

# A quest for activity cycles in low-mass stars

K. Vida

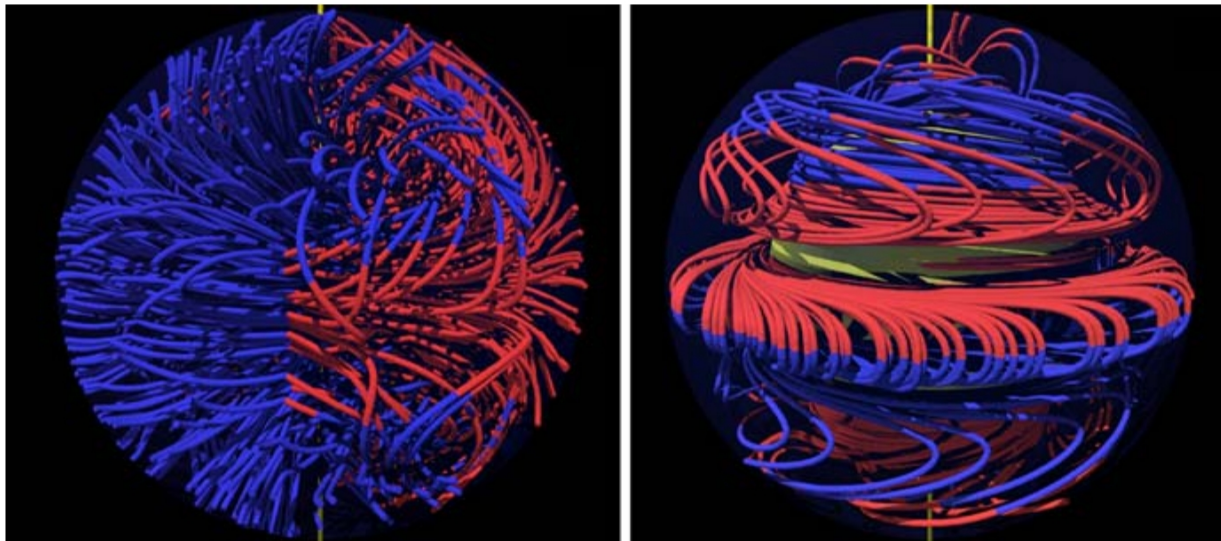
Konkoly Observatory



FIKUT 6, 2012  
Budapest

# Introduction

- Stars of different masses (interior structures) are supposed to have different kinds of magnetic dynamos
- Stars with masses like the Sun, are supposed to have activity cycles



$M < 0.35 M_{\odot}$

$0.35 M_{\odot} < M < 1.5 M_{\odot}$

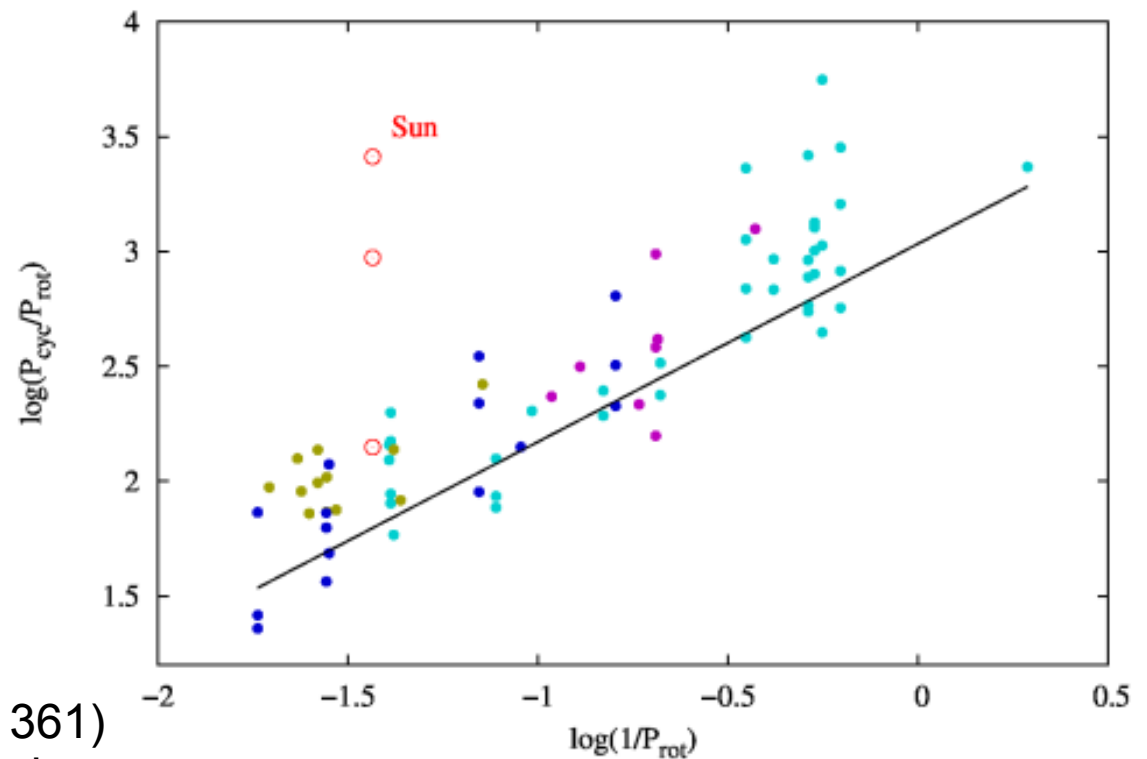
Strassmeier, 2009  
A&ARv 17, 251

Possibly an  
 $\alpha^2$ -dynamo

Solar-like  $\alpha\Omega$  or  
distributed  $\alpha^2\Omega$   
dynamo


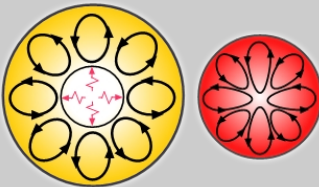

# Introduction

- Stars of different masses (interior structures) are supposed to have different kinds of magnetic dynamos
- Stars with masses like the Sun, are supposed to have activity cycles
- The length of the cycle seems to be connected with the rotation rate



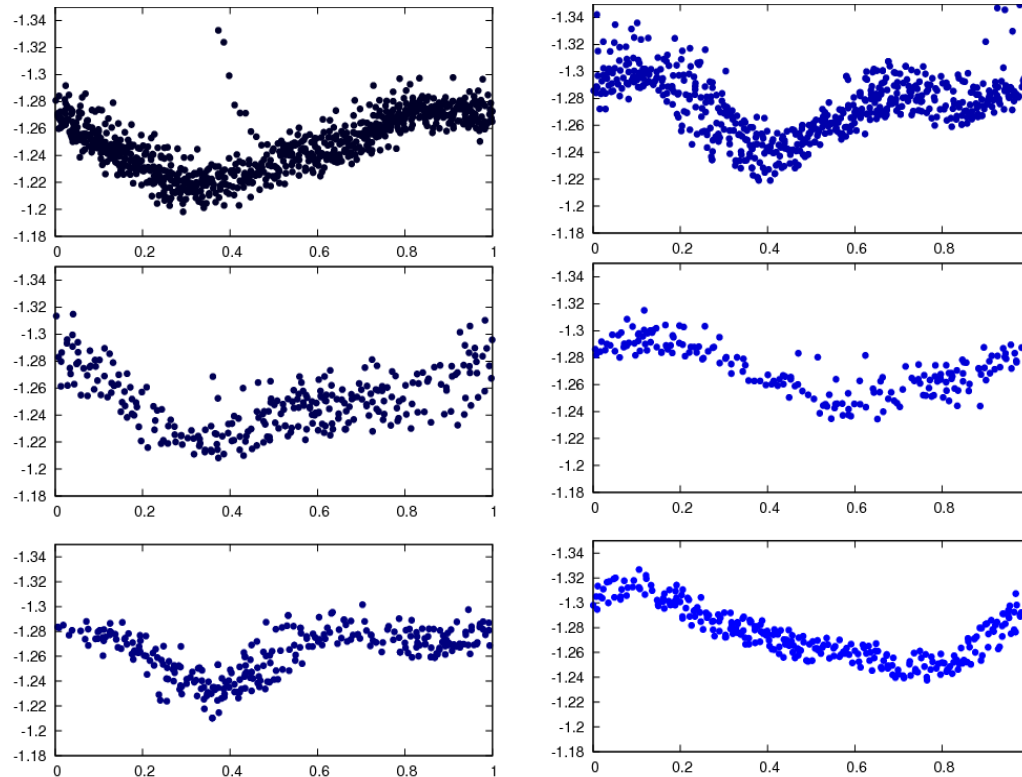
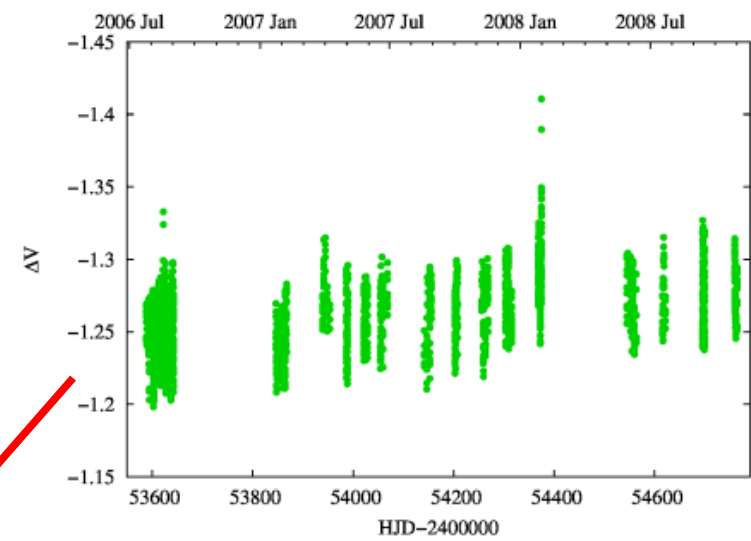
Oláh & Strassmeier (2002, AN, 323, 361)  
Fit is to the shortest activity cycles.

# The sample

	EY Dra	V405 And	GSC 3377-0296	V374 Peg
Spectral type	dM1-2	M0V+M5V	K3?	dM4
Binary	-	+	+	-
Mass(es)	$0.5M_{\text{Sun}}$	$0.49+0.21M_{\text{Sun}}$	?	$0.28M_{\text{Sun}}$
$P_{\text{rot}}$	0.459d	0.465d	0.422d	0.445d
Interior			?	

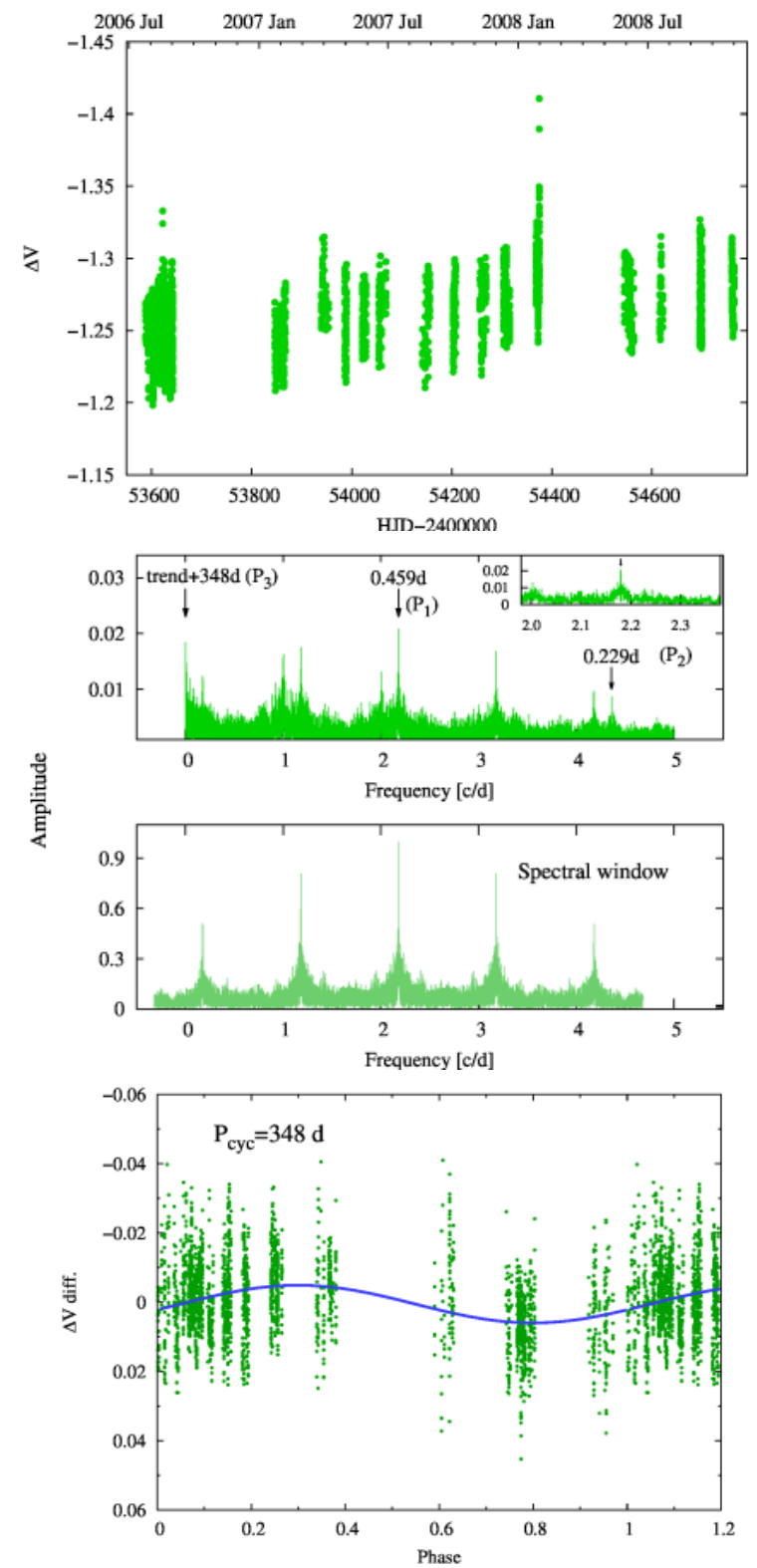
# EY Dra

- evolution of the light curve
- flip-flop effect



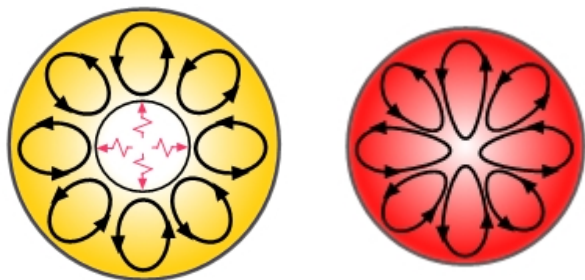
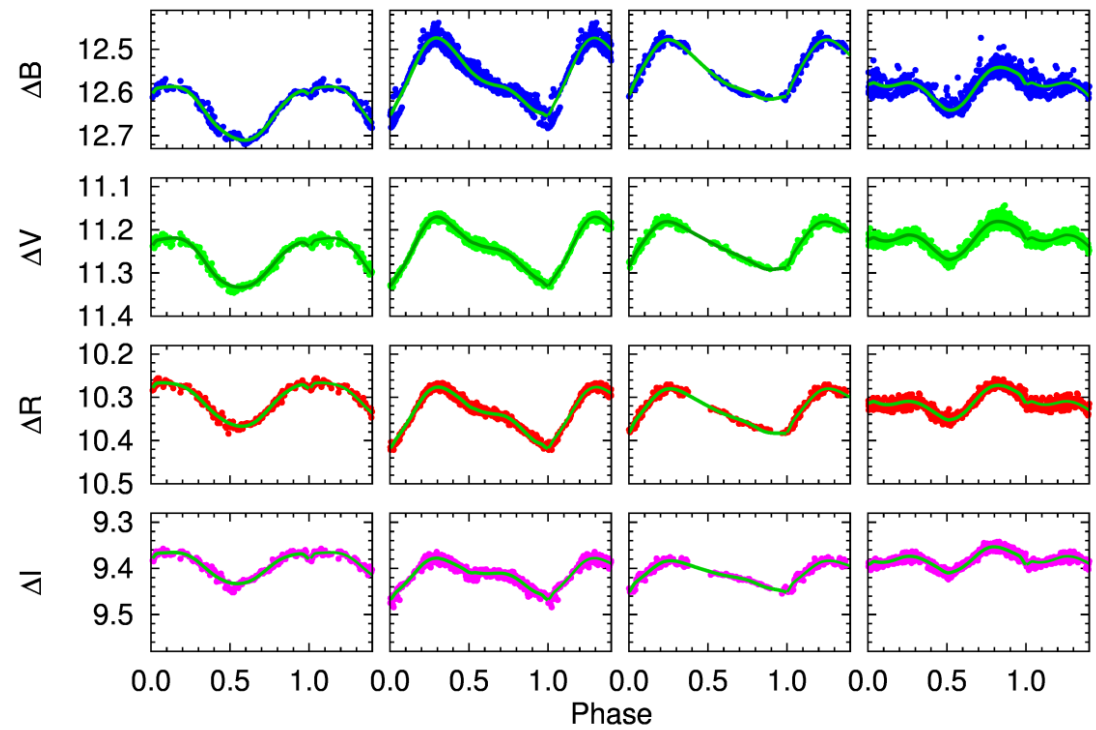
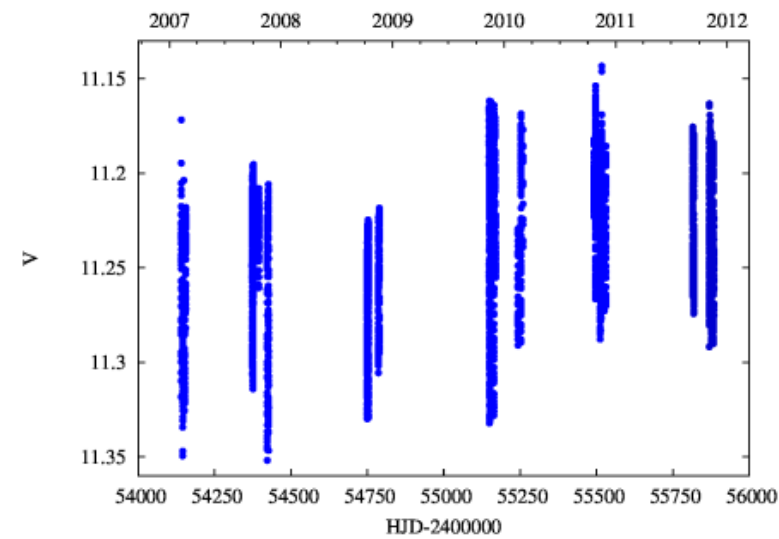
# EY Dra

- evolution of the light curve
- flip-flop effect
- a cycle of  $\sim 350$  days



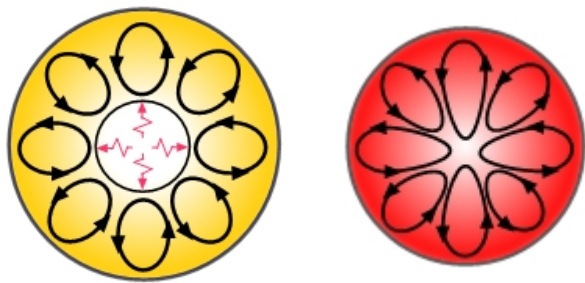
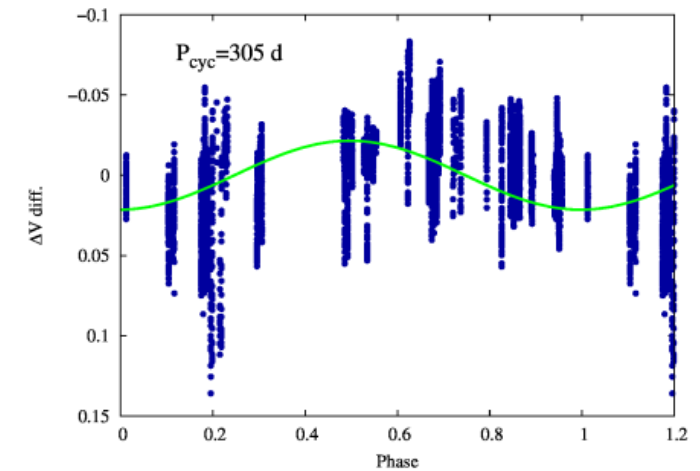
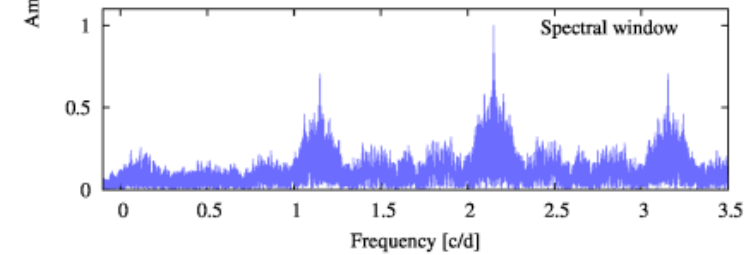
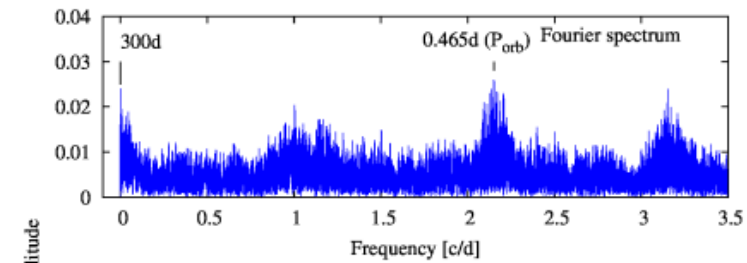
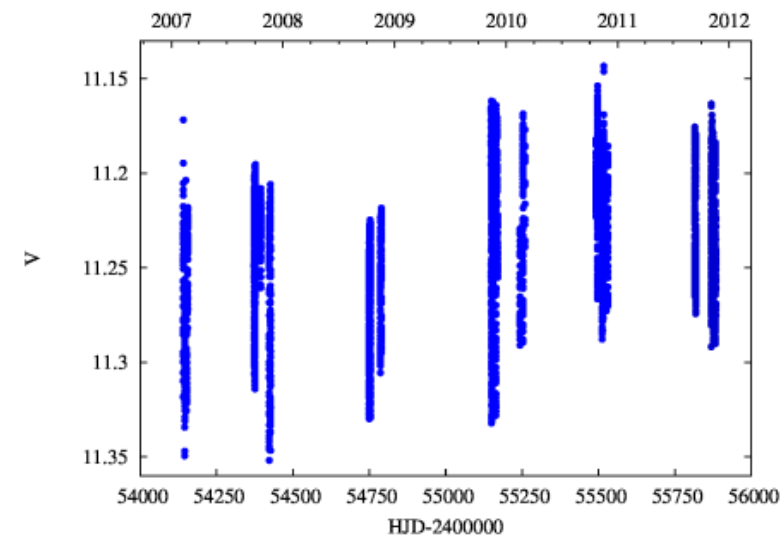
# V405 And

- grazing eclipsing binary
- slowly evolving light curve



# V405 And

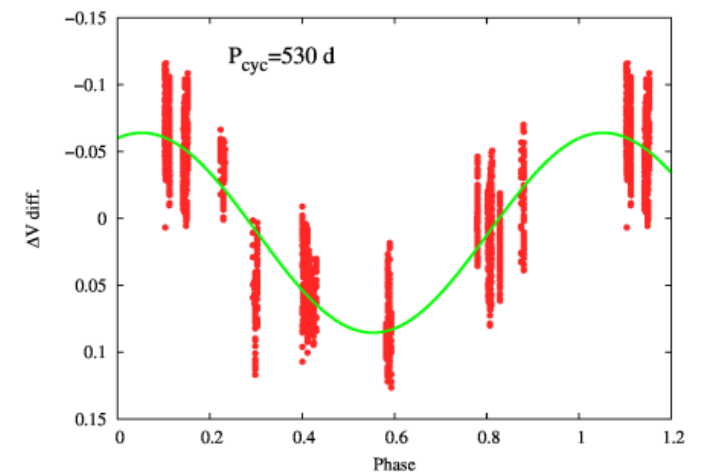
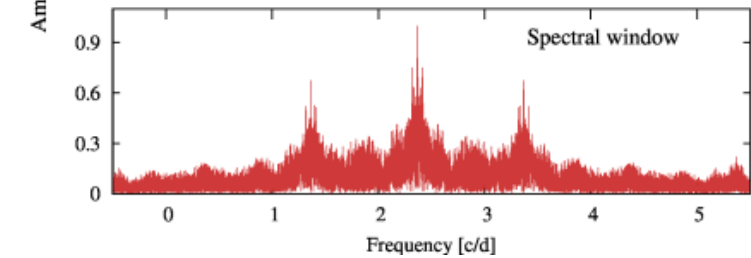
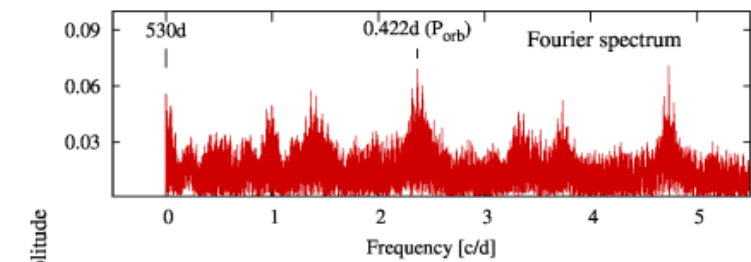
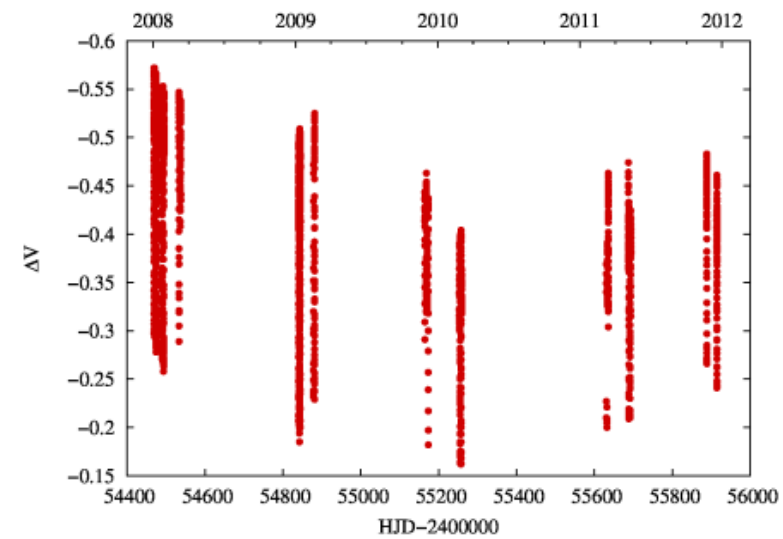
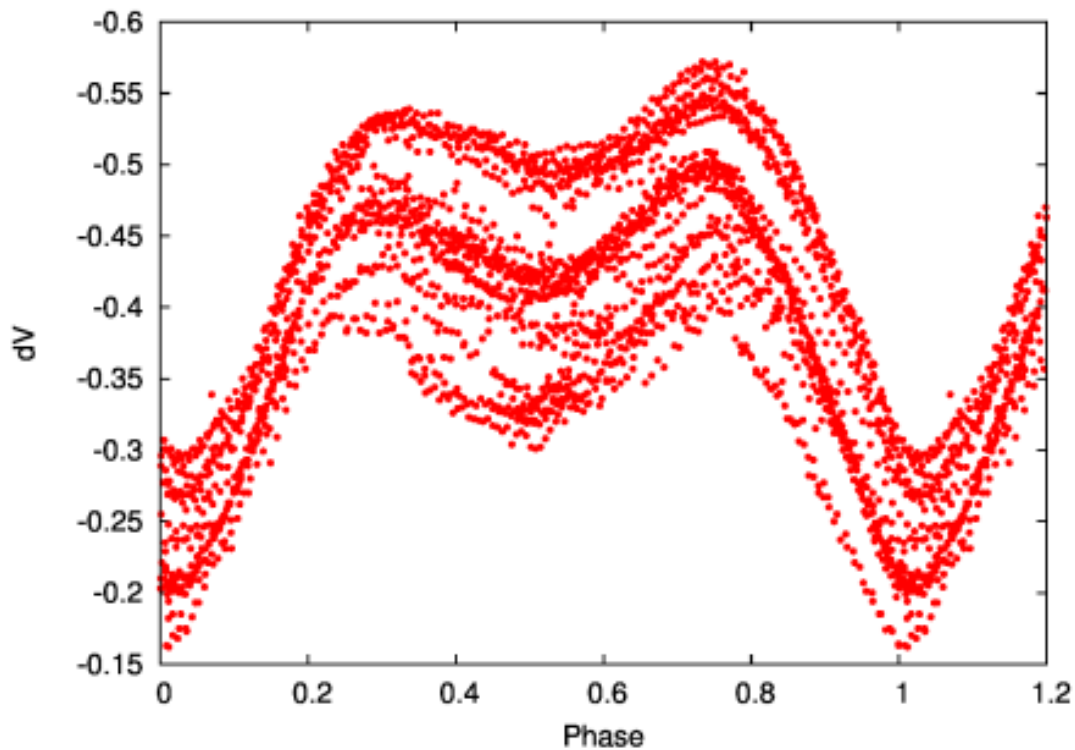
- grazing eclipsing binary
- slowly evolving light curve
- cycle of  $\sim 300$  days





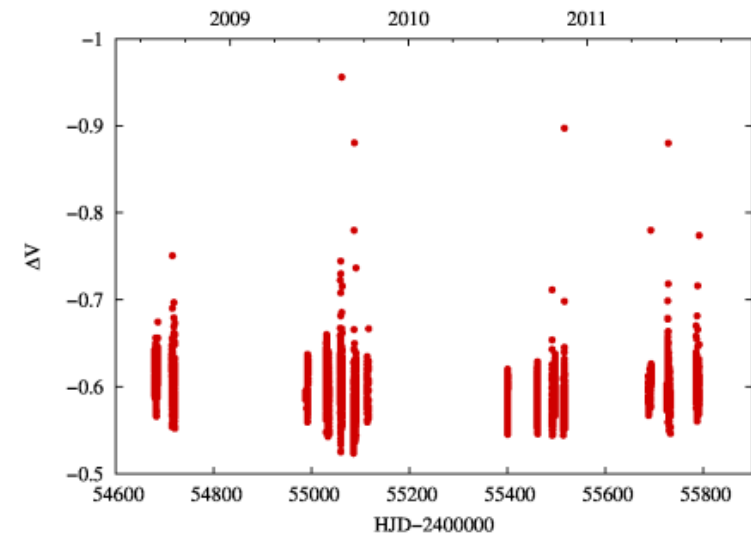
# GSC 3377-0296

- eclipsing binary with yet unknown parameters
- small evolution
- cycle of  $\sim 530$  days



# V374 Peg

- ZDI measurements  $\rightarrow$  poloidal, axisymmetric, stable magnetic field

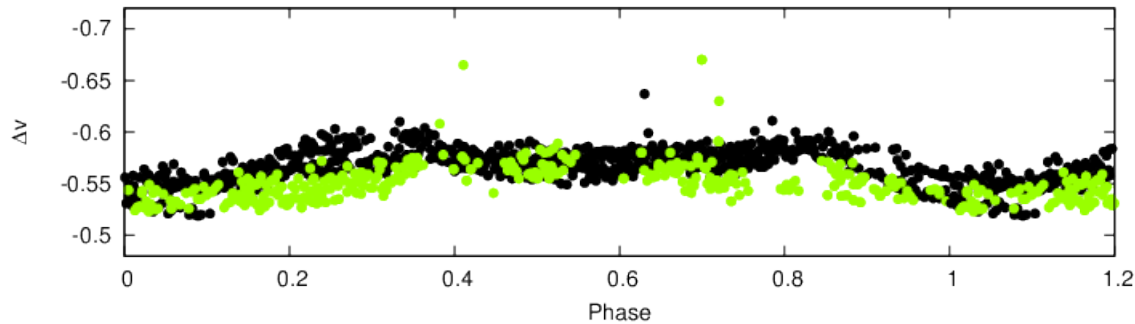
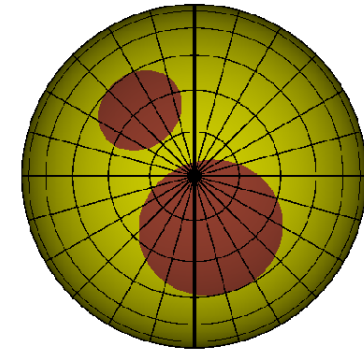
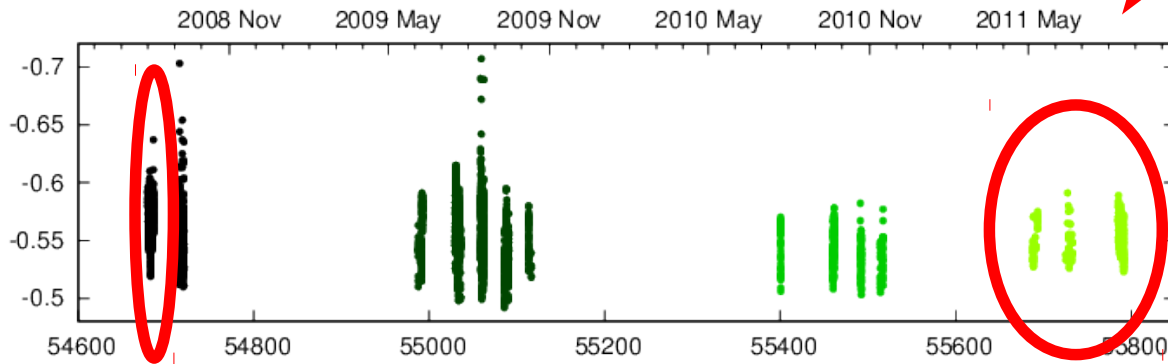
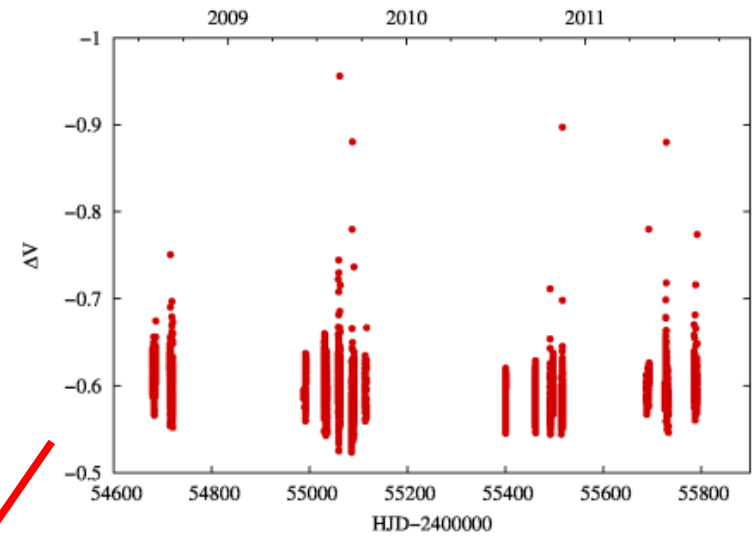


Donati et al. 2006,  
Sci, 311, 633



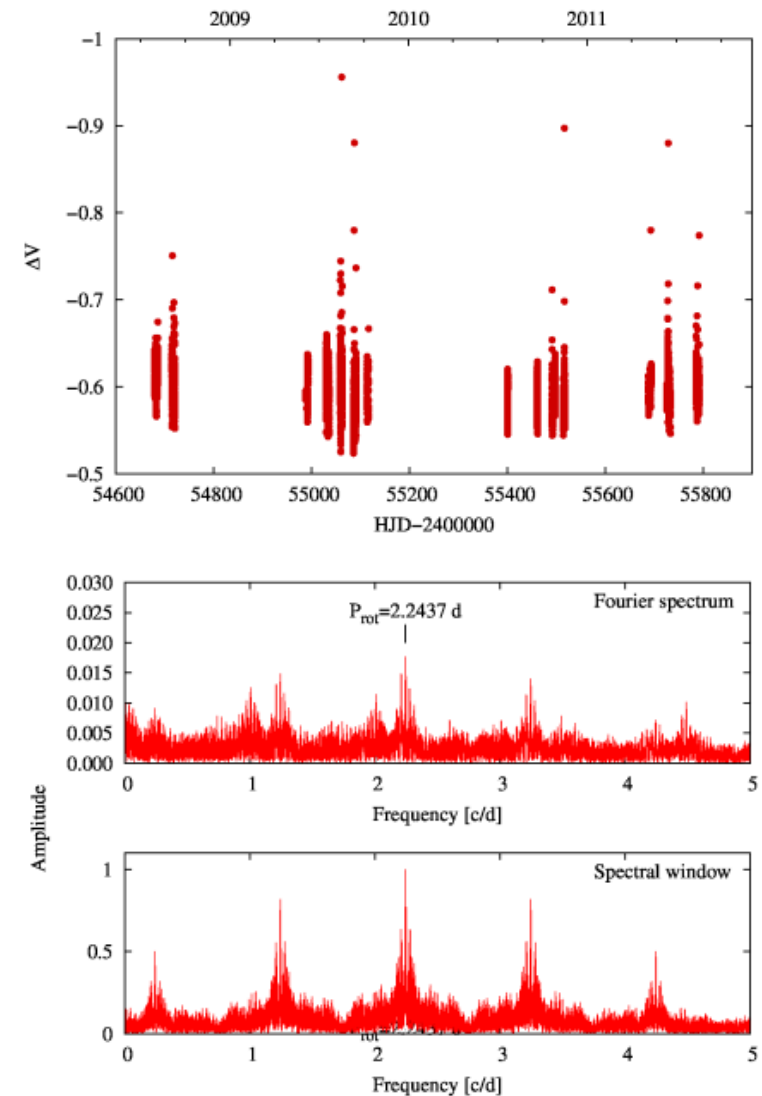
# V374 Peg

- ZDI measurements  $\rightarrow$  poloidal, axisymmetric, stable magnetic field
- The light curve is stable for  $\sim 3$  years


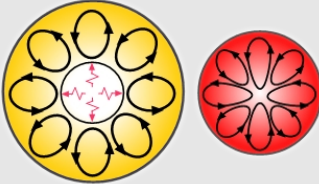



# V374 Peg

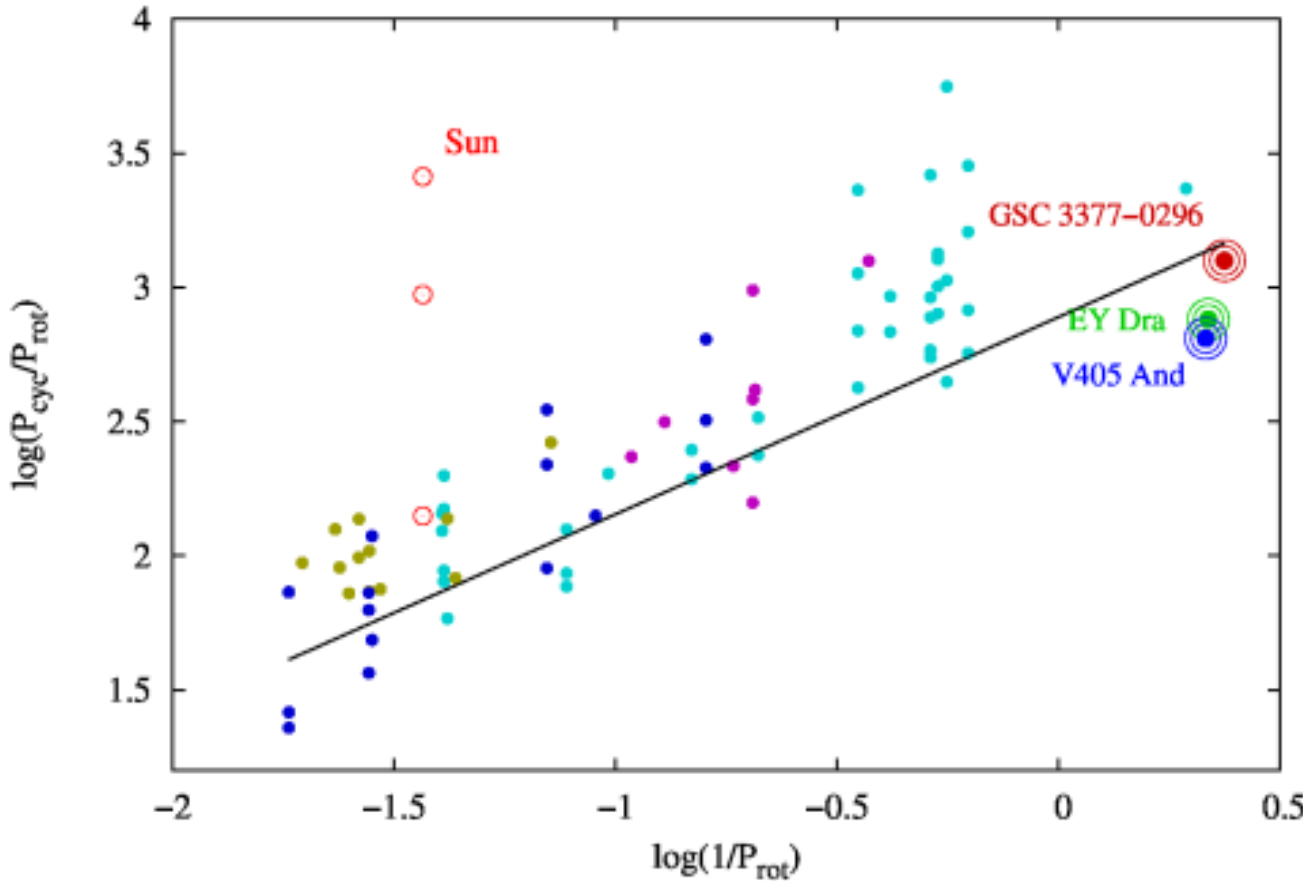
- ZDI measurements  $\rightarrow$  poloidal, axisymmetric, stable magnetic field
- The light curve is stable for  $\sim 3$  years
- No cycle observed
- ...but this is good, as these stars should have a different kind of dynamo, and no cycles



# Summary

	EY Dra	V405 And	GSC 3377-0296	V374 Peg
Spectral type	dM1-2	M0V+M5V	K3?	dM4
Binary	-	+	+	-
Mass(es)	$0.5M_{\text{Sun}}$	$0.49+0.21M_{\text{Sun}}$	?	$0.28M_{\text{Sun}}$
$P_{\text{rot}}$	0.459d	0.465d	0.422d	0.445d
Cycle length	350d	300d	530d	-
Interior			?	

# Summary



Thank you!