

High Energy Astrophysics

Balloon X-ray Astronomical Observations: a China-Japan Collaborative Transoceanic Flight

Heng-Rong Hang, Zhi-Yun Zang, Shan-Zhao Liu, Gui-Qing Ma and I-Zhong Gong, *Purple Mountain Observatory, Academia Sinica, Nanjing, China*
 Takamasa Yamagami, *Institute of Space and Astronautical Science, Tokyo, Japan*
 Michio Nakagawa, *Osaka City University, Osaka, Japan*

Abstract: A China-Japan X-ray balloon flight took place in 1988 August. Preliminary results are presented for the energy spectrum of Cyg X-1.

A China-Japan collaborative transoceanic flight took place on 1988 August 23. The balloon (B50-C6) for X-ray astronomical observations took off at Kagoshima in Japan, flew at a height of 34.7 km and landed at Jangsu in China. The whole flight took about 15 hours.

The balloon-borne detector is a 570 cm² window pressurised proportional counter. The interior size is 490 × 178 × 150 mm³. The window is made of 0.5 mm aluminium foil. The counter is filled with a gas mixture of 95% Xe and 5% CO₂ at a total

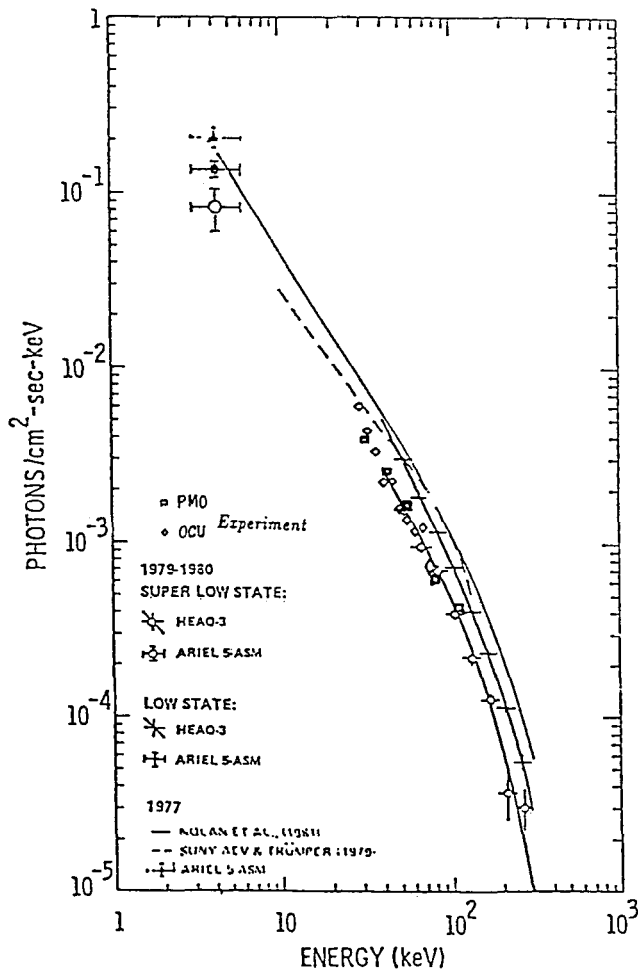


Figure 2 – Energy spectrum of Cygnus X-1

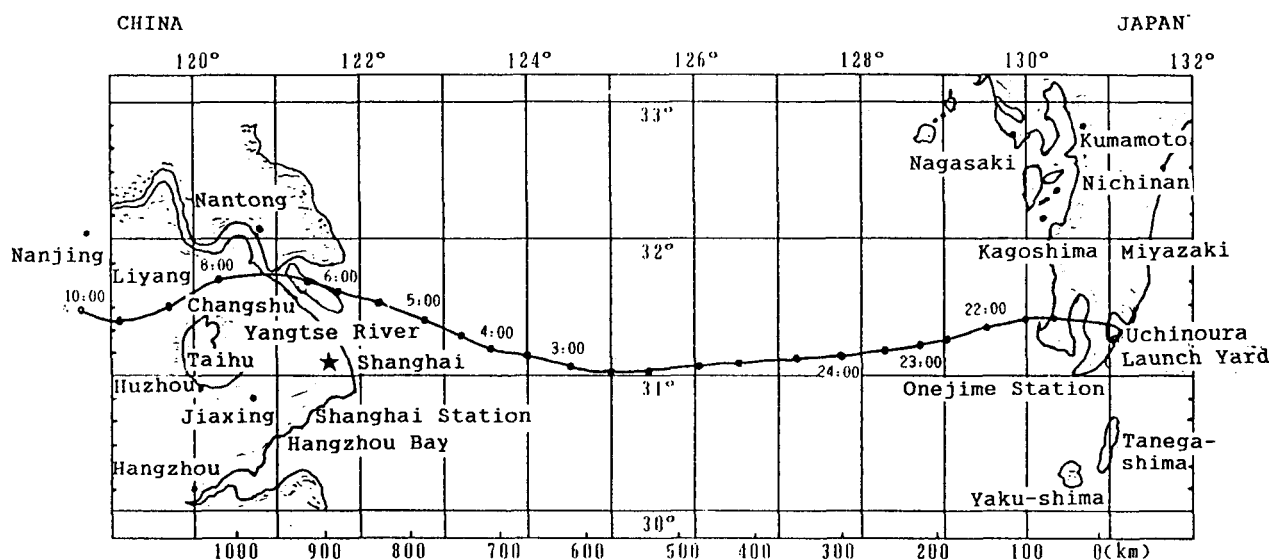


Figure 1 – Flight-path of the balloon

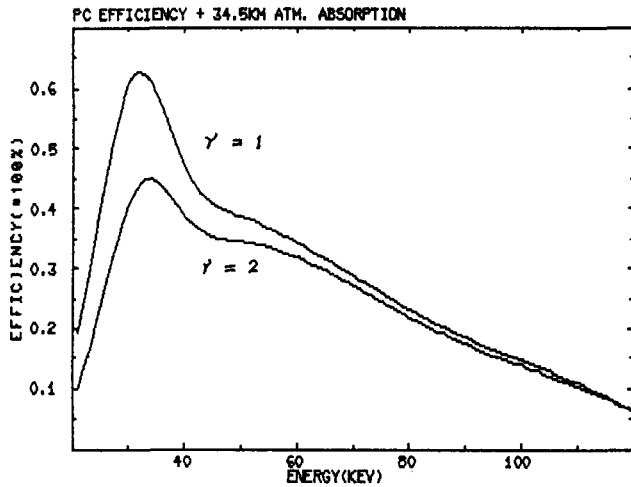


Figure 3 – Efficiency of the detector

pressure of 2.5 atm. The field of view is 11° by 28° FWHM. The energy range is 25–120 keV and energy resolution is 17% at 59 keV.

The size of the gondola is $1820 \times 790 \times 700 \text{ mm}^3$, its total weight is about 256 kg, excluding ballast. Payloads comprise the detector, azimuth mounting, attitude control system, telemetry transmitter, telecommand receiver and batteries. There are two rotating axes, i.e., horizontal and vertical. The pointing accuracy is 0.1° .

We observed the binary X-ray source Cyg X-1 and two other sources for about seven hours. The preliminary analysis shows that Cyg X-1 has sometimes a quasi-period of 21 seconds and was in the super-low state of its energy spectrum during the time of observation.

In addition, two NaI (T1) scintillation counters with effective area 125 cm^2 (belonging to Osaka City University) are also mounted on the gondola. But in this case the zenith angle of the counters is fixed (4°) for observation of Cyg X-1.

Figures 1–3 show the flight path of the balloon, the energy spectrum of Cyg X-1, and the efficiency of the proportional detector