THE X-RAY SPECTRA OF TYCHO AND SN1006

K.Koyama
Institute of Space and Astronautical Science
Komaba 4-6-1 Meguro-ku, Tokyo, 153, Japan

The supernova remnants (SNR) SN1006 and Tycho are considered to be originating from type I supernovae (SN). Therefore one may expect a large amount of heavy elements, particularly iron, in the SNRs. In fact, our recent analysis of new data on the X-ray spectrum Tycho shows strong line emission associated with ionized silicon, sulfur and iron. This result contradicts the results of previous analyses which did not require an overabundance of iron.

Another puzzling has been the X-ray spectra and morphologies of Tycho and SN1006. In the case of SN1006, the spectrum between 1.5 - 20 keV is well-represented by a featureless power law. This spectrum is in sharp contrast to the X-ray emission from Tycho. If one compares the radio and X-ray emission from SN1006 with that from the Tycho, however, one finds very similar morphologies. We observed these two SNRs with the Tenma gas scintillation proportional counters (GSPC) in an attempt to better define the emission line features and the continuum of both the remnants in the X-ray spectral range 1.5-20 keV. We also attempted to resolve some of the confusion associated with these SNRs.

The resulting spectra are displayed in figure 1 along with the best-fit nonequilibrium ionization model spectra for a plasma which has t (sec) after the initial shock-heating to a single (constant) temperature (kT) and density (n). Both spectra can be well-expalined by similar parameter values; $nt=10^{10}$ $sec.cc^{-3}$, kT=2.1 keV. The abundances of heavy elements (Si - Fe) for Tycho are about 10 times solar values, while those for SN1006 are consistent with solar values.

A possible explanation of the difference in abundances between Tycho and SN1006 is that the X-ray emission of Tycho may come from the ejecta(reverse shock) and that of SN1006 may come from the interstellar matter (blast wave).

Fig.1

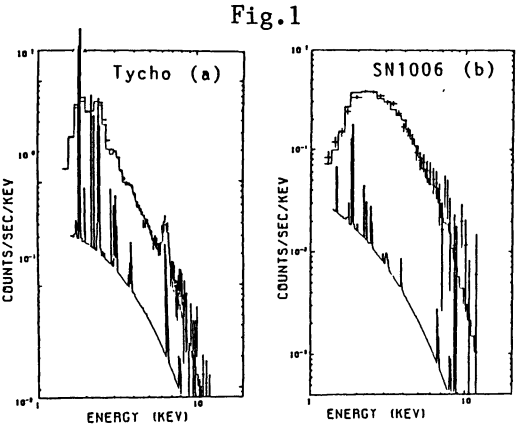

Figure 1
The energy spectra of Tycho (a) and SN1006 (b) along with the best-fit model of a thin thermal plasma in an ionizing state.

References
Koyama,K.,Tsunemi,H,Becker,R.,Hughes,J.P.1986 submitted to P.A.S.J.
Tsunemi,H., Yamashita,K., Masai,K., Hayakawa,S., and Koyama,K. 1986, Ap. J., in press.

D. J. Helfand and J.-H. Huang (eds.), The Origin and Evolution of Neutron Stars, 128.