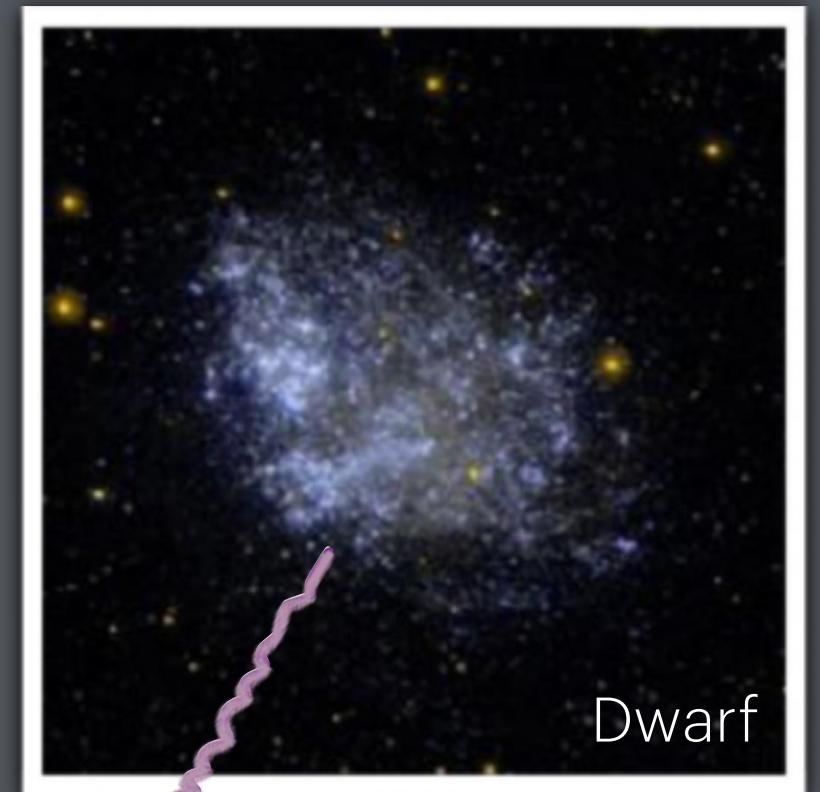
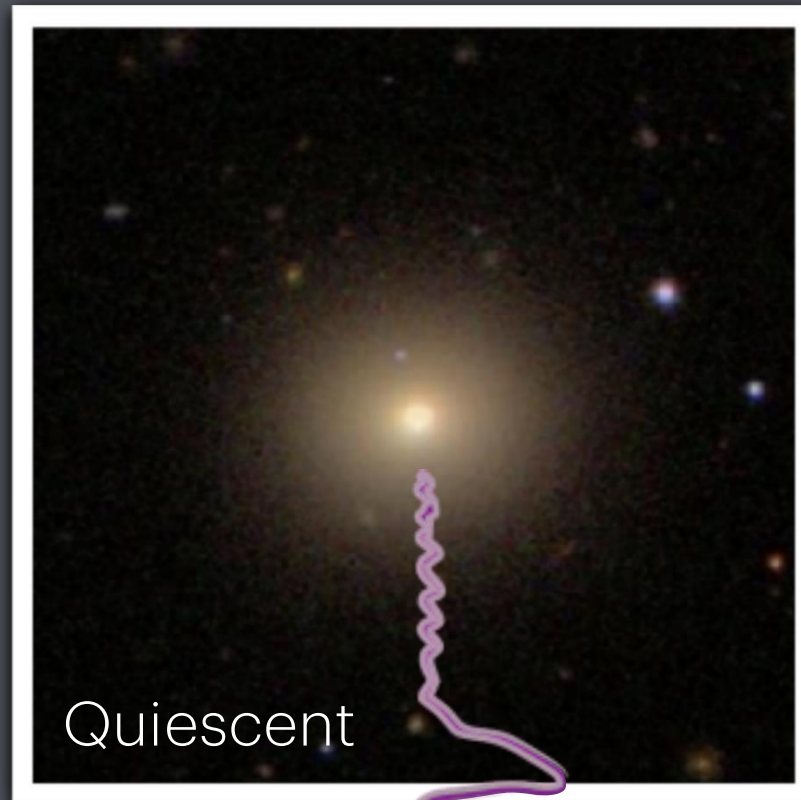


Investigating the Connection between Persistent Radio Sources and Fast Radio Bursts

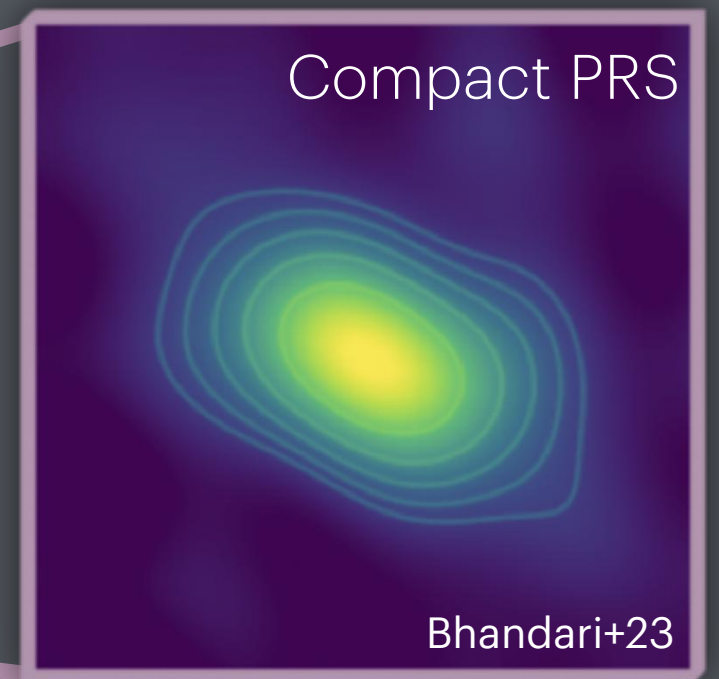
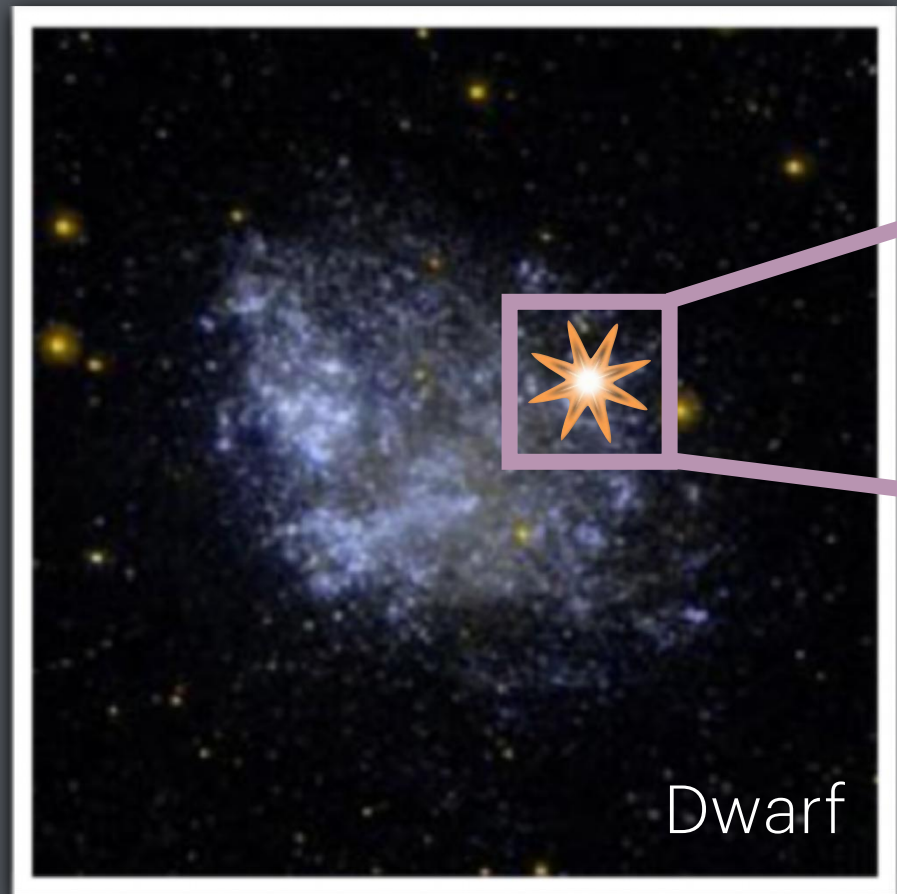
Yuxin Dong (董雨欣)
Tarraneh Eftekhari & Wen-fai Fong
Northwestern University

Texas in Shanghai Symposium
Dec. 11th, 2023

FRBs: millisecond, bright flashes of radio pulses usually at cosmological distances.



Associations with a Persistent Radio Source



Known **FRB-PRS pairs** so far:

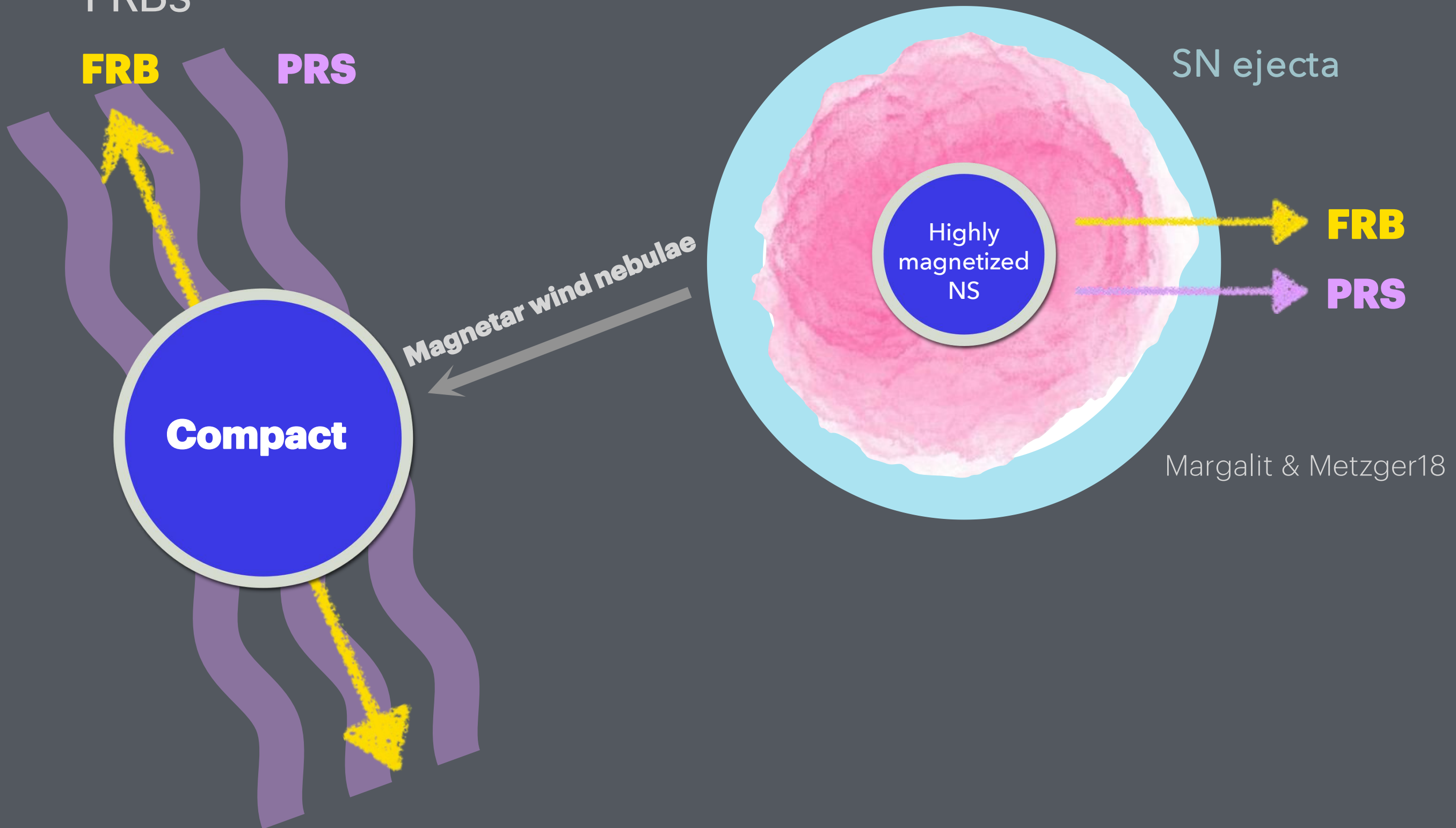
FRB 20121102A (Nature, Chatterjee+17)

FRB 20190520B (Nature, Niu+22)

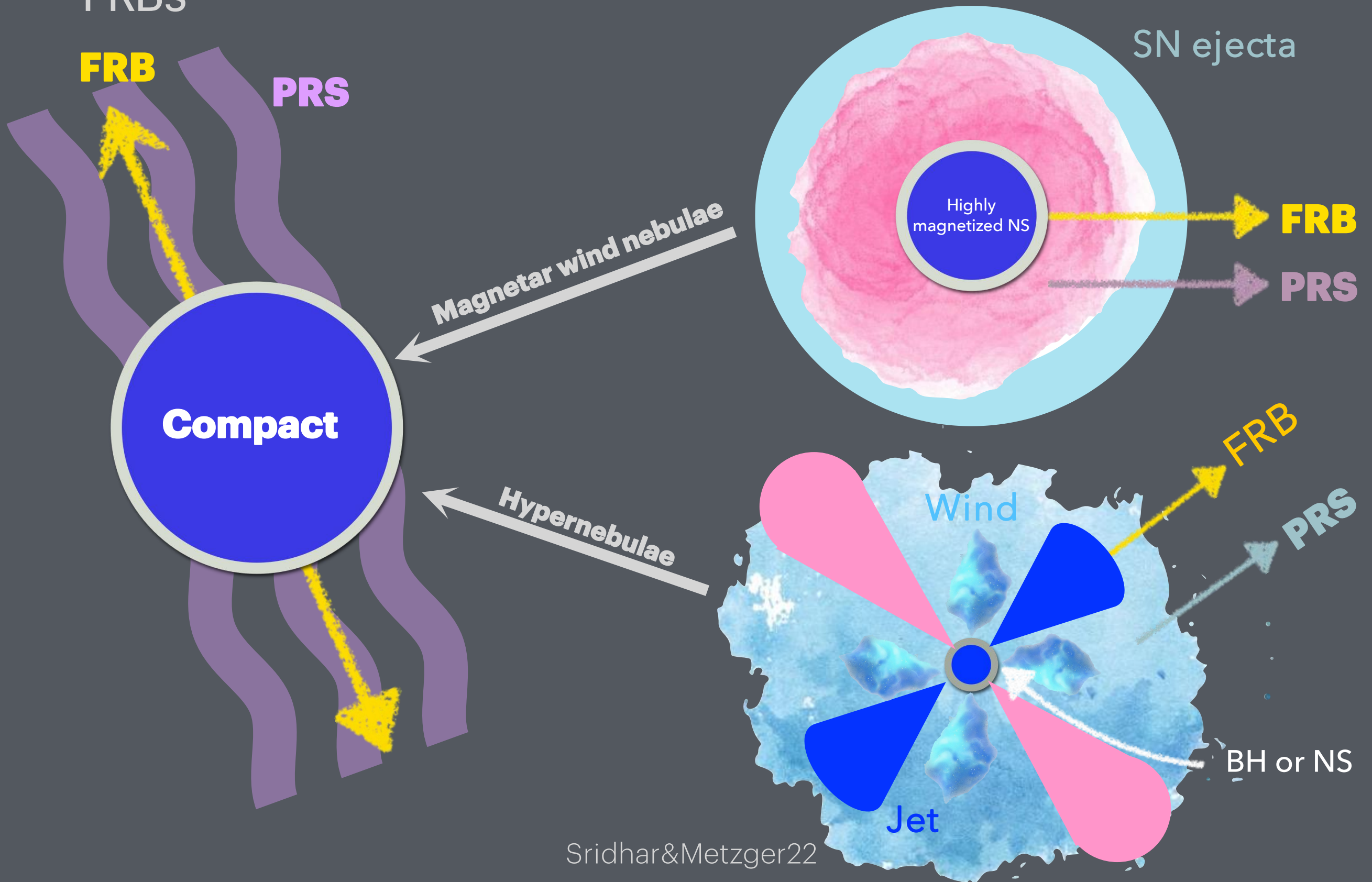
PRSs: constant radio sources coincident with a FRB that are distinct from radio emission from ongoing star formation in the host.

Discovered by FAST!

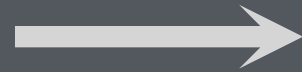
PRS companion: constraining the progenitor models of FRBs



PRS companion: constraining the progenitor models of FRBs



Constrain the progenitor models with observations



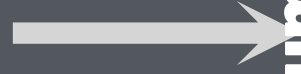
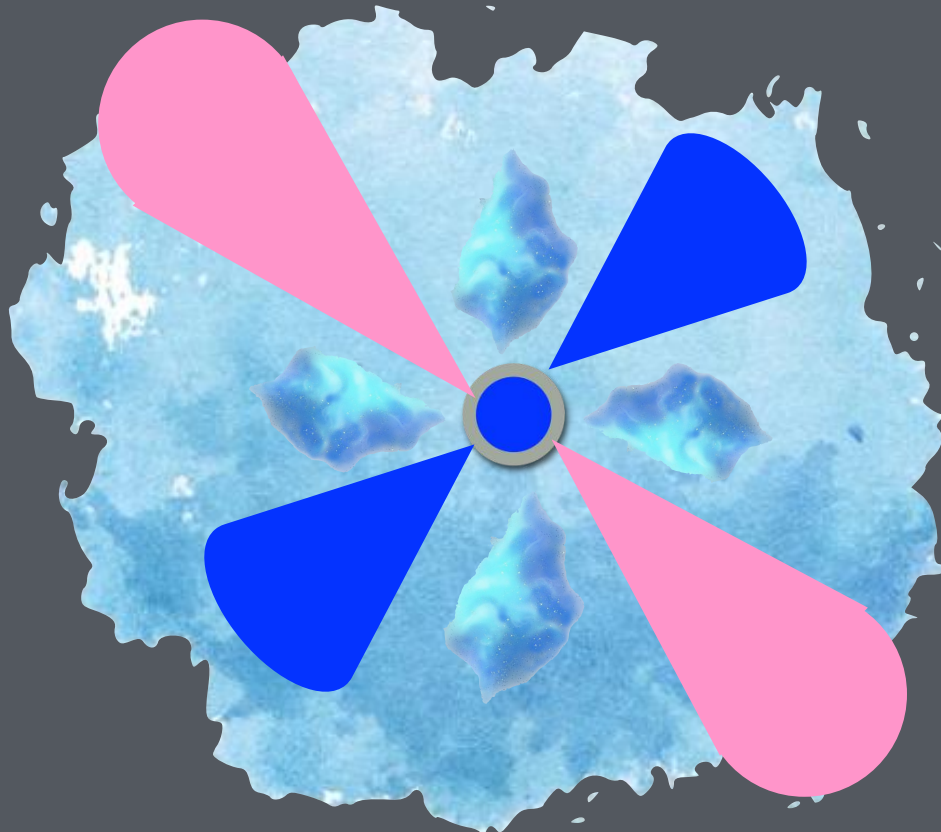
Luminosity

Frequency



Luminosity

Time



Luminosity

Frequency



Time



Hunt for PRSs

... in nearby dwarf galaxies

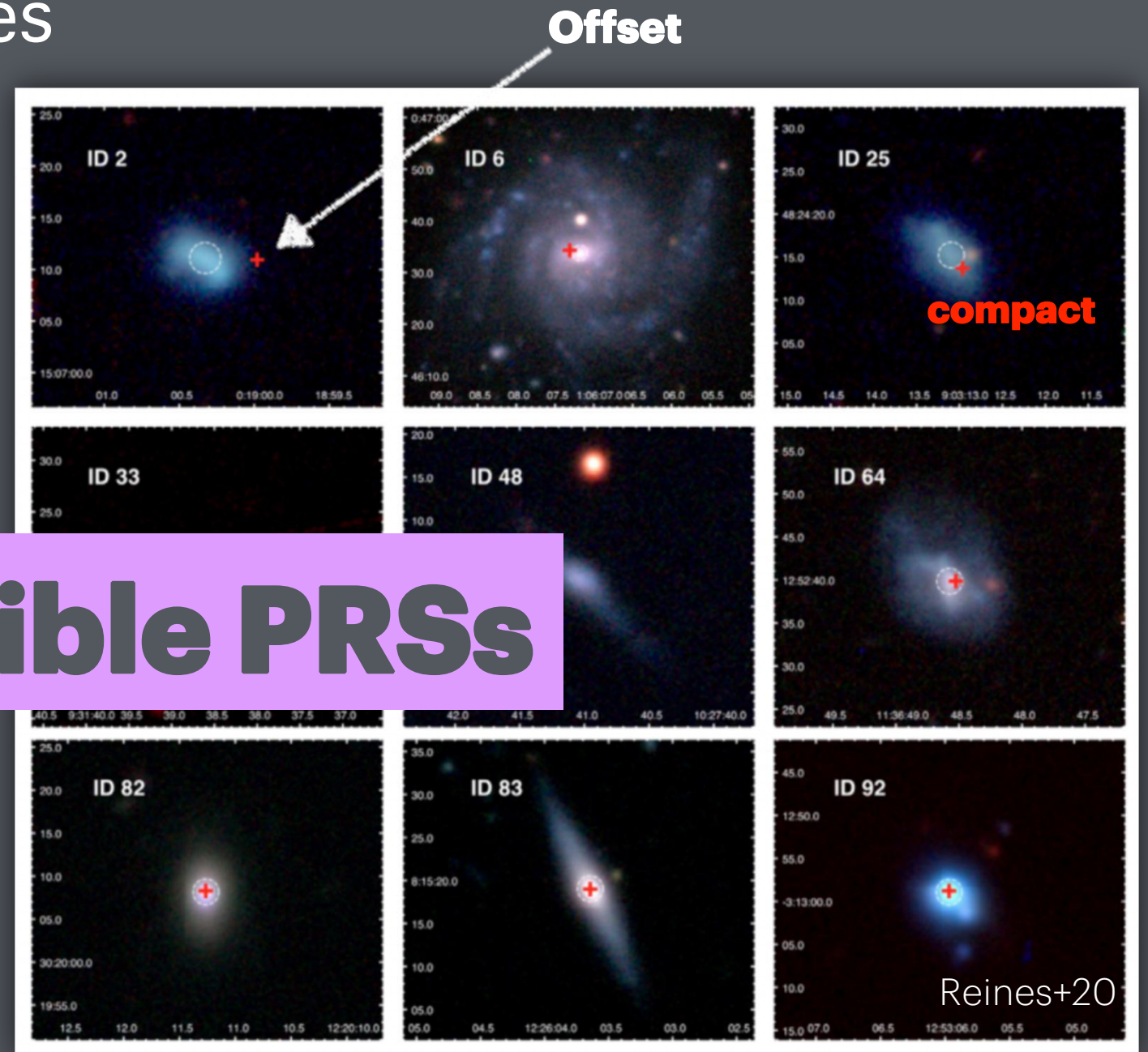
($z < 0.05$)

Signposts of FRBs



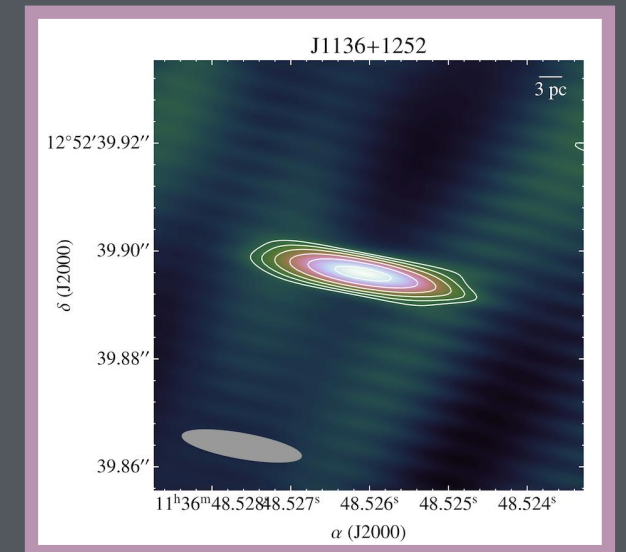
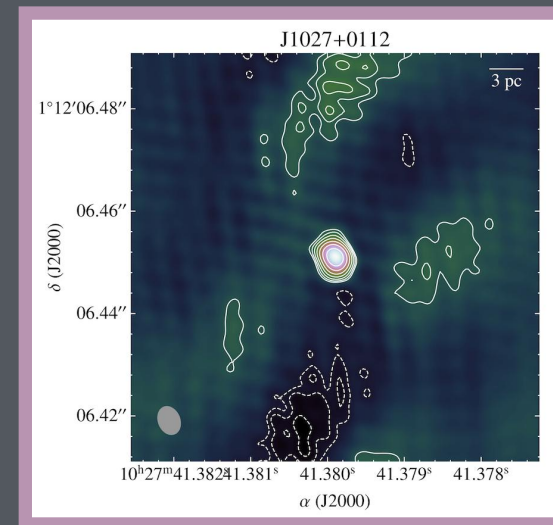
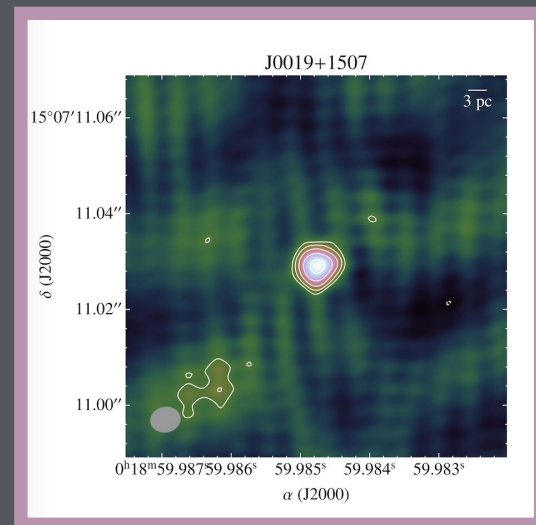
Dwarf host galaxy

Plausible PRSs

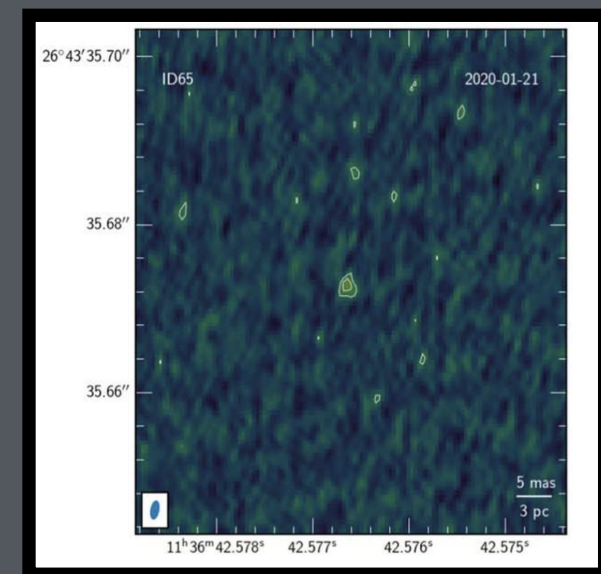
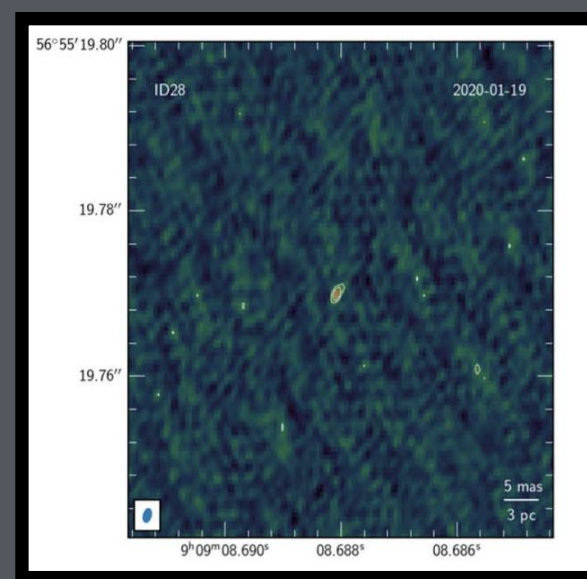


Physical size: 5/12 radio sources are compact on mas scale

New EVN Observations

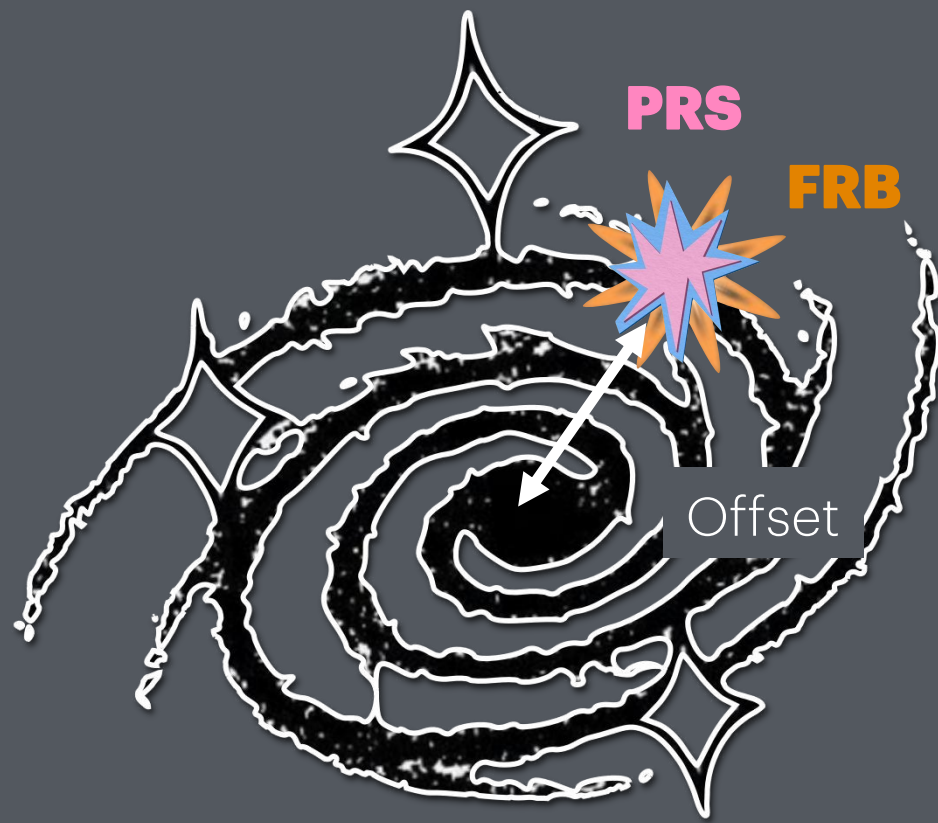


PRSs are compact on sub-pc and pc scales.

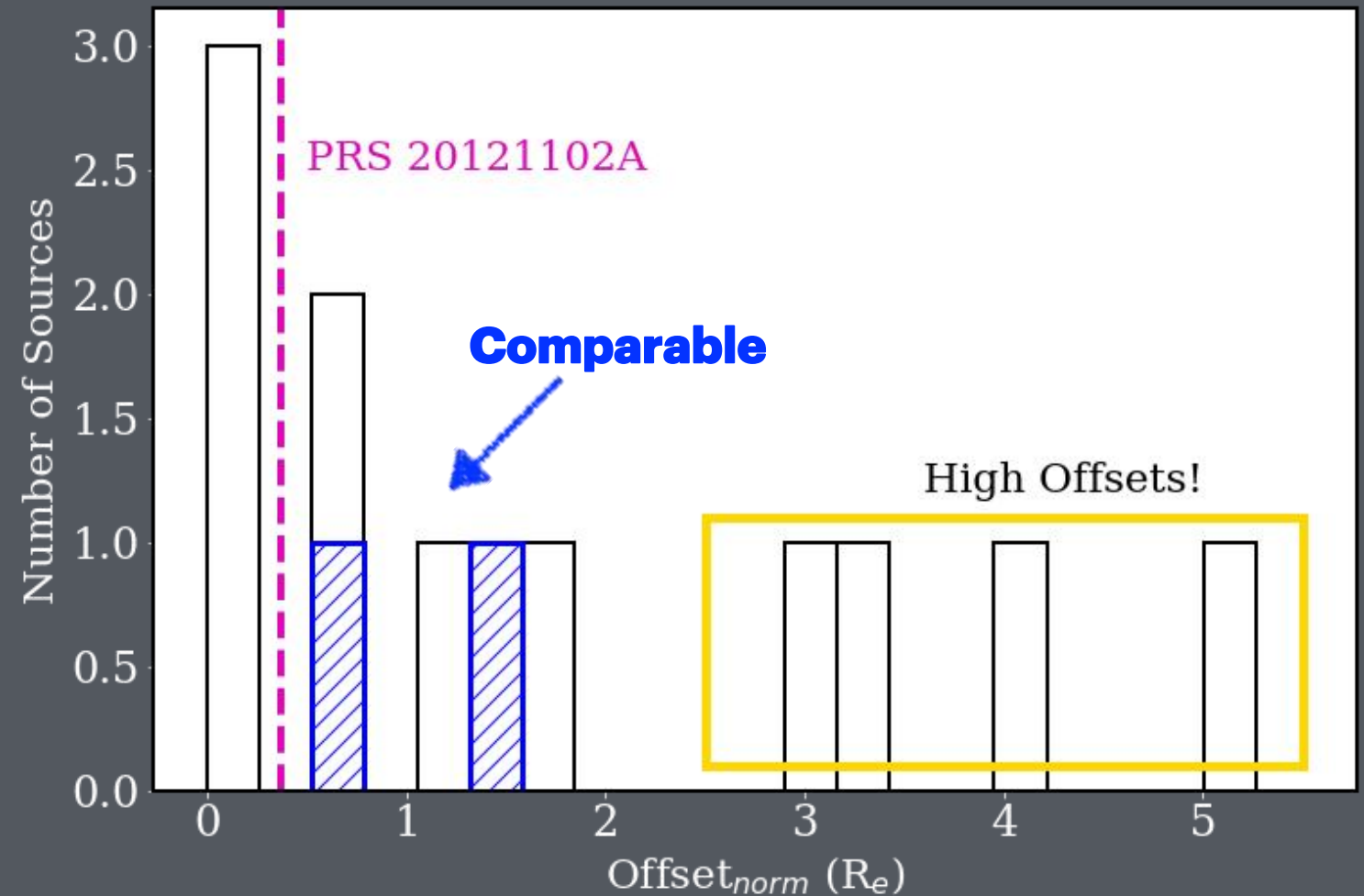


Sargent+22

Offset: **2/5** radio sources have similar offsets to that of PRSs

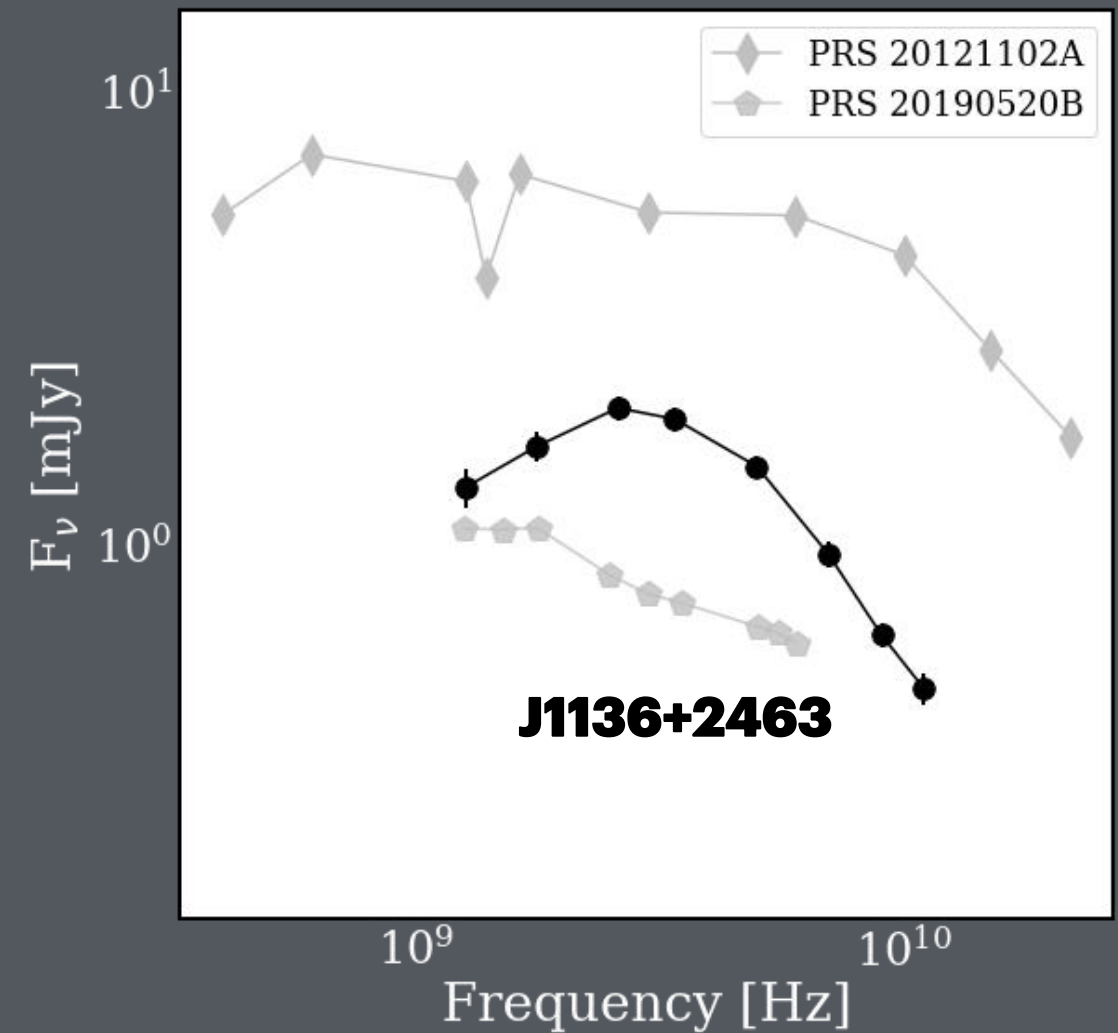
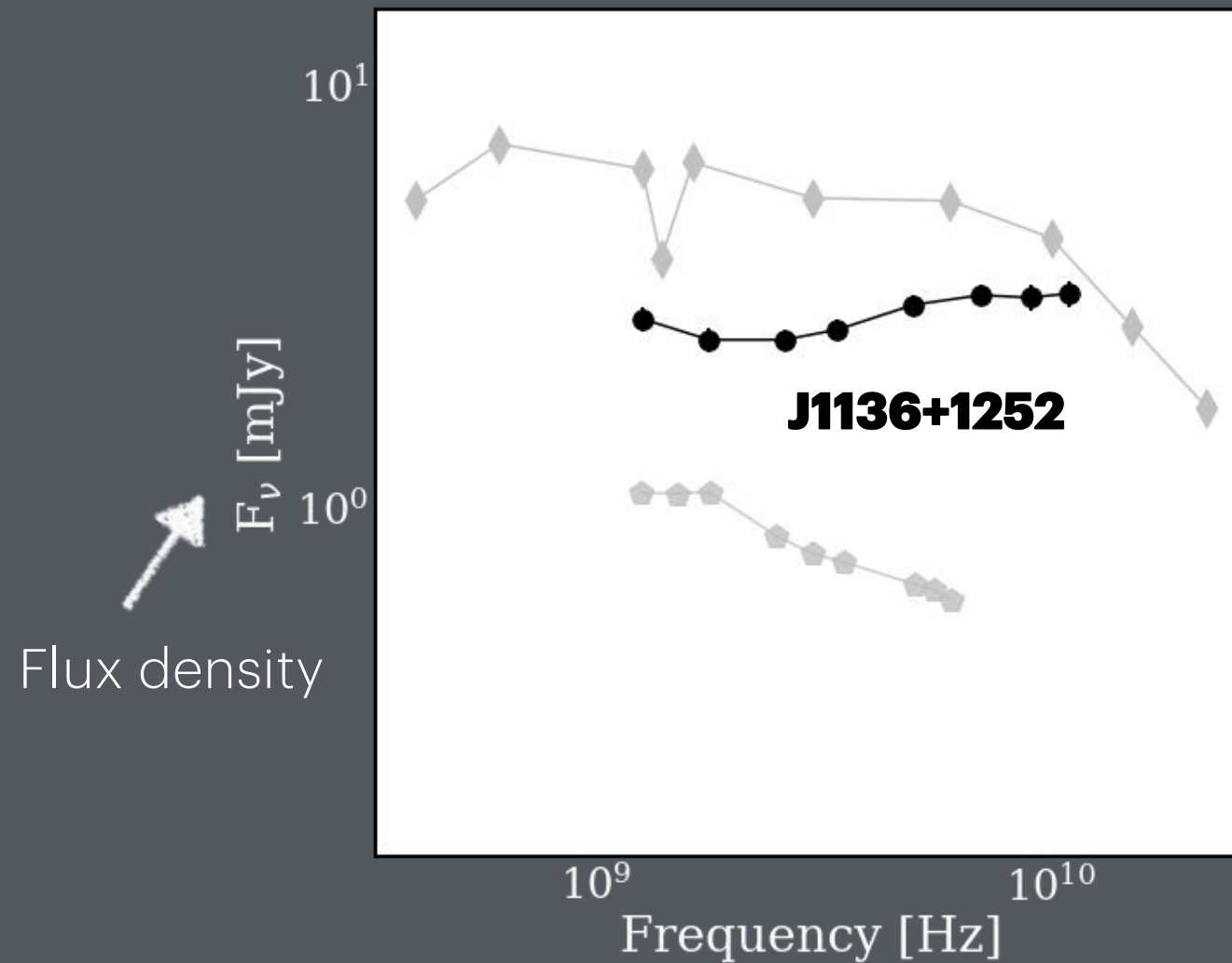


Dwarf host galaxy



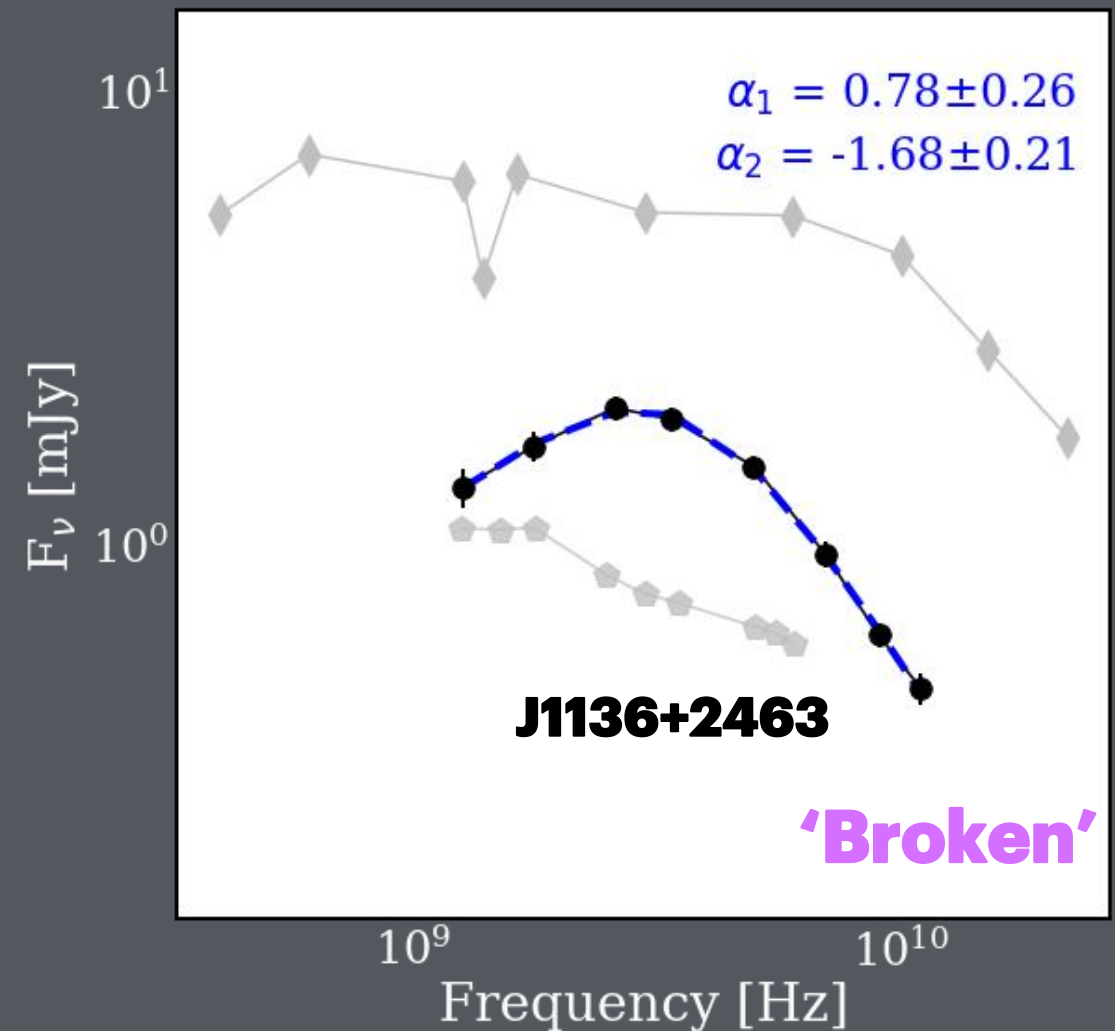
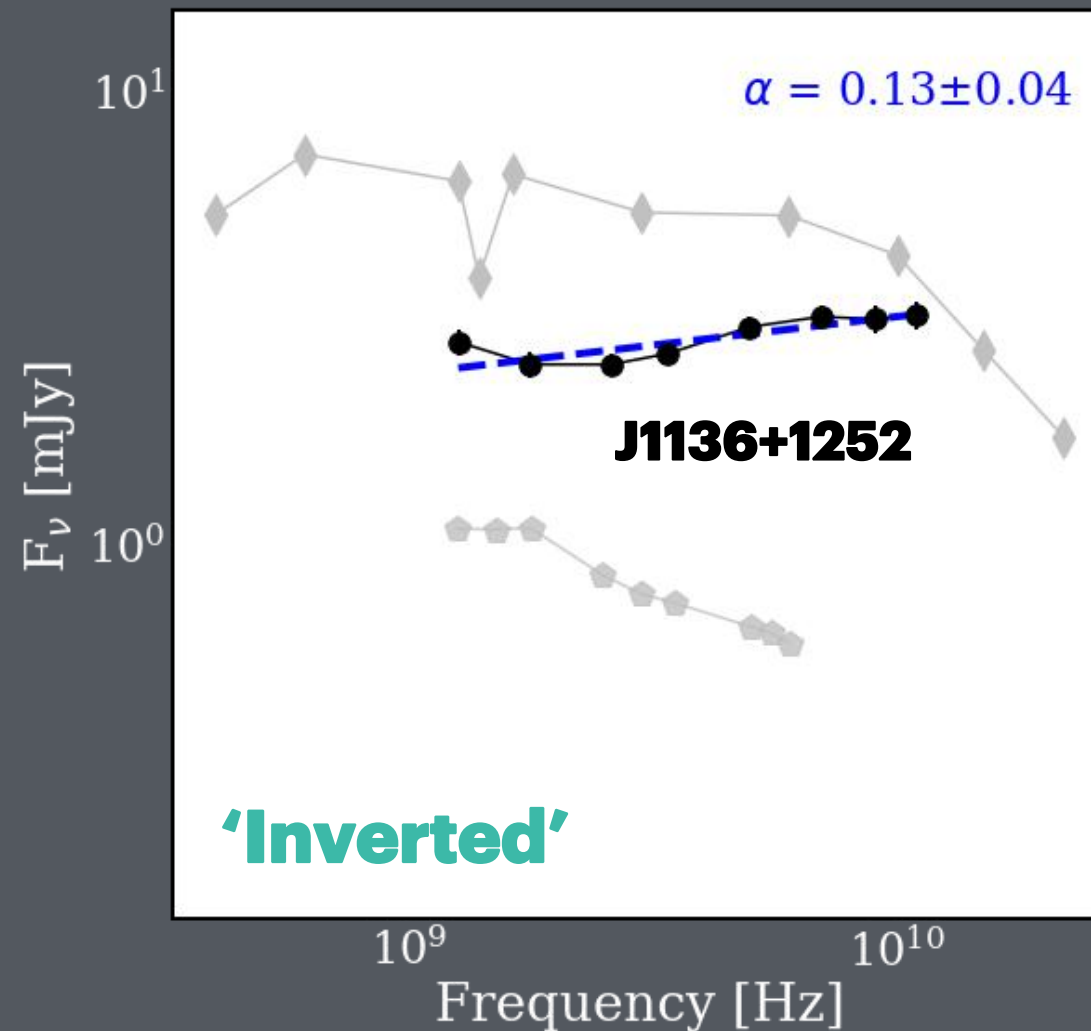
New radio observations from the VLA (1-12 GHz)

Spectral Energy Distributions (SEDs)

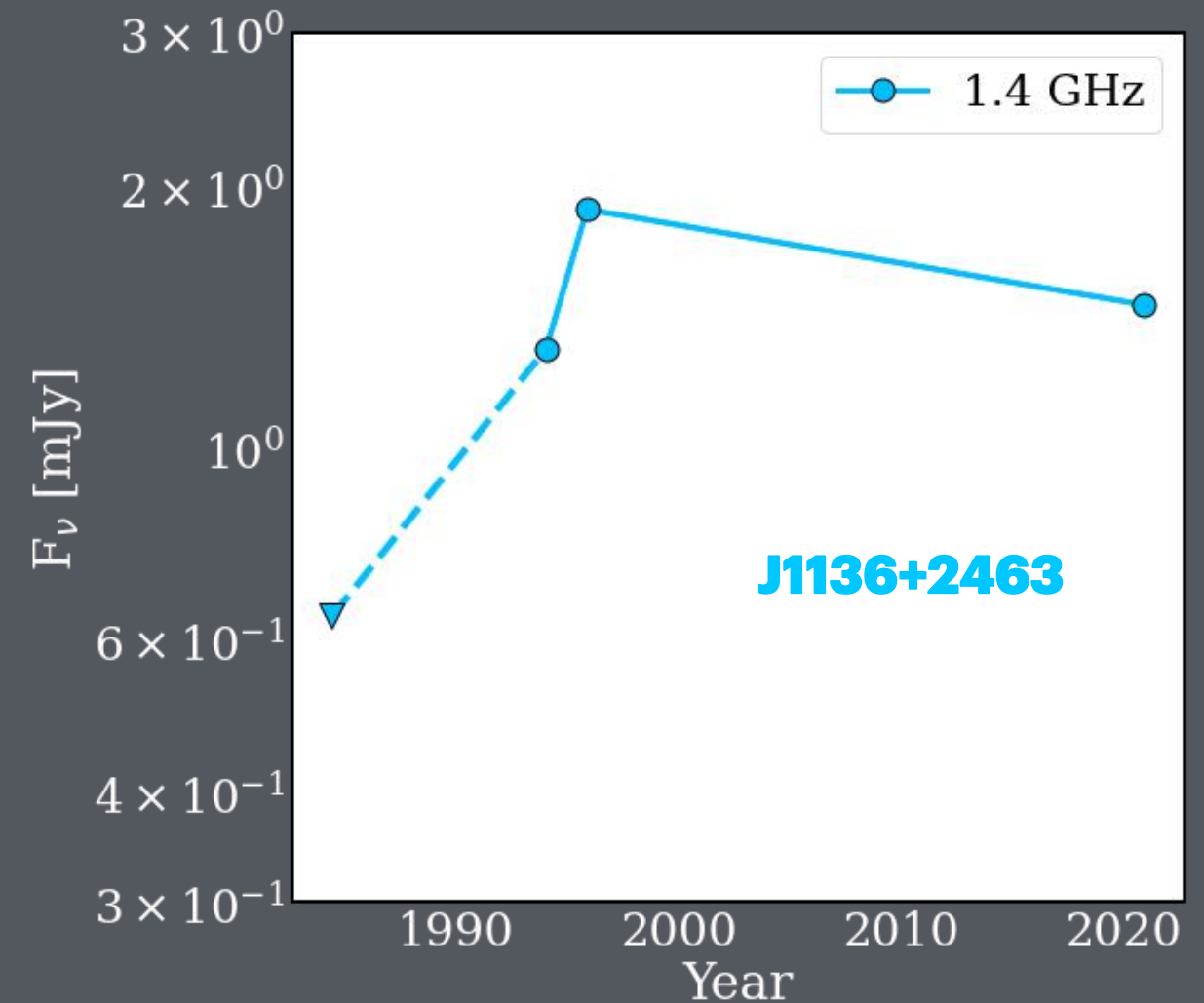
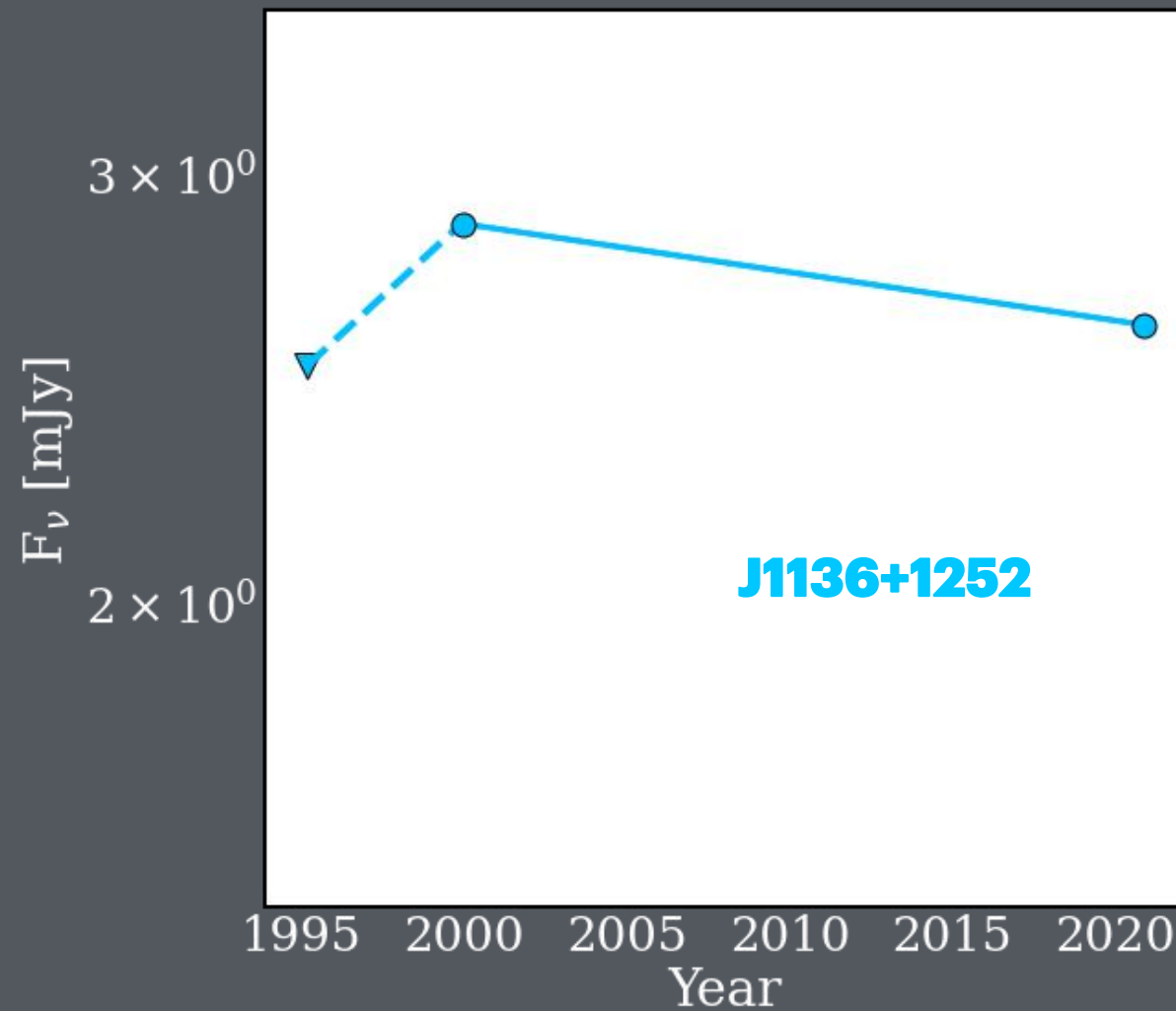


SEDs reveal **different** spectral evolution

and mostly differ from those of the PRSs.

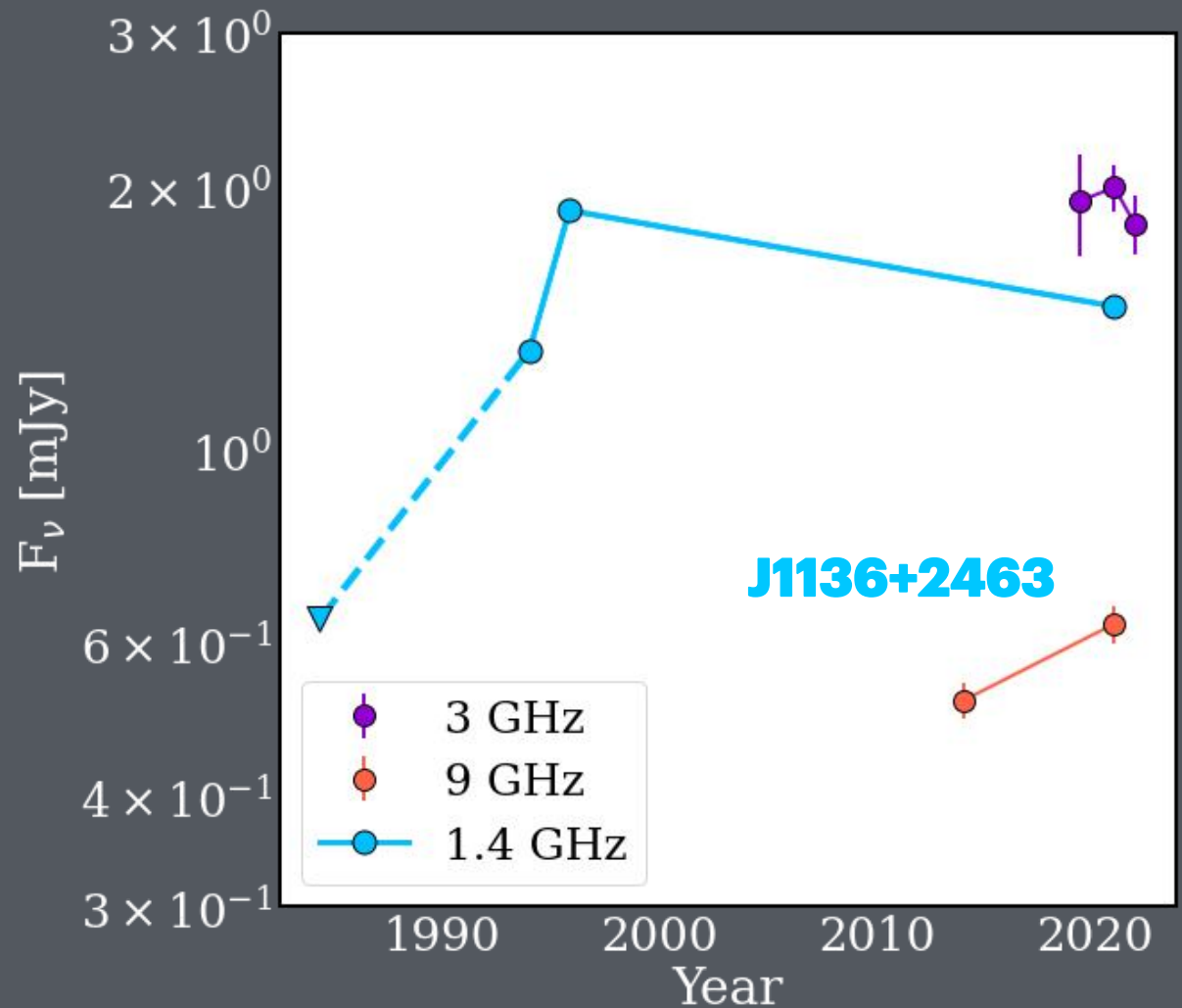
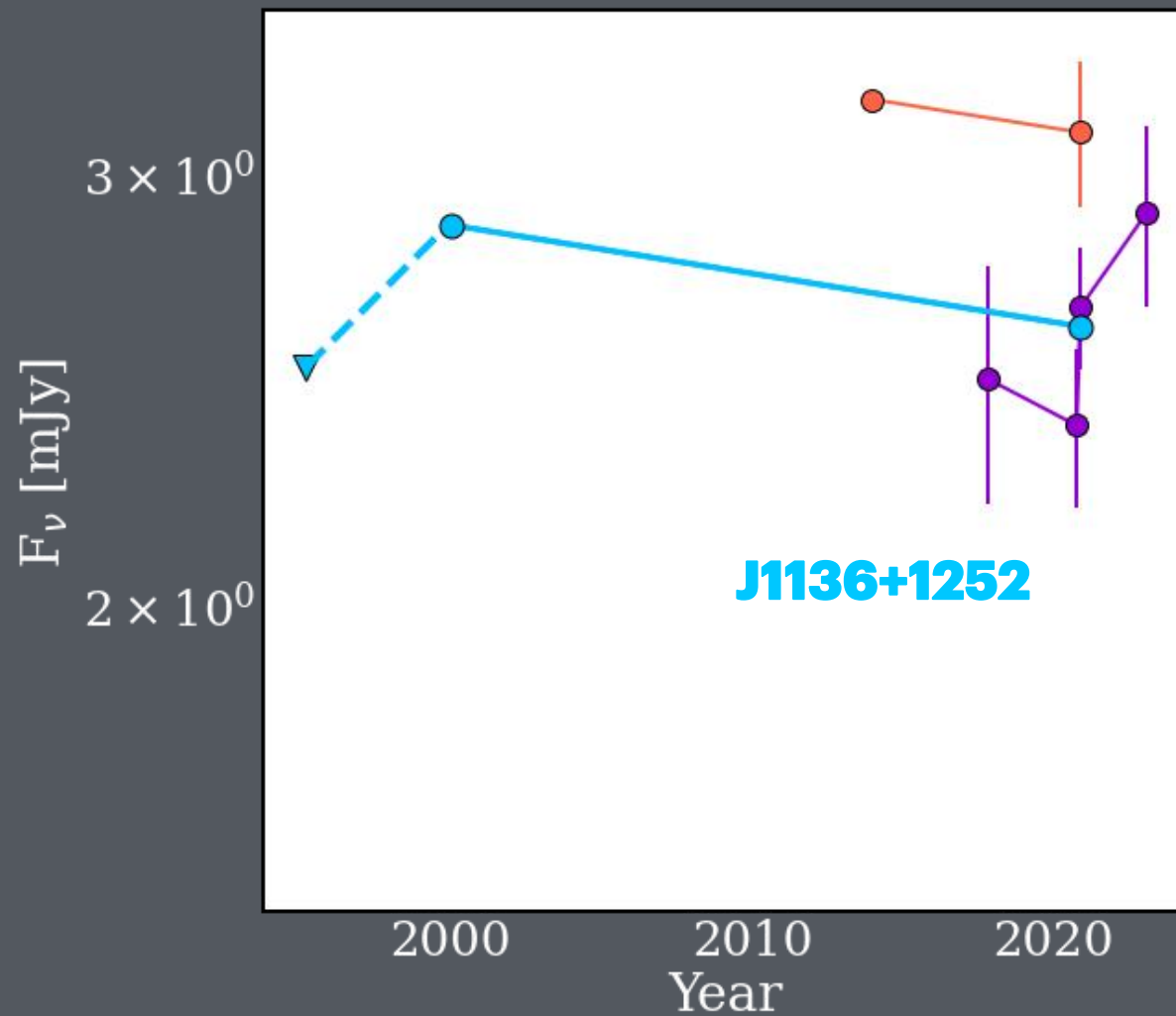


Light curves (LCs) exhibit **variations**, as expected for PRSs

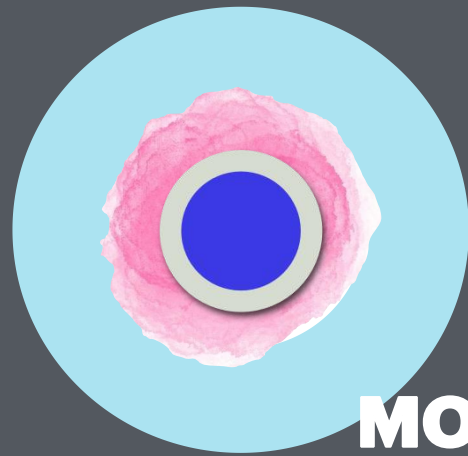


Light curves (LCs) exhibit **variations**

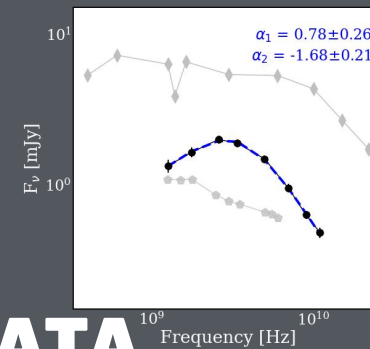
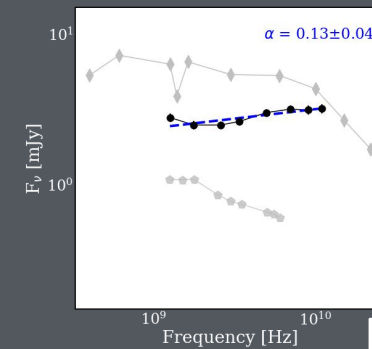
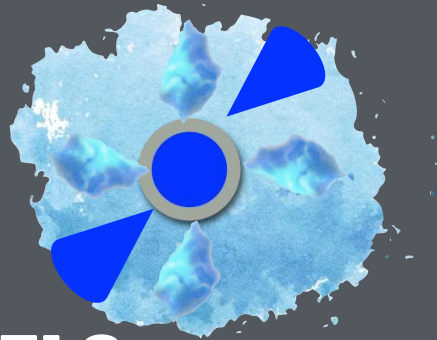
on both short and long timescales



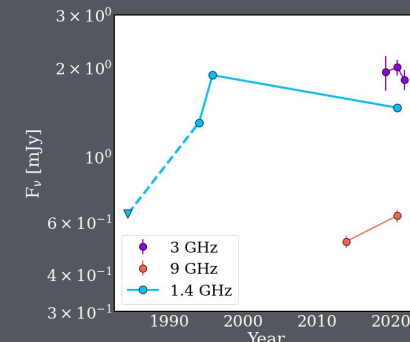
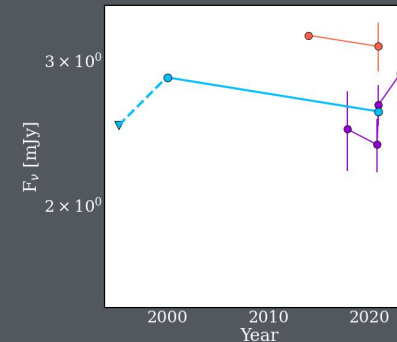
NEXT: **compare** the most likely PRS candidates with progenitor models



MODELS



DATA



NO



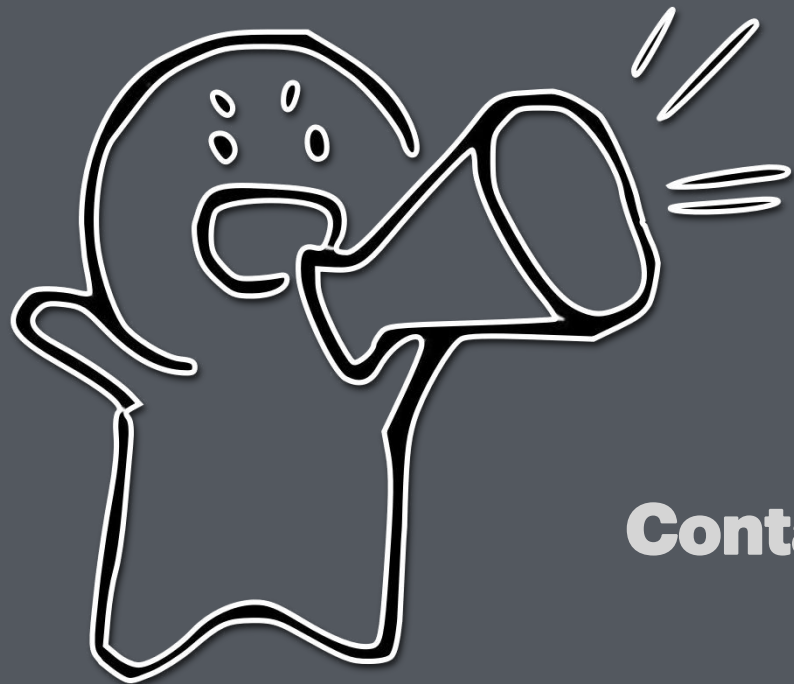
YES

Promising PRS

Summary

Compact radio sources in nearby dwarf galaxies are potentially **analogs of PRSs** associated with FRBs and serve as **signposts** for future FRB discoveries.

A larger sample of **FRB-PRS pairs** would provide key insights into the **progenitor channels** of FRBs.



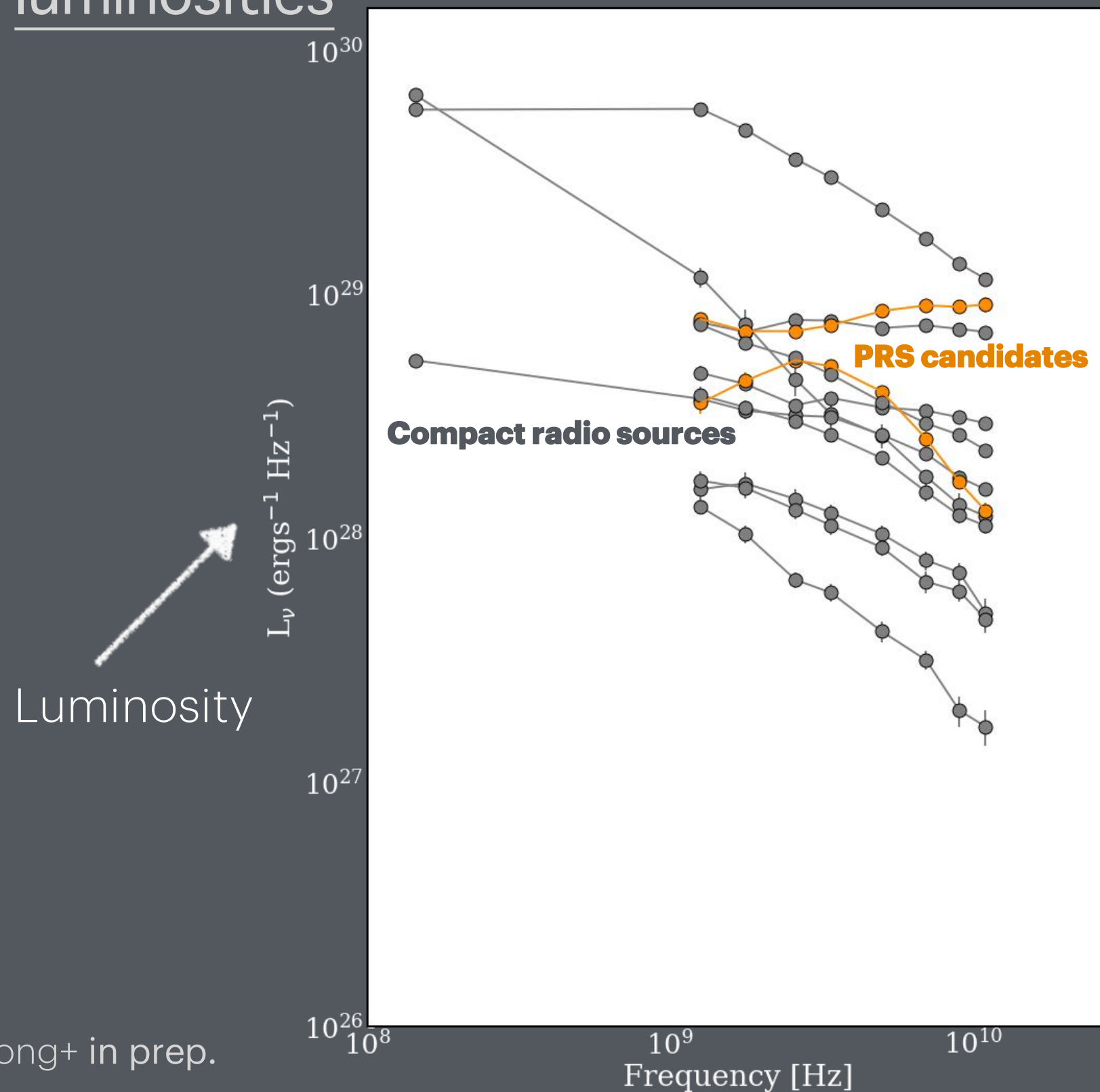
Thank you!

Contact: yuxin.dong@northwestern.edu

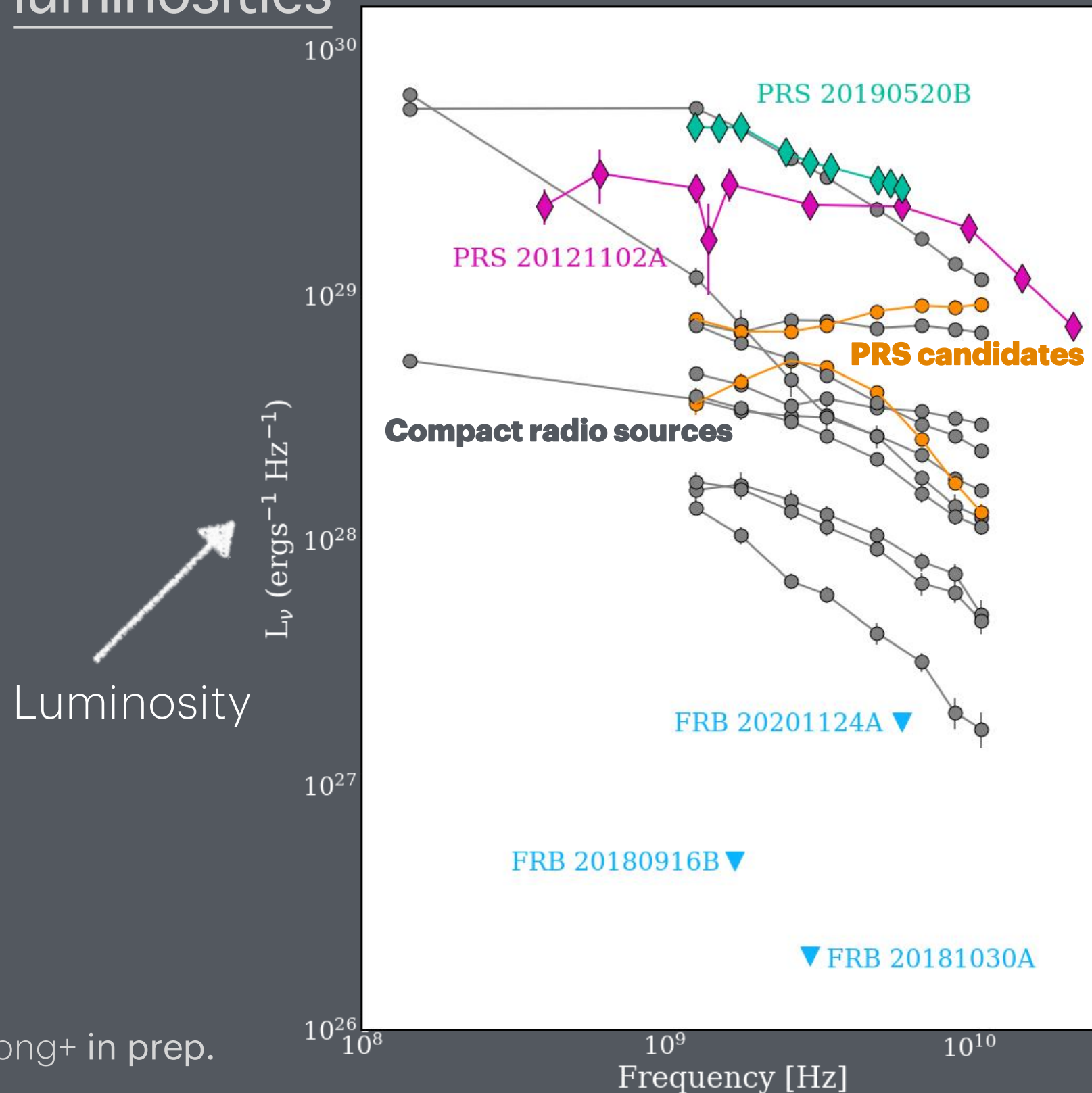


Back up

Comparisons as a population shows **difference** in luminosities



Comparisons as a population shows **difference** in luminosities



The compact radio sources are mostly **sub-luminous** compared to **PRSs** and brighter than **PRS limits**.

The origin(s) of FRBs still remain an open question

PROMPT



DELAYED*



* = FRB 20200120E
from a globular
cluster
(Bhardwaj+21, Kirsten+21)

Margalit+19, Lu+22

