



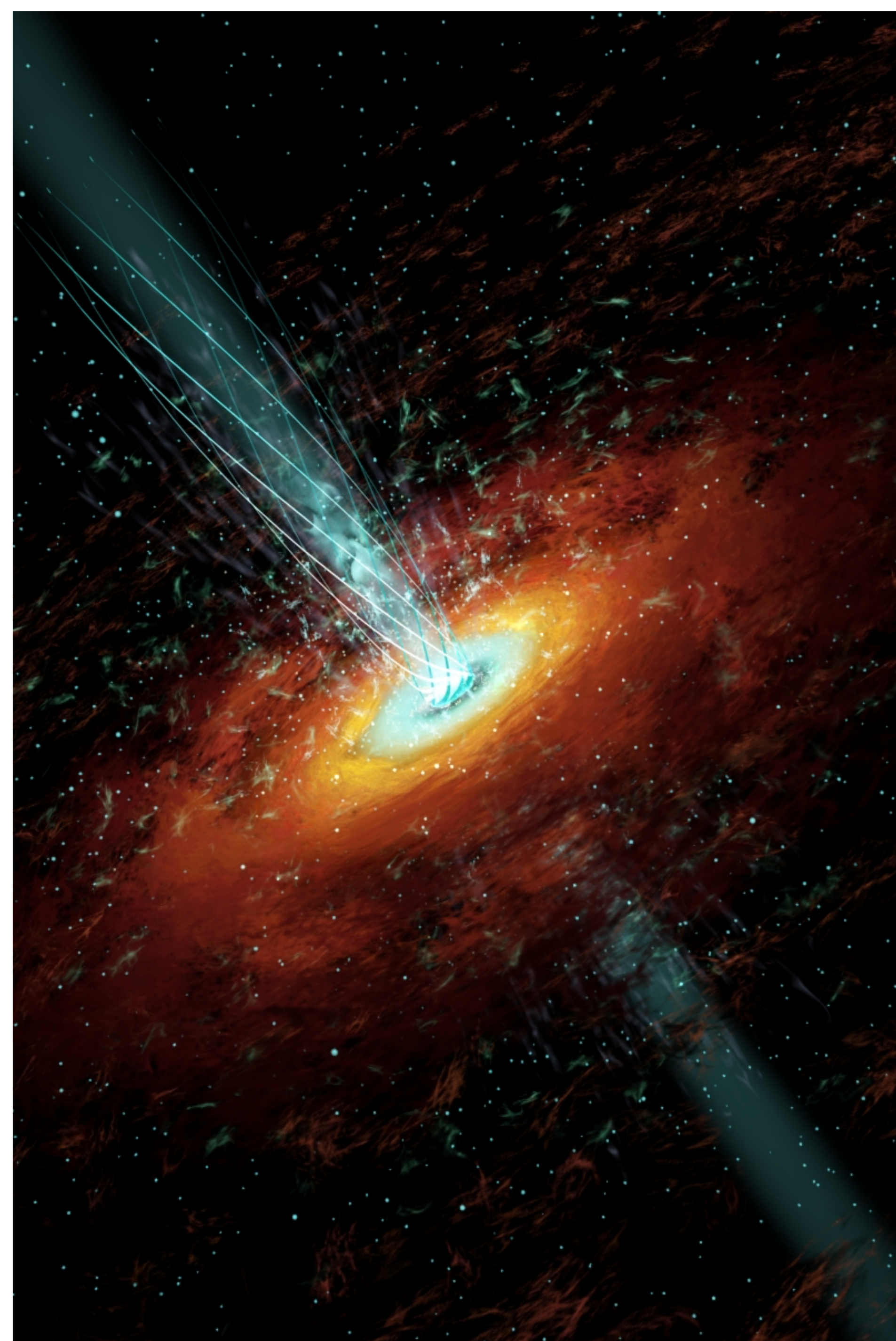
# Towards a TeV blazar sequence

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# Context

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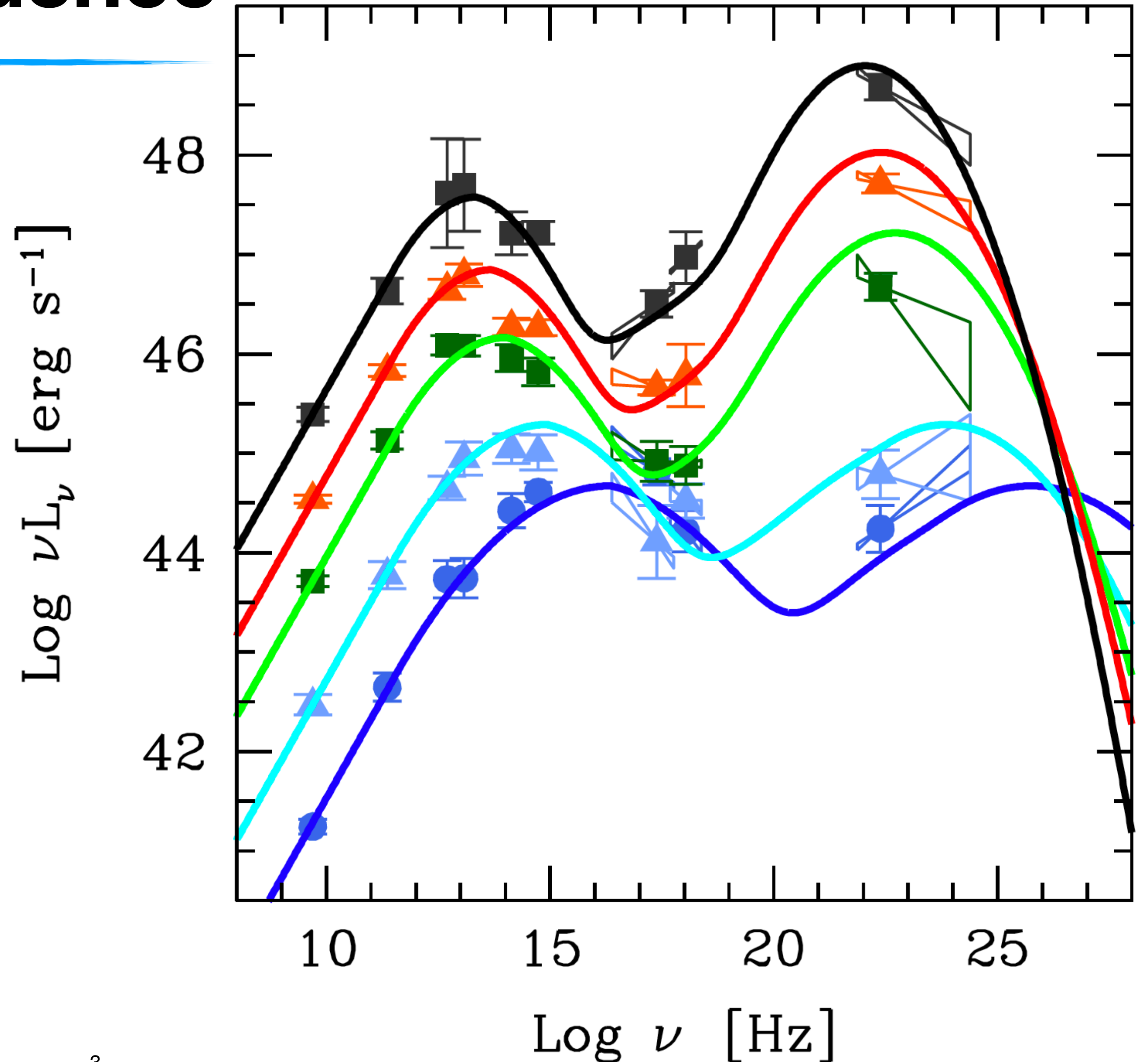
- The origin of blazar sequence
- The TeV component
- Work in progress
- Take home messages



# The original blazar sequence

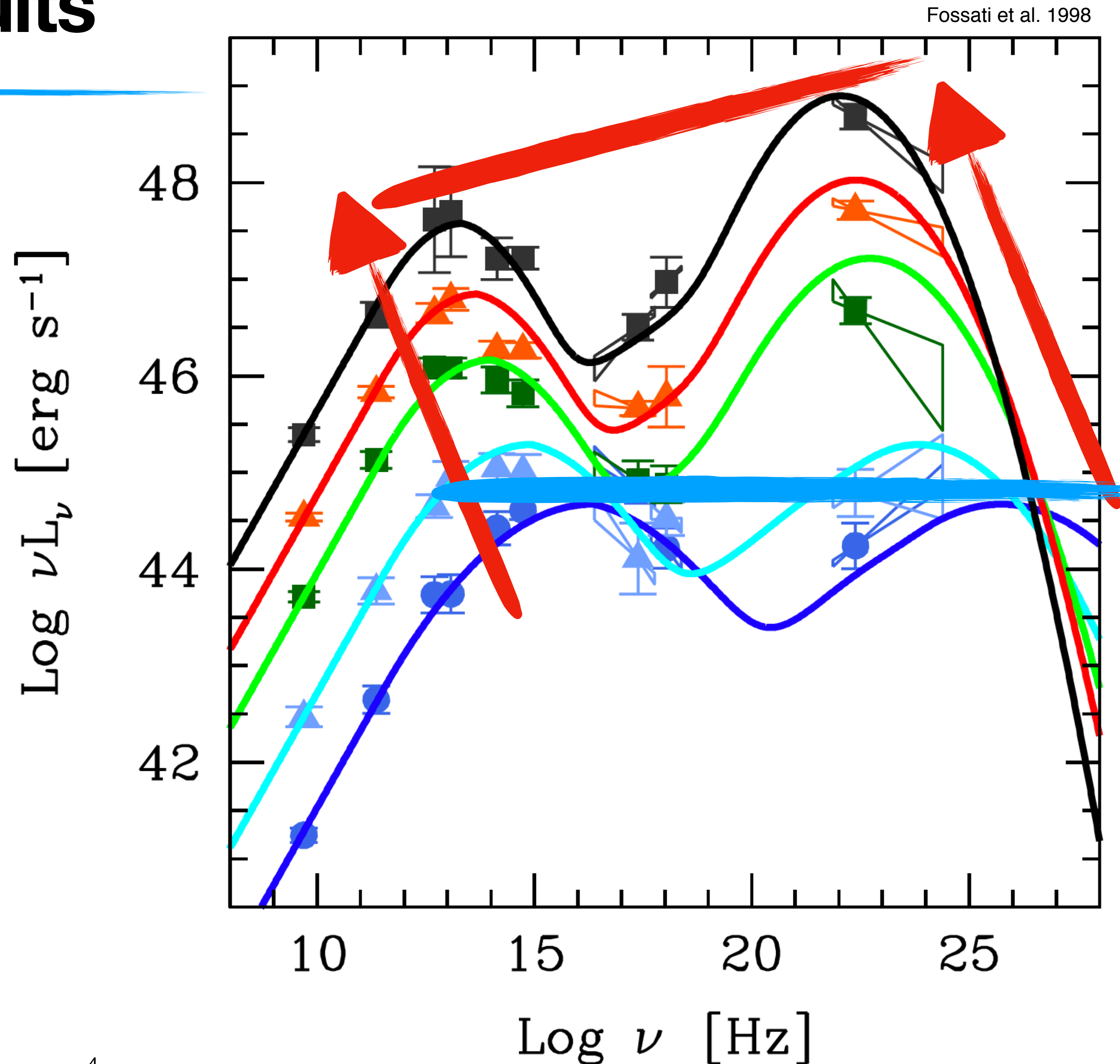
Fossati et al. 1998

- 126 sources selected from X and radio samples;
- only 33 detected on gamma;
- 5 luminosity bin selected in radio;

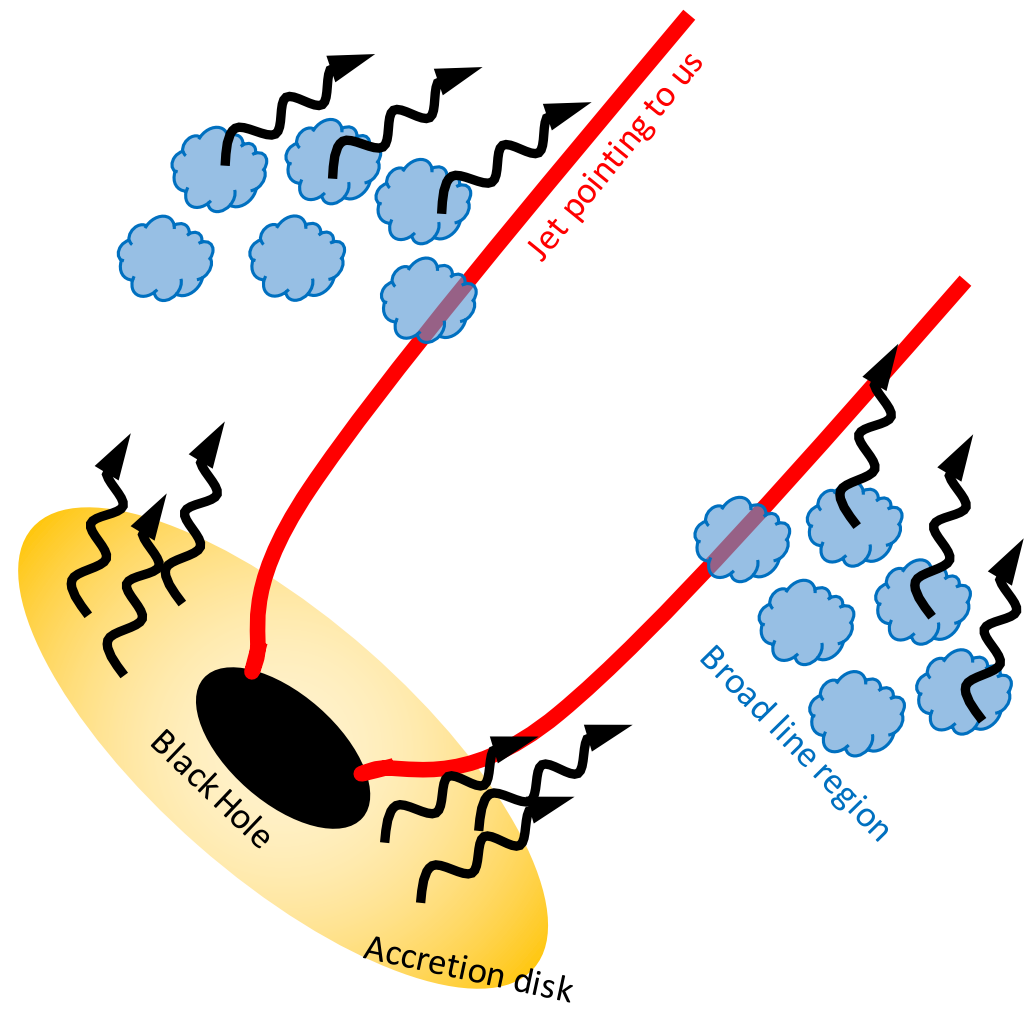


# The blazar sequence: results

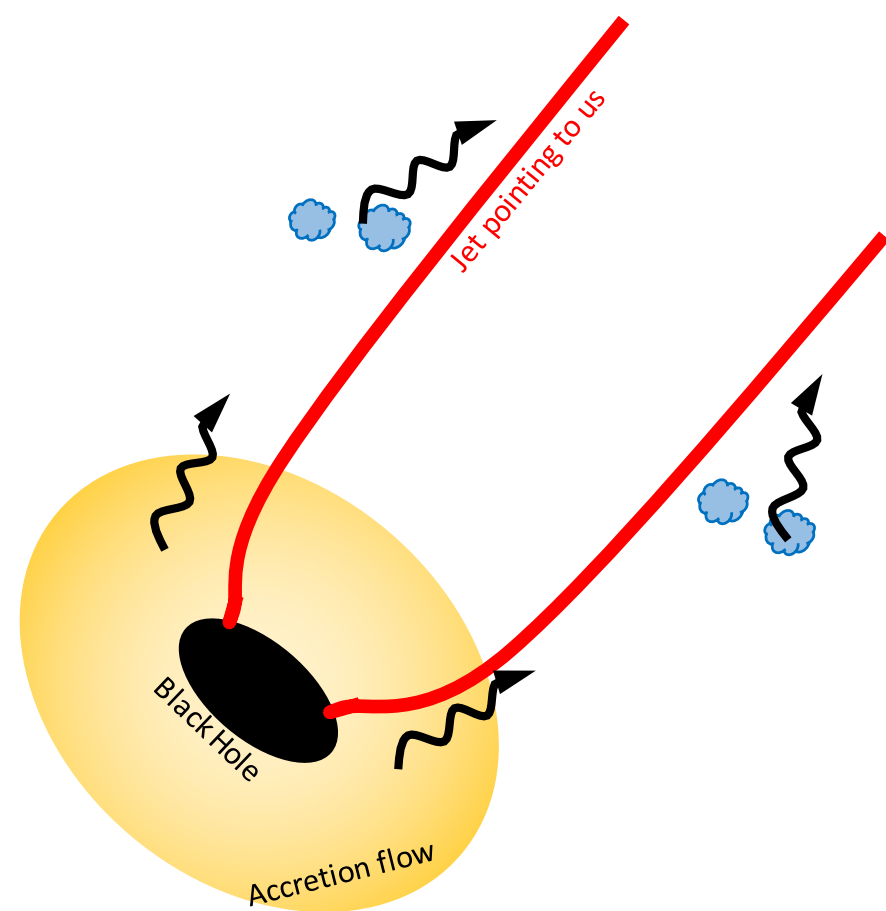
- trends of the SED controlled by the total observed luminosity;
- Redder when brighter
- The brighter the more Compton dominated
- the gamma-ray slope become softer with increasing  $L_{\text{bol}}$ ;
- the X-ray slope becomes harder with increasing  $L_{\text{bol}}$



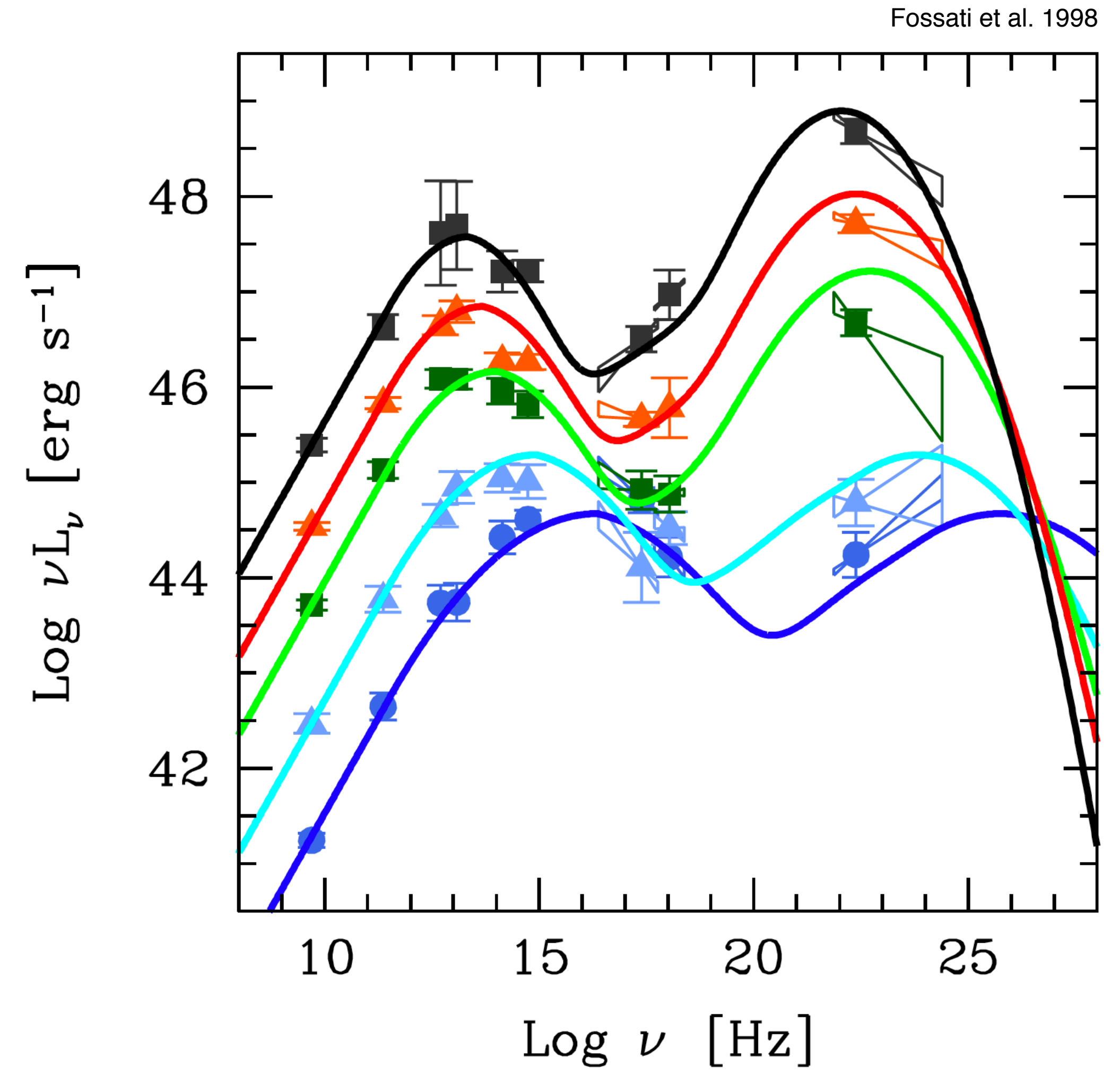
# The blazar sequence: results



Syncro + SSC + EC



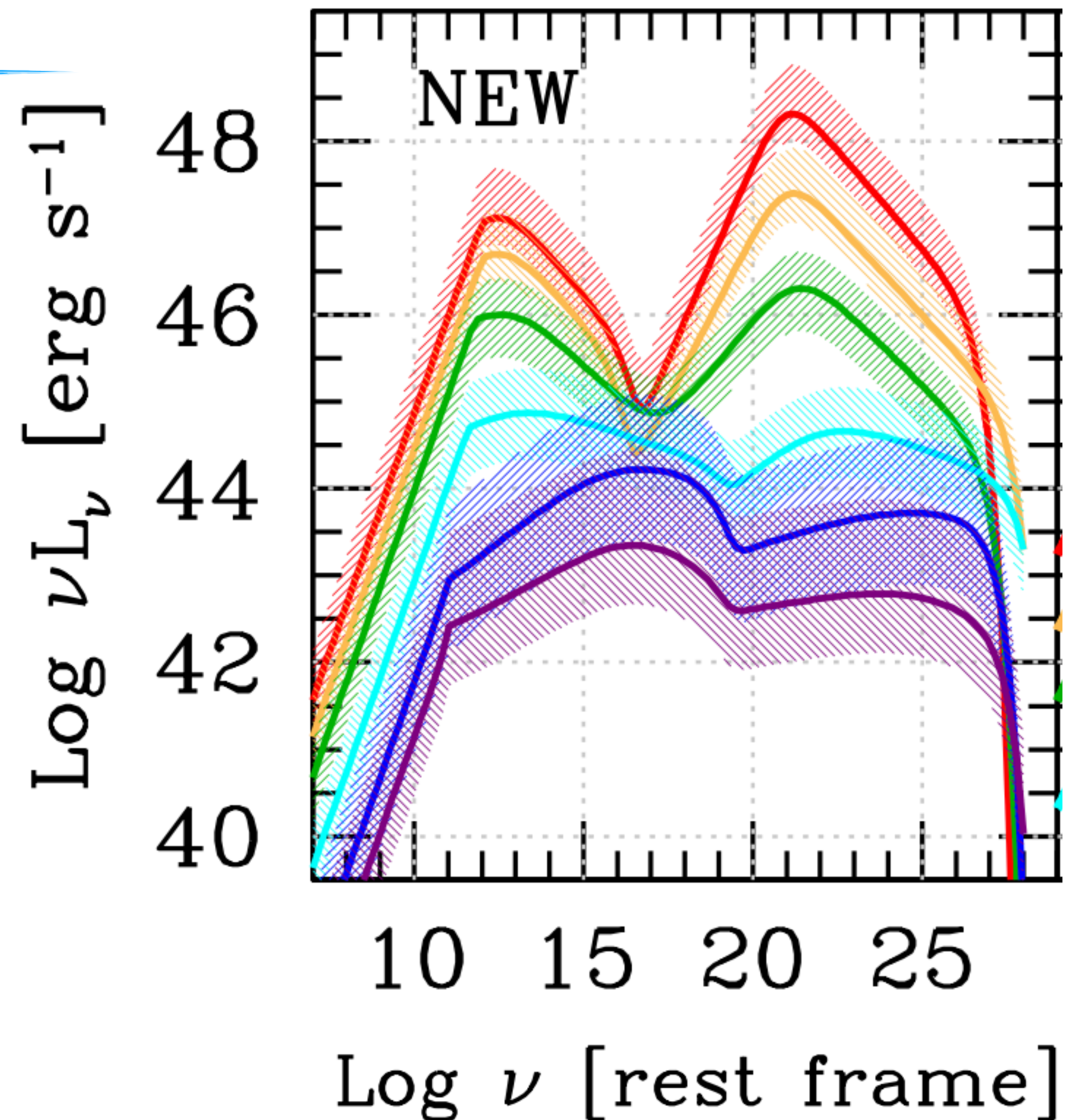
Syncro + SSC



# The blazar sequence 2.0

Ghisellini, Righi et al. 2017

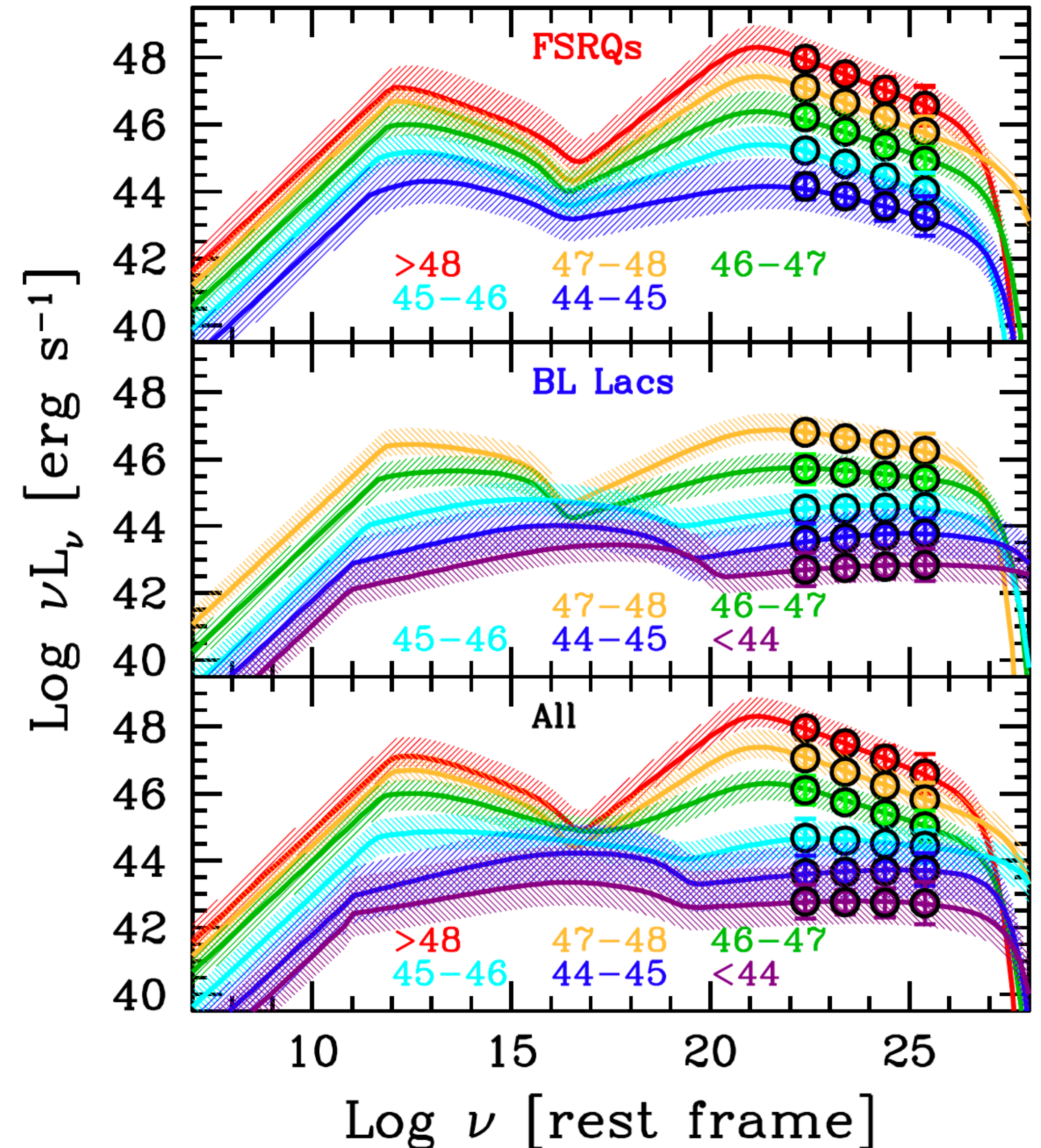
- 747 sources detected by Fermi-LAT;
- only the sources with a redshift reported in the Fermi catalog was selected;
- 6 luminosity bins selected in gamma-ray band.



# The blazar sequence 2.0

Ghisellini, Righi et al. 2017

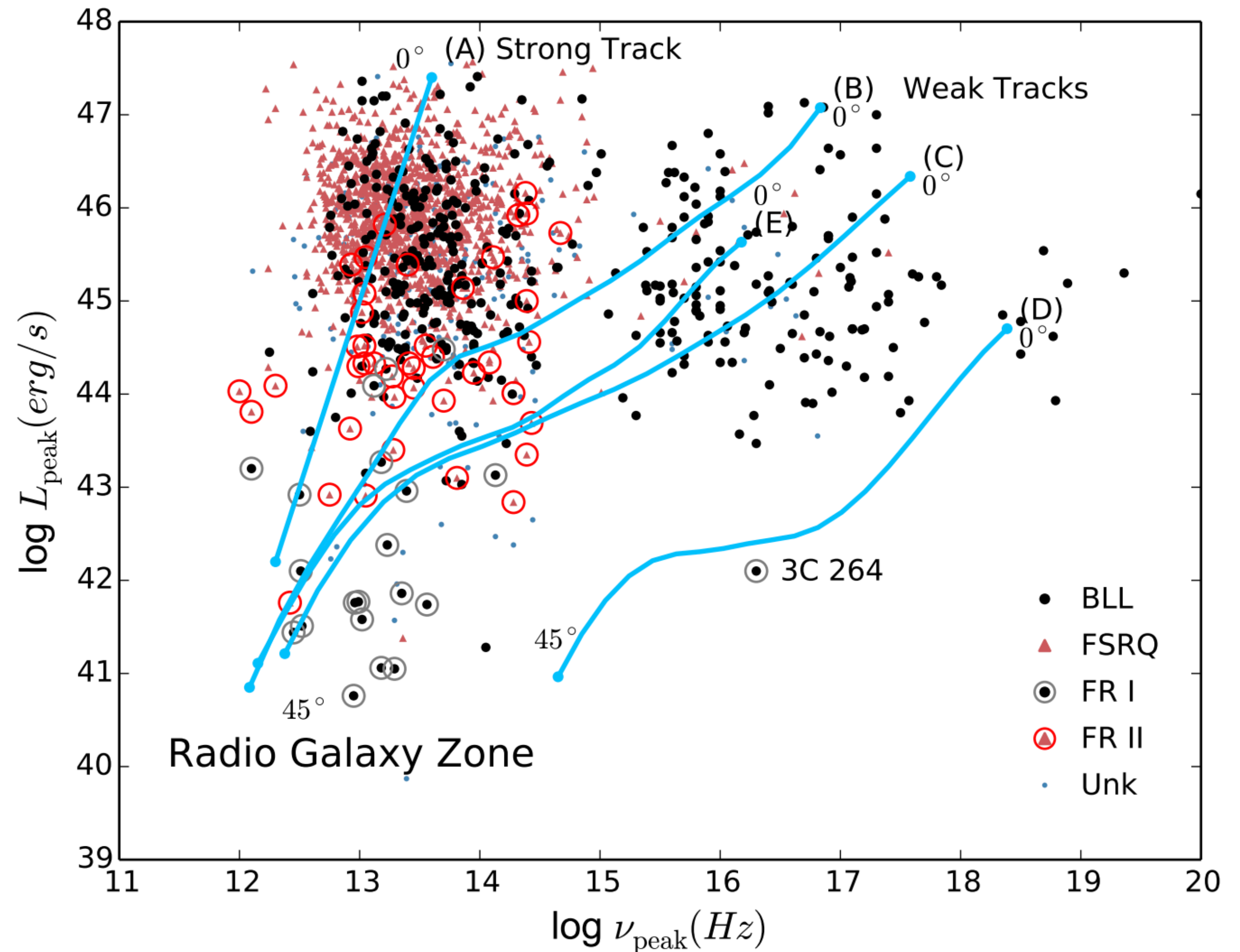
- Blazar sequence 2.0 follows the same trend
- FSRQ: same shape of the SEDs, strong Compton dominance
- BL Lacs: redder when brighter



# Criticism on the blazar sequence

- Candidate sources out of the sequence: Giommi, Menna, Padovani 1999; Perlman + 2001; Padovani+ 2003; Caccianiga & Marcha 2004; Anton & Browne 2005; Giommi+ 2005; Nieppola, Tornikoski, Valtoja 2006; Padovani, Giommi, Rau 2012
- Giommi, Padovani et al. 2012: sequence is apparent, being the result of selection effects
- Keenan et al 2020: no sequence present with a large sample

Keenan et al. 2020

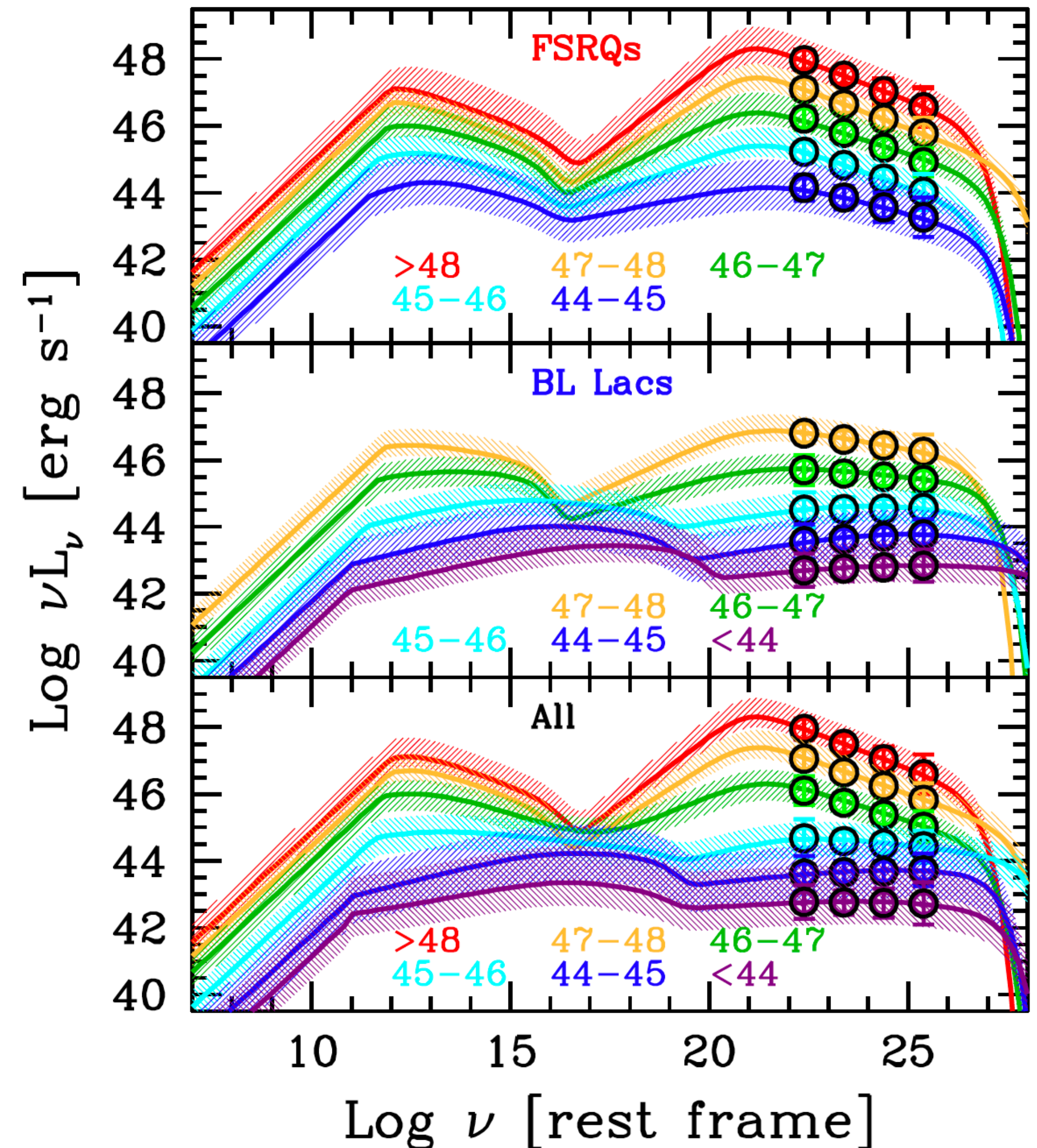




# TeV component

Ghisellini, Righi et al. 2017

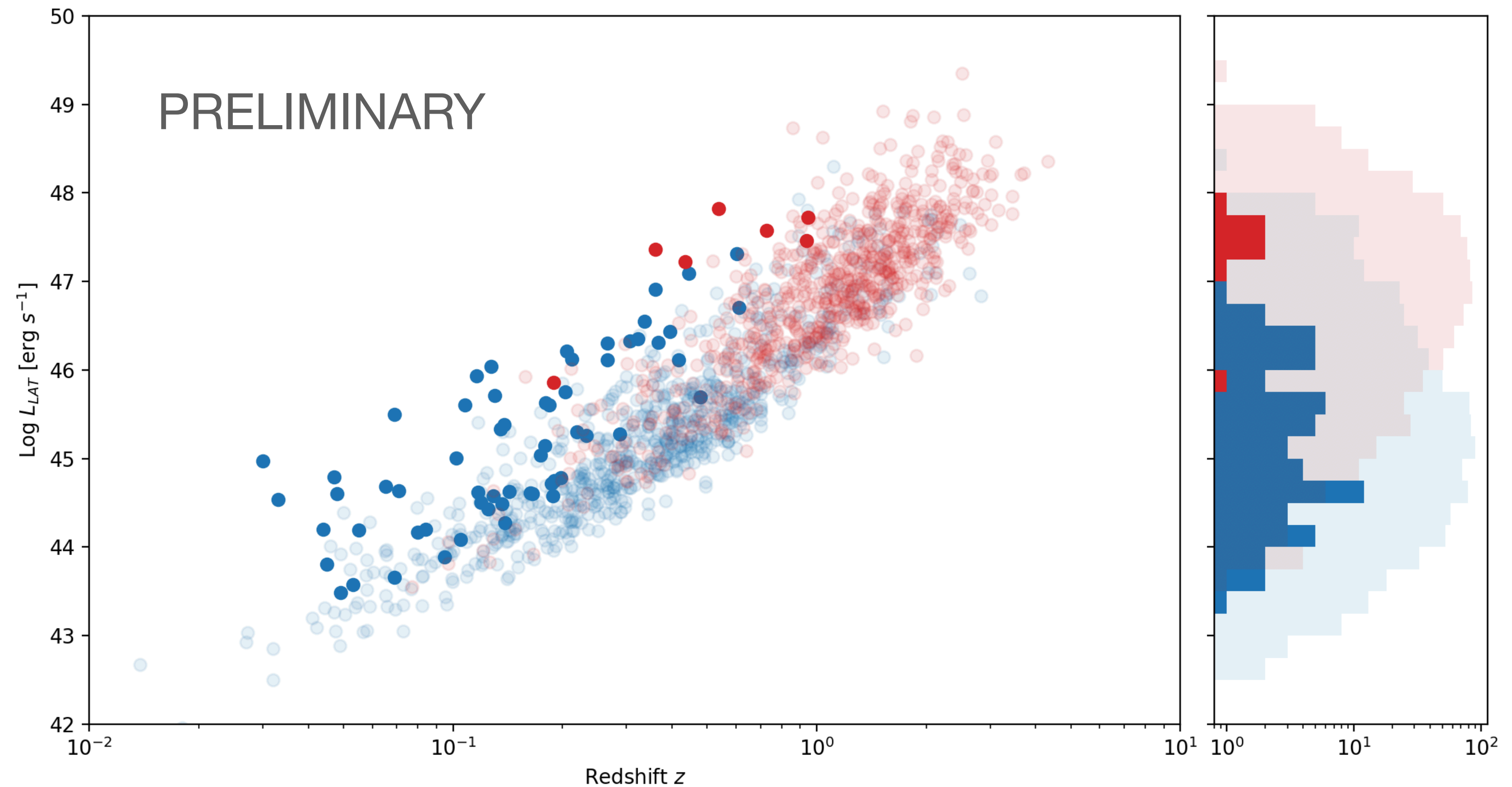
- 82 blazars detected at TeV (from TeVcat)
- How does the variability affect the blazar sequence?
- Is there a relation X-TeV notable in the blazar sequence?
- Can the neutrino emission can be explain from the blazar sequence?
- Do EHBL sources follow the blazar sequence?



# The TeV blazar sequence

Prandini, Righi et al. in prep.

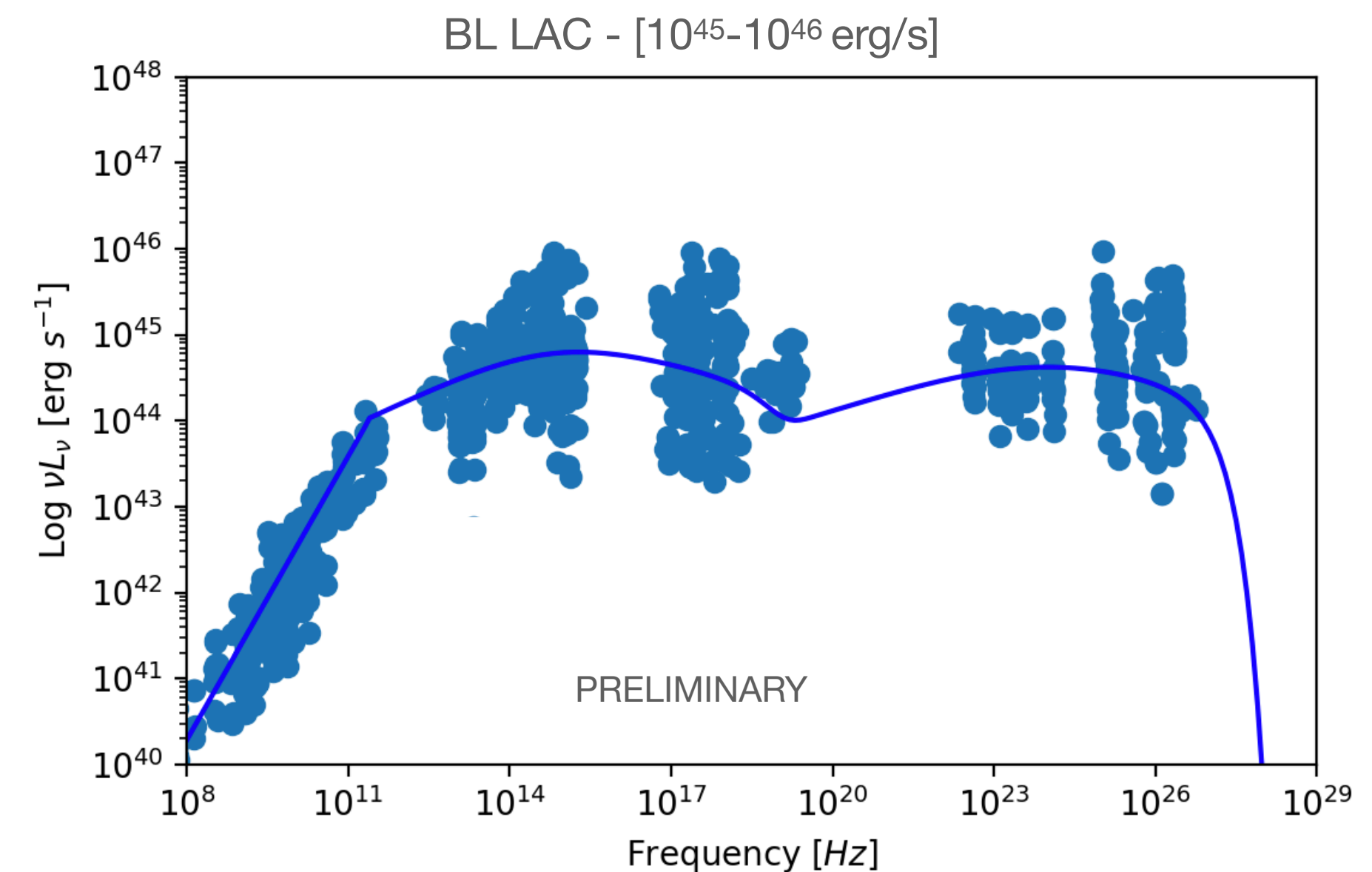
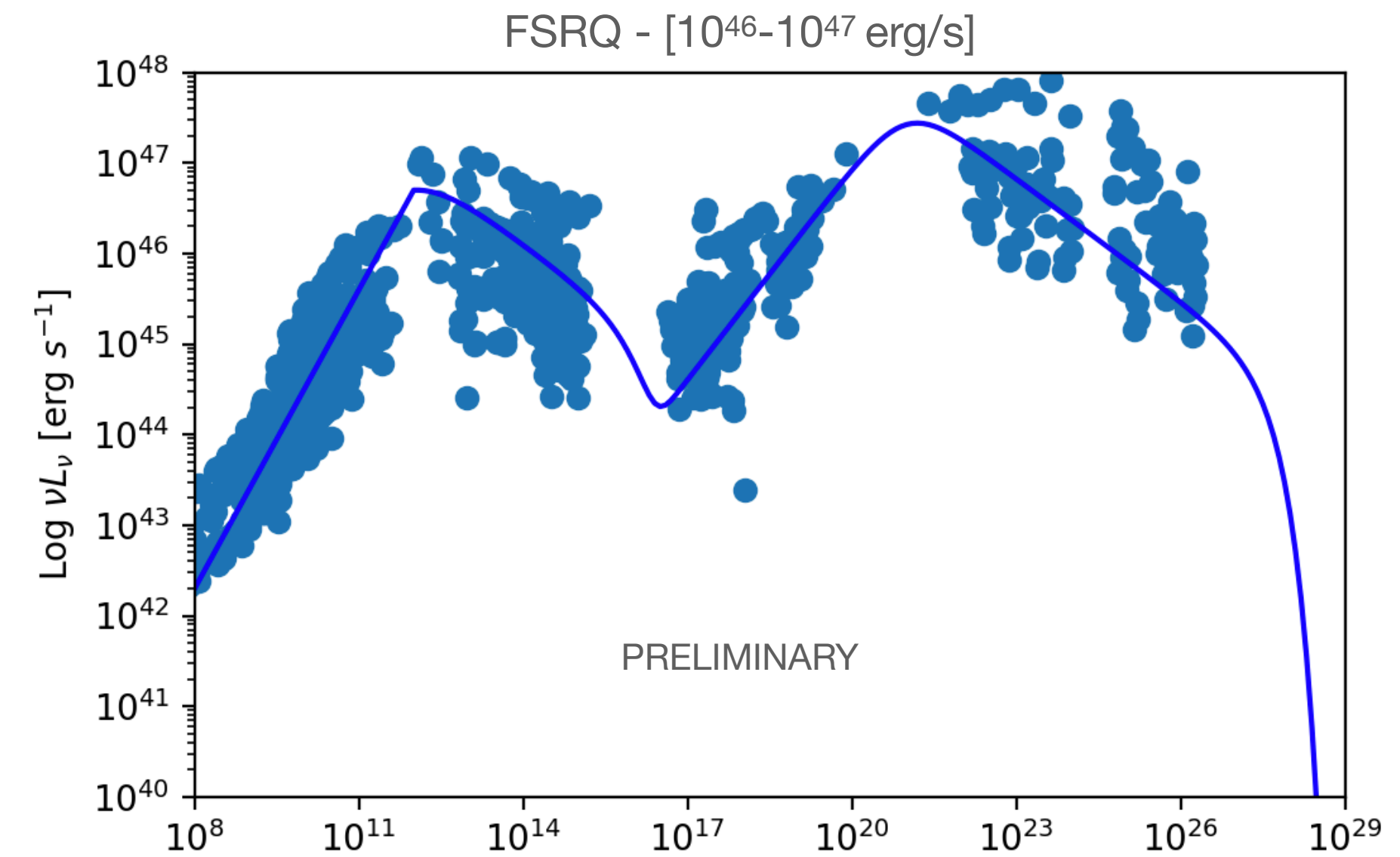
- 1503 objects with firmly determined redshift,
- 740 FSRQs,
- 41 radiogalaxies
- 722 as BL Lacs
- 70 TeV detected sources
- 6 luminosity bins



# The TeV blazar sequence

- 2 luminosity bins for FSRQ
- 4 luminosity bins for BL Lacs
- Large spread of the X ray component for BL Lac

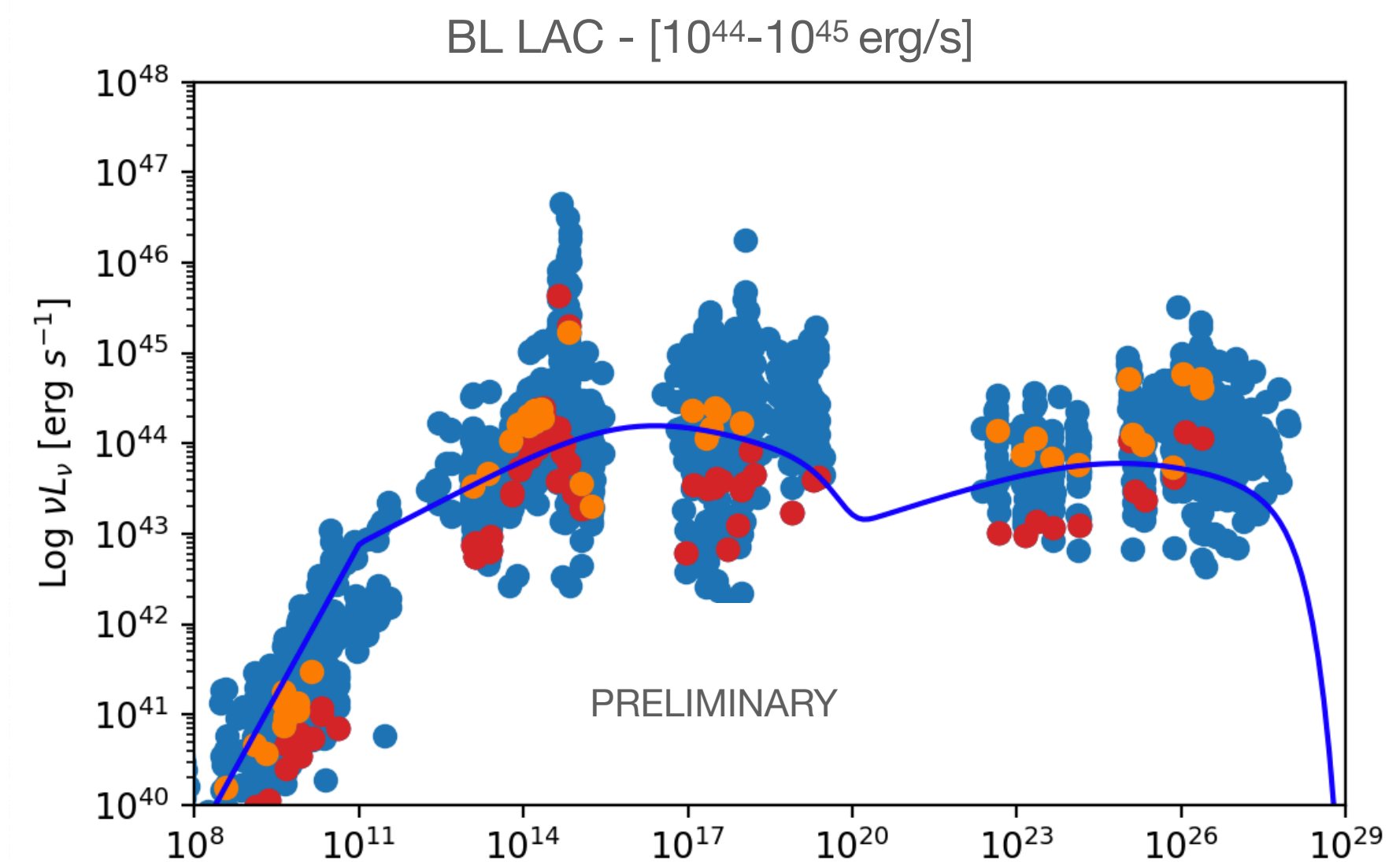
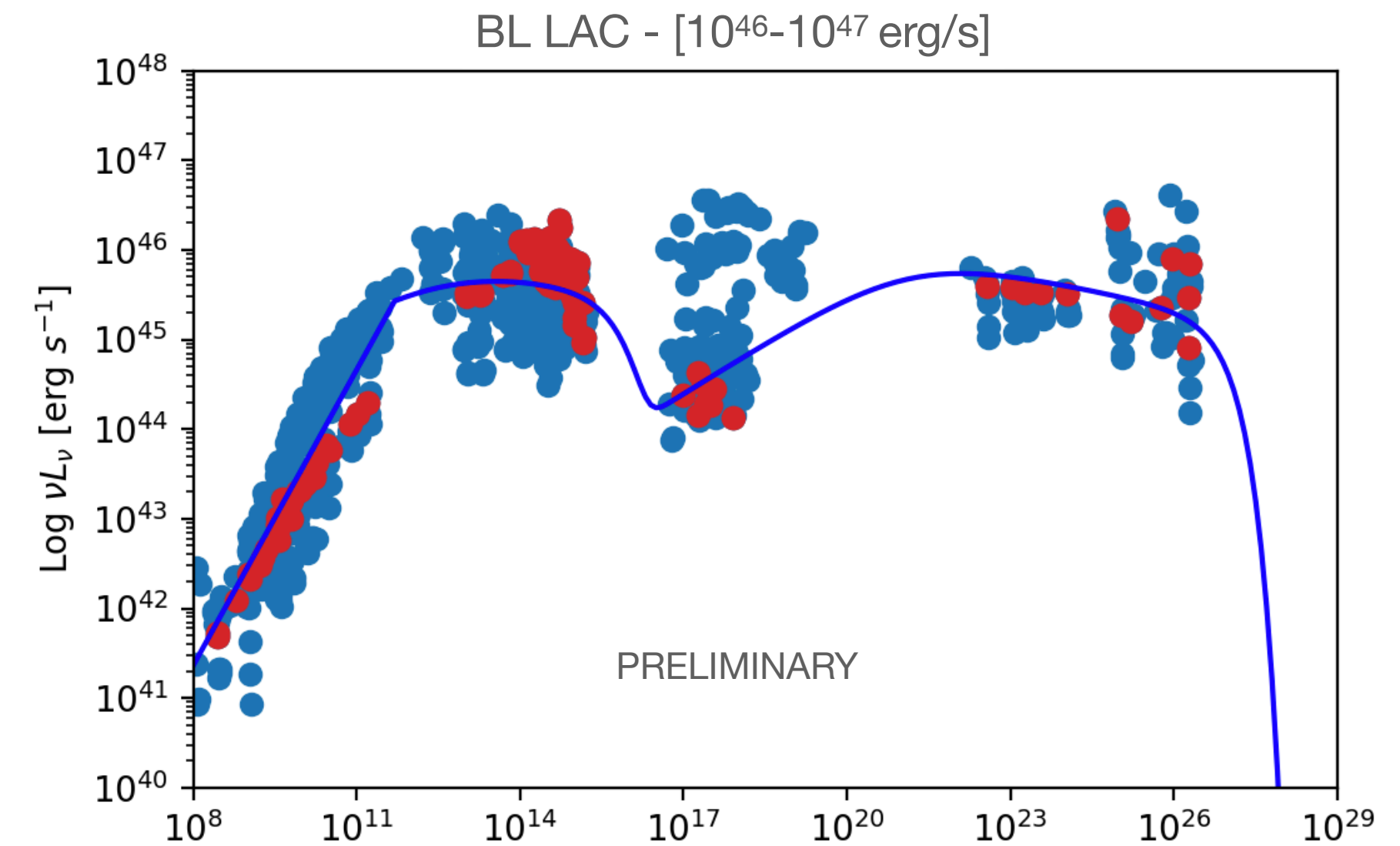
Prandini, Righi et al. in prep.



# Take home messages

Prandini, Righi et al. in prep.

- Redshift plays a key role for the classification of the sources
- As first approximation TeV blazars follow the blazar sequence 2.0 (Prandini, Ghisellini 2021)
- Stay tuned for new results



A night sky filled with stars, with a large radio telescope structure in the foreground. The telescope is a complex metal lattice structure with a large dish antenna. A tall, thin mast rises from the center of the dish, supported by several cables. The sky is dark with many small, bright stars. The text "THANK YOU!" is overlaid in the center of the image.

**THANK YOU!**