

- **nsa: neutron star atmosphere**

This model provides the spectra in the X-ray range (0.05-10 keV) emitted from a hydrogen atmosphere of a neutron star. There are three options : nonmagnetized ($B < 10^8 - 10^9$ G) with a uniform surface (effective) temperature in the range of $\log T_{eff}(K) = 5.0 - 7.0$; a field $B = 10^{12}$ G with a uniform surface (effective) temperature in the range of $\log T_{eff}(K) = 5.5 - 6.8$; a field $B = 10^{13}$ G with a uniform surface (effective) temperature in the range of $\log T_{eff}(K) = 5.5 - 6.8$. The atmosphere is in radiative and hydrostatic equilibrium; sources of heat are well below the atmosphere. The Comptonization effects (significant at $T_{eff} > 3 \times 10^6$ K) are taken into account. The model spectra are provided as seen by a distant observer, with allowance for the GR effects. The user is advised to keep M_{ns} and R_{ns} fixed and fit the temperature and the normalization. MagField must be fixed at one of 0, 10^{12} , or 10^{13} .

The values of the effective temperature and radius as measured by a distant observer ("values at infinity") are :

$$T_{eff}^{\infty} = T_{eff} g_r$$

$$R_{ns}^{\infty} = R_{ns} / g_r$$

where

$$g_r = \left(1 - 2.952 \frac{M_{ns}}{R_{ns}} \right)^{1/2}$$

is the gravitational redshift parameter.

Please send your comments/questions to Slava Zavlin (VYACHESLAV.ZAVLIN@msfc.nasa.gov) and/or George Pavlov (pavlov@astro.psu.edu). If you publish results obtained using these models, please reference Zavlin, V.E., Pavlov, G.G., & Shibarov, Yu.A. 1996, A&A, 315, 141 for nonmagnetic models, and Pavlov, G.G., Shibarov, Yu.A., Zavlin, V.E., & Meyer, R.D. 1995, in "The Lives of the Neutron Stars," ed. M.A. Alpar, U. Kiziloglu, & J. van Paradijs (NATO ASI Ser. C, 450; Dordrecht: Kluwer), p. 71 for magnetic models.

par1	$\log T_{eff}$, (unredshifted) effective temperature
par2	M_{ns} , neutron star gravitational mass (in units of solar mass)
par3	R_{ns} , neutron star radius (in km)
par4	neutron star magnetic field strength (0, $1e12$, or $1e13$ G)
K	$1/D^2$, where D is the distance of the object in pc.

