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Magnetic field and accretion in EX Lup

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Abstract. While the Sun is a quiet and well-balanced star now, during its first few million years it possessed a strong magnetic field and actively accreted material from its circumstellar environment. Theoretical models predict that under certain circumstances the interaction of a strongly magnetic star and its circumstellar disk may lead to short bursts of increased accretion onto the star (D'Angelo & Spruit 2012). Examples for this phenomenon may be the members of a group of young eruptive stars called EXors. Their prototype, EX Lup, had its historically largest outburst in 2008. Spectroscopic evidence suggests that the mass accretion proceeds through the same magnetospheric accretion channels both in quiescence and in outburst but with different mass flux (Sicilia-Aguilar *et al.* 2012). To characterize for the first time EX Lup's magnetic field, we obtained spectropolarimetric monitoring for it with the CFHT/ESPaDOnS. We detected strong, poloidal magnetic field with a prominent cool polar cap and an accretion spot above it. We compared our results with numerical simulations, in order to check the applicability of the d'Angelo & Spruit model as an explanation of EX Lup's accretion outbursts. If EX Lup is a good proxy for the proto-Sun, similar magnetic field-disk interactions and outbursts might have happened during the early evolution of the Solar System as well.

References

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