Space Science Seminar
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X rays From Magnetic B-type Stars

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Host: Adam Goldstein (Sponsored by USRA)

Recent spectropolarimetric advancements and surveys such as MIMES and BOB have found that about 10% of OB-type stars host strong (~kG), mostly dipolar magnetic fields. The prominent idea describing the interaction between the stellar wind and the magnetic field is the magnetically confined wind shock model. For regions close to the photosphere, the stellar wind is forced to flow along the magnetic field loop from the surface footpoints until it collides with the wind from the opposite footpoint at the magnetic equator creating a shock. As the shocked material cools radiatively, it will emit X-ray photons. Therefore, X-ray spectroscopy is a key tool in detecting and characterizing the magnetically confined wind material of these stars.   A recent study of known magnetic OB-type stars with modern X-ray observations found a group of stars that have a higher observed X-ray luminosity than predicted. We explore the possible reasons for this "overluminous" region in detail. Most of the stars in this region have rotational periods that could be dynamically significant (~days). Therefore, we adapt previous models developed for slow rotators to include centrifugal physics and determine the effects of the rapid rotation on the X-ray production within the magnetosphere. The added centrifugal force is predicted to cause faster wind outflows along the field lines that will change the shock conditions and therefore the X-ray luminosity. On the other hand, one of the overluminous stars, Tau Sco, is a slow rotator that has been found to host a magnetic field with higher multipole components. We, therefore, delve into how the assumption of a dipolar field affects the predicted X-ray luminosity through a detailed look at shock conditions along extrapolated field loops.

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