中国科学院新疆天文台
XINJIANG ASTRONOMICAL OBSERVATORY, CAS

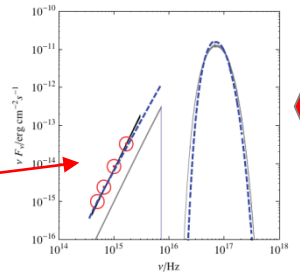
Spectral energy distributions of isolated neutron stars

H. Tong (tonghao@xao.ac.cn, Xinjiang Astronomical Observatory)
R. X. Xu (r.x.xu@pku.edu.cn, Peking University)

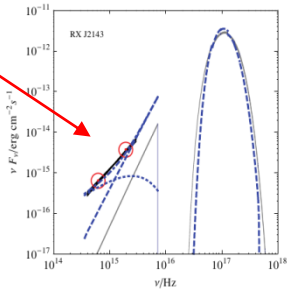
Objects: X-ray dim isolated neutron stars (XDINSs). They are nearby, thermally emitting isolated neutron stars. They have very well thermal spectrum in the X-ray band. Optical/UV observations show that they all have an optical/UV excess.

Things we've done: We build a magnetospheric model for the optical/UV excess of XDINSs. In our model, their X-ray emissions are thermal emissions from the whole neutron star surface. When the X-rays pass through the magnetosphere, it will be scattered by the electrons there. For the scattering in strong magnetic field, it is called resonant cyclotron scattering (RCS). Down scattering of RCS process is responsible for the optical/UV excess of XDINSs. We model the RCS process using the photon diffusion equation method (Kompaneets euqation).

Results:



Spectral energy distributions of RX J1856.5-3754 and the RCS model calculations. The gray region is the X-ray blackbody and its extrapolation to the optical and UV range. The red region is the power law fit to the optical and UV data. The red circles are observational data points, only central values are included. The dashed line is from the RCS model calculations.



Spectral energy distributions of RX J2143.0+0645. It may contain contributions from the bremsstrahlung component of the electron system (dotted line). This will result in a flat optical/UV spectrum.

References:
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4. **Tong, H., Xu. R. X.**, Song, L. M., 2011, RAA, 11, 1371