Abstract Submitted
for the CUWIP21 Meeting of
The American Physical Society

X-ray Evidence of a Stellar Wind Mass-Loss Rate Increase in the O Supergiant ζ Puppis over 18 Years[1] JIAMING WANG, Swarthmore College — During 2018 and 2019, NASA's *Chandra X-ray Observaotry* carried out a set of observations on ζ Pup, a hot and luminous star that is classified as an O supergiant. The observations supplement data acquired in 2000 and motivate analysis on the long-term variations in ζ Pup's stellar wind properties. In stars like ζ Pup, hot X-ray emitting plasma is distributed throughout a colder X-ray absorbing stellar wind. Emission lines from the hot plasma are Doppler-broadened due to the high wind speeds and are made asymmetric by absorption. Fitting 10 strong X-ray emission lines with a line profile model that incorporates those wind properties, we find a stellar mass-loss rate of $2.47 \pm 0.09 \times 10^{-6} \mathrm{M}_{\odot}$ yr^{-1}, which represents a 40 percent increase since 2000. This surprising result is also accompanied by a 13 percent increase in X-ray emission flux. Because the result is unexpected, we supplement the model fitting with a non-parametric analysis and also with Gaussian fitting to confirm the changes in the emission line profile properties.

[1]We would like to thank the Provost Office of Swarthmore College for funding and support.

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Date submitted: 04 Jan 2021 Electronic form version 1.4