The NEXXUS database
X-ray properties of nearby stars

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Abstract
We compiled the NEXXUS database of Nearby X-ray and UV-emitting stars. This is an X-ray equivalent to the CNS4 catalog of nearby stars. It contains the X-ray data of all stars within a distance of 25 pc. It was constructed using ROSAT data from the final all-sky survey and pointing catalogs and we began recently to also include data from the XMM-Newton Source Catalog. This large number of sample stars (>1300 detections) proves to be a powerful tool to investigate the X-ray properties of the solar neighbourhood. We constructed volume-limited samples of F/G- stars, K-stars, and M-stars with detection rates greater than 90%. The analysis of these samples shows that the mean X-ray luminosity decreases for later spectral types, while the X-ray surface flux distribution appears to be independent of spectral type with a lower limit corresponding to the flux level of solar coronal holes.

The data base
We searched for positional coincidences of the stars listed in the CNS4 and the X-ray sources from the ROSAT X-ray source catalogs. The results, including detailed information about the star itself and the associated X-ray source(s), were gathered in the NEXXUS data base. The NEXXUS data base is accessible via www. at http://www.hs.uni-hamburg.de/DE/For/Gal/Gruppen/nexxus

Volume-limited samples
To compare the X-ray properties of stars of different spectral types, we sort the stars to their groups based on their absolute magnitude. These groups, with 3.0 ≤ M_V ≤ 5.8, 5.8 < M_V ≤ 8.5, and M_V > 8.5 correspond approximately to the spectral types F or G, K, and M respectively. We also considered only the very nearest stars for which almost complete detections are available and excluded white dwarfs and giants.

Within a distance of 12 pc all stars of the F/G sample have been detected, up to 14 pc the detection rate is still 94%. For the K stars we find a detection rate of 96% when considering stars up to 12 pc, the M star sample had to be truncated above 6 pc to obtain 91%.

In Fig. 2 we plot the X-ray luminosity L_X (in erg/s) computed from count rate and distance of the star as a function of distance for the three samples. The absence of solar-like stars with X-ray luminosities of 10^{34} erg/s and below is conspicuous.

This becomes even clearer in a plot of X-ray luminosity as a function of the absolute magnitude as done in Fig. 3. Furthermore L_X appears to decrease with M_V. By converting the X-ray luminosity to a mean surface flux F_X this turns out to be a scaling effect resulting in the different sizes of the stars. The mean surface flux distribution of the three samples shows little difference and the lower envelope of the distribution at F_X = 10^{33} erg/cm^2/sec is the X-ray flux level observed in solar coronal holes.

Further development and outlook
NEXXUS will be kept up-to-date and is not limited to ROSAT data only. New stars discovered in the solar vicinity will be added as well as data from the current X-ray observatories Chandra and XMM-Newton. The first XMM-Newton Serendipitous Source Catalogue has already been included.

References