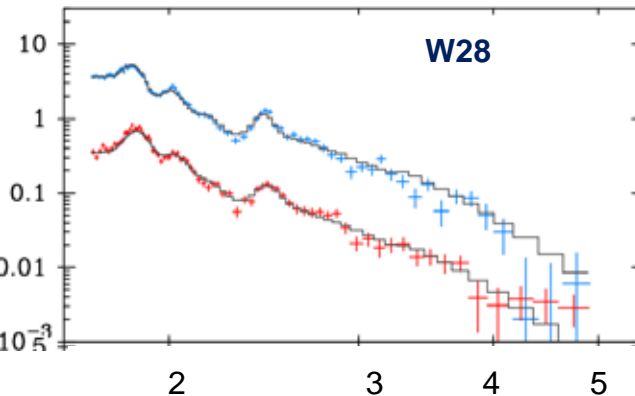
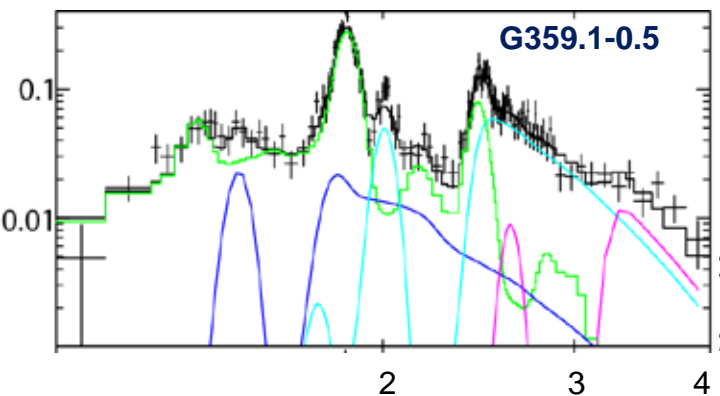
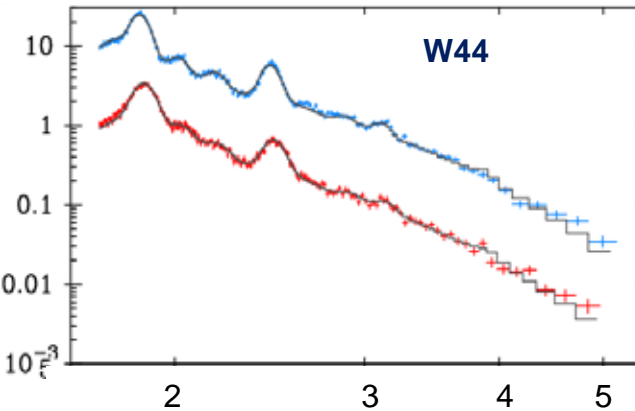
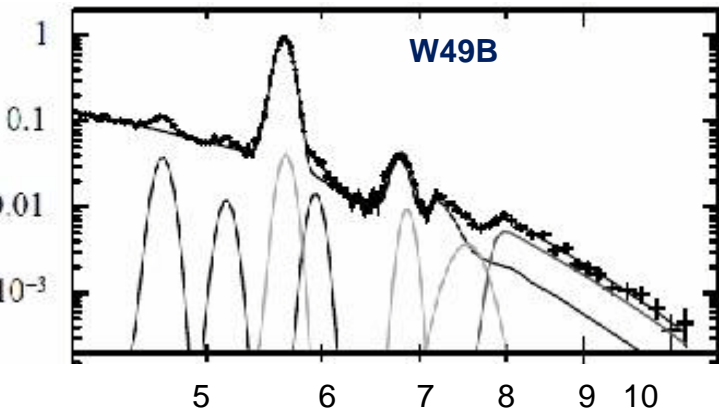
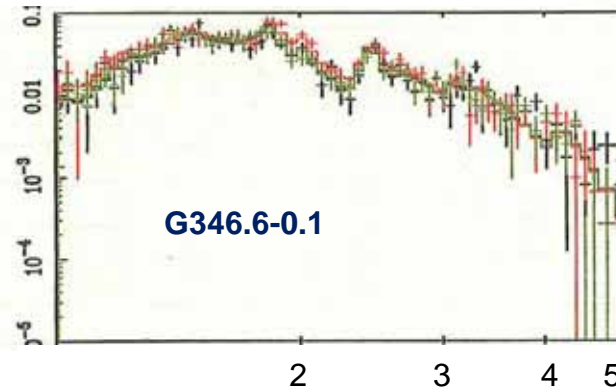
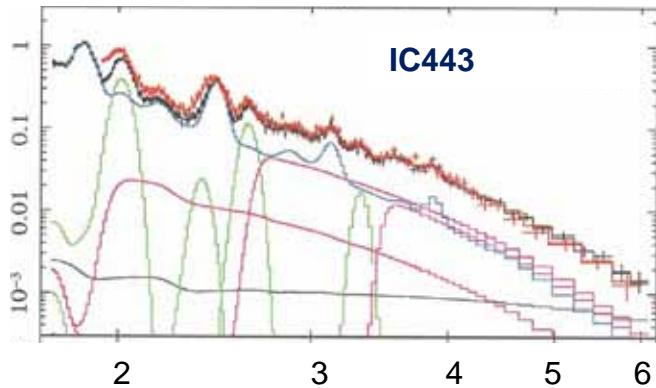


Early Report on the Spectral Survey of Mixed-Morphology SNRs with Suzaku

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List of MM-SNRs with over-ionized/recombining Plasma ($kT_e < kT_z$)



Possible Origin of Over-ionized /recombining Plasma

- (1) $kT_z > kT_e$ by **Photo-ionization** such as GRB/Afterglow: W49B
- (2) kT_e is cooled by **thermal conduction** to molecular clouds.
- (3) Explosion in a dense CSM (high kT CIE plasma)
 \rightarrow break-out to the ISM
 \rightarrow kT_e is cooled by **adiabatic expansion.**
- (4) **Ionization by supra /non-thermal electrons** (big solar flares: Over-ionized plasma + hard X-ray tail)