



# On the gamma-ray emission of W44 and its surroundings

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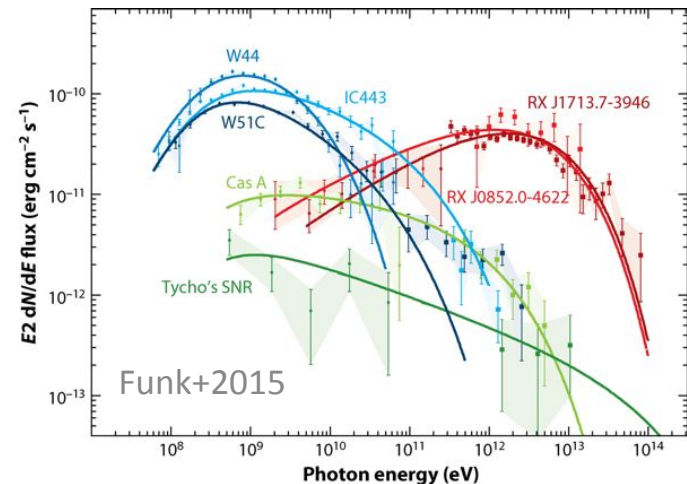
# Supernova Remnants

**Supernova Remnants (SNRs) are considered to be the main accelerators of Galactic Cosmic Rays**

- Sufficient power to maintain GCRs [Baade&Zwicky 1934]
- Efficient acceleration mechanism: DSA [Bell 1978, Bandfor&Ostriker 1978]
- Prominent gamma-ray emission both at GeV and TeV; [e.g. Aharonian 2013]

**BUT...**

- No clear observation compatible with PeV emission;
  - Is escape playing a role? [e.g. Gabici+2007]



# W44

Perfect target to study escape because:

- **Middle age** (10000 years) : particle had the time to leave the remnant;
- **Massive molecular cloud** complex in its surroundings;

Spectrum:

Low energy  $\rightarrow$  hadronic origin of the emission

High energy  $\rightarrow$  escape

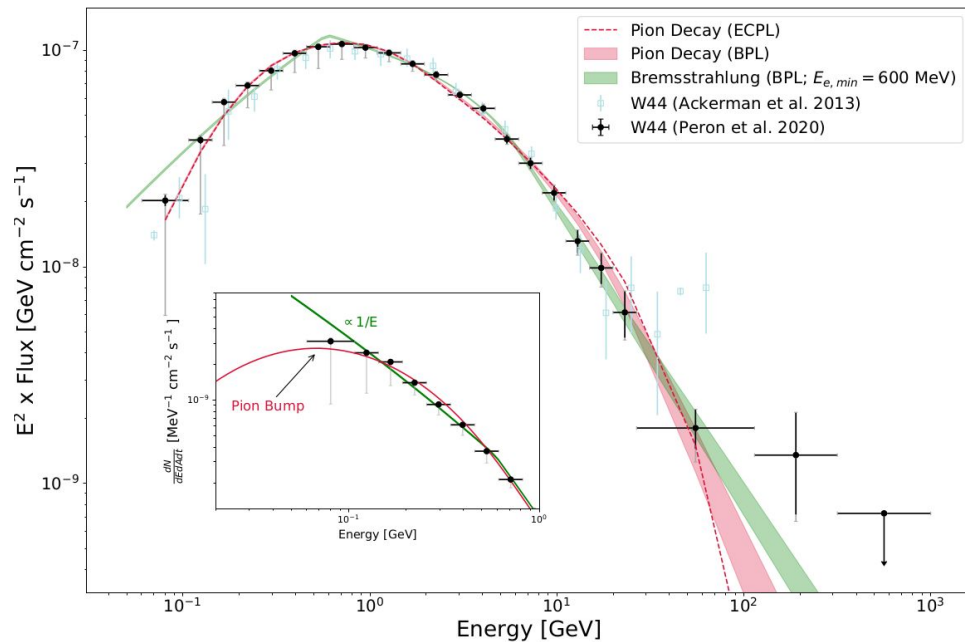
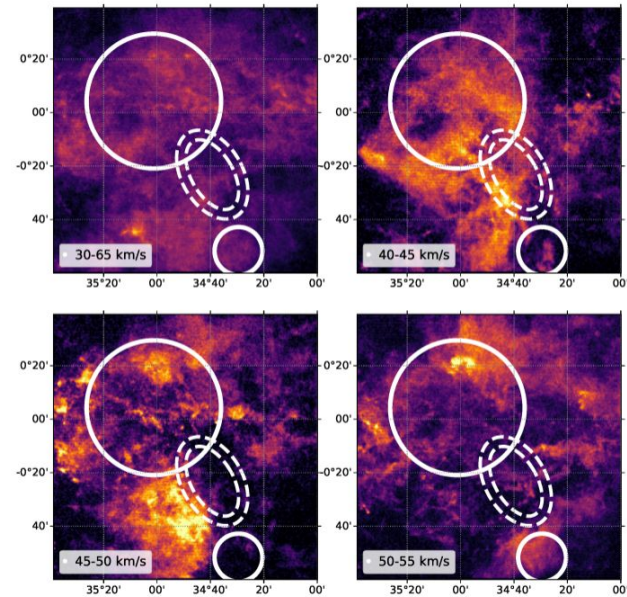
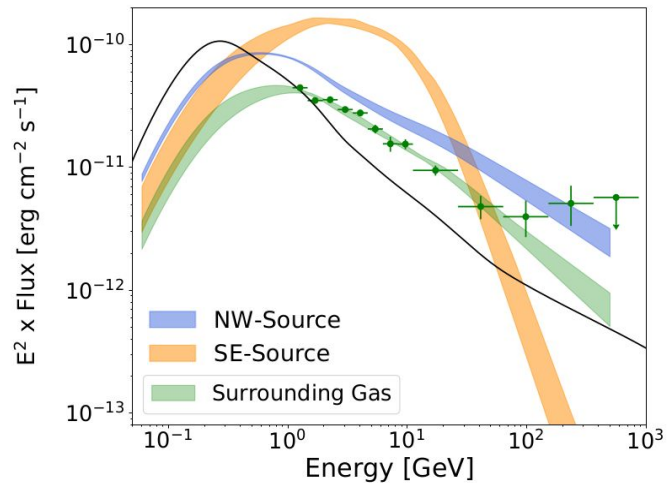


Figure adapted from Peron et al. 2020

# The surroundings

- Unveiled two extended sources at the opposite edge of the SNR along the major axis;
- The gamma-ray emission do not correspond to regions of enhanced gas density  $\rightarrow$  enhanced CR density;



Figures adapted from Peron et al. 2020

- The rest of the gas has a spectrum compatible with the CR sea;
- The morphology and the spectrum of the two sources is different