

Abstract Submitted
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Holistic Framework for Understanding the Evolution of Stellar Coronal Plasmas¹ ERIC BLACKMAN, University of Rochester , JAMES OWEN, Institute for Advanced Study (Princeton) — Understanding how the coronal X-ray activity of stars depends on magnetic field strength, dynamos, rotation, mass loss and age is of interest not only for the basic plasma physics of stars, but also for stellar age determination and implications for habitability. Approximate relations between field strength, activity, spin down, mass loss and age have been measured, but remain to be understood theoretically. The saturation of plasma activity of the fastest rotators and the decoupling of spin-down from magnetic field strengths for slow rotators are particular puzzles. To explain the observed trends, I discuss our minimalist holistic theoretical framework that combines a Parker wind with (i) magnetic dynamo sourcing of thermal energy, wind energy and x-ray luminosity (ii) dynamo saturation based on magnetic helicity conservation and shear-induced eddy shredding and (iii) coronal equilibrium to determine how the magnetic energy divides into wind, x-ray, and thermal conduction sinks. We find conduction to be important for older stars where it can reduce the efficacy of wind angular momentum loss, offering an alternative explanation of this trend to those which require dynamo transitions. Overall, the framework shows promise and provides opportunity for further

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