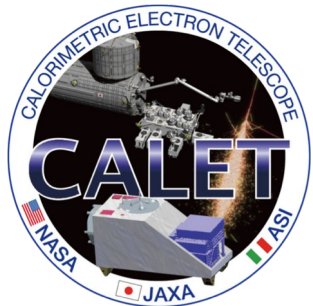


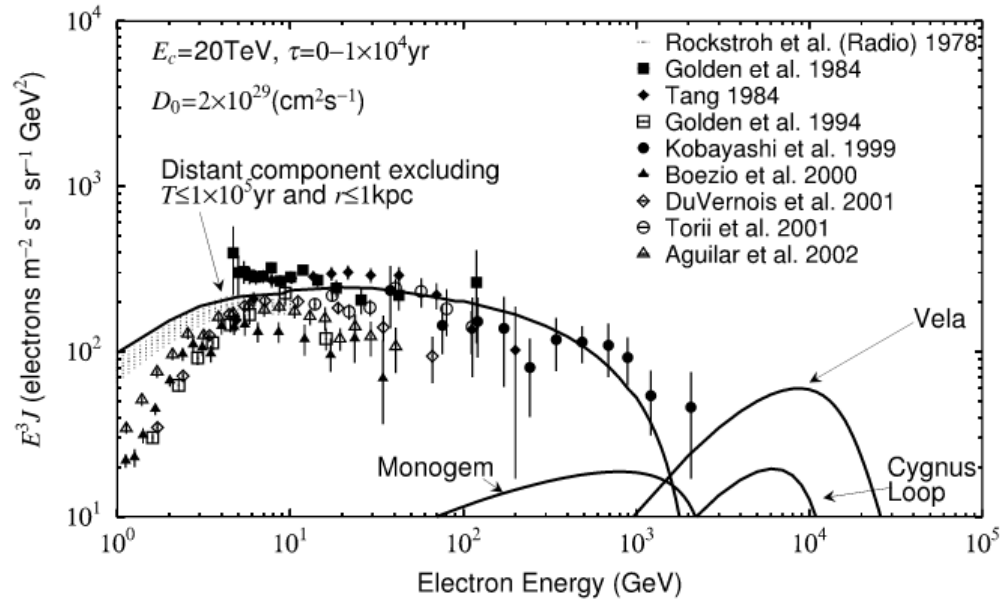
Investigating the Vela SNR's Emission of Electron Cosmic Rays with CALET at the International Space Station



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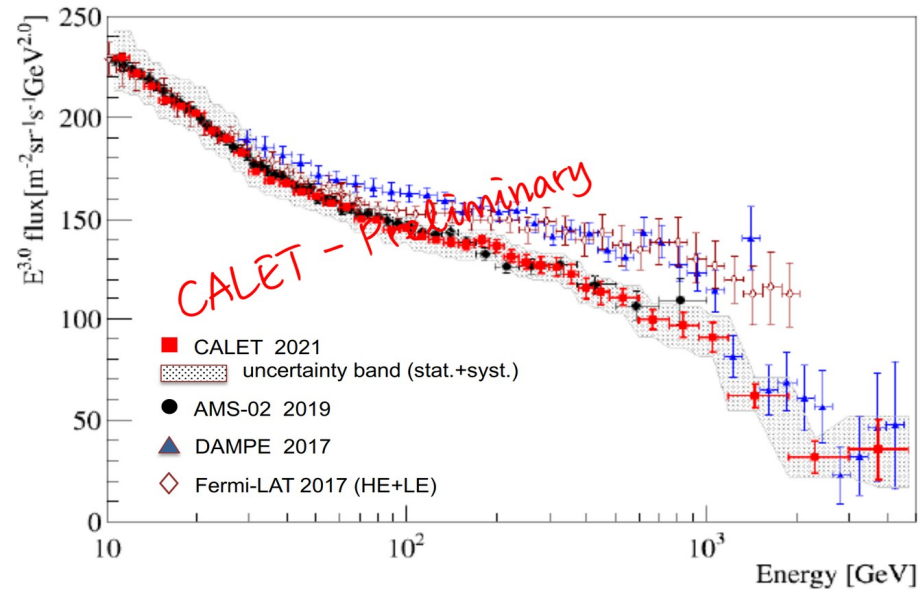


Introduction



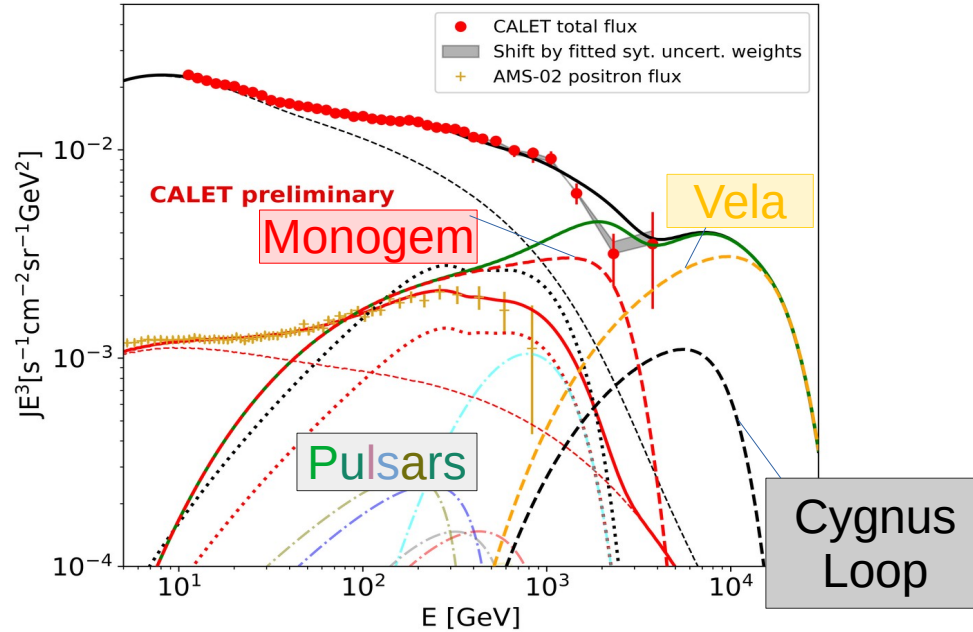
- In the TeV region of the electron CR spectrum, we expect only three supernova remnants to significantly contribute: Vela, Monogem, Cygnus Loop
- The estimated energy emitted as electron CR is on the order of 10^{48} erg (T. Kobayashi et al 2004 ApJ 601 340, “The Most Likely Sources of High-Energy Cosmic-Ray Electrons in Supernova Remnants”)

The Goals



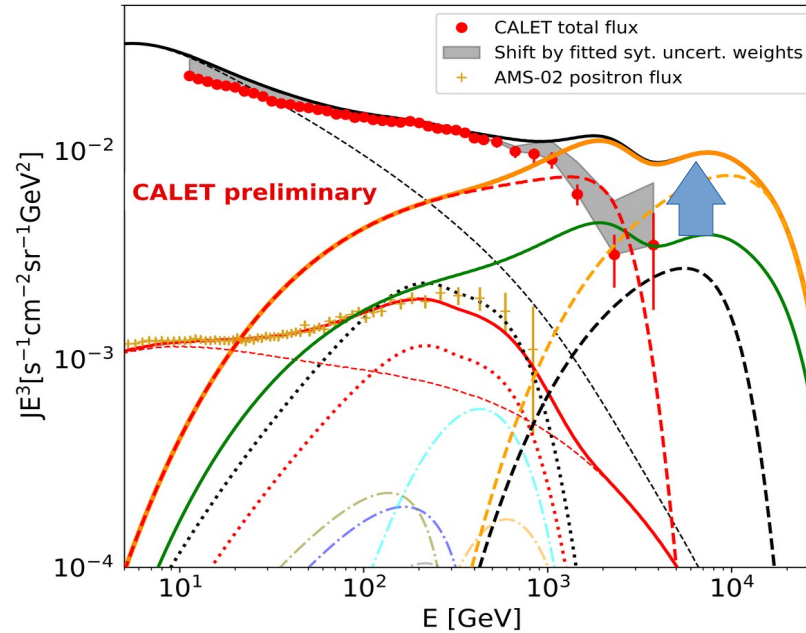
- Use the latest CALET all-electron spectrum (talk #737 by S. Torii) to:
 - Check if it agrees with the 10^{48} erg hypothesis
 - Constrain the preferred range of emitted energy further
 - Set limits on this value for Vela and nearby SNR

Method



- Calculate the signatures of the nearby SNRs with DRAGON
- Combine them with a flexible parametrization of the background which includes pulsars as the source of the positron excess (guaranteed background from AMS-02 positron) ...and secondaries...and distant SNRs
- Fit the model to the **CALET all-electron spectrum** and **AMS-02 positron only data**.

Best Fit and Limit



- Best fit: Flexible normalization for the nearby SNR (emitted energy)
- Limit: Increase emitted energy until fit excluded at 95% CL

Parameter Space

- 4 Propagation Models covering a wide range of local diffusion speed (based on calculation of nuclei spectra with DRAGON) – determines common power law index for all SNR and species
- 2 Generic scenarios for the release of the cosmic rays from the SNR:
 - Continuous for a duration
 - Burst-like with a delay
- Values for duration/delay: 0, 1, 2, 5, 10 kyr
- Range of cut-off energies: 10, 20, 50, 100, 200 TeV
- 2 Studies: Vela-only and three nearby SNR (Vela, Monogem, Cygnus Loop)

Result

- CALET data is compatible with the hypothesis of 10^{48} erg for the emitted energy in electron CR above 1 GeV
- For a wide range of propagation conditions and injection timing:
 - Best fits for the emitted energy are several 10^{47} erg
 - Limits are a few 10^{48} erg
- Exception: Delayed emission, slow diffusion → only highest energy electrons from Vela
 - A few 10^{48} erg best fit energy
 - $\sim 5 \times 10^{48}$ erg limits (if considering all three SNR)

For the details:
please look at the poster
and proceedings