

- **hrefl: reflection model**

A simple multiplicative reflection model due to Tahir Yaqoob. This model gives the reflected X-ray spectrum from a cold, optically thick, circular slab with inner and outer radii (R_i & R_o , respectively) illuminated by a point source a height H above the center of the slab. The main difference between this model and other reflection models is that analytic approximations are used for the Chandrasekar H functions (and their integrals) and ELASTIC SCATTERING is assumed (see Basko 1978, ApJ, 223, 268). The elastic-scattering approximation means that the model is ONLY VALID UP TO ≈ 15 keV in the source frame. Future enhancements will include fudge factors that will allow extension up to 100 keV. The fact that no integration is involved at any point makes the routine very fast and particularly suitable for generating error contours, especially when fitting a large number of data channels. The model is multiplicative, and so can be used with ANY incident continuum.

Parameters are as follows:

par1	minimum angle (degrees) between source photons incident on the slab and the slab normal $\left[= \tan^{-1}(R_i/H) \right]$
par2	maximum angle (degrees) between source photons incident on the slab and the slab normal $\left[= \tan^{-1}(R_o/H) \right]$
par3	Angle (degrees) between the observer's line of sight and the slab normal.
par4	Iron abundance relative to Solar
par5	Iron K-edge energy
par6	Fraction of the direct flux seen by the observer
par7	Normalization of the reflected continuum
par8	redshift

Suppose the incident photon spectrum is $N(E)$ photons $\text{cm}^{-2}\text{s}^{-1}\text{keV}^{-1}$ and that the incident continuum is steady in time, and suppose further that the reflected continuum from the slab is $R(E)$. When you multiply the incident spectrum with hrefl, what you actually get is the following:

$$M(E) = \text{par6} \cdot N(E) + \text{par7} \cdot R(E)$$

Thus, the actual physical situation described above corresponds to

par6=1.0
par7 =1.0.

You may decide to float par6 and/or par7. In that case, you must decide what the best-fitting values of these parameters mean physically for your case. It may imply time-lags between the direct and reflected components, different source and/or disk geometries to those assumed, or something else.