

A sudden change of the global magnetic field of the active M-dwarf AD Leo



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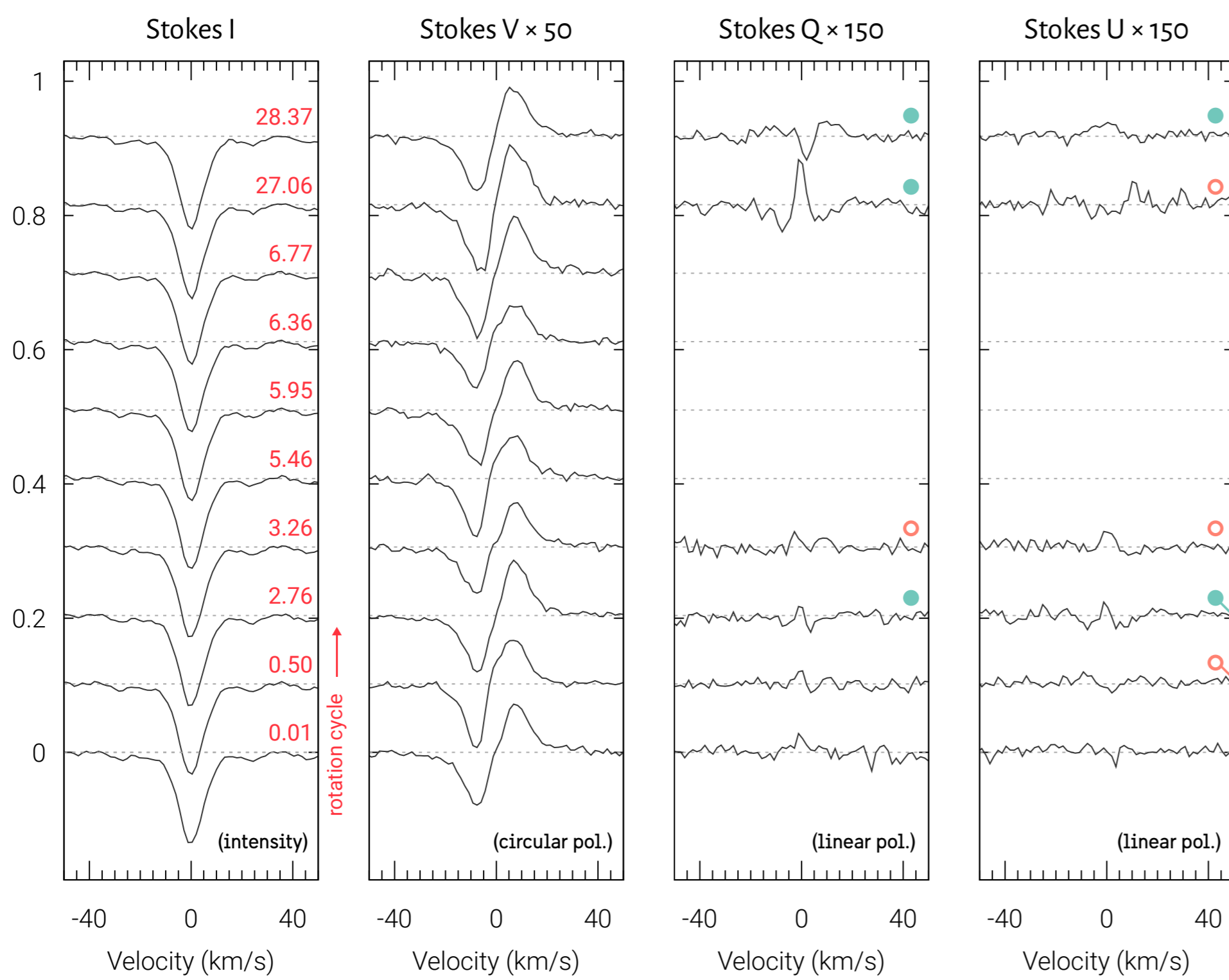
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Online augmented poster at:
<http://alex.is/posters/cs20/>

2016



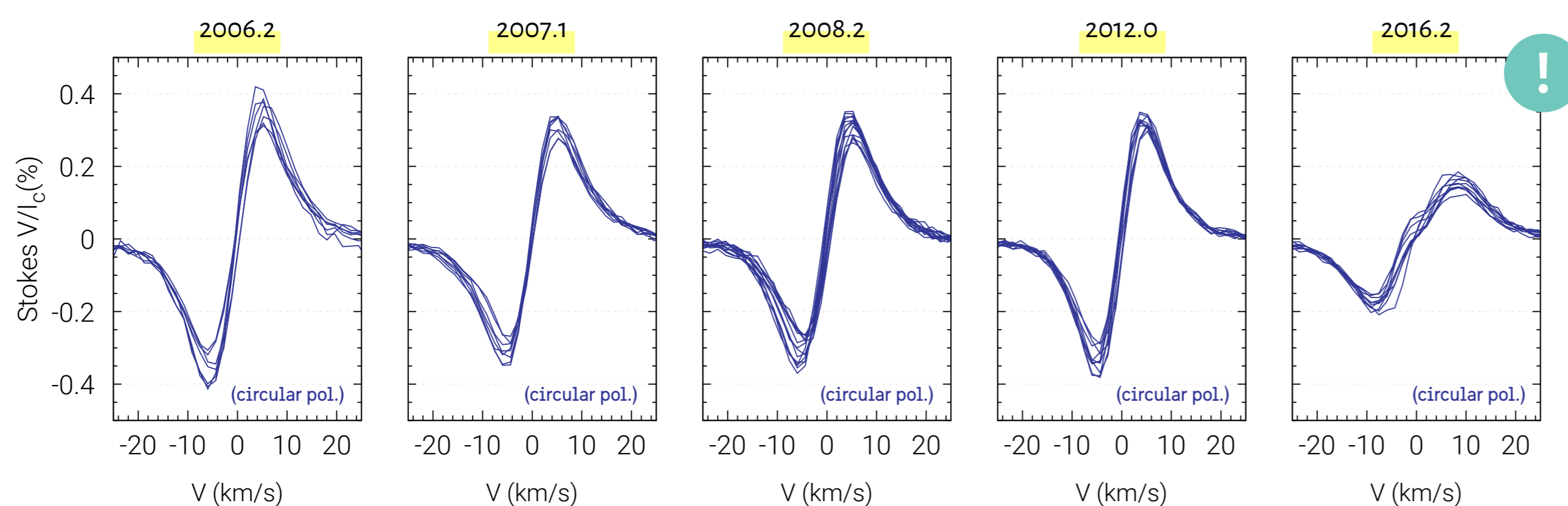
We acquired high-resolution high-SNR full Stokes vector observations of AD Leo with the ESPaDOnS@CFHT spectropolarimeter in 2016. Our goal: to detect linear polarisation in spectral lines.

We used a multi-line technique (Least Square Deconvolution, LSD) to combine the signal from 1000+ atomic lines. The LSD profiles are plotted on the left (sorted by rotation cycle, indicated in red).

We did detect linear polarisation, albeit weaker than expected. **This is the first detection of linear polarisation in the spectral lines of an M dwarf though!**

definite detection
marginal detection

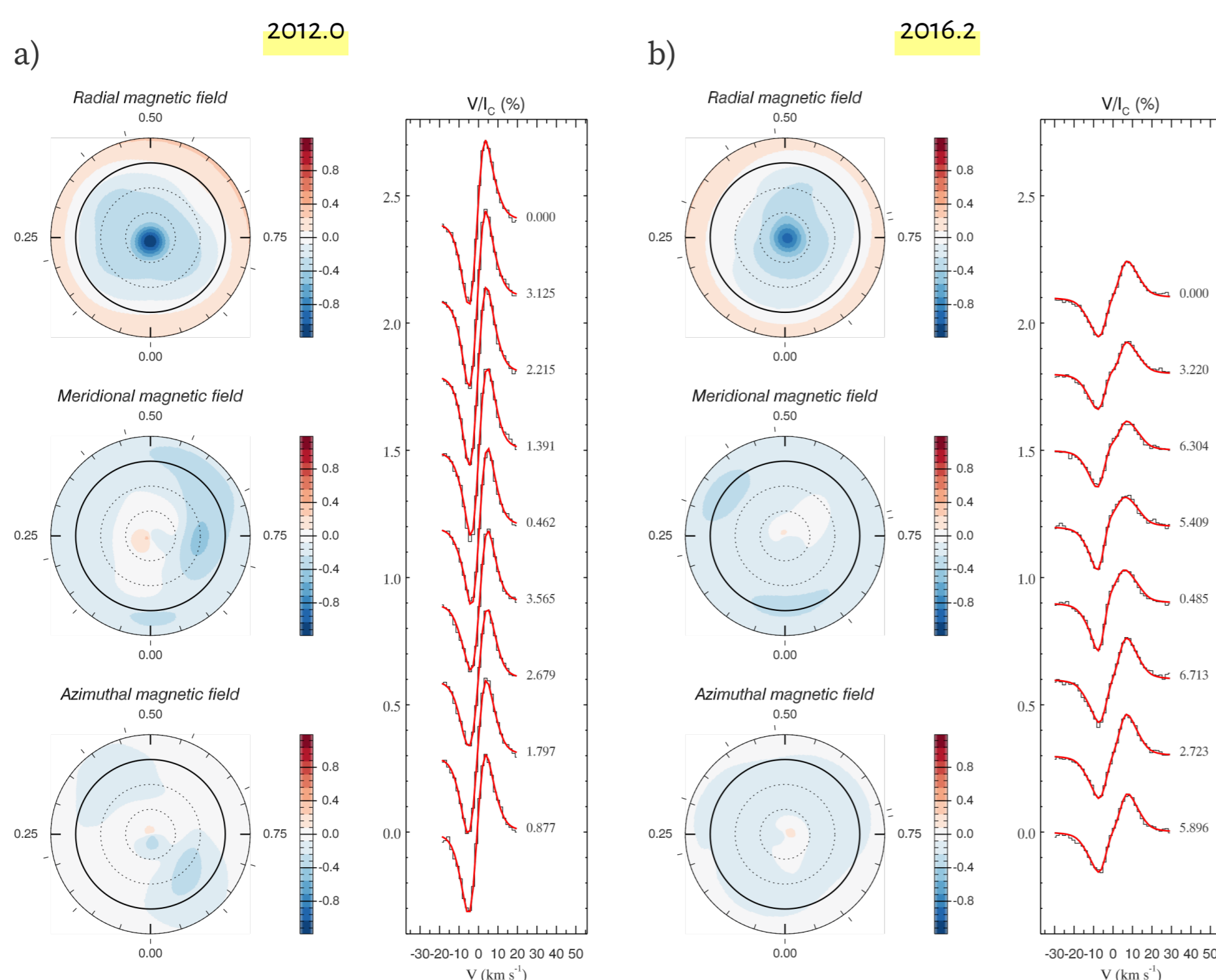
However... the circular polarisation (Stokes V) that used to be remarkably constant in all archival observations (2006-2012), was suddenly different in 2016!



see the previous study of AD Leo by Morin+ 2008 (2008MNRAS.390..567M)

Interested? Want to know more?

- ▶▶ find me (Alexis) and **let's have a chat** ☺
- ▶▶ read the paper [arXiv:1807.02346](#)
- ▶▶ tweet [@astro_alexis](#)
- ▶▶ mail alexis.lavail@physics.uu.se



We computed maps of the surface magnetic field for the 2012 and 2016 datasets using Zeeman Doppler Imaging (with Stokes V only). It seems that the magnetic field topology is mostly unchanged (axisymmetric dipole) but that **the magnetic field became concentrated into smaller structures** (magnetic filling factor decreased from 13% to 7%)

This is the first evidence that **an active M dwarf with dipole-dominated axisymmetric field topology can undergo a long-term global magnetic field evolution.**

We should really consider doing **long-term spectropolarimetric monitoring of M dwarfs** with the upcoming near-IR spectropolarimeters (CRIRES+ and SPIRou among others).