SolFER Spring 2021 Meeting

Temperature in Solar Sources of ^{3}He-rich Solar Energetic Particles and Relation to Ion Abundances

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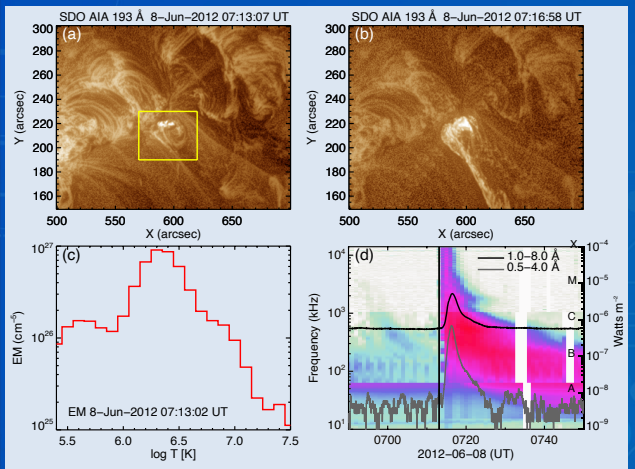
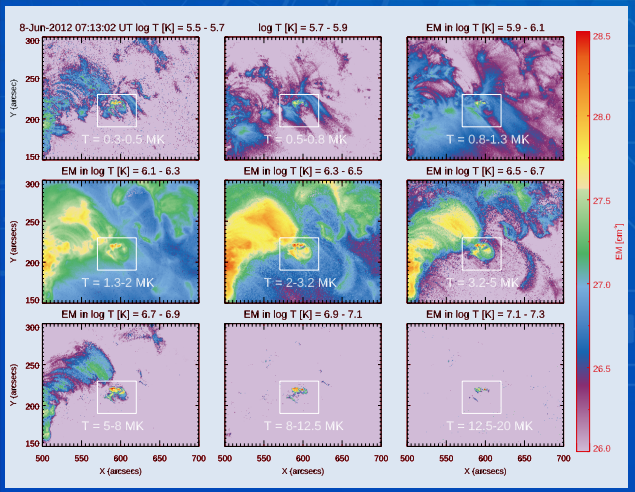
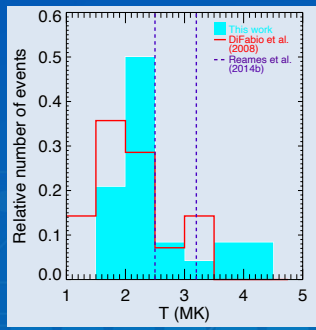
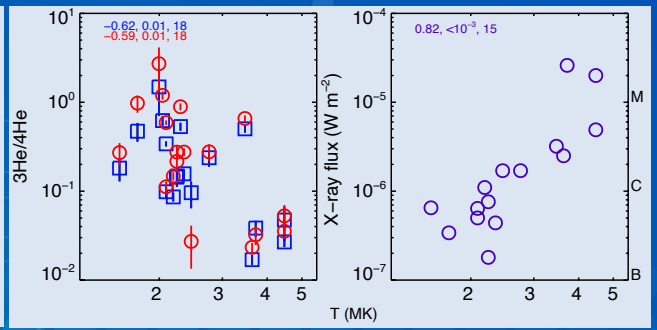


Examined 24 events. The temperature in solar source determined using DEM analysis at type III burst start time. EM computed for each pixel (EM maps below), then EM spatially averaged in the box surrounding the source, and weighted temperature calculated using EM curve ((c) upper Figure).

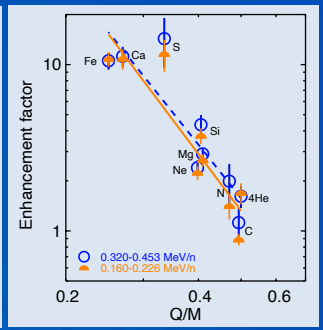




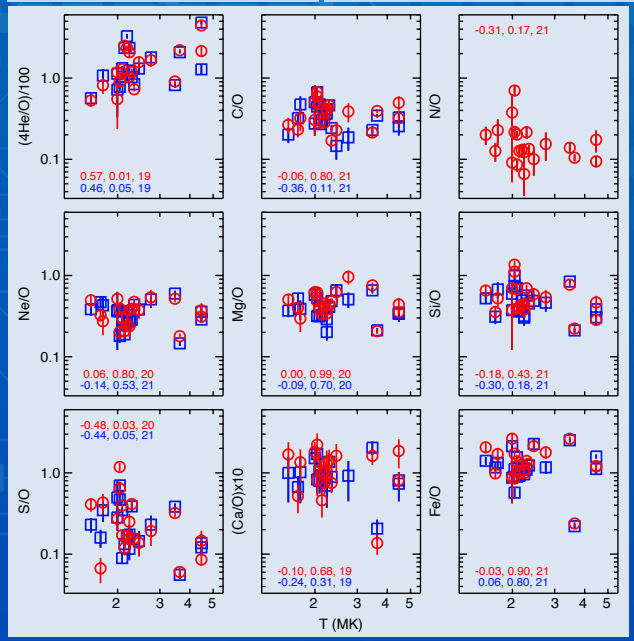
Temperature inferred from EUV observations agrees with temperature obtained from charge state (DiFabio et al.) & abundance measurements.

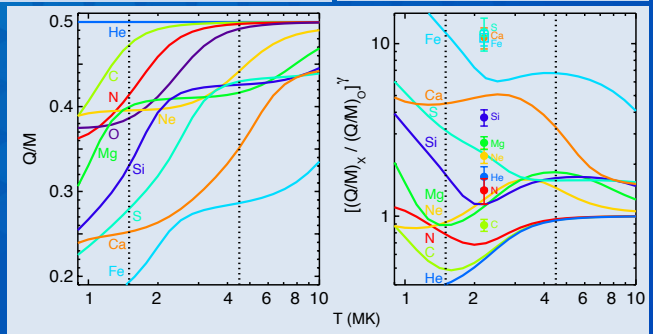


Explored 137 (squares) & 193 (circles) keV/n ratios vs. T. He is ionized at inferred temperatures → an anti-correlation of 3He/4He with T is not caused by charge-changing processes. It probably reveals dependence on X-ray peak flux. Only 4He/O and S/O show a clear correlation with T (see below).



Measured enhancement factor (EF) vs. Q/M at 193 keV/n fitted with power-law with γ=-3.53. Calculated EF vs. T is compared with ratios vs. T.





The complex profile of calculated EF (right panel) for Fe, Ca, Si, Ne, N - consistent with no correlation for corresponding measured ratios. Profiles of Si and He consistent with measurements; profiles of C, Mg do not.

- 3He/4He dominated by non-charge-changing mechanisms
- Heavier elements, except C and Mg, depend on temperature as expected from calculated EF assuming ionization equilibrium

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