Contribution ID: **100** Type: **Oral Presentation**

X-ray emission from magnetized rotation-powered pulsars

Monday 30 March 2020 15:30 (15 minutes)

We present recent X-ray timing and spectral results on isolated pulsars, including the X-ray and radio mode switching PSR B0943+10, and PSR J0726-2612, which is an old radio pulsar sharing several of the properties of the XDINSs. Our analysis properly accounts for the effects of the (relatively) high magnetic field on the surface emission properties.

Previous studies of PSR B0943+10 showed that its X-ray flux consists of an unpulsed nonthermal plus a pulsed thermal component arising from a hot spot. We reanalyzed all the available X-ray observations, fitting the thermal component with appropriate models of magnetized hydrogen atmospheres as well as with models of condensed surfaces. We could successfully reproduce its spectral and timing properties, in particular the large pulsed fraction, with a geometry consistent with the radio observations. The derived emitting area and magnetic field are in agreement with the values inferred in the dipole approximation and we discussed these results in the broader context of the polar cap accelerator models in old pulsars.

PSR J0726-2612 is a highly magnetized (B=3x10ˆ13 G) slowly rotating pulsar (P=3.4 s), with a thermal X-ray spectrum and a double-peaked asymmetric pulse profile. The results of our spectral and timing analysis based on magnetized atmosphere models strengthen the similarity between PSR J0726-2612 and the XDINSs and support the possibility that the lack of radio emission from the latter might simply be due to an unfavourable viewing geometry.

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Session Classification: Parallel 2B

Track Classification: Observations and Surveys