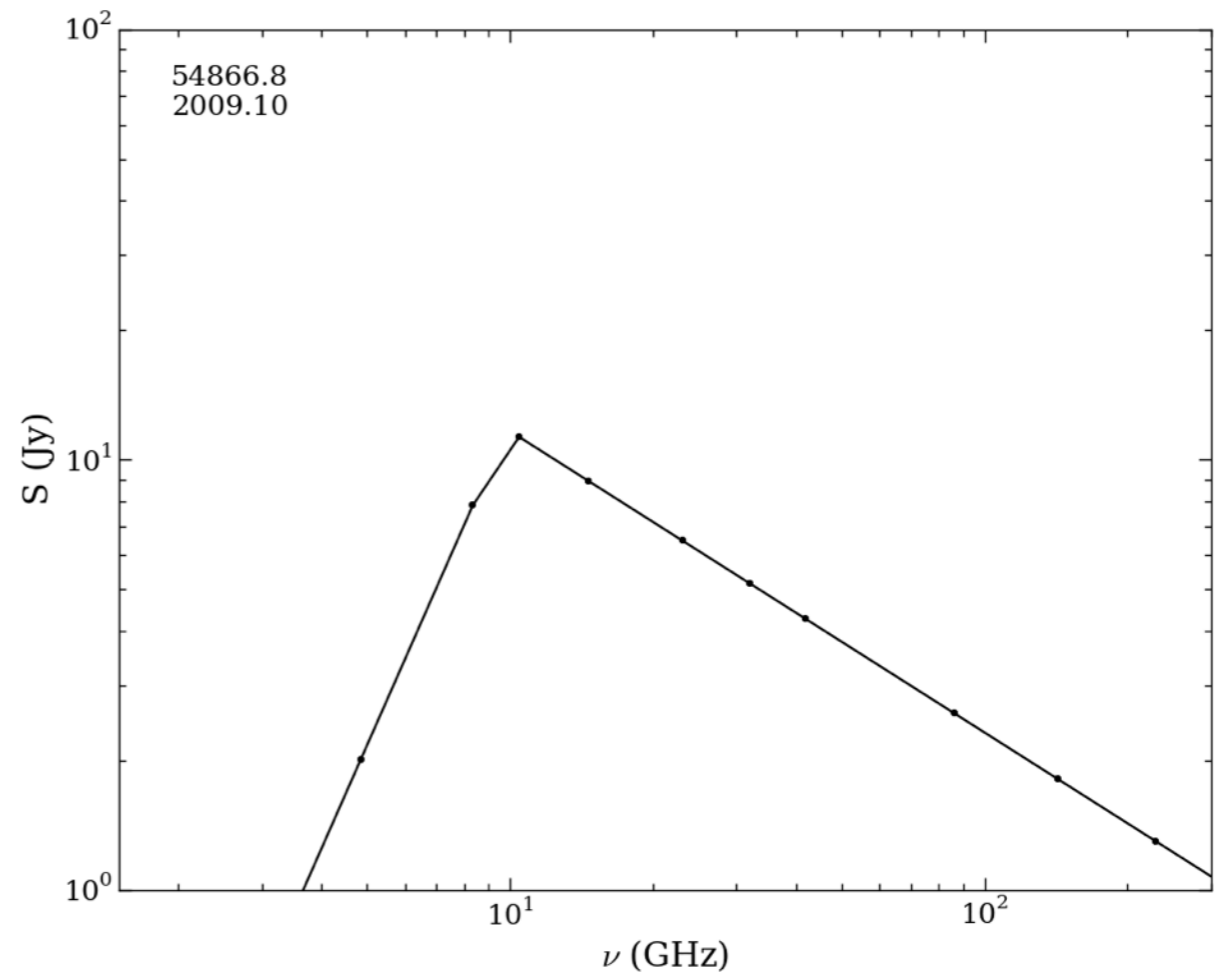
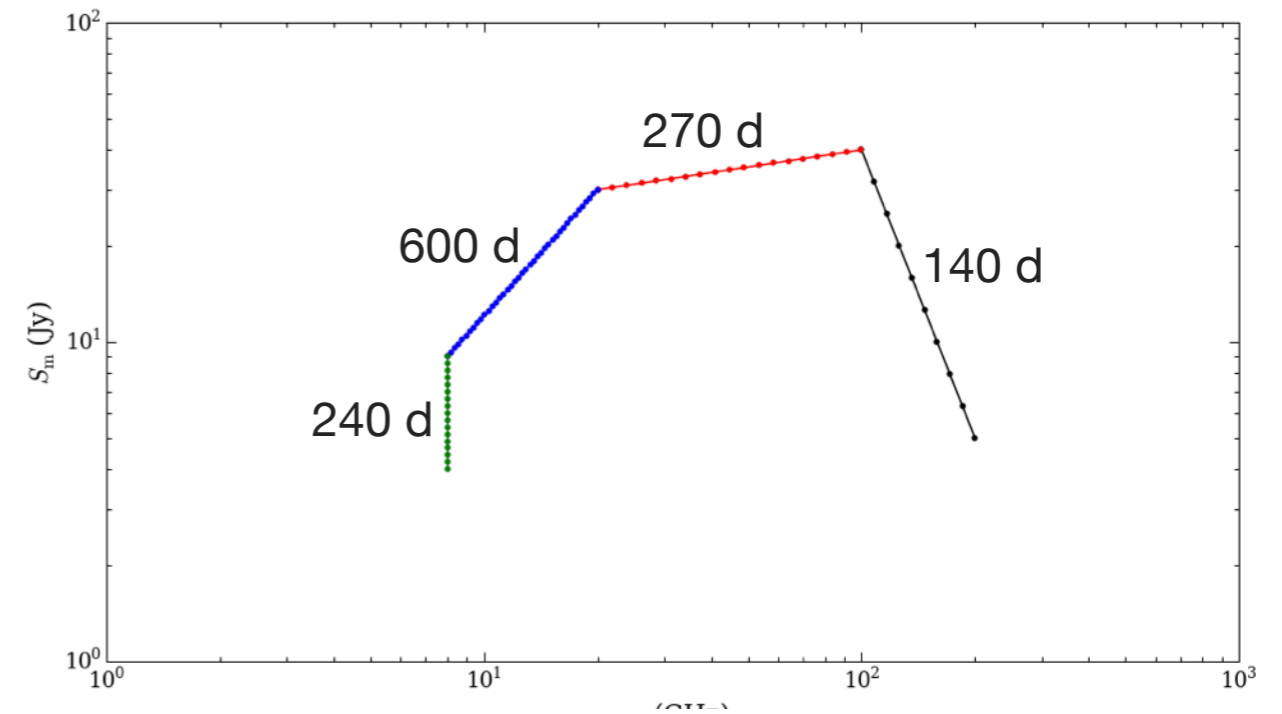


Myserlis, EA et al. in prep.



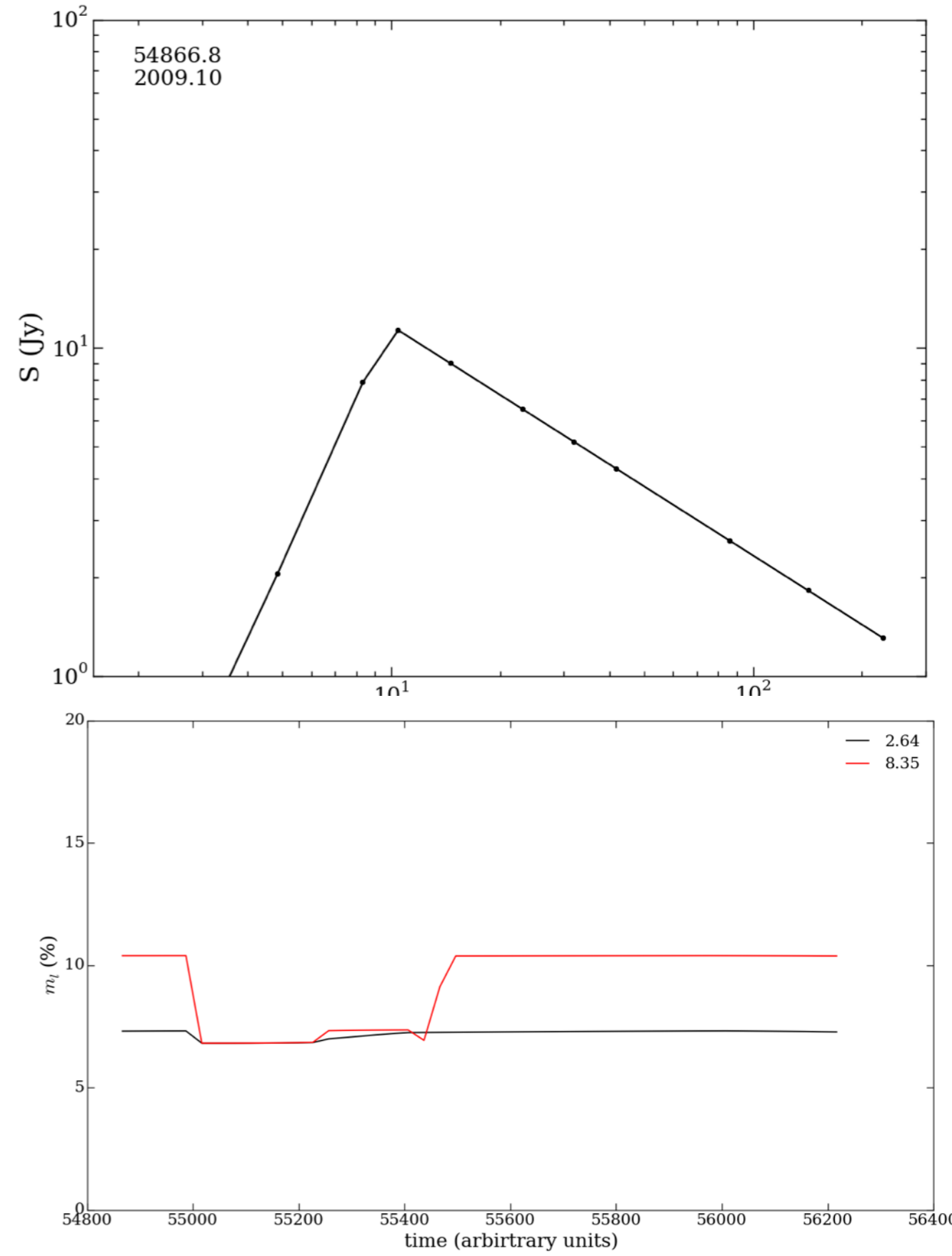
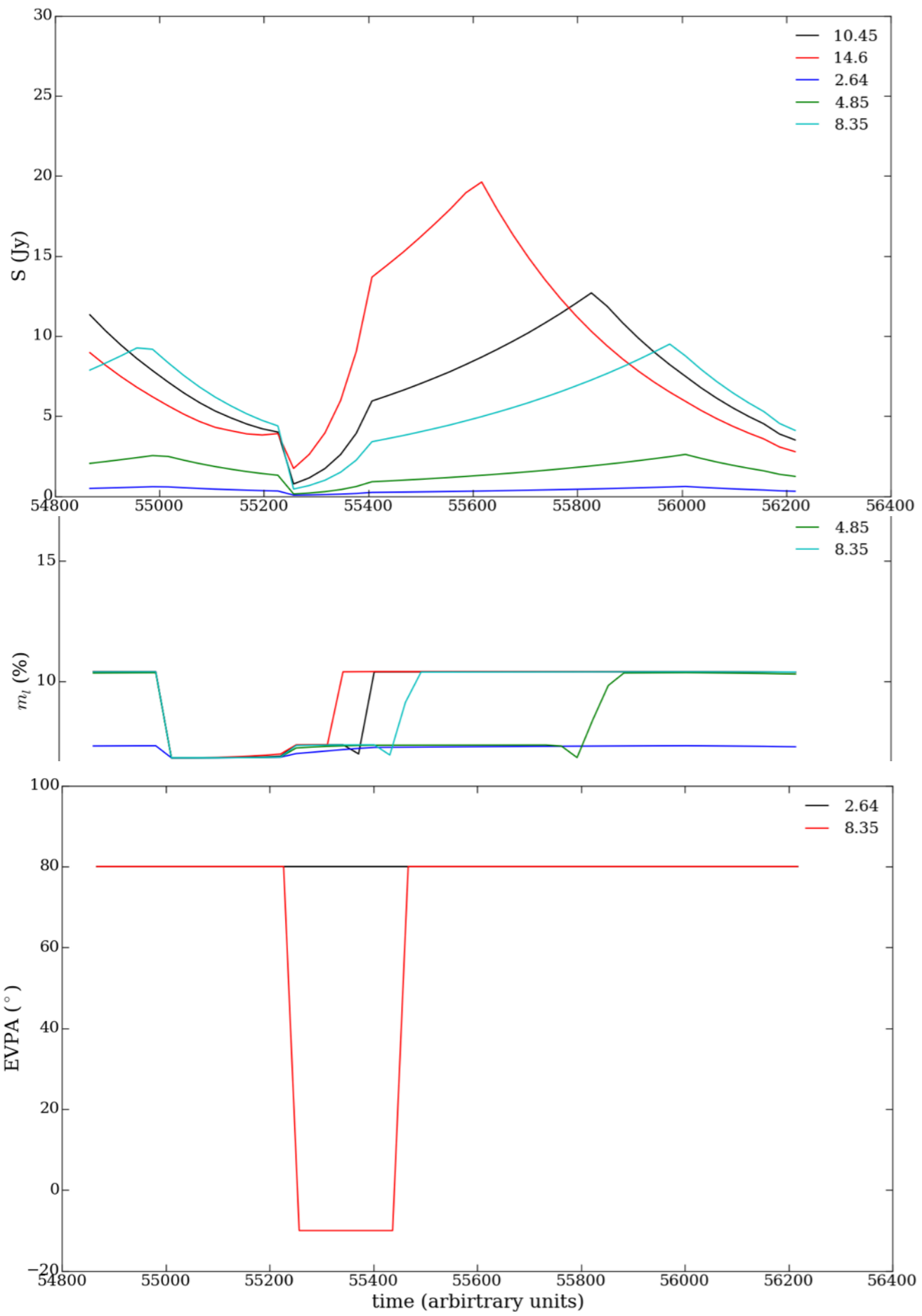
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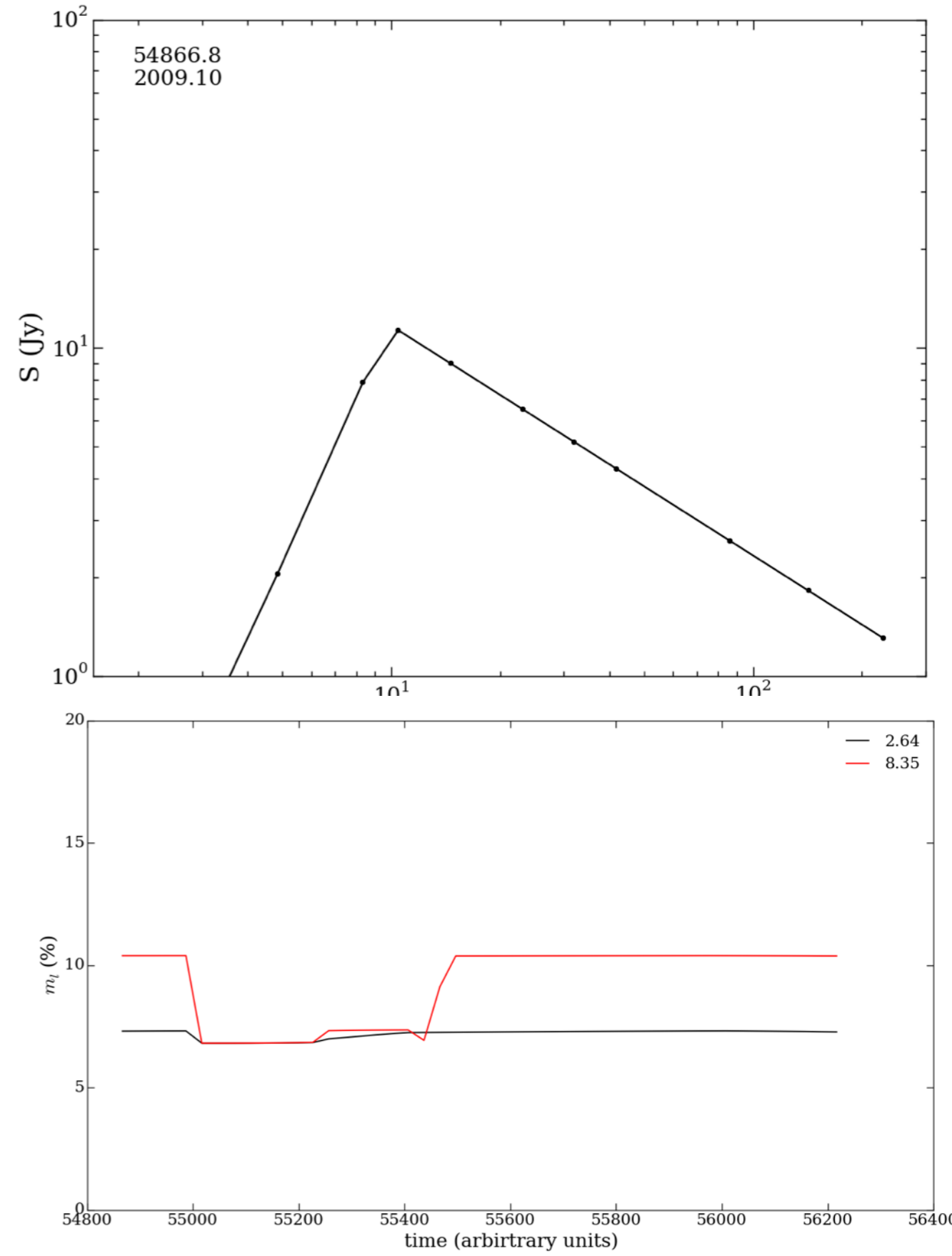
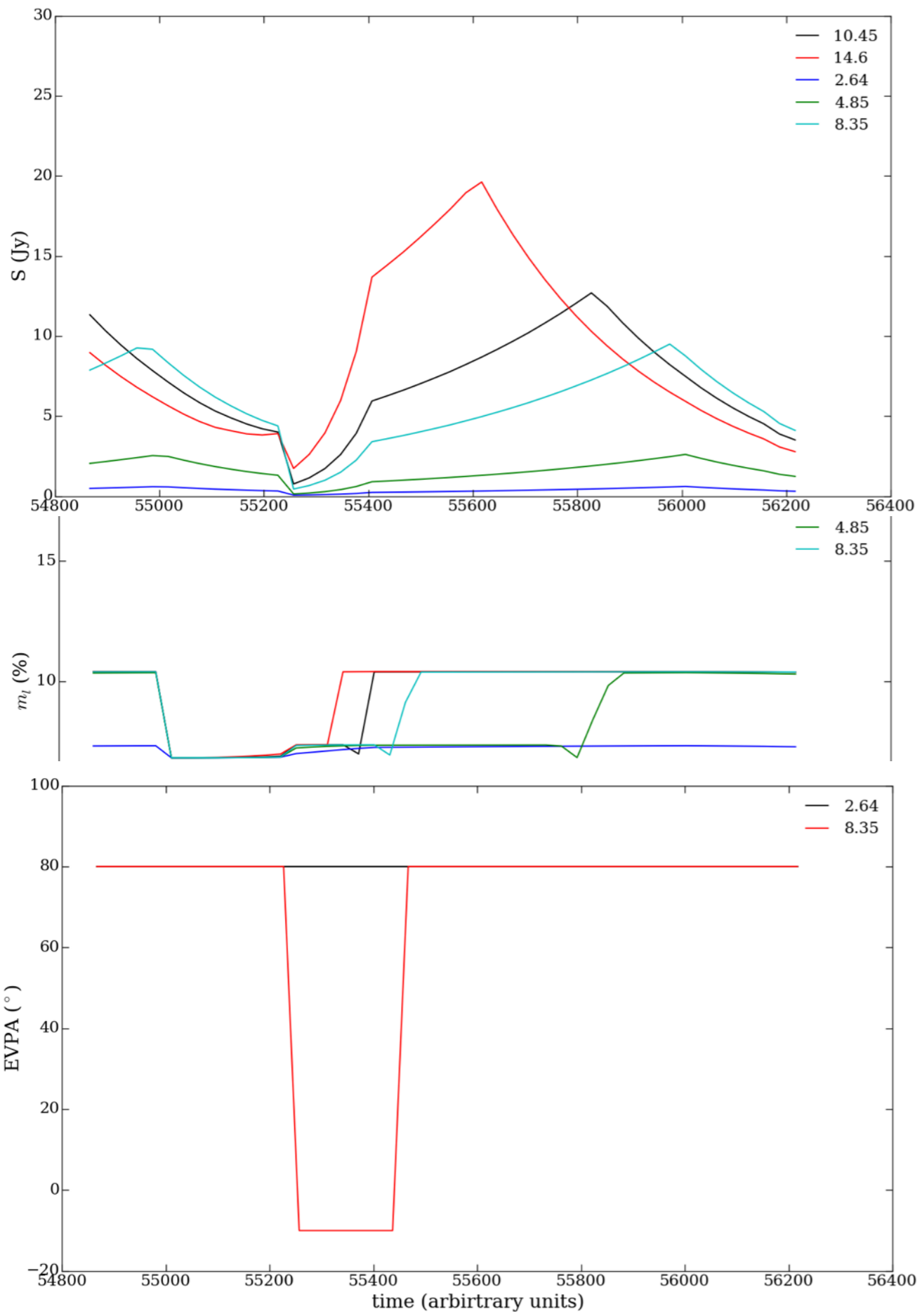
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- a rich dataset of polarization data is available (RadioPol / F-GAMMA):
 - ▶ 90 most fermi bright sources
 - ▶ 8 years
 - ▶ cadence 1 — 1.3 months
 - ▶ 8 frequencies
- within the framework of traveling shocks we can reproduce the observed behaviors:
 - ▶ 2 components on a similar evolutionary path
 - ▶ equal power
 - ▶ 20% uniform field

- within this framework we can learn:
 - ▶ the jet composition (e^{+-} vs e^- ion) from the enhancement of polarization (*Jones 1988*)
 - ▶ m_c/m_i can tell you the FR conversion and rotation coefficients and estimate the thermal content of the plasma
 - ▶ B field strength and uniformity
 - ▶

- Note: **Dmitry Blinov's** talk on: "Rotations of Optical Polarization Plane in Blazars as Seen by RoboPol"

thank you

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