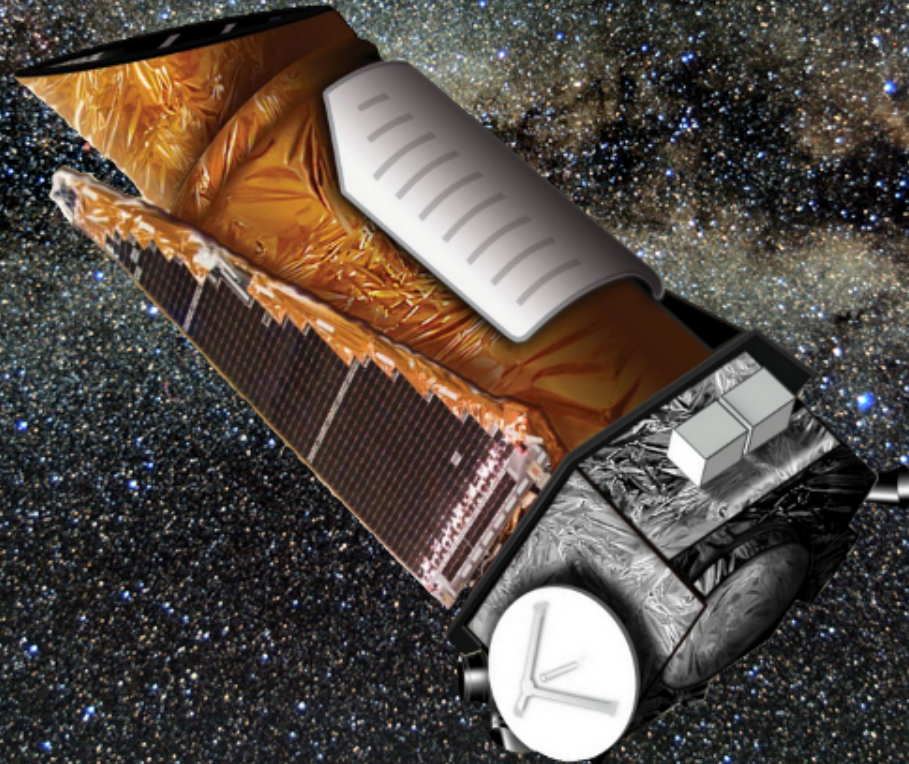
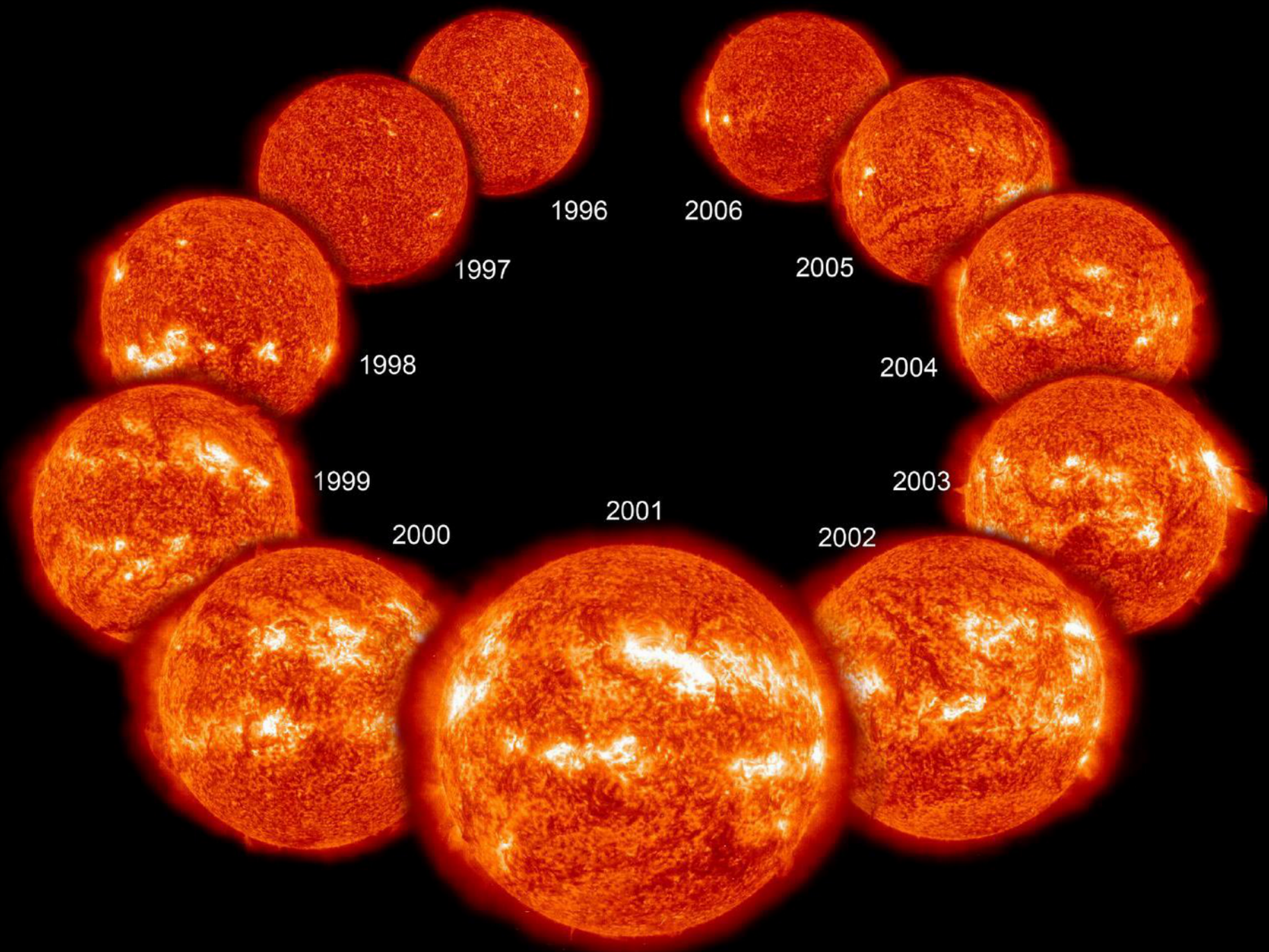


A Stellar Context for the Solar Activity Cycle

Travis Metcalfe (SSI)



with Ricky Egeland (HAO) and Jennifer van Saders (Carnegie)



1996

2006

1997

2005

1998

2004

1999

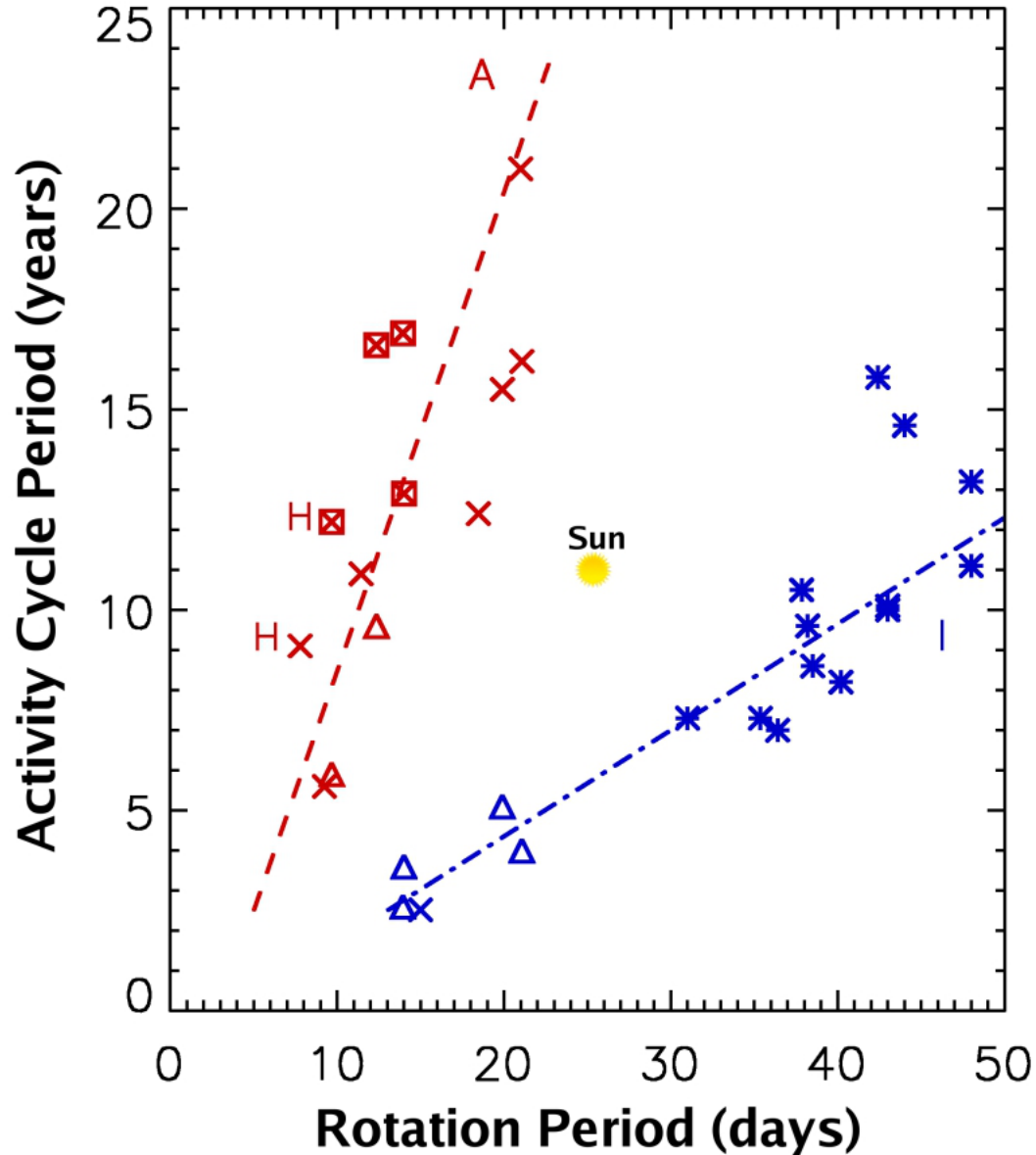
2003

2000

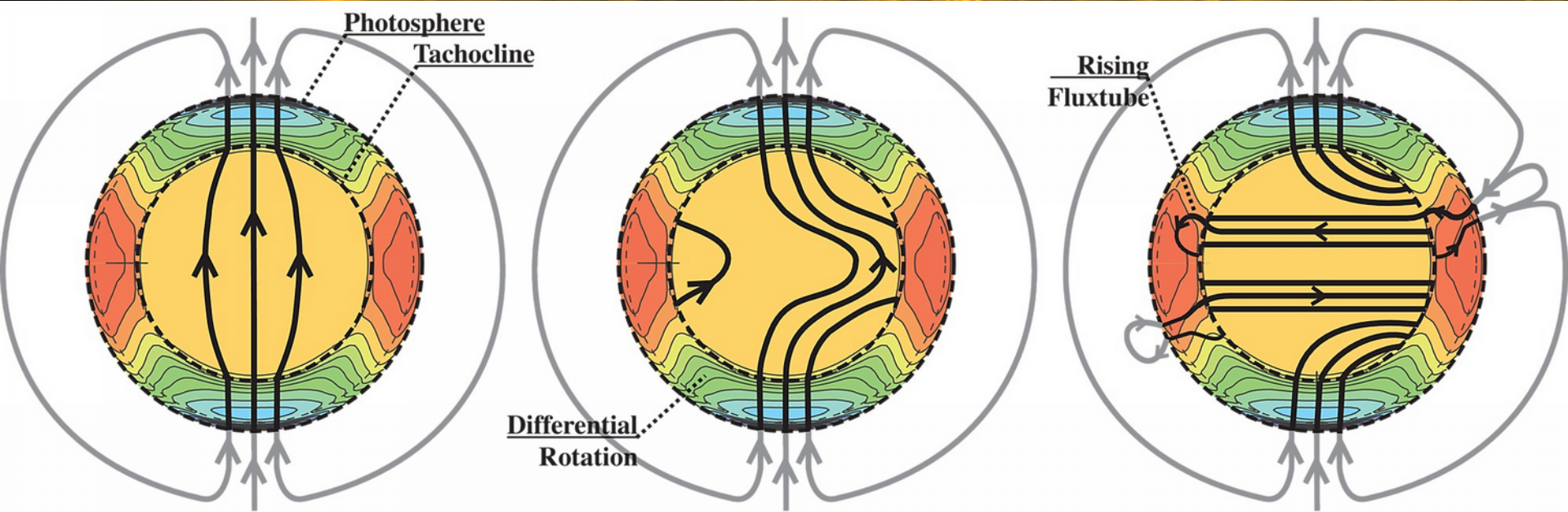
2001

2002

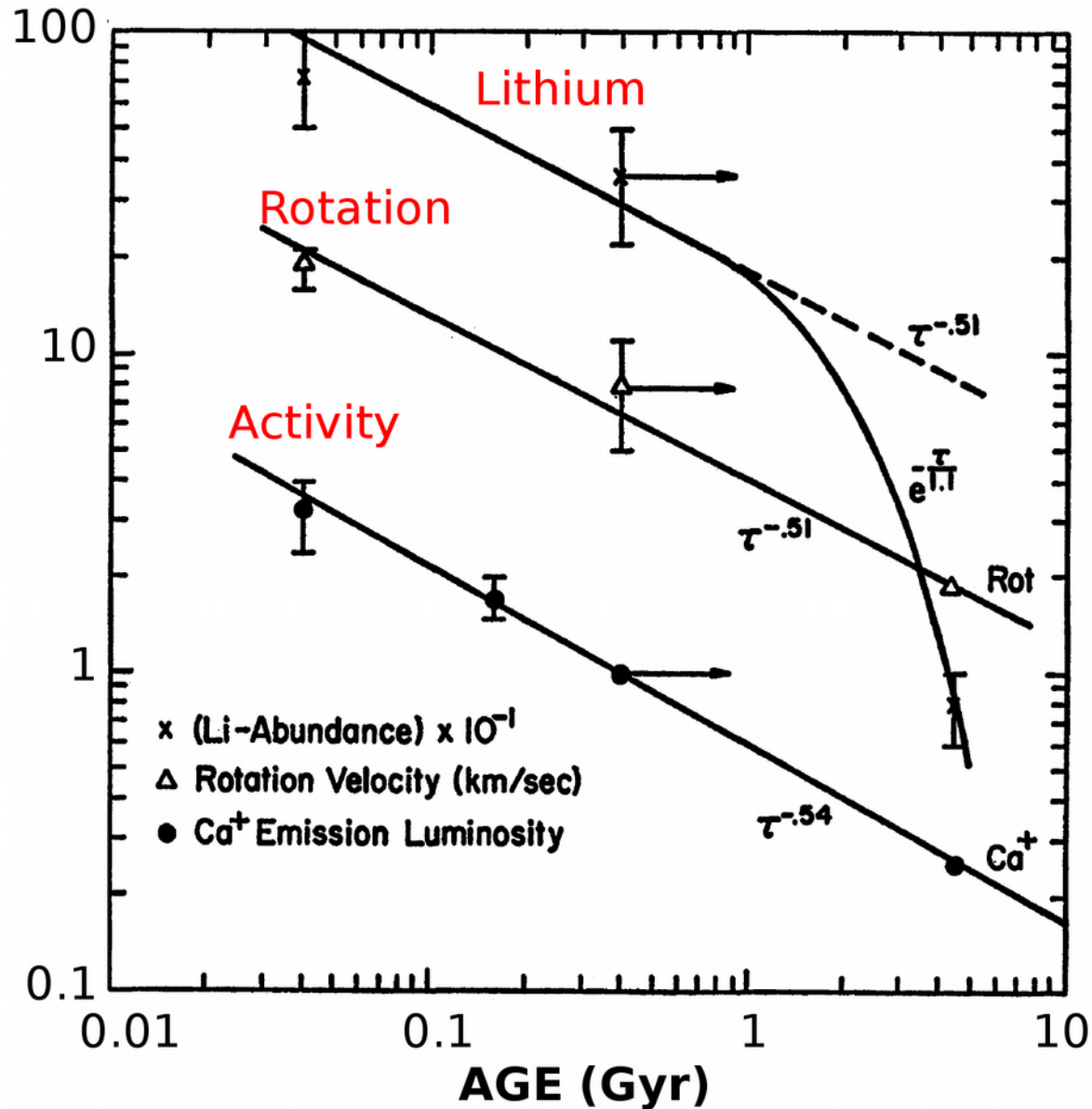
Rotation and Cycle Periods



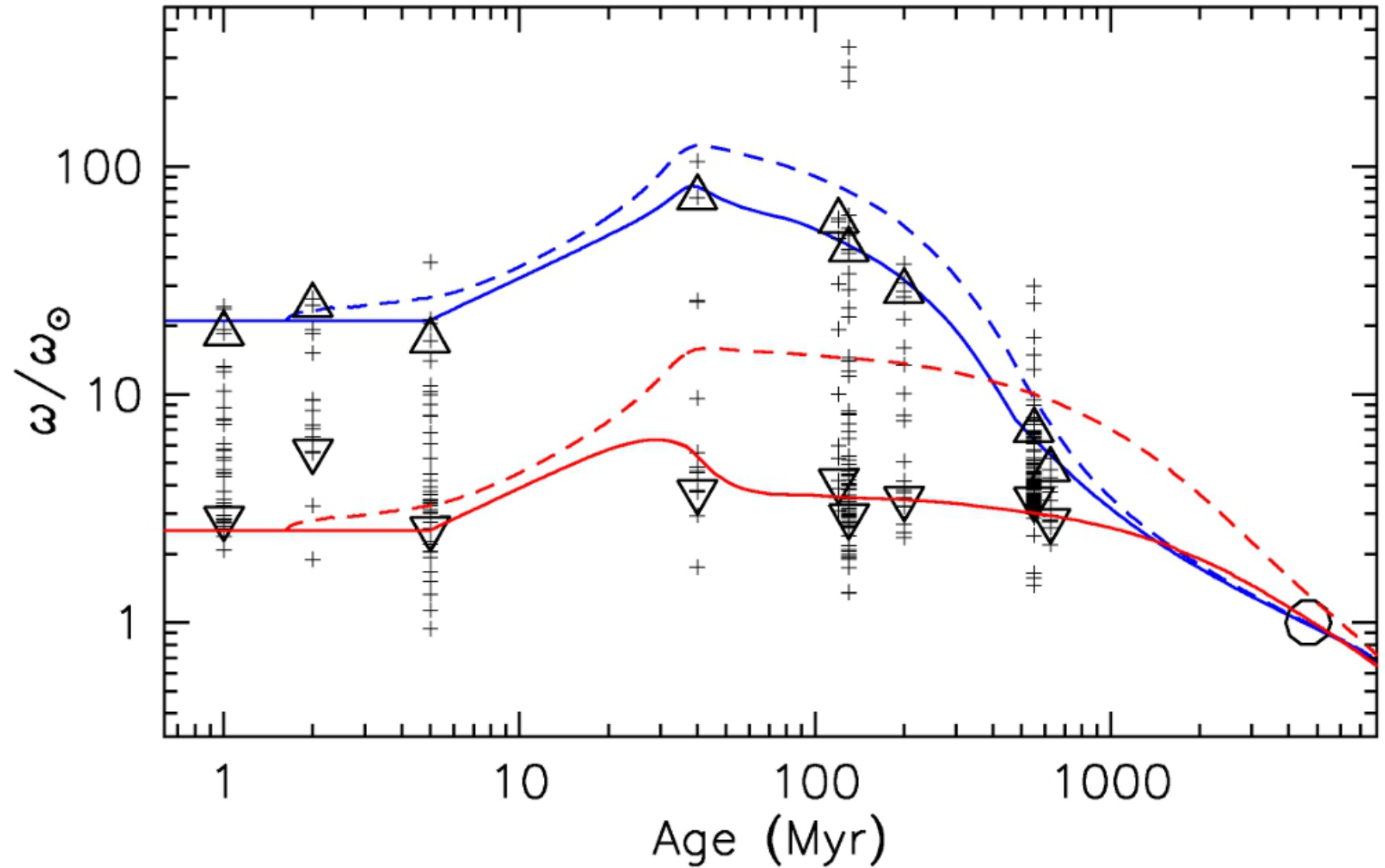




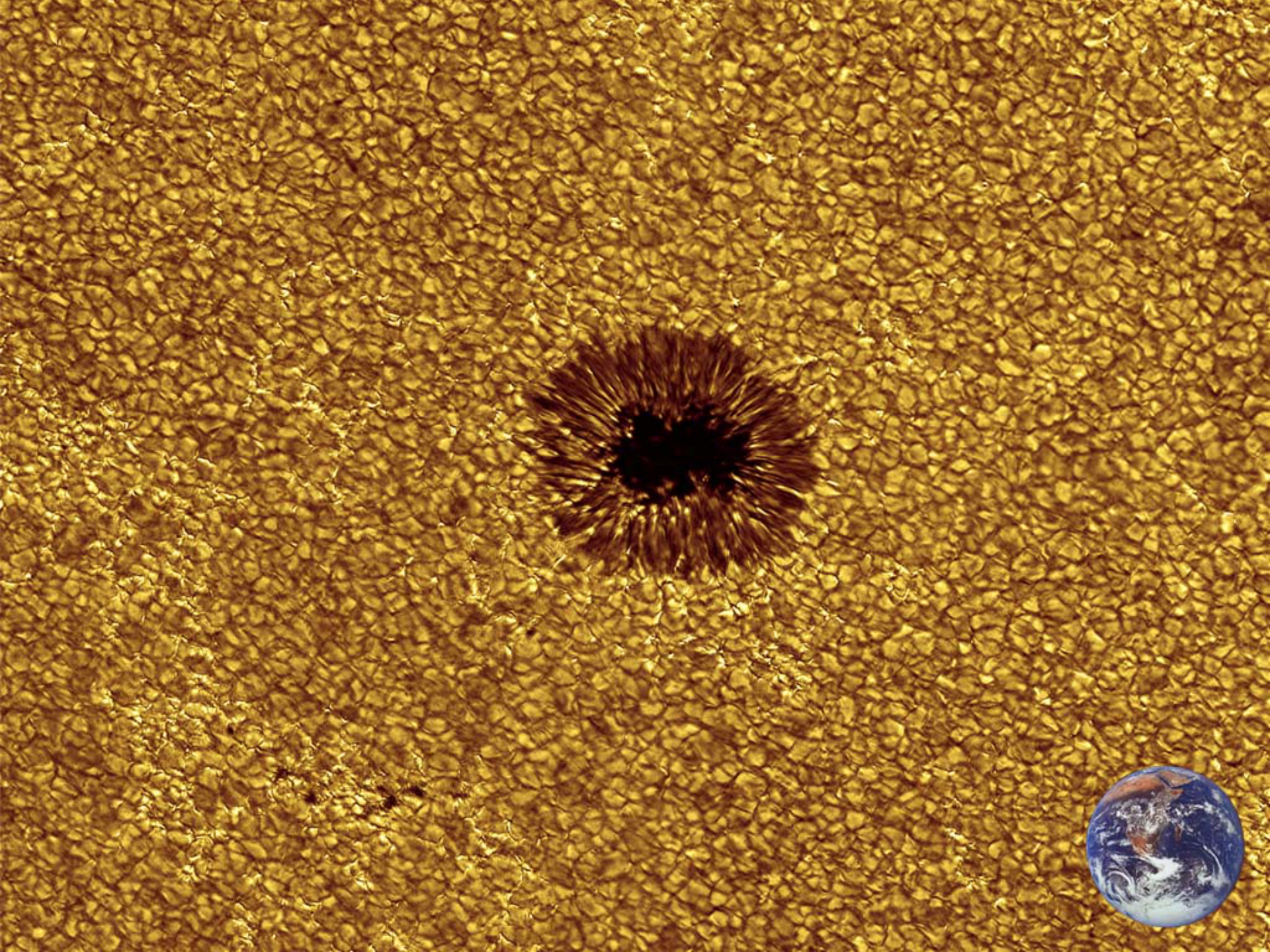
Skumanich relation



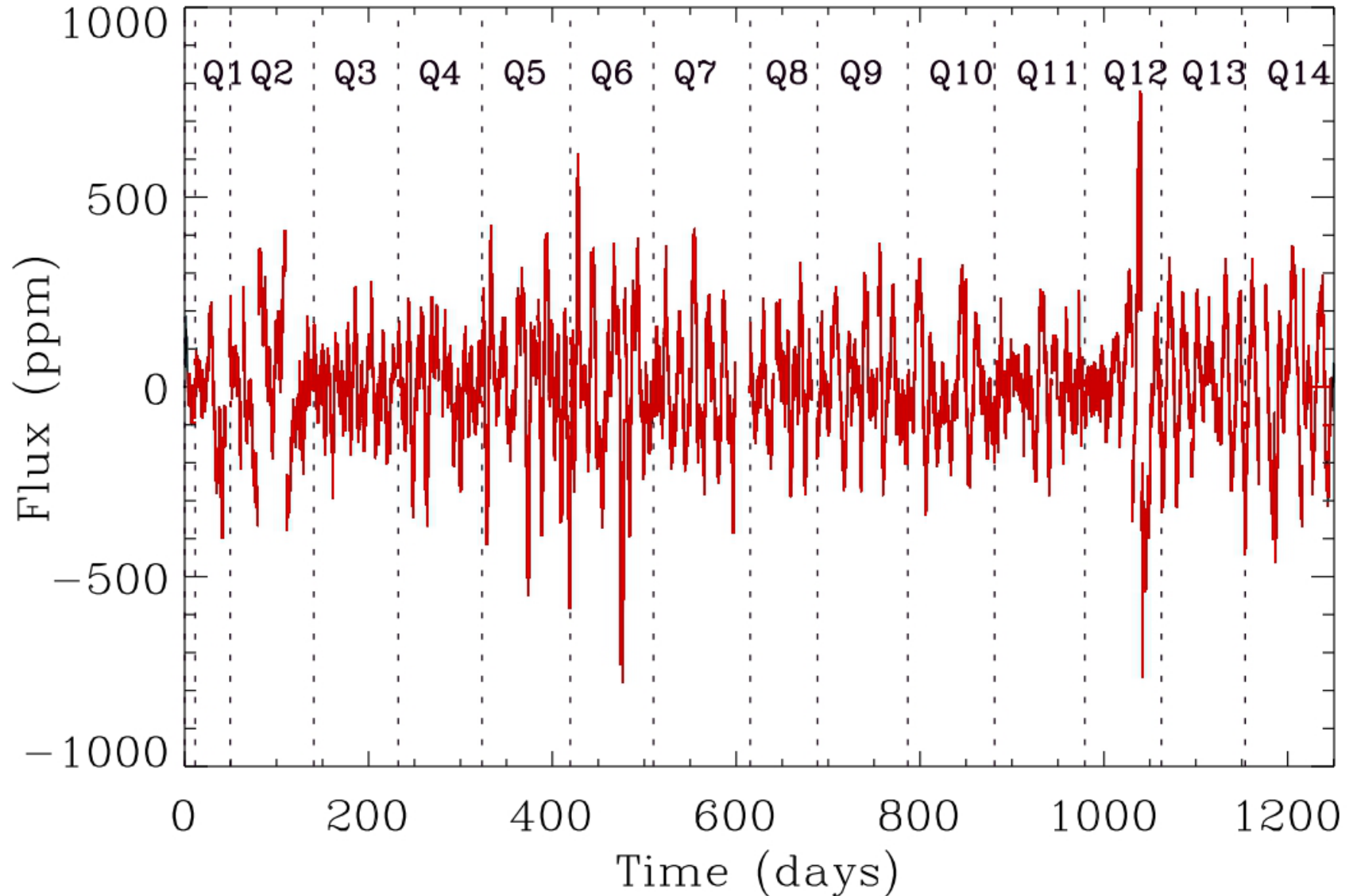
Rotational evolution



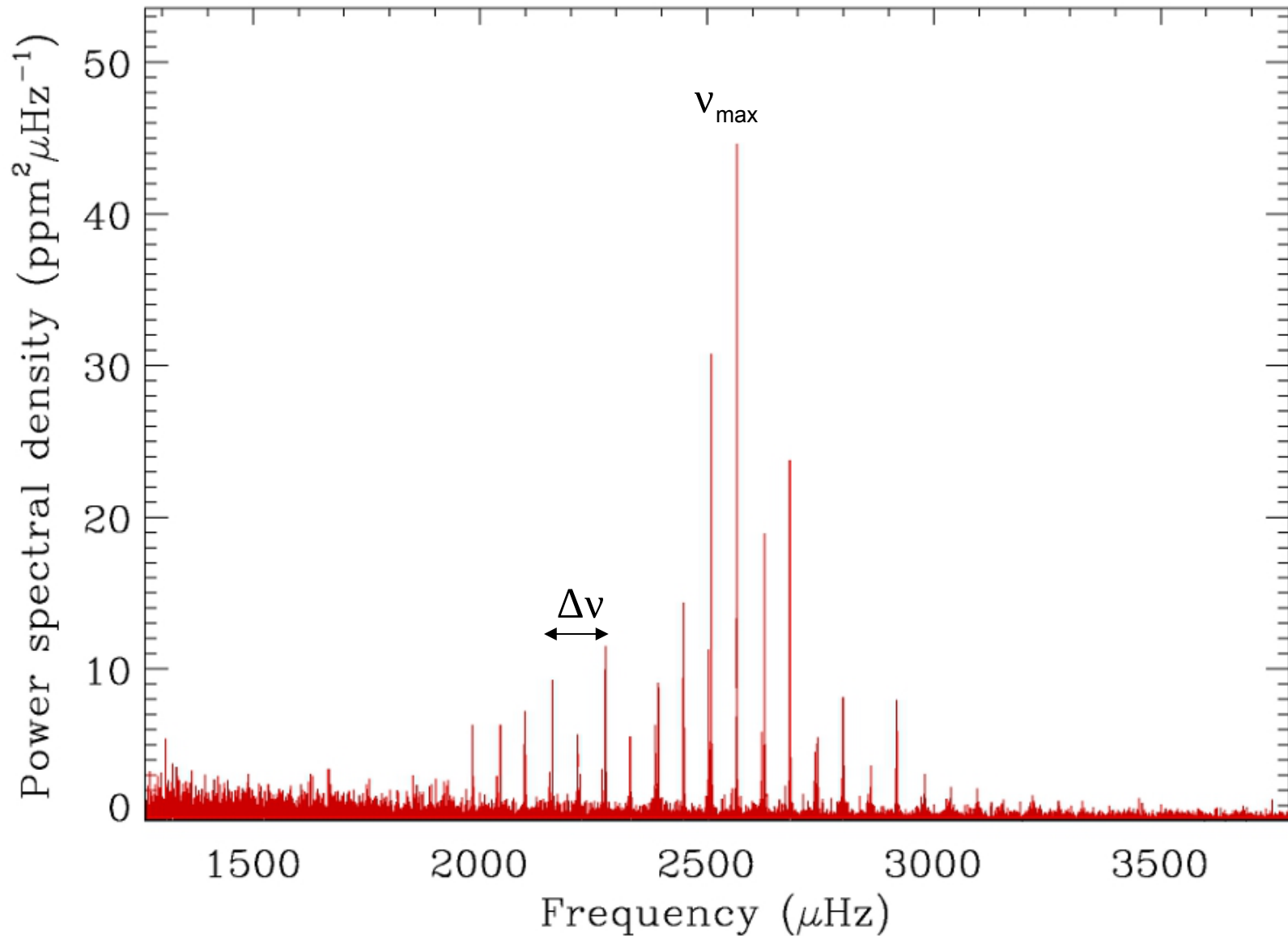




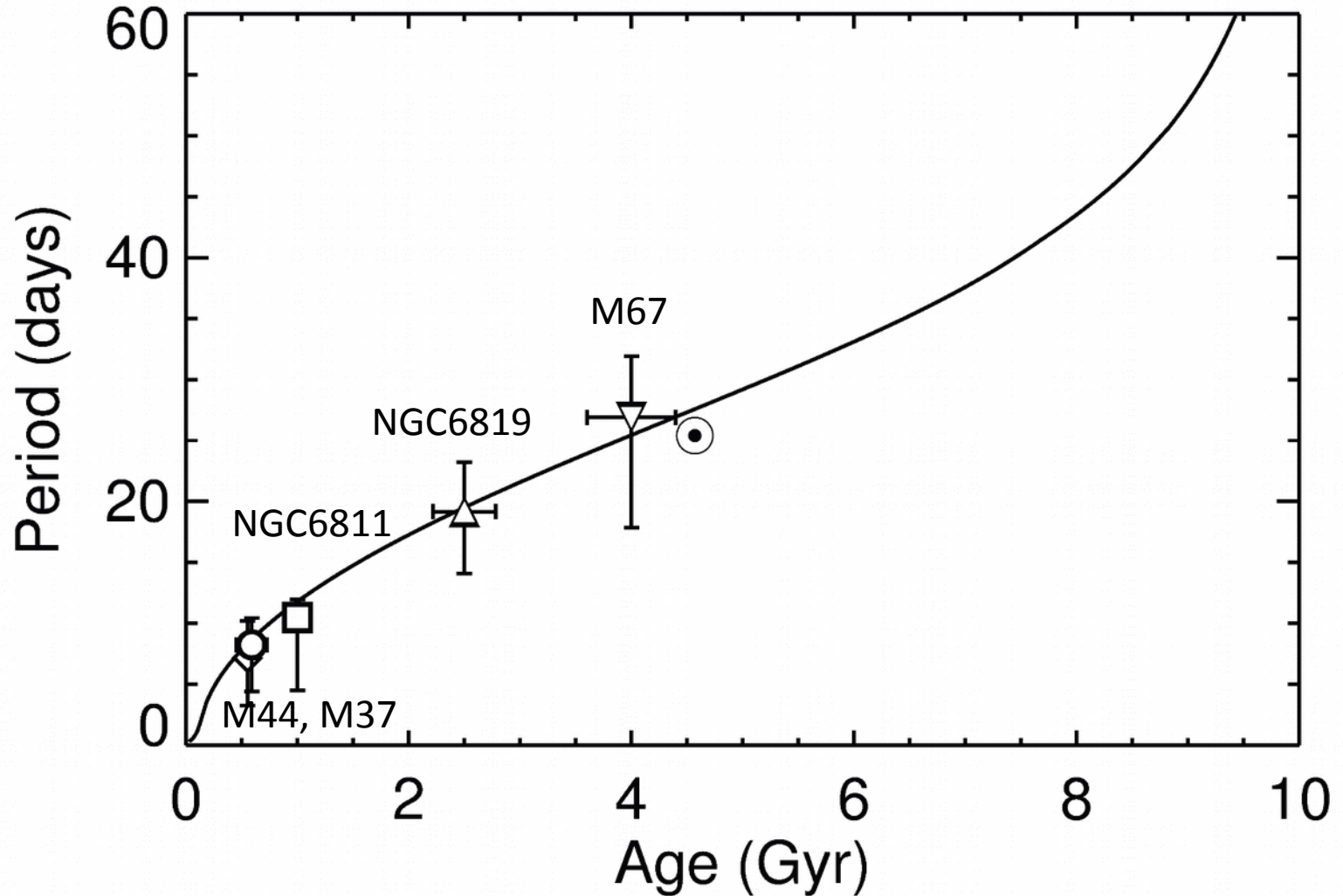
Stellar rotation with Kepler



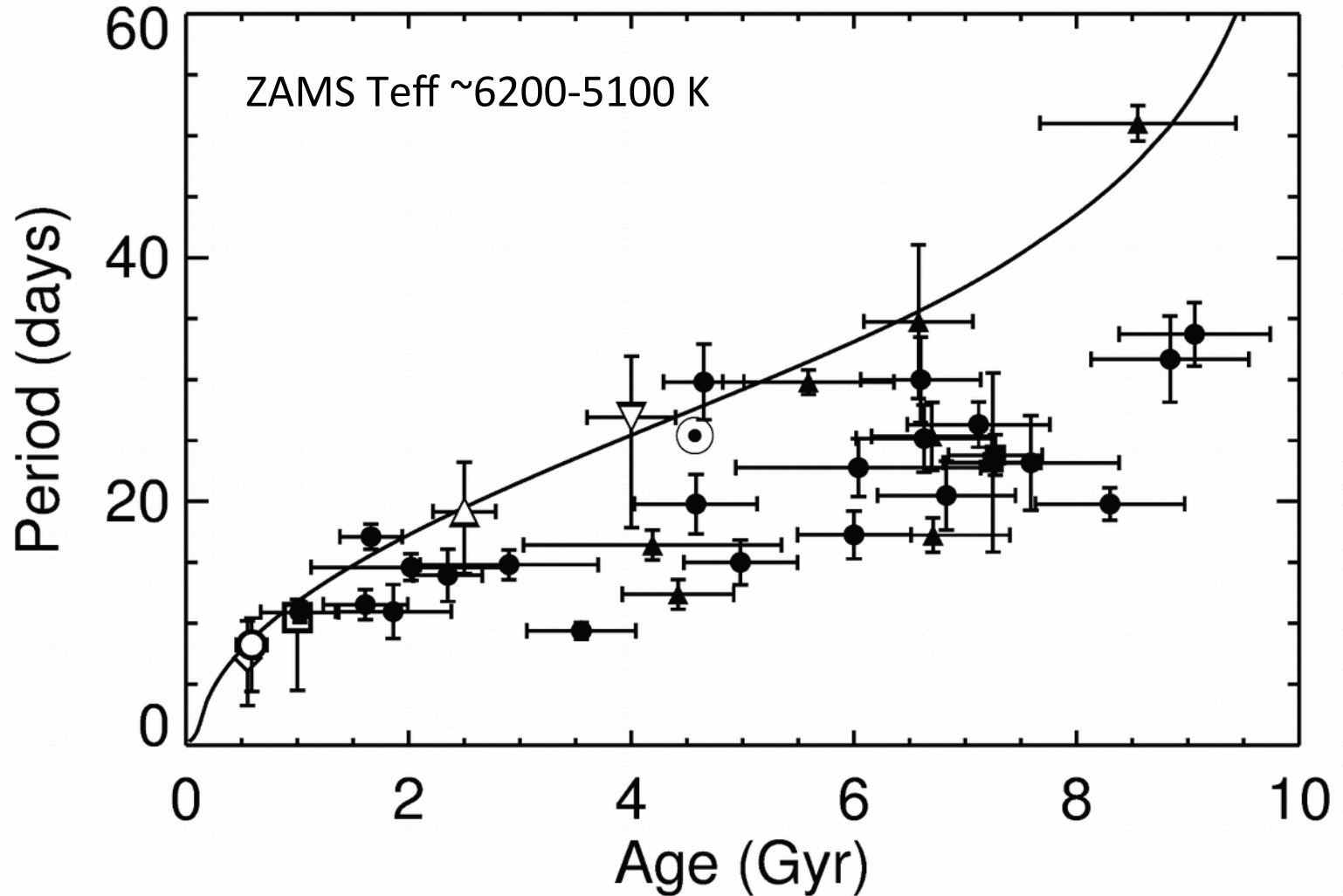
Asteroseismology with Kepler



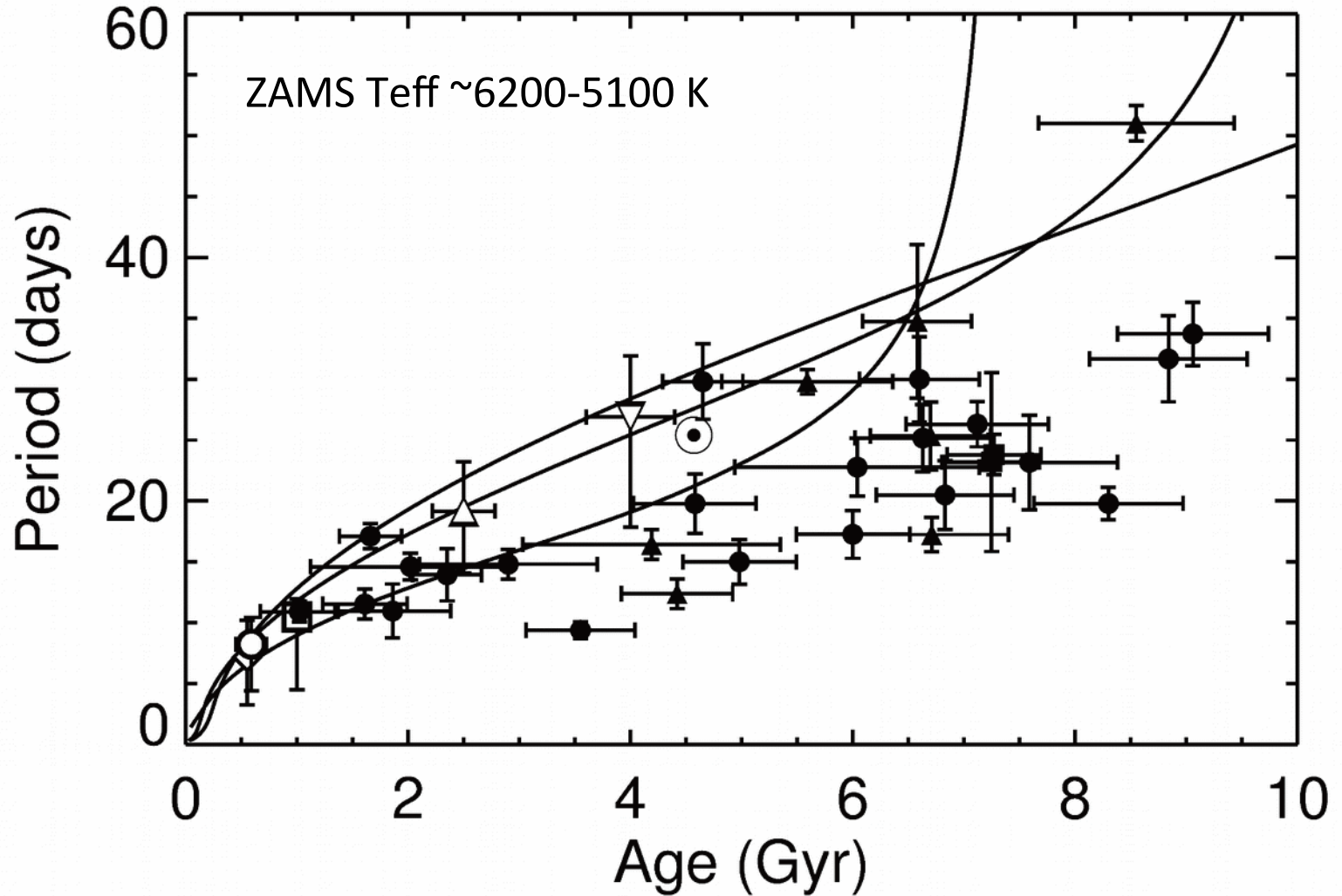
Gyrochronology



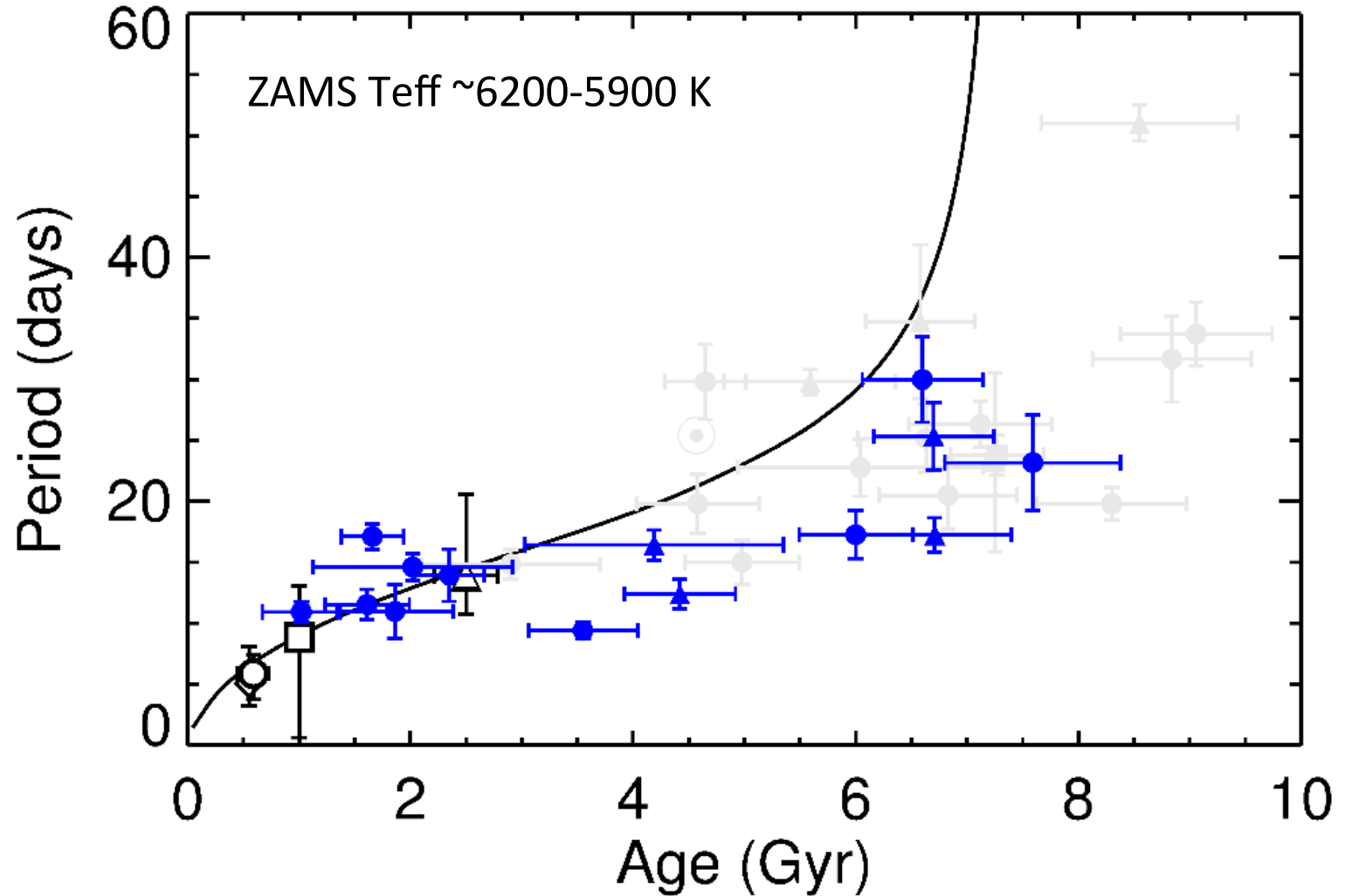
Gyrochronology



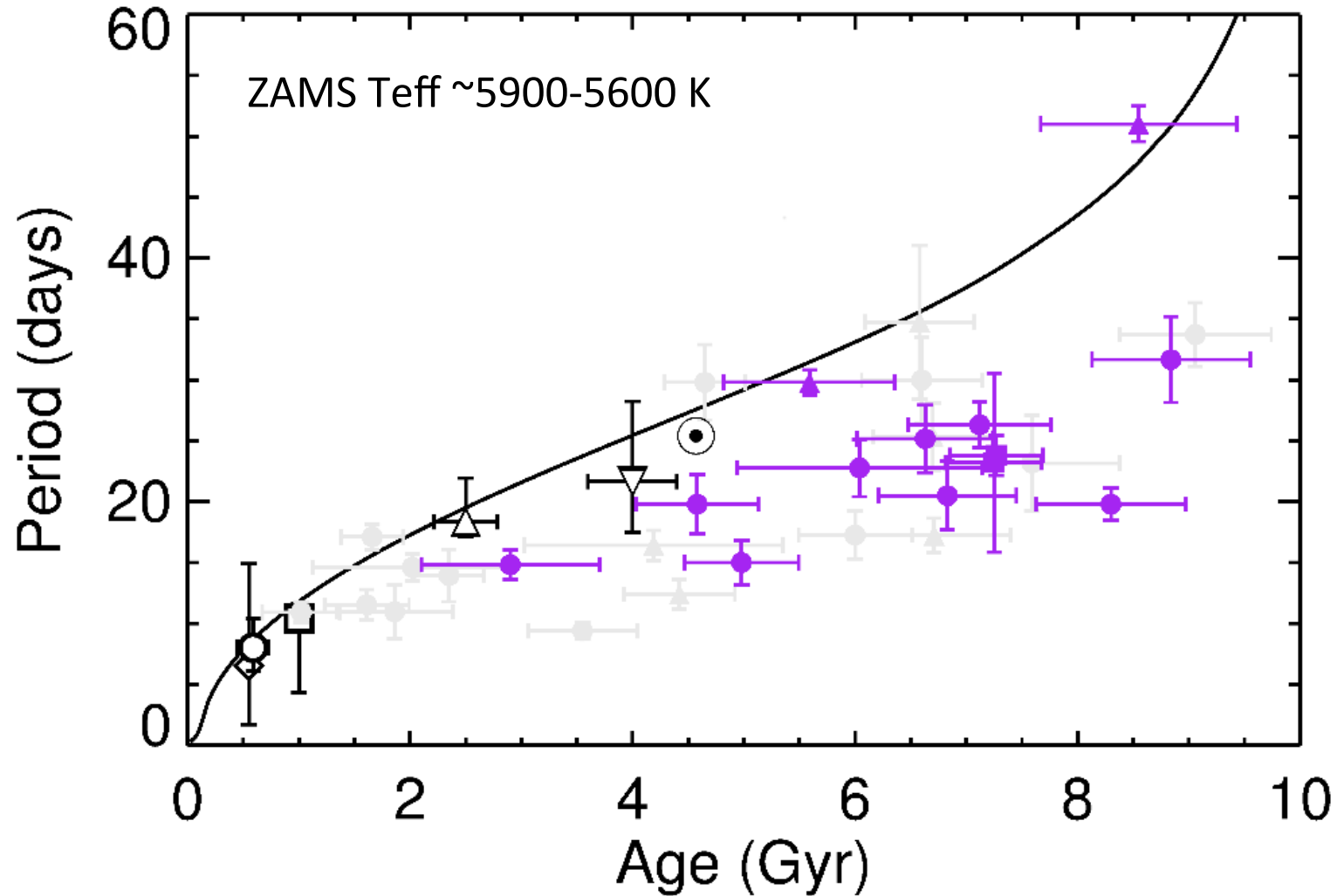
Gyrochronology



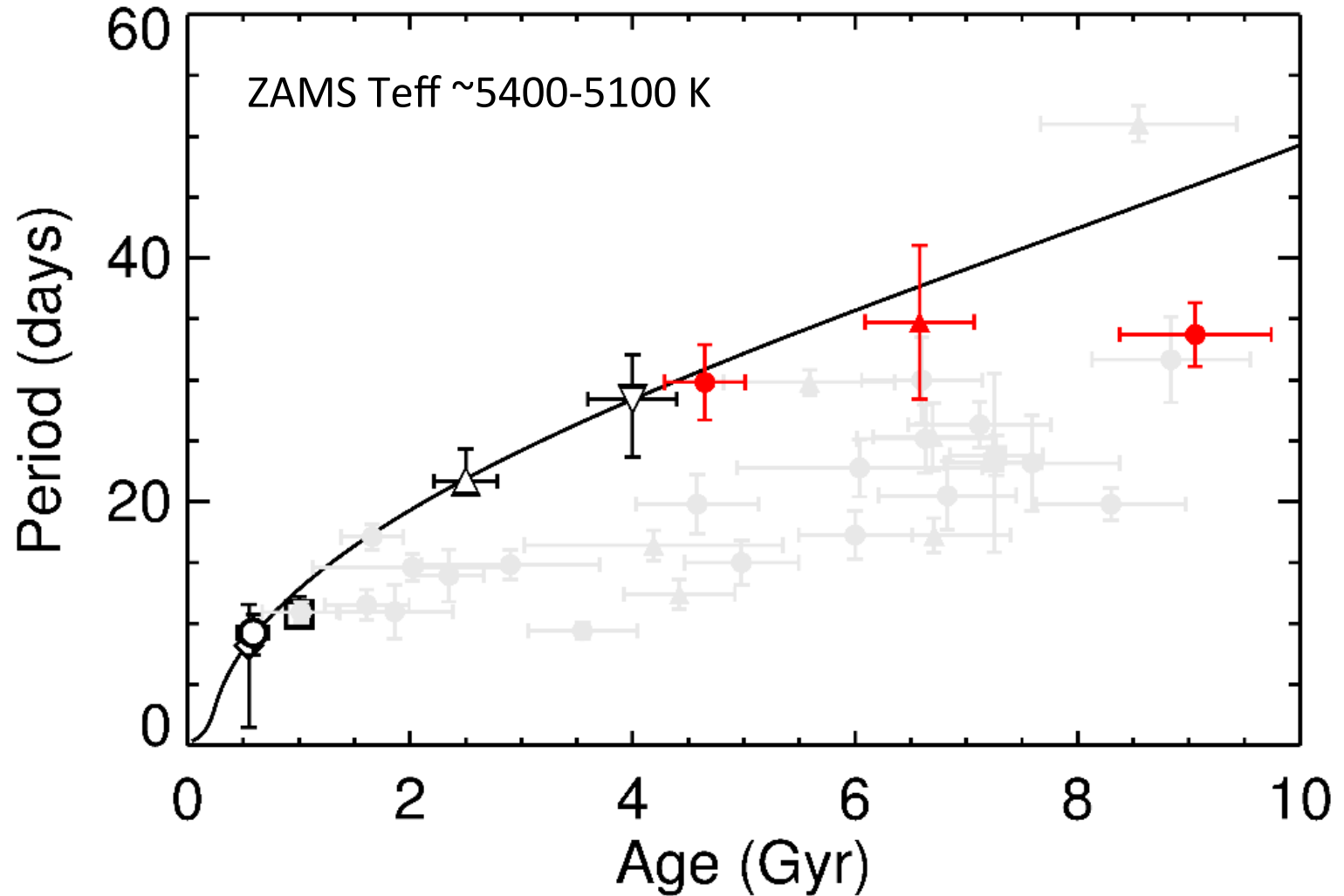
Gyrochronology



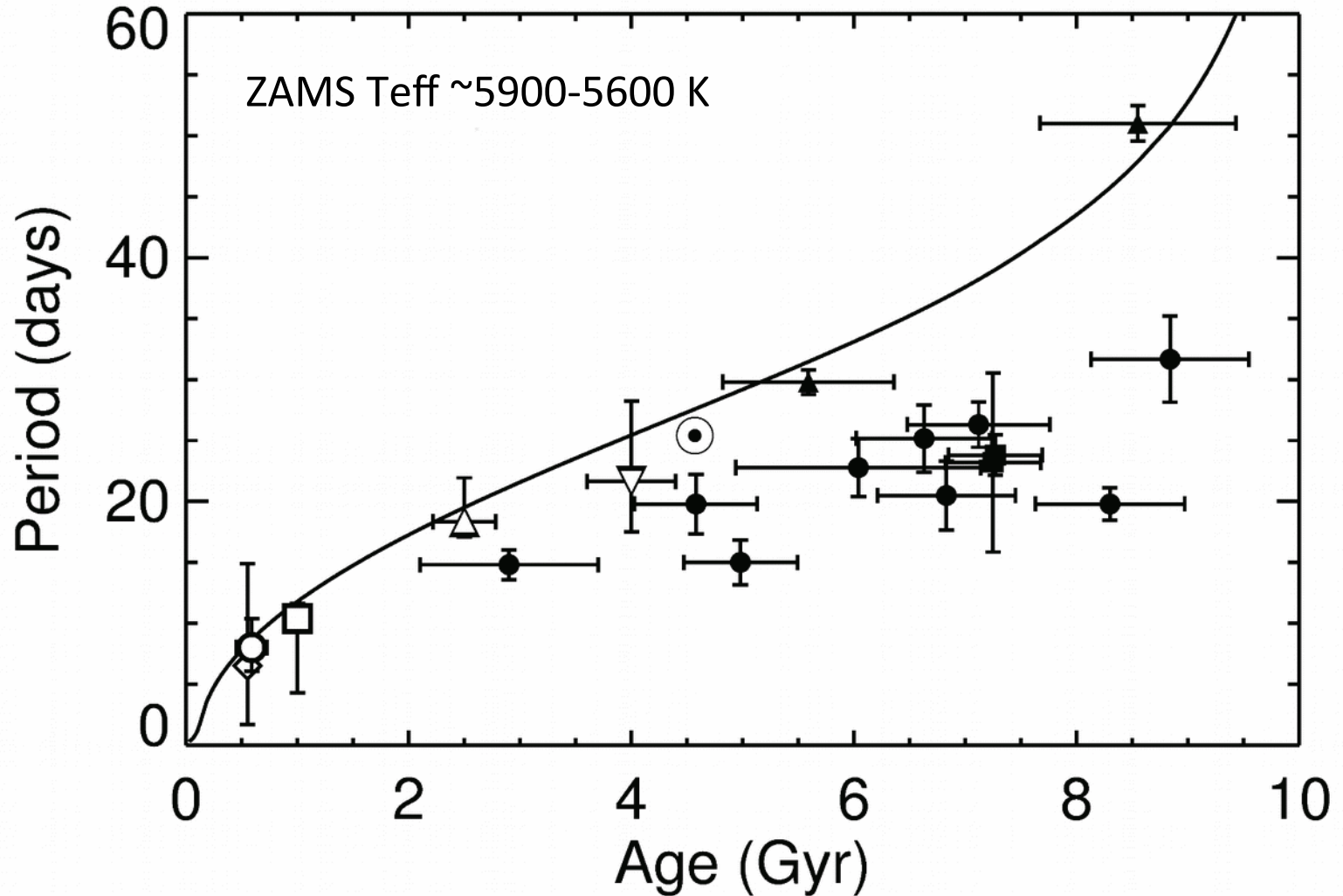
Gyrochronology



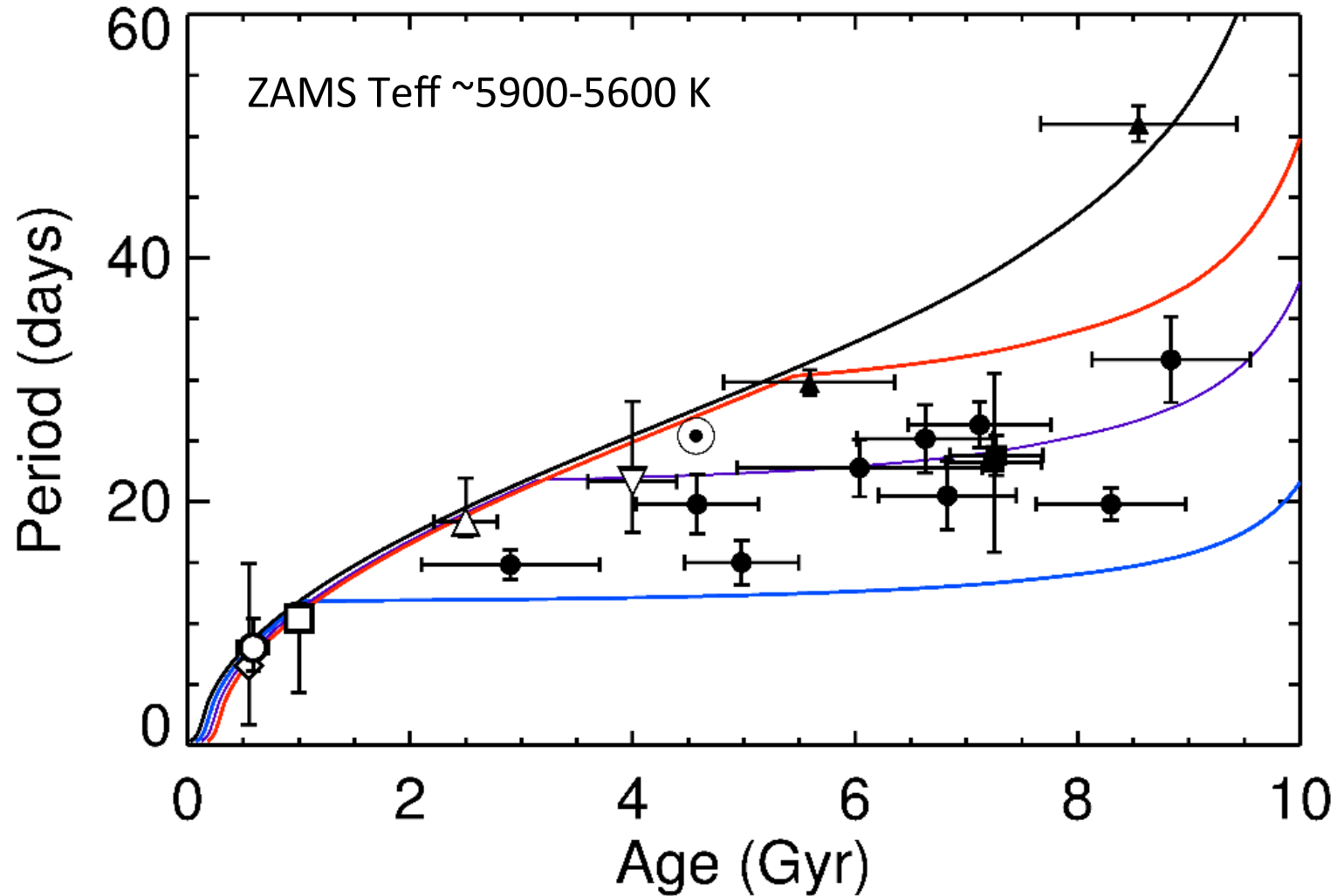
Gyrochronology



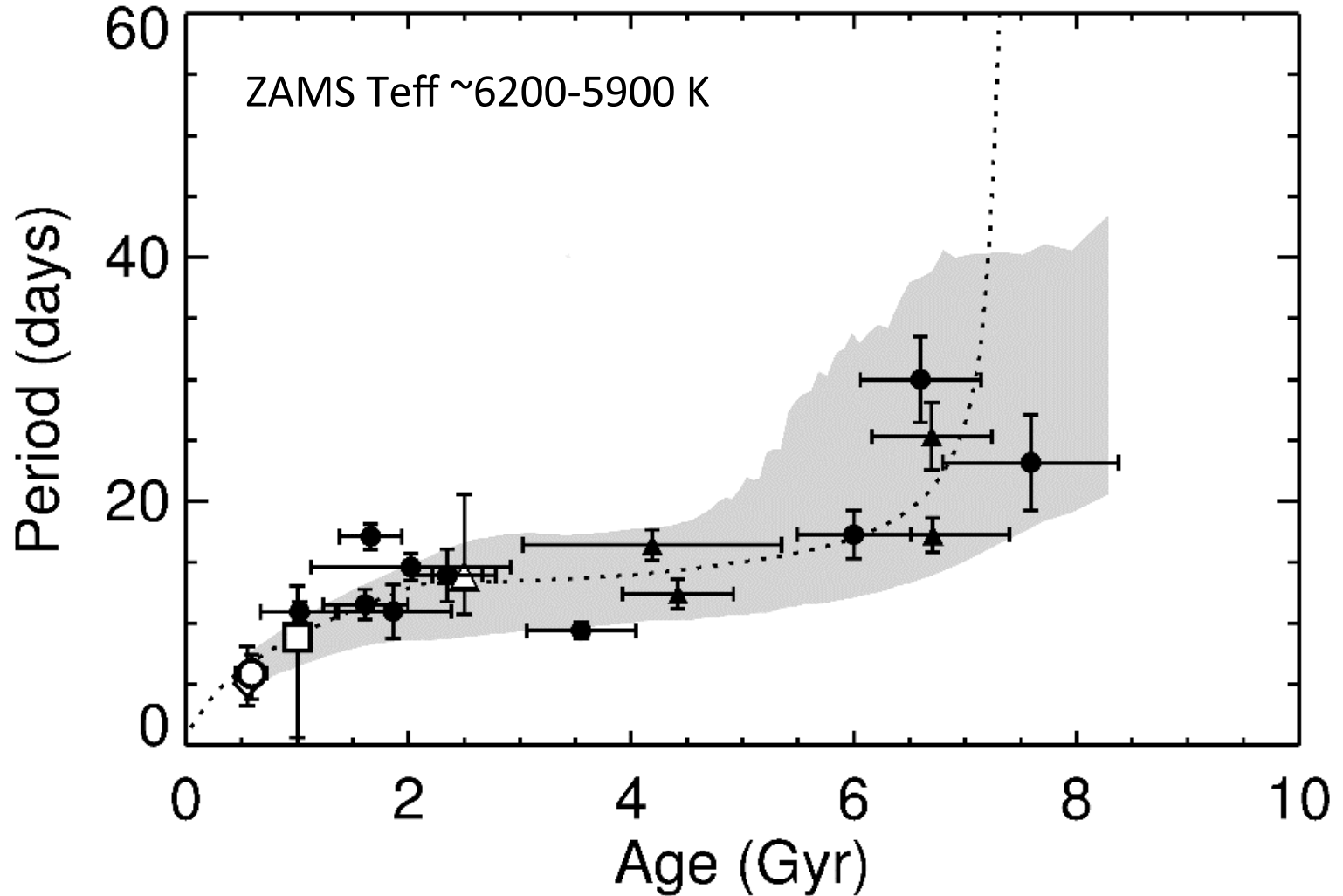
Gyrochronology revised



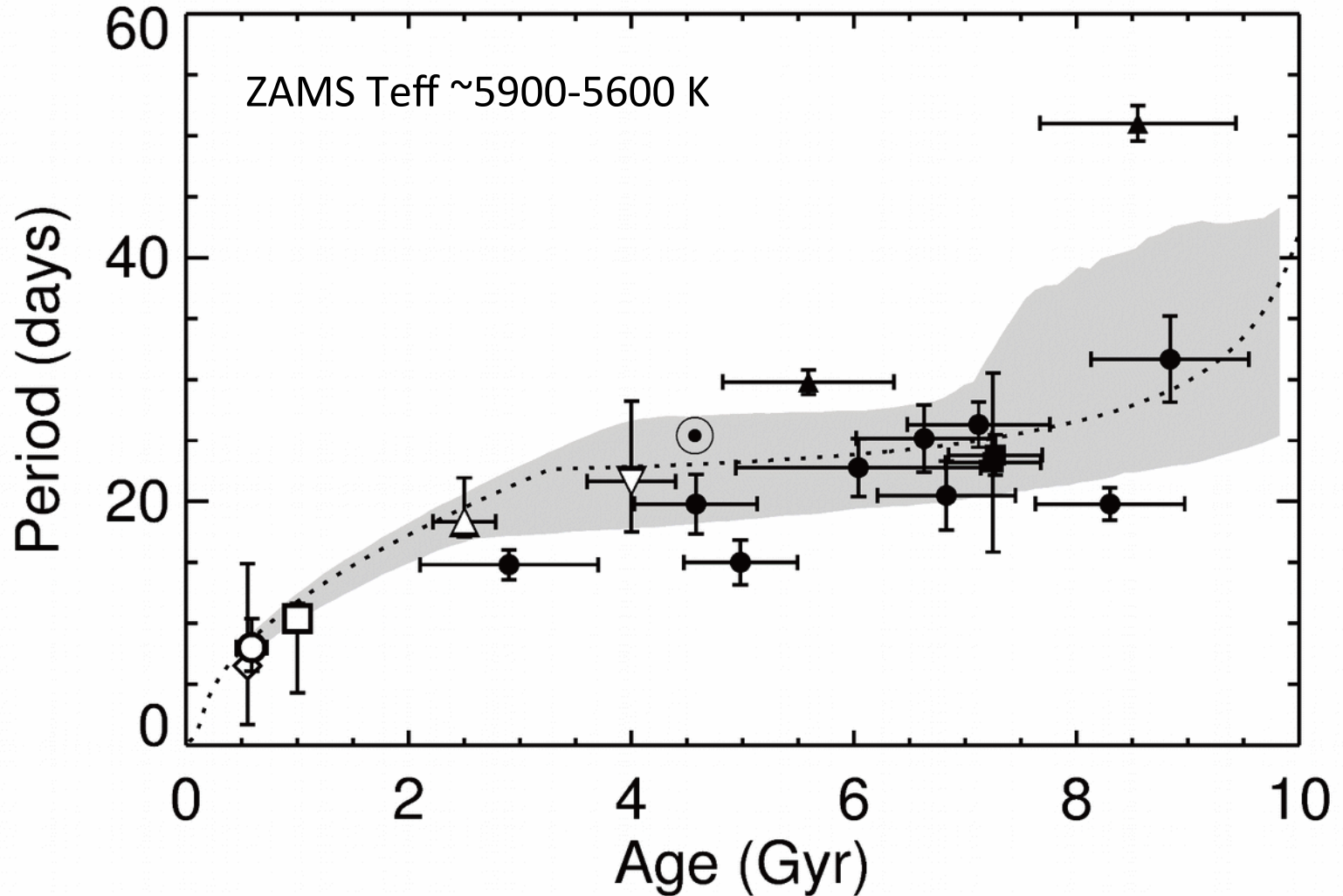
Gyrochronology revised



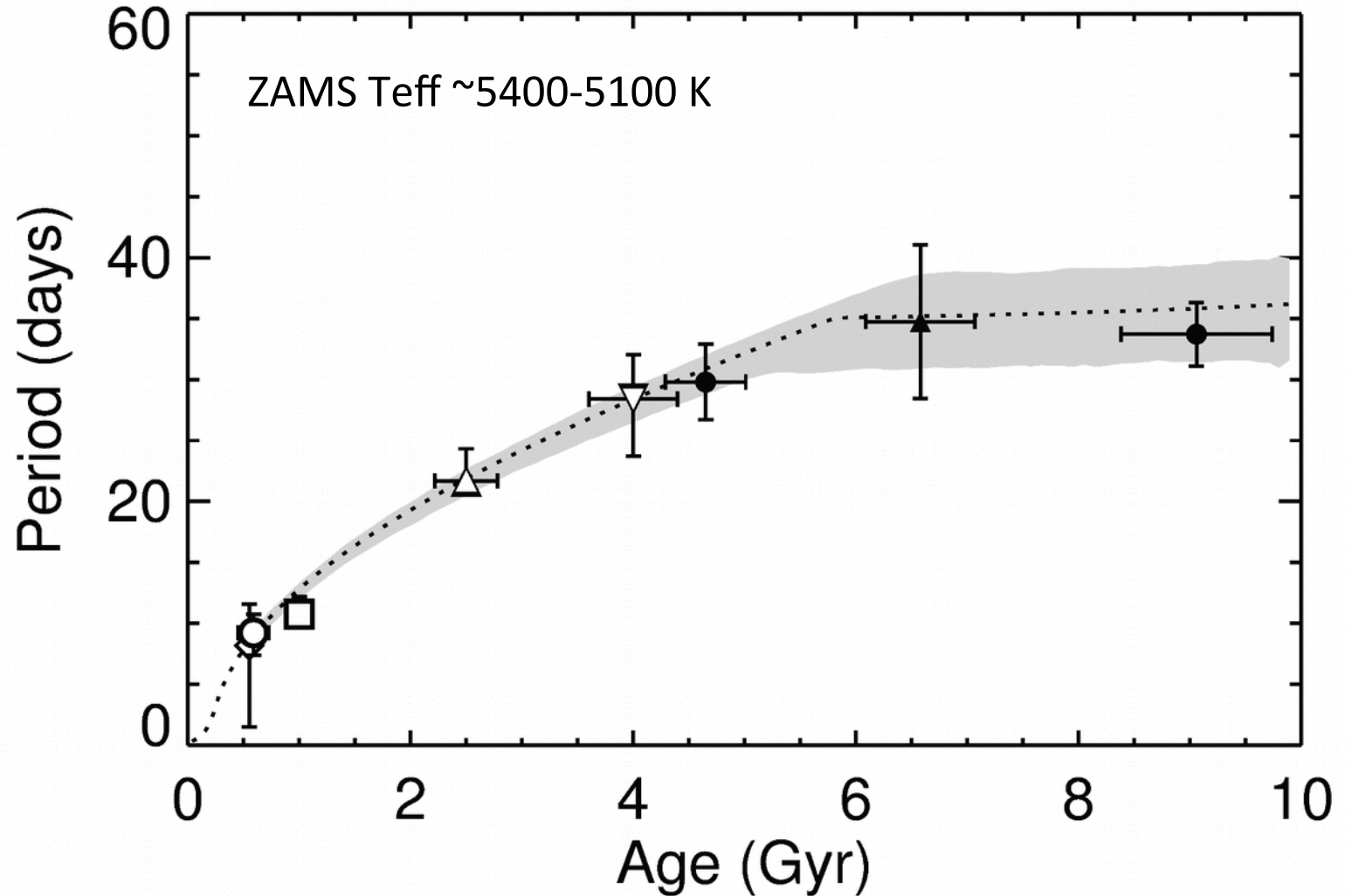
Gyrochronology revised



Gyrochronology revised



Gyrochronology revised



Kepler Field of View



Vega

Milky Way

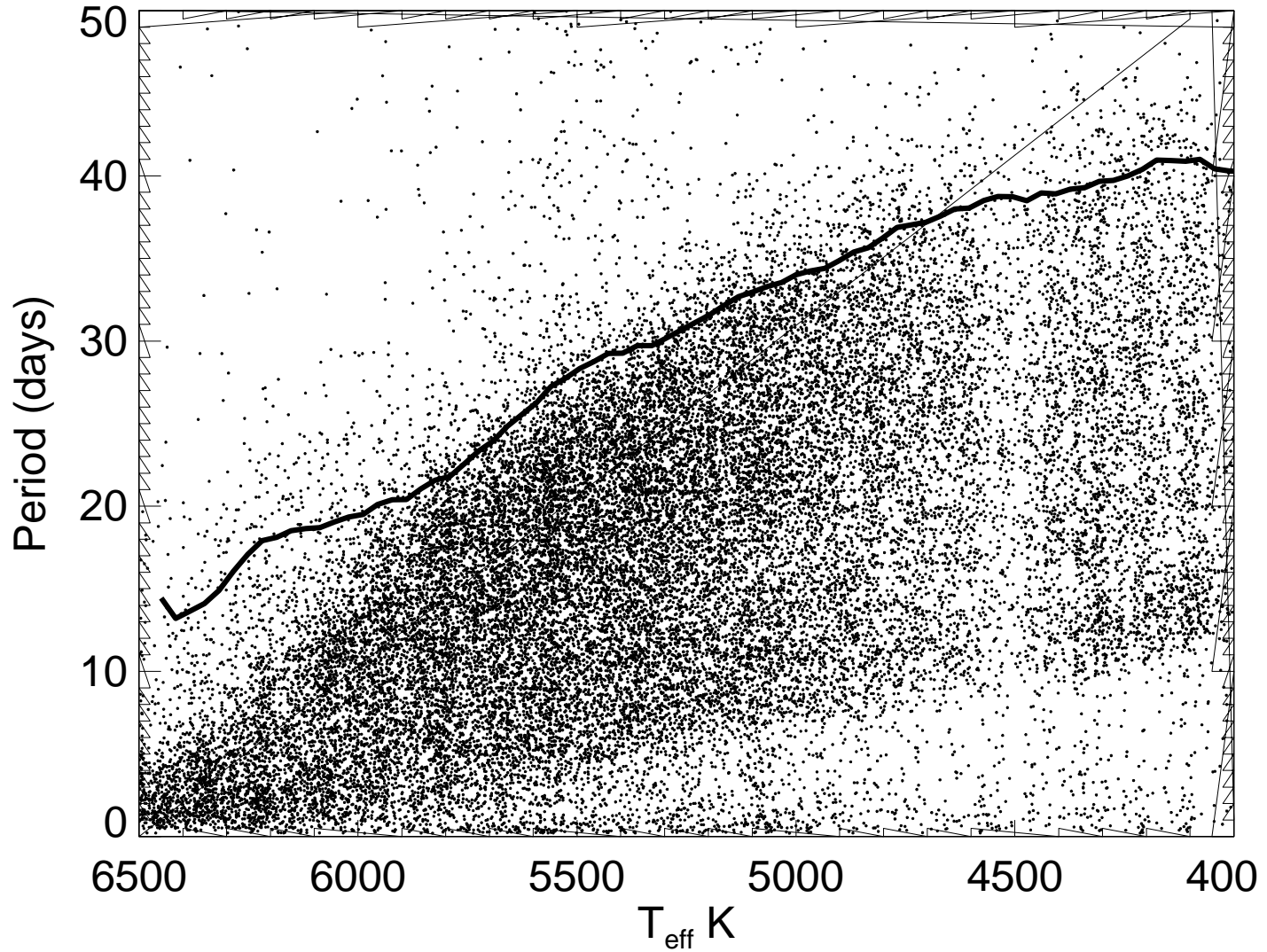
Albireo

Deneb

CYGNUS

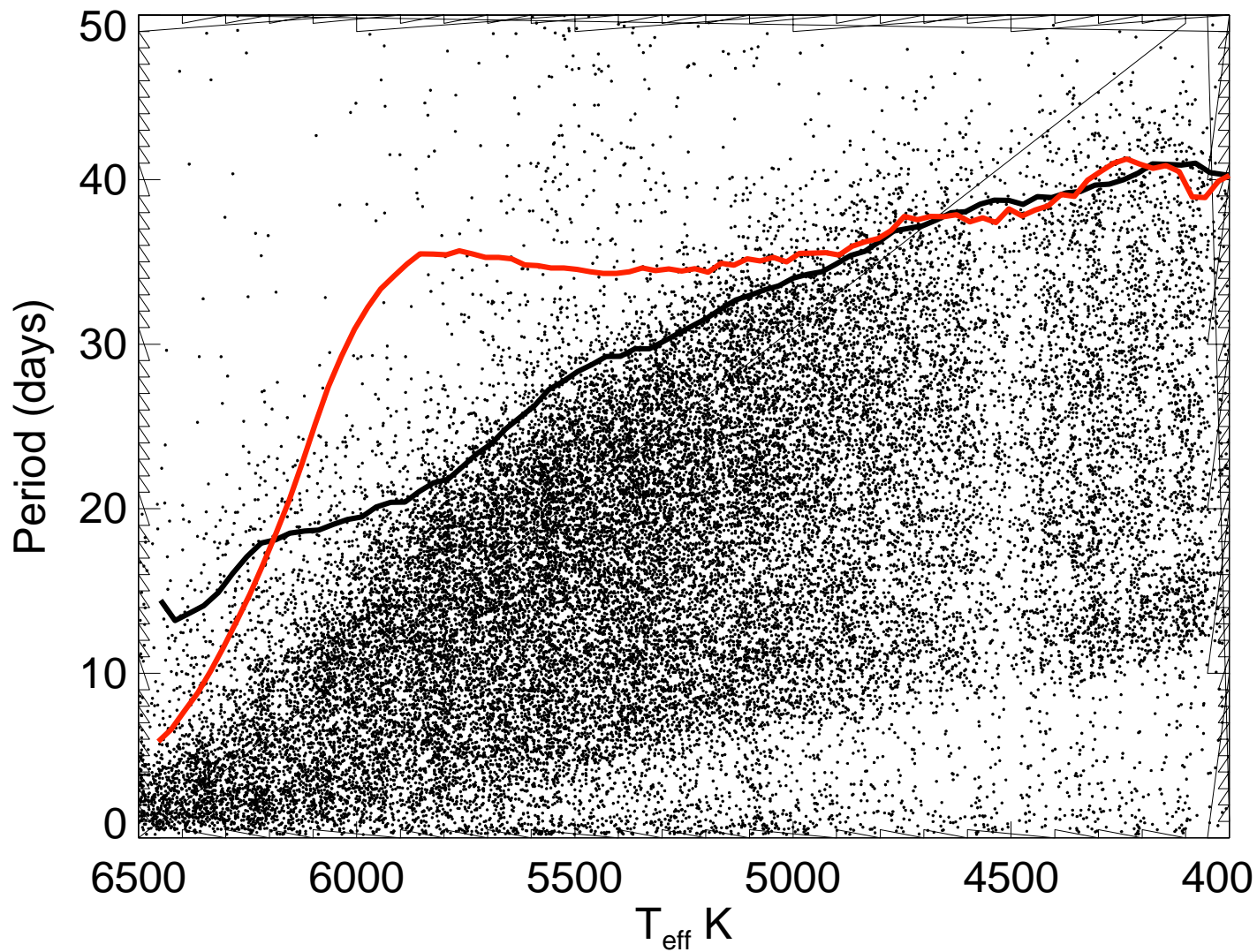
Altair

Observed edge



Observed edge

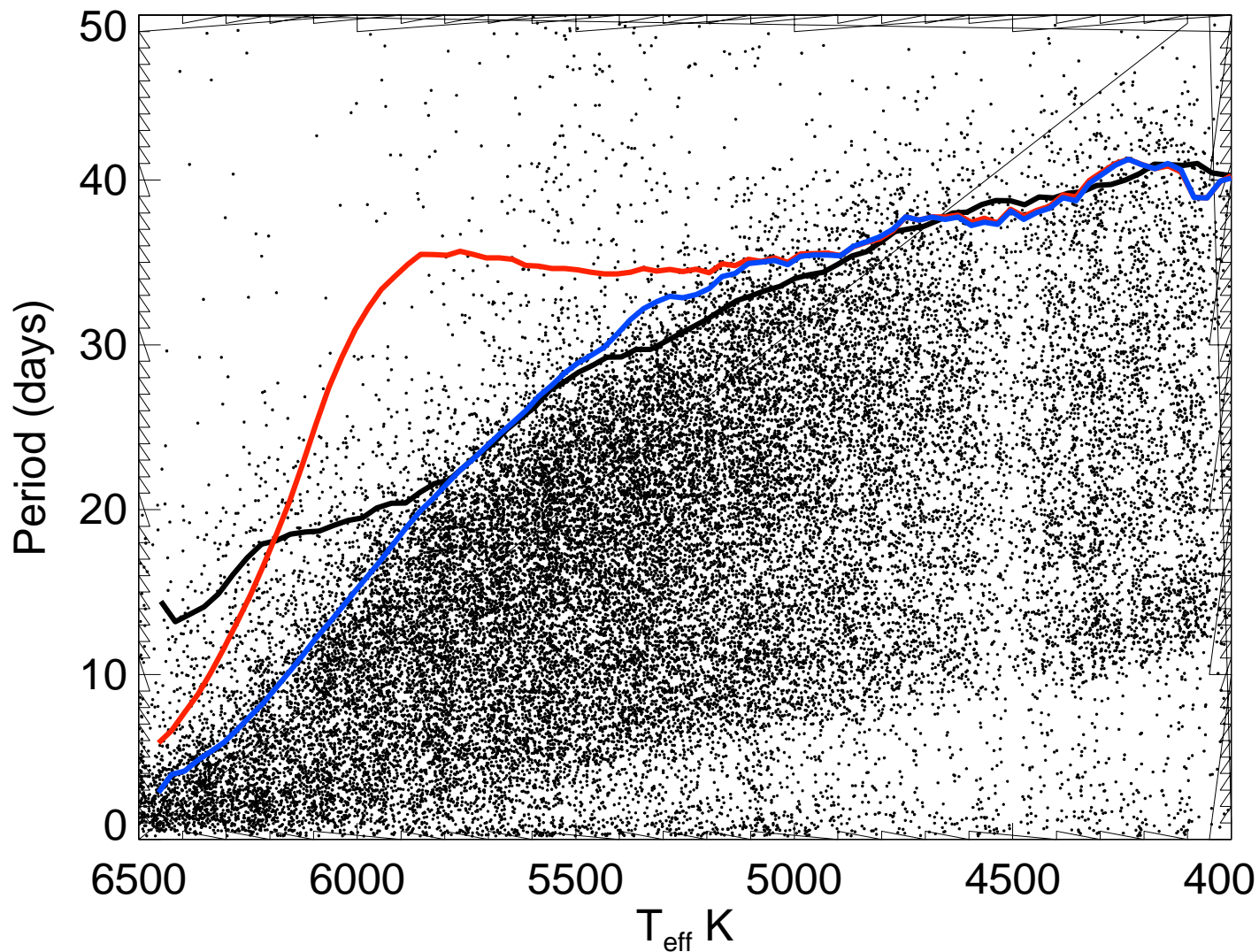
Standard spin-down



Observed edge

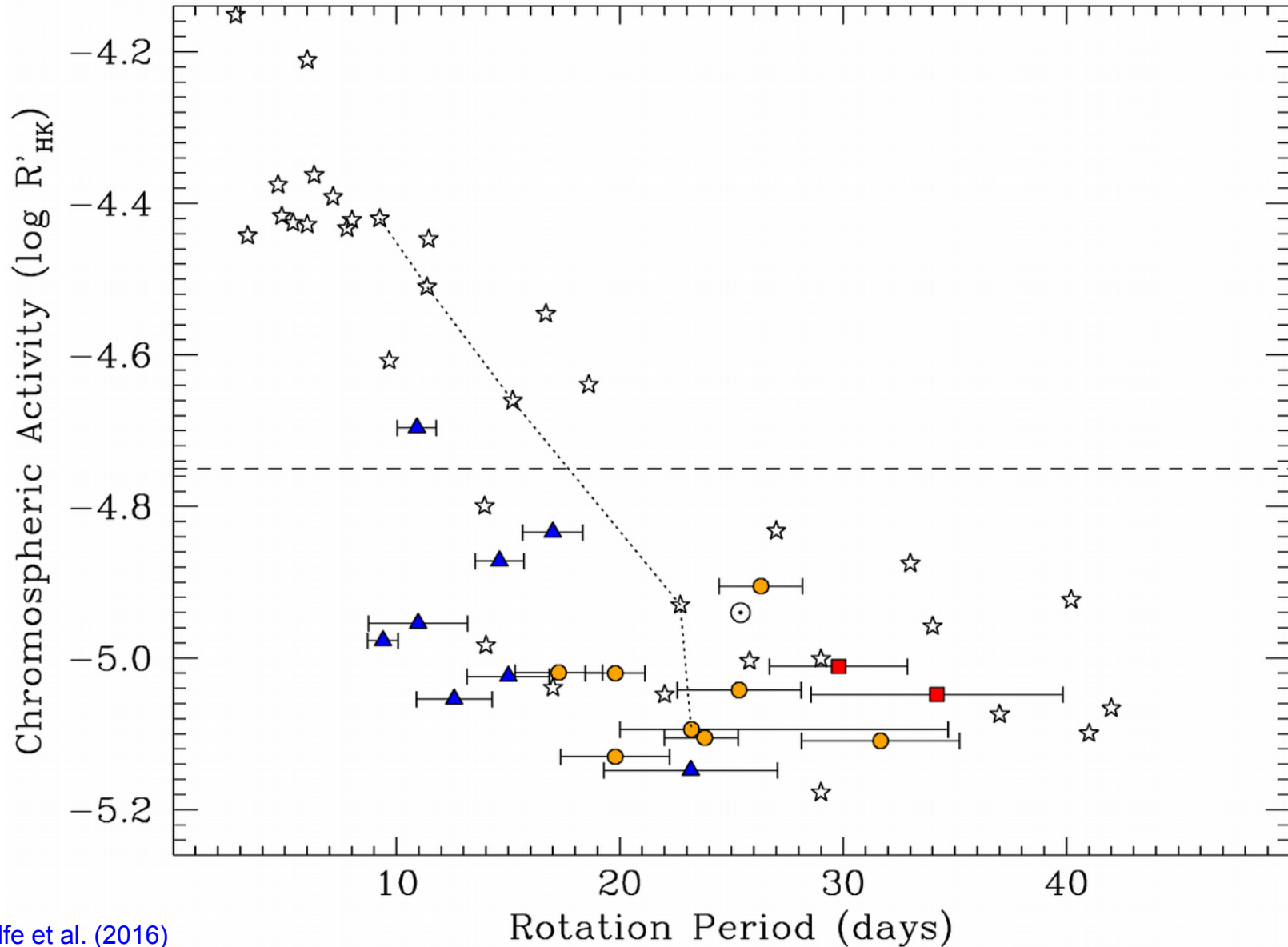
Standard spin-down

Ro cut at 2.16

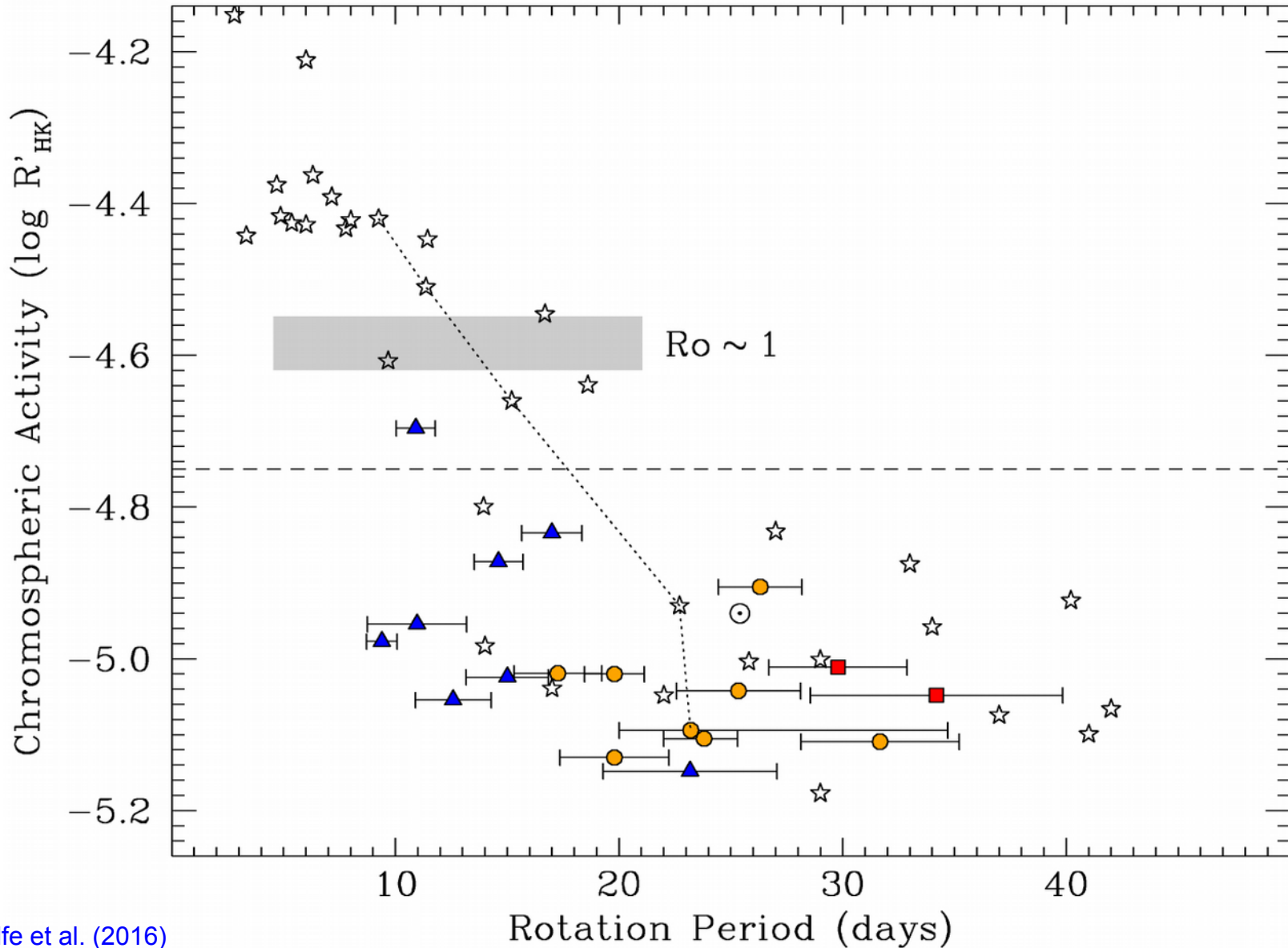




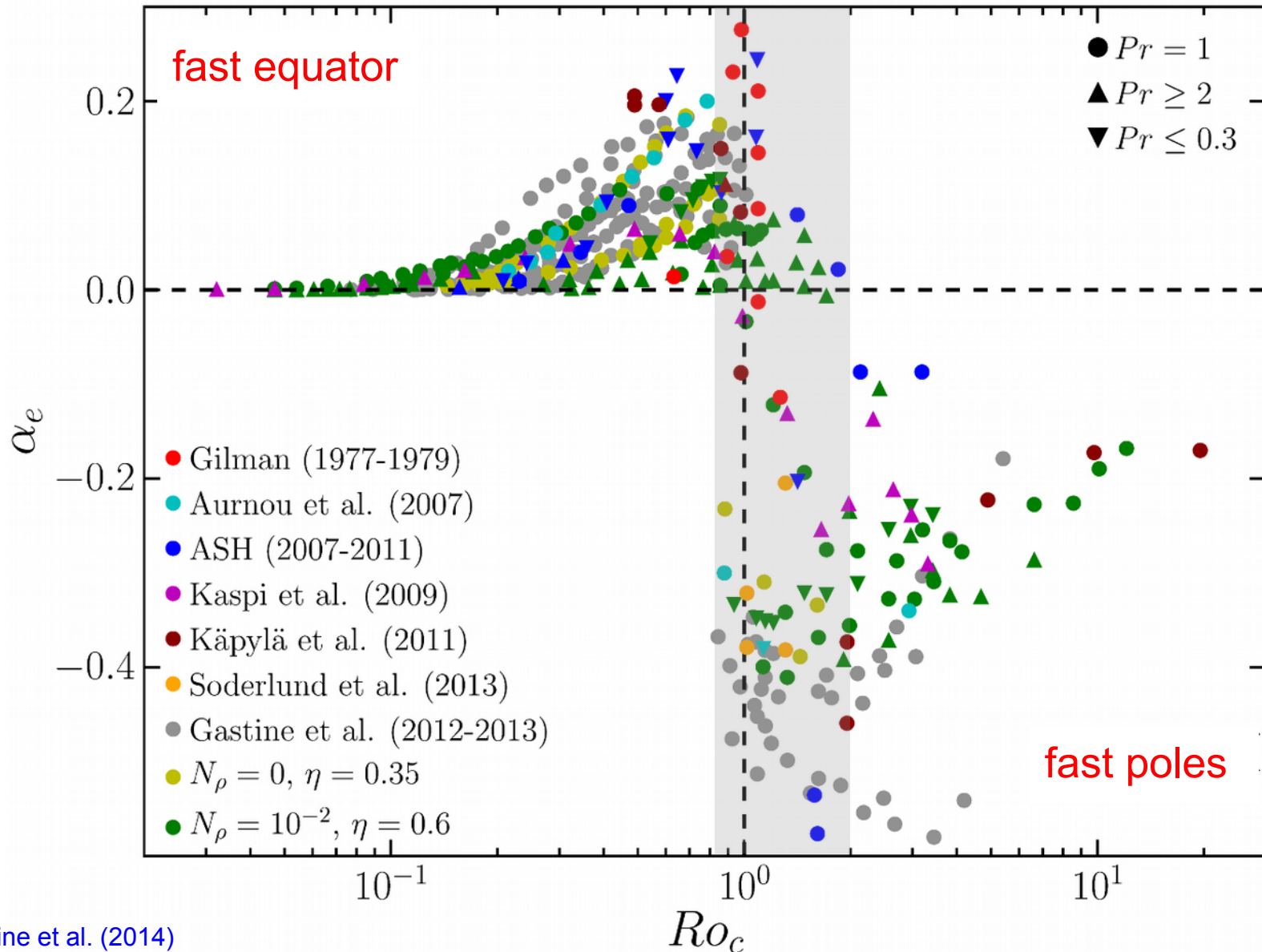
Rotation-activity relation



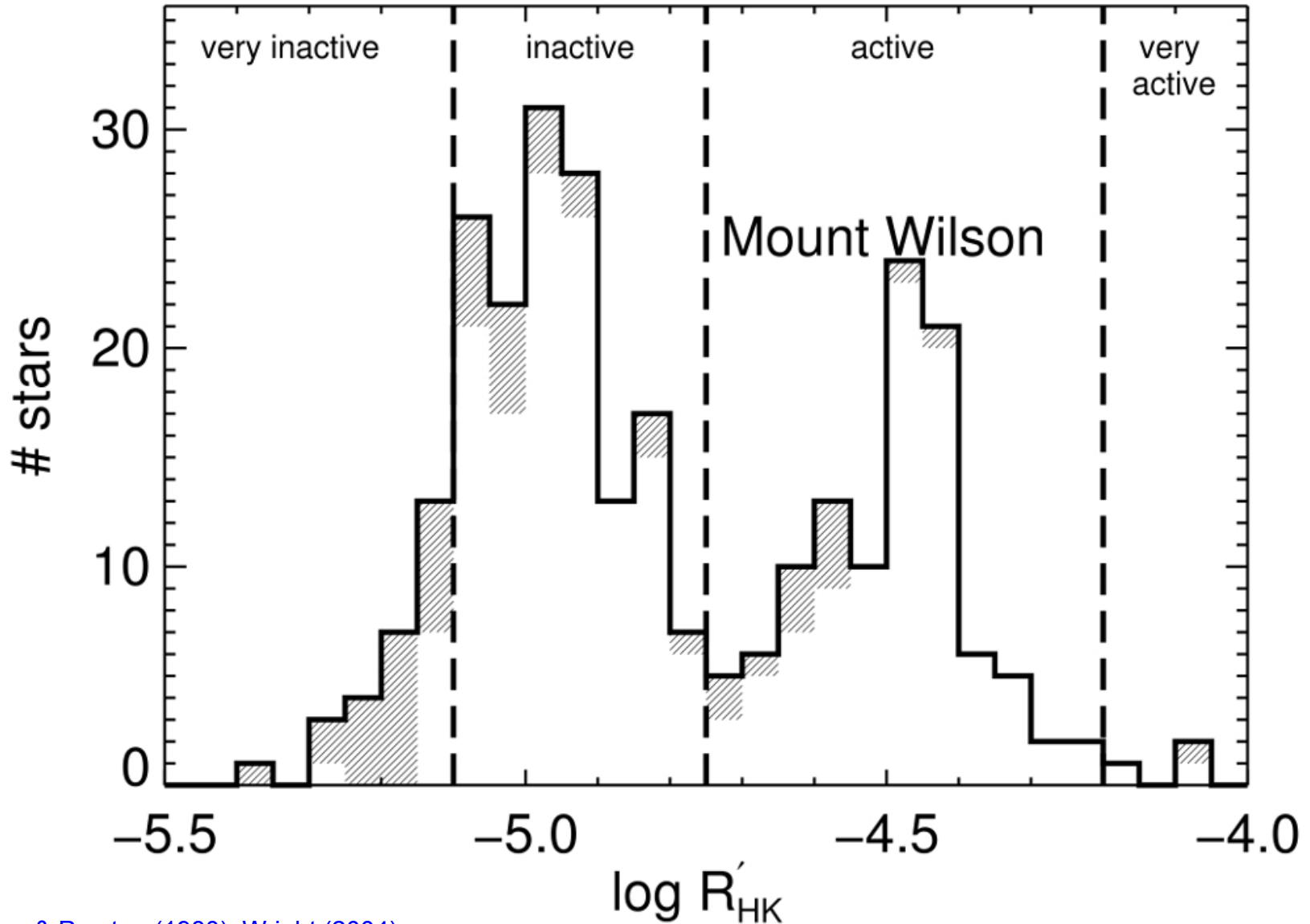
Rotation-activity relation



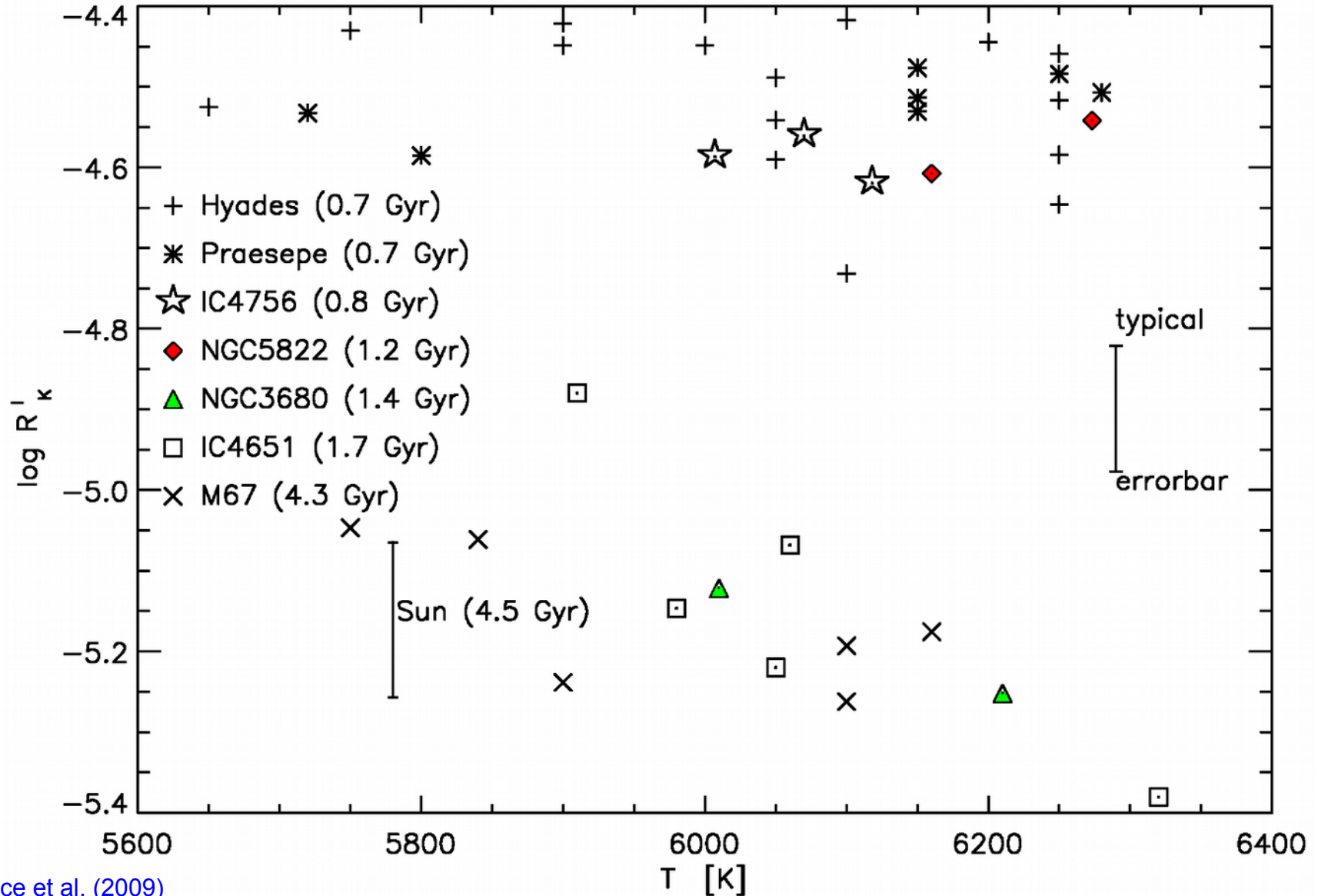
Differential rotation



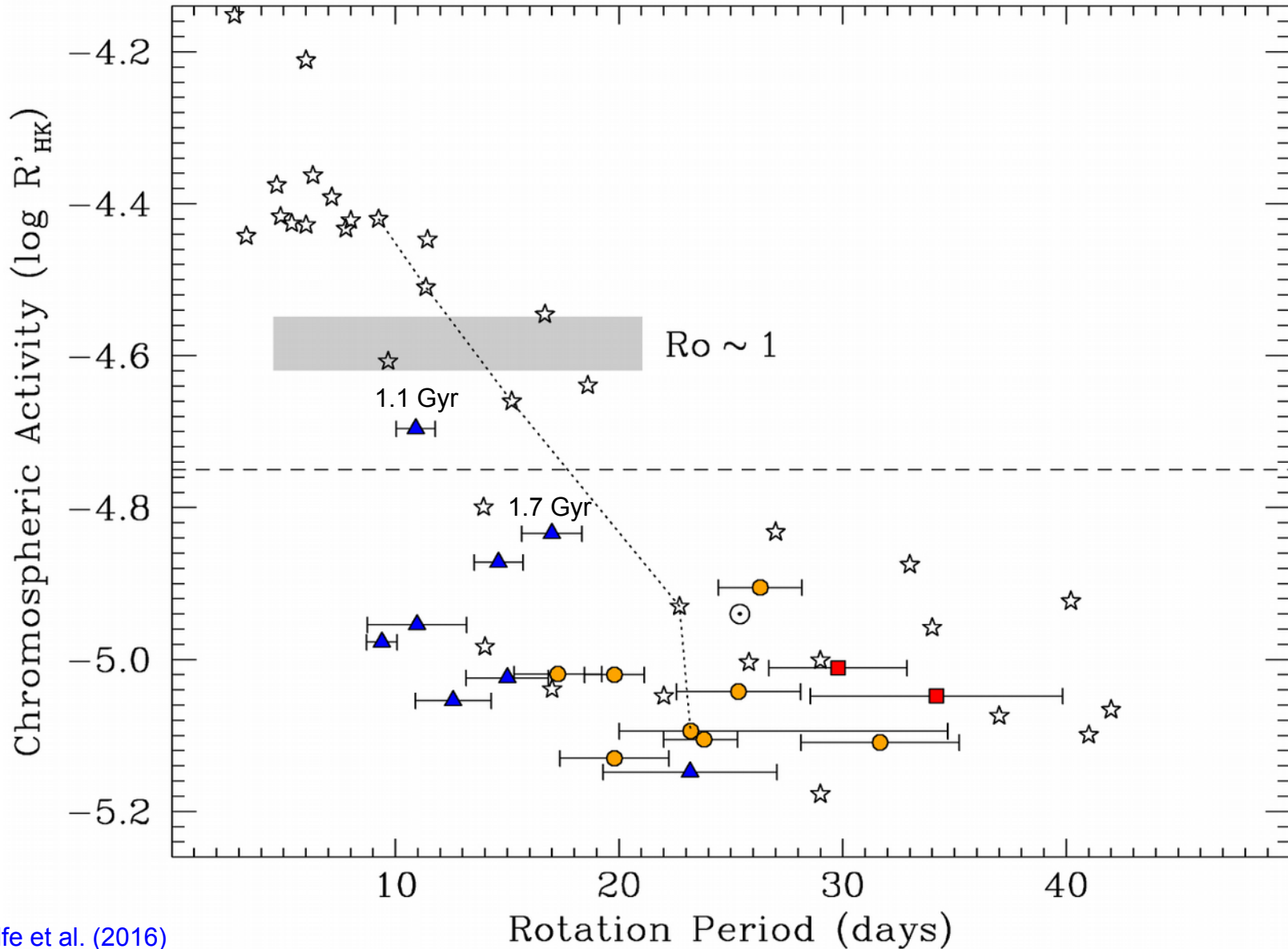
Vaughan-Preston gap



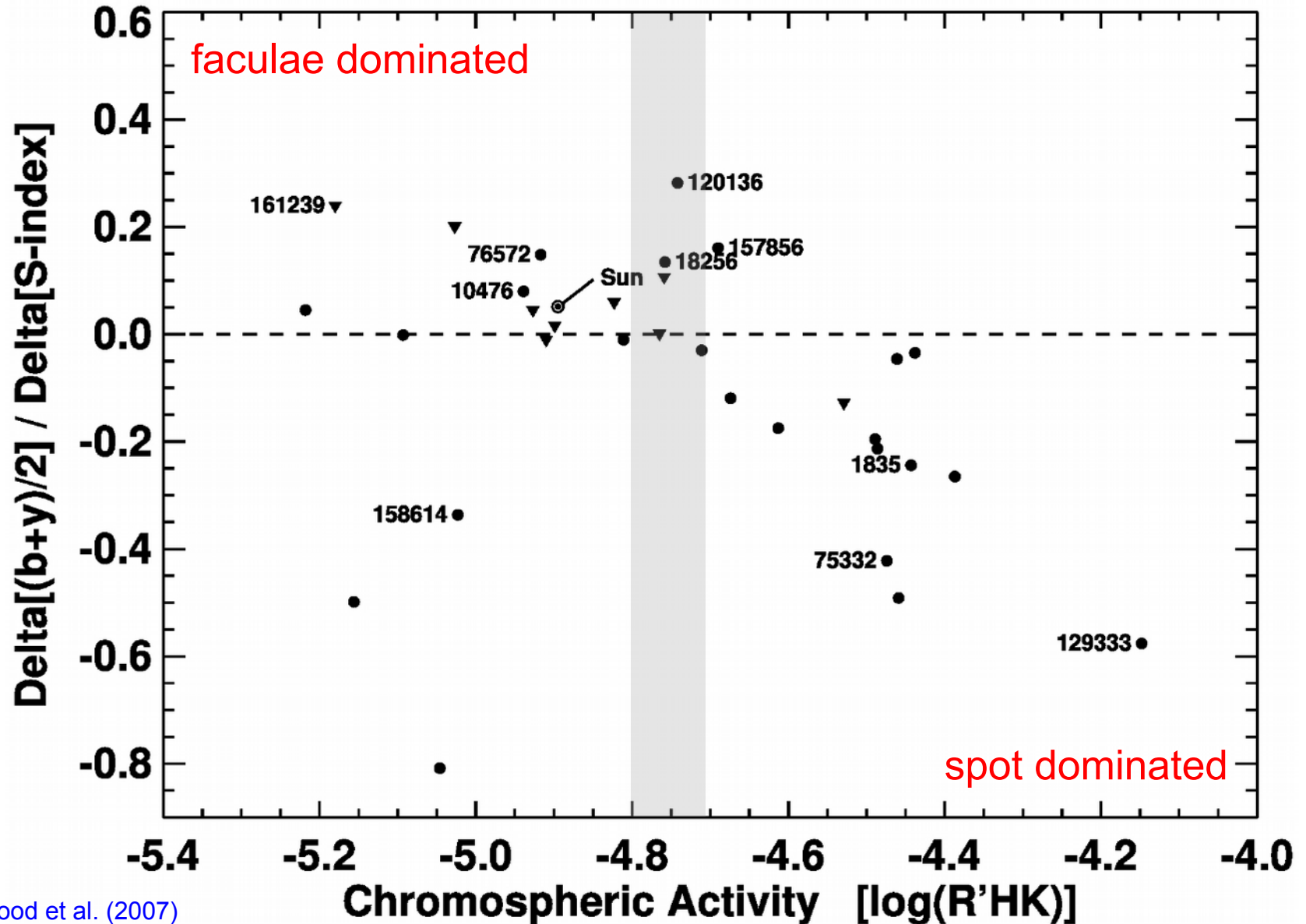
Rapid magnetic evolution



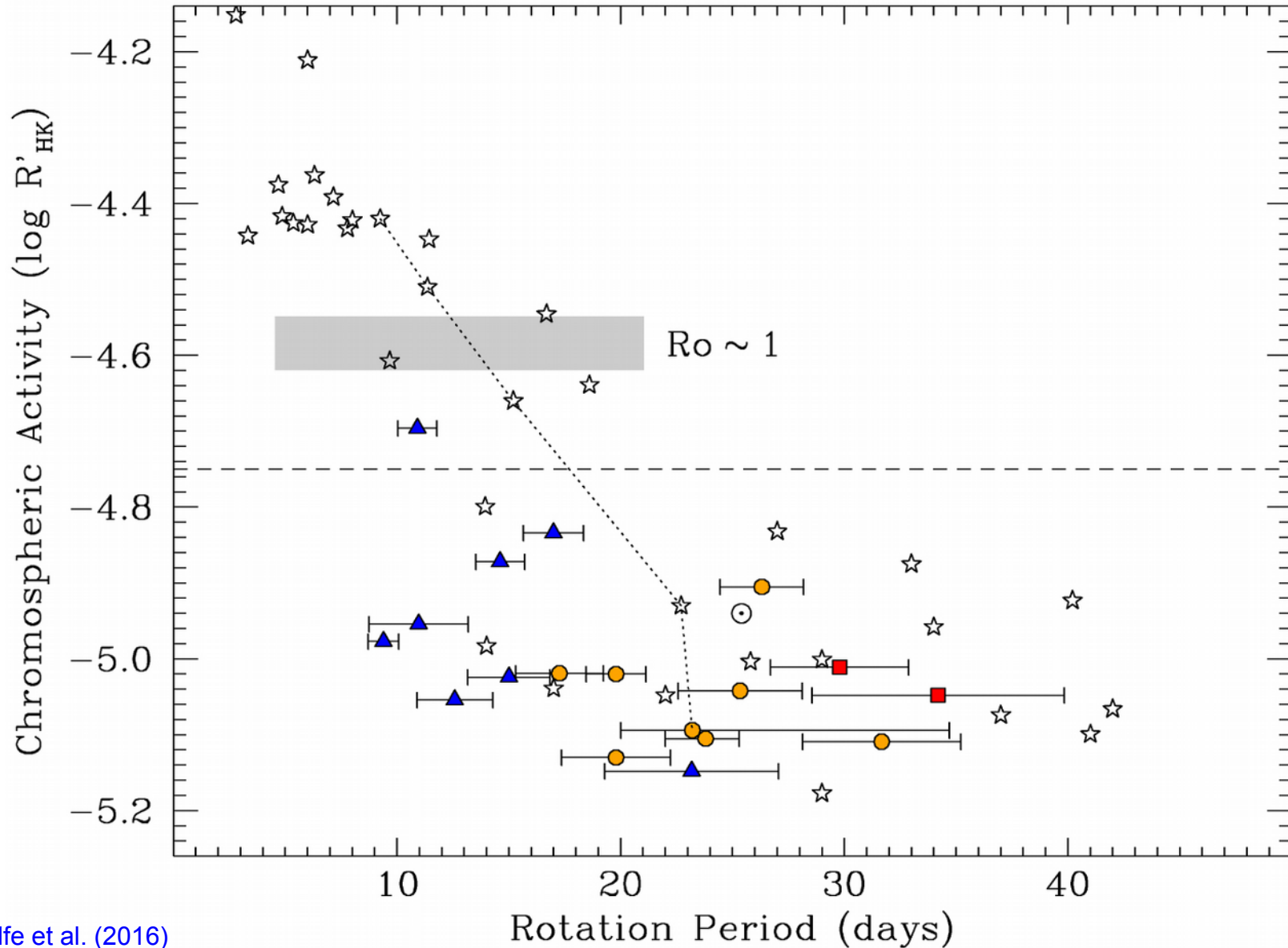
Rapid magnetic evolution



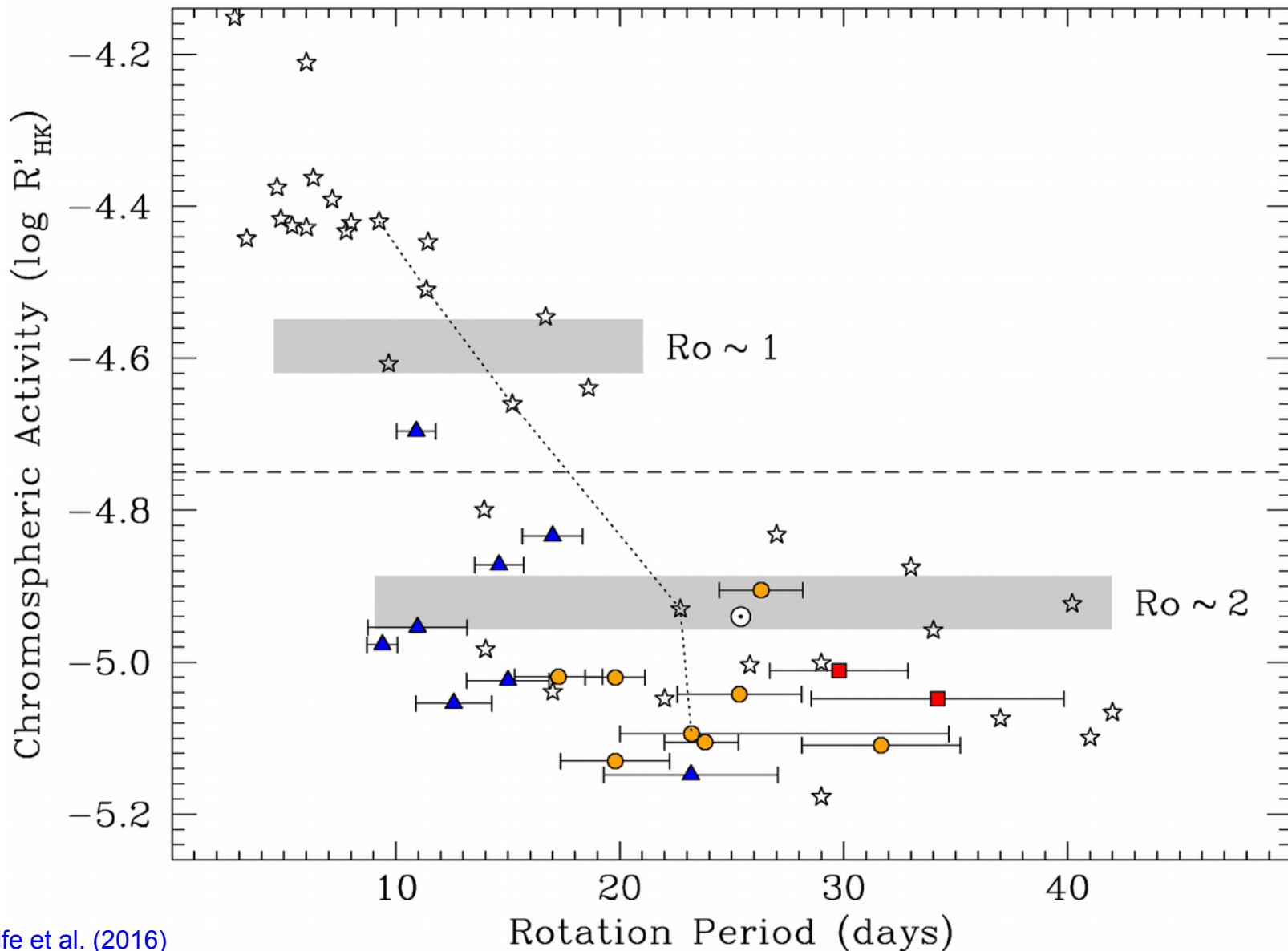
Spots and faculae



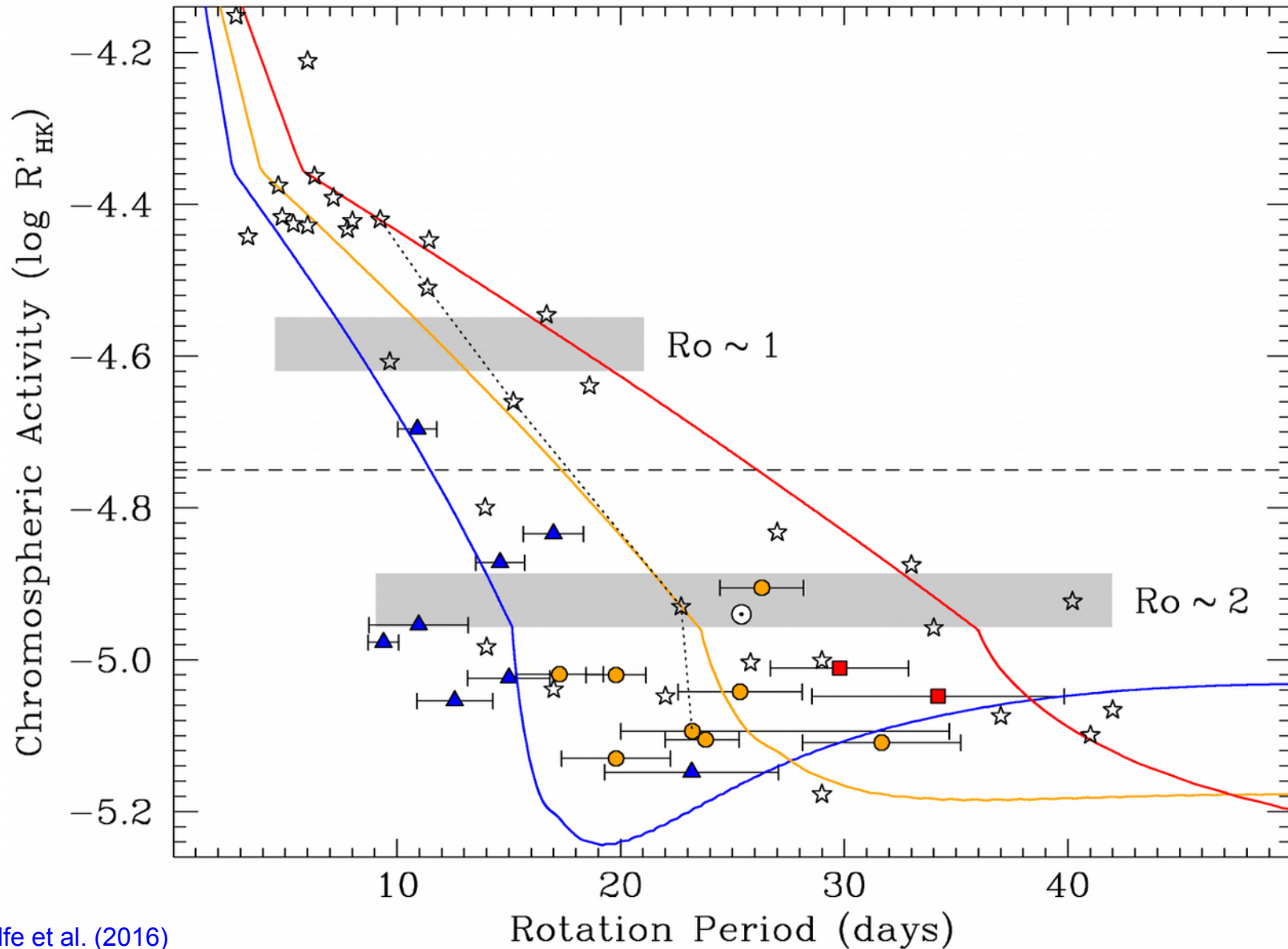
Breaking magnetic braking



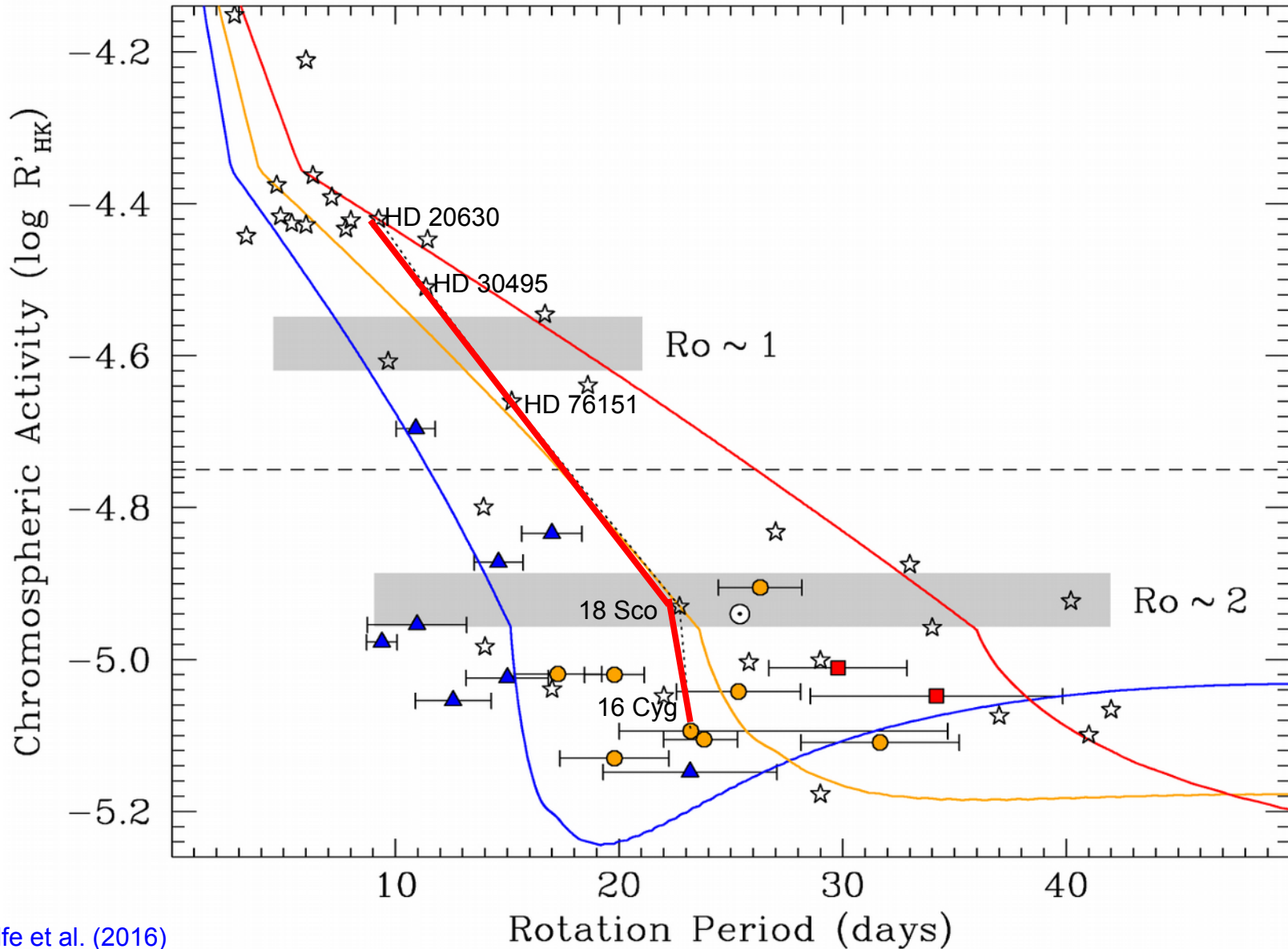
Breaking magnetic braking



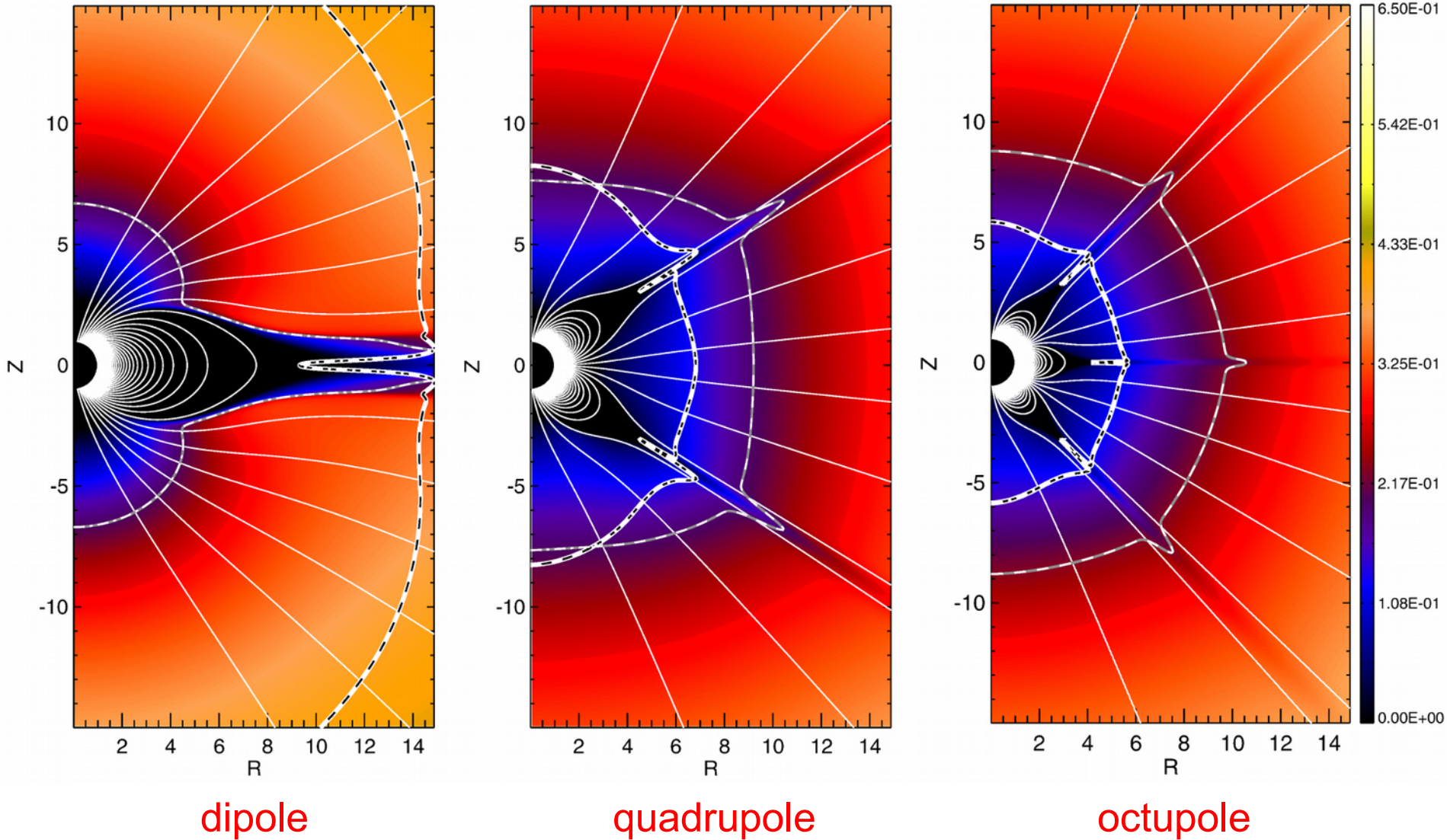
Breaking magnetic braking



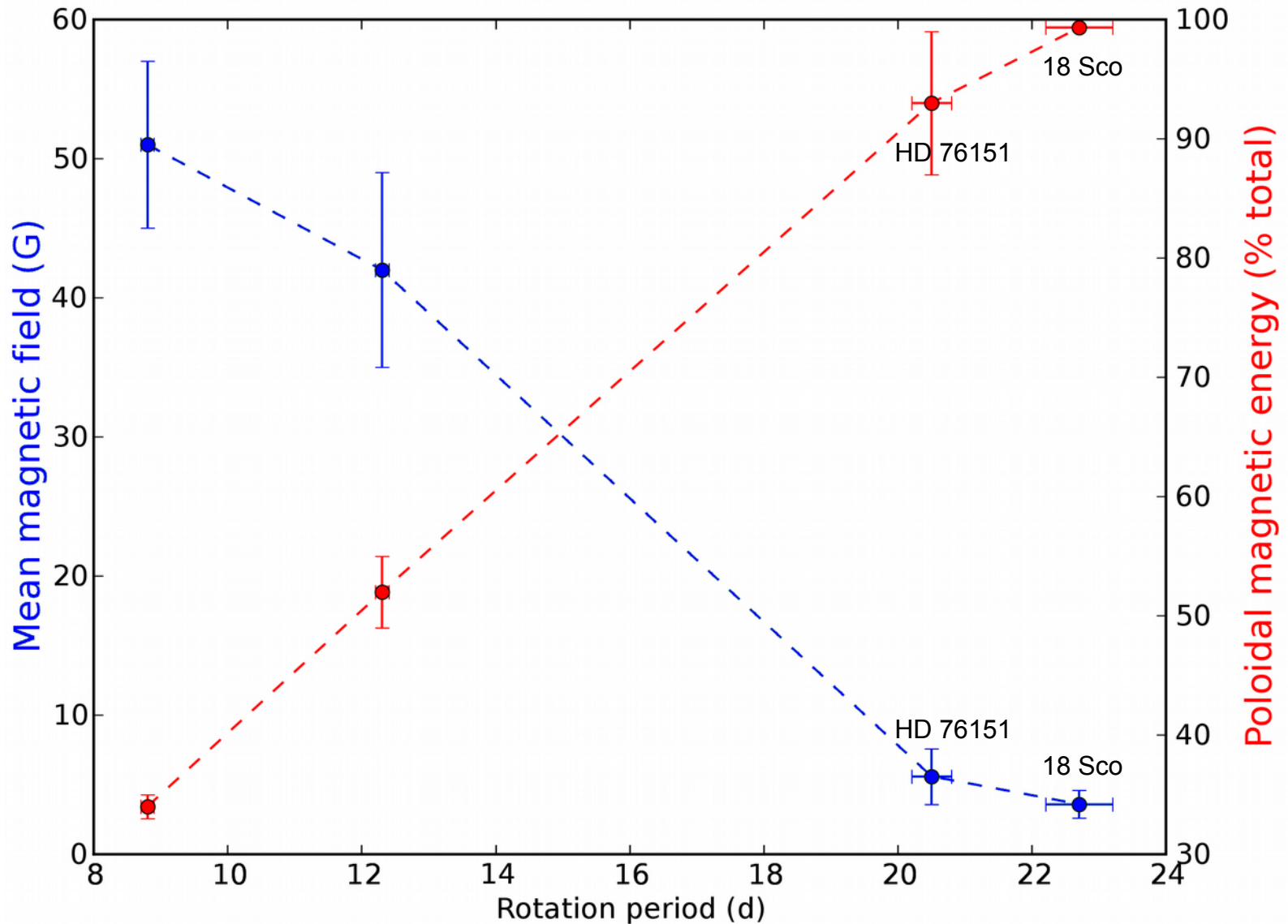
Solar analogs



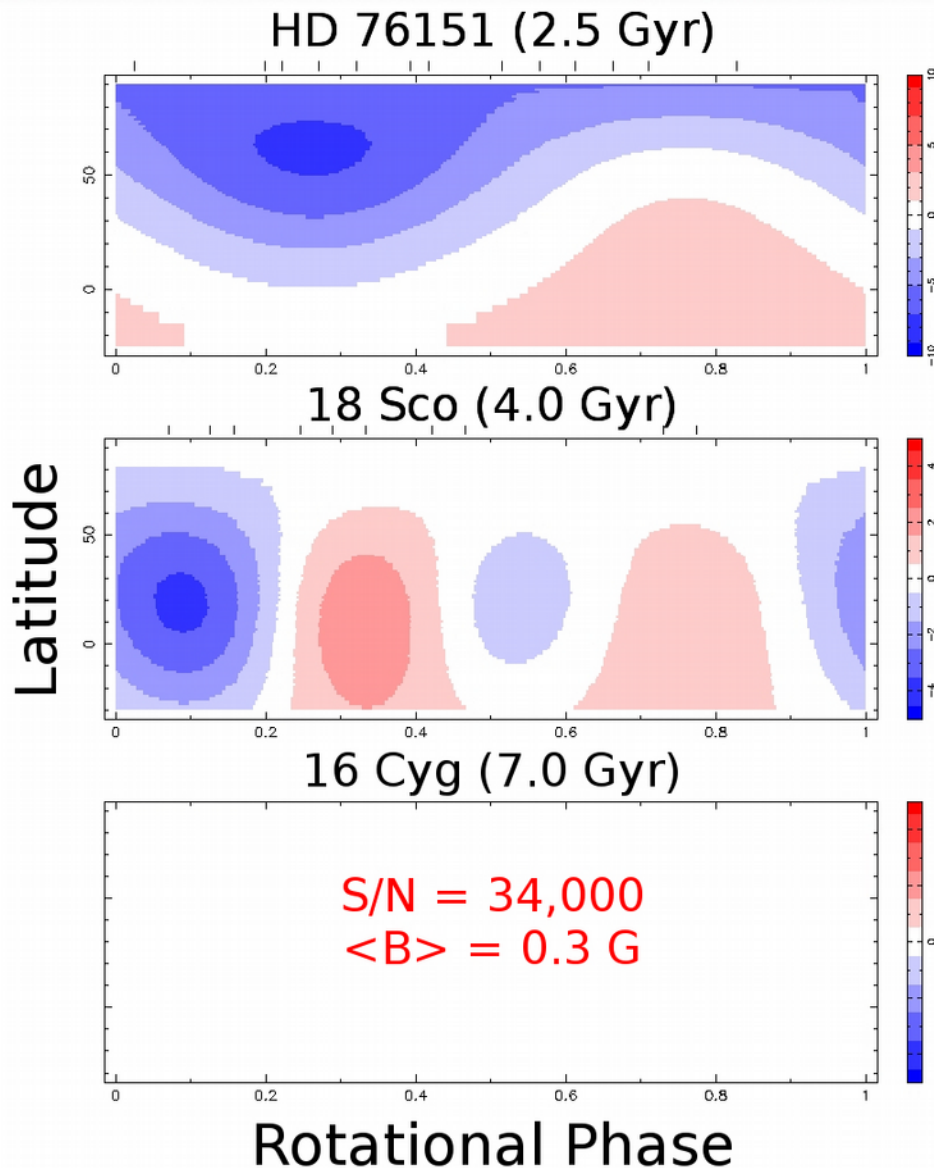
Spindown and magnetic topology



Zeeman Doppler imaging

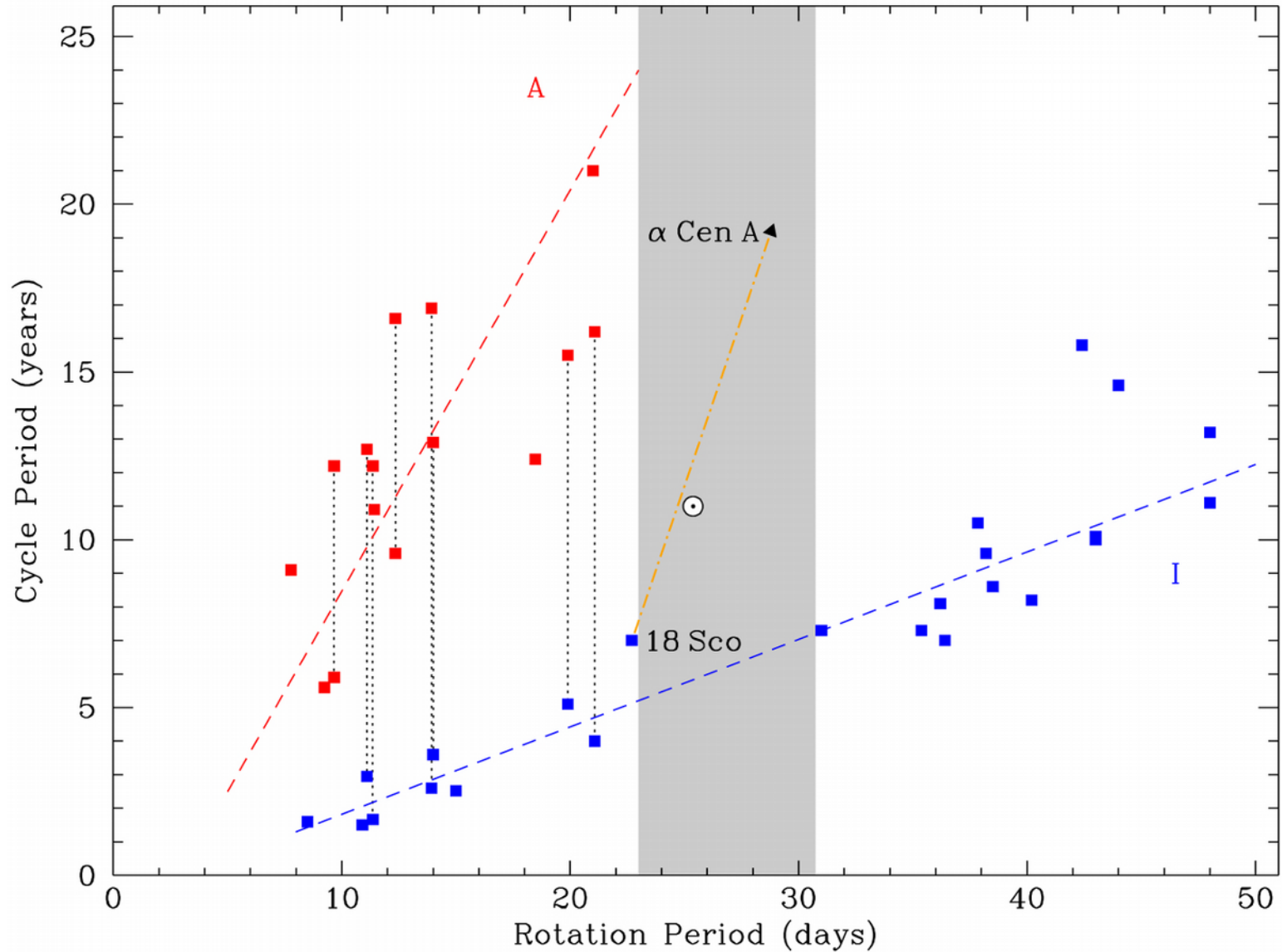


Zeeman Doppler imaging

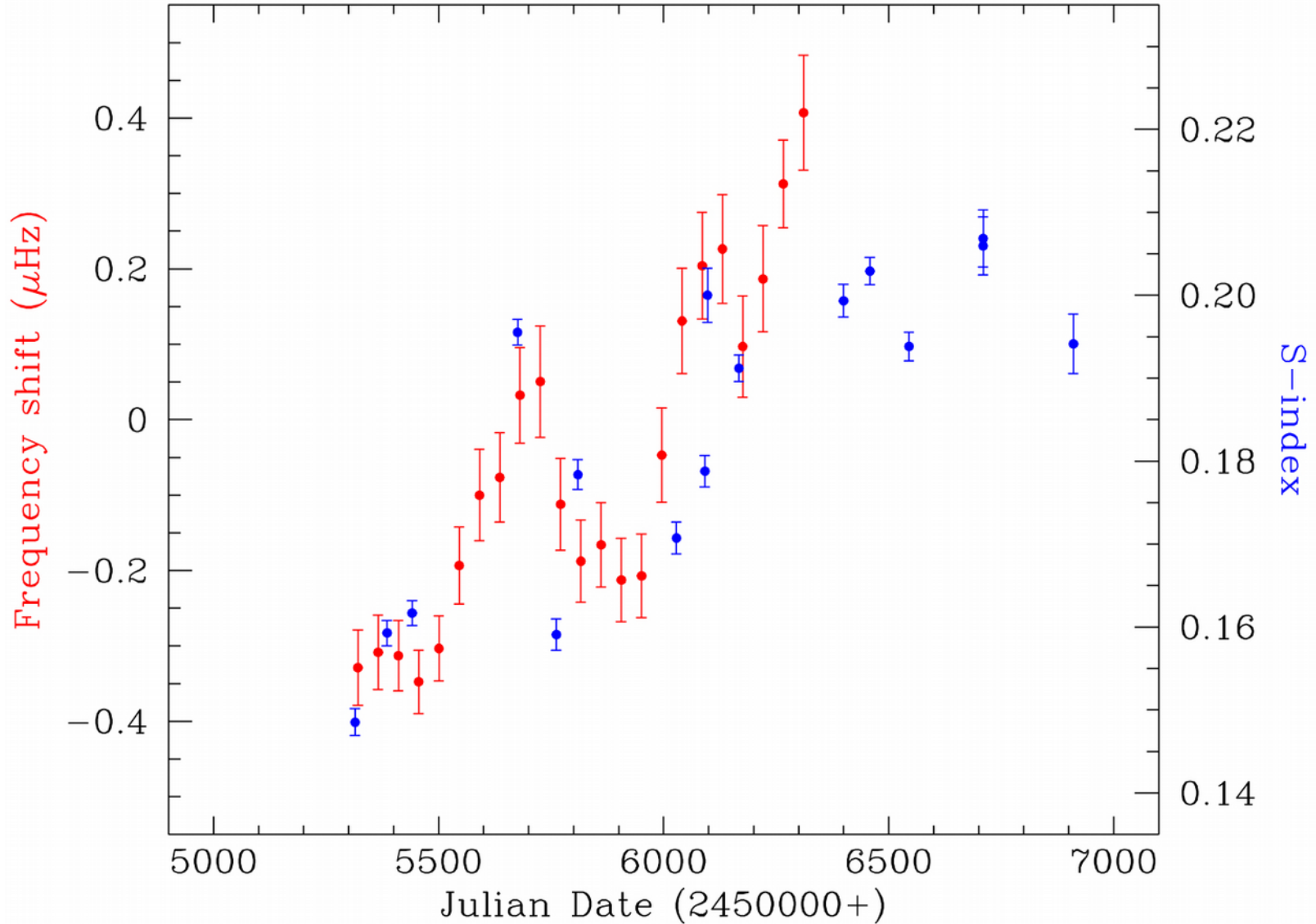


- Young solar analog is dominated by a dipole (80% of poloidal field)
- Dipole (35%) is already disappearing in 18 Sco, with 55% in quadrupole
- Old solar analog has no Zeeman signatures, weak average line-of-sight field

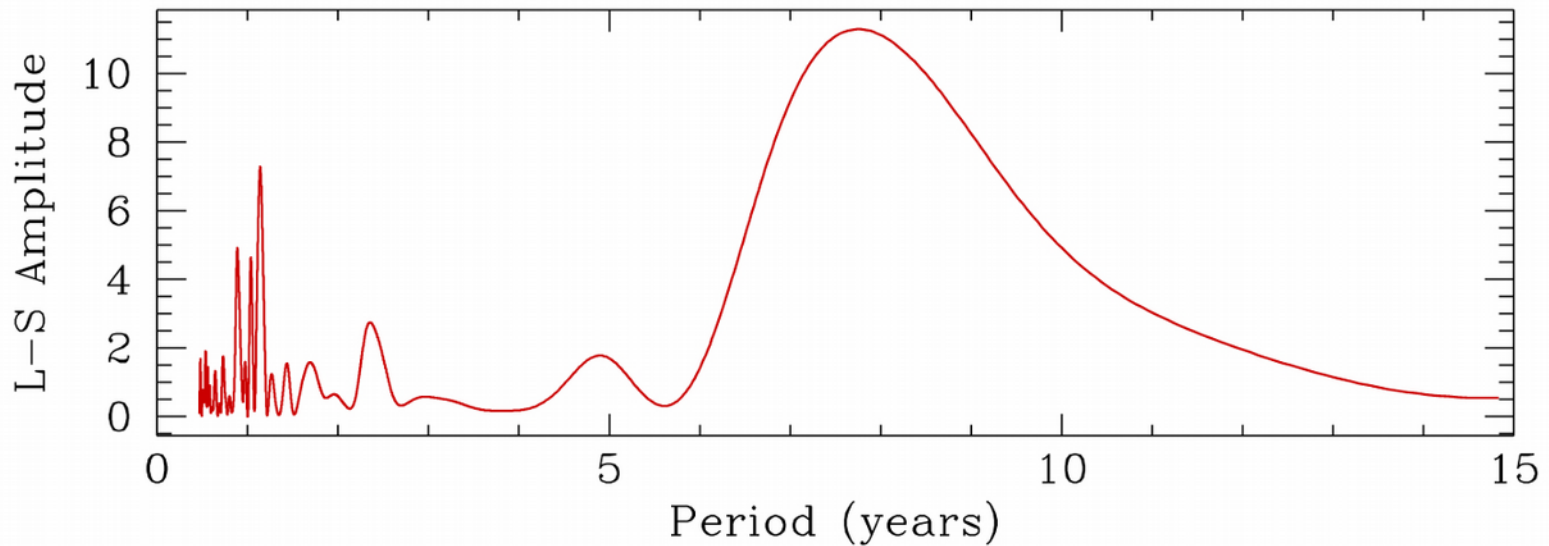
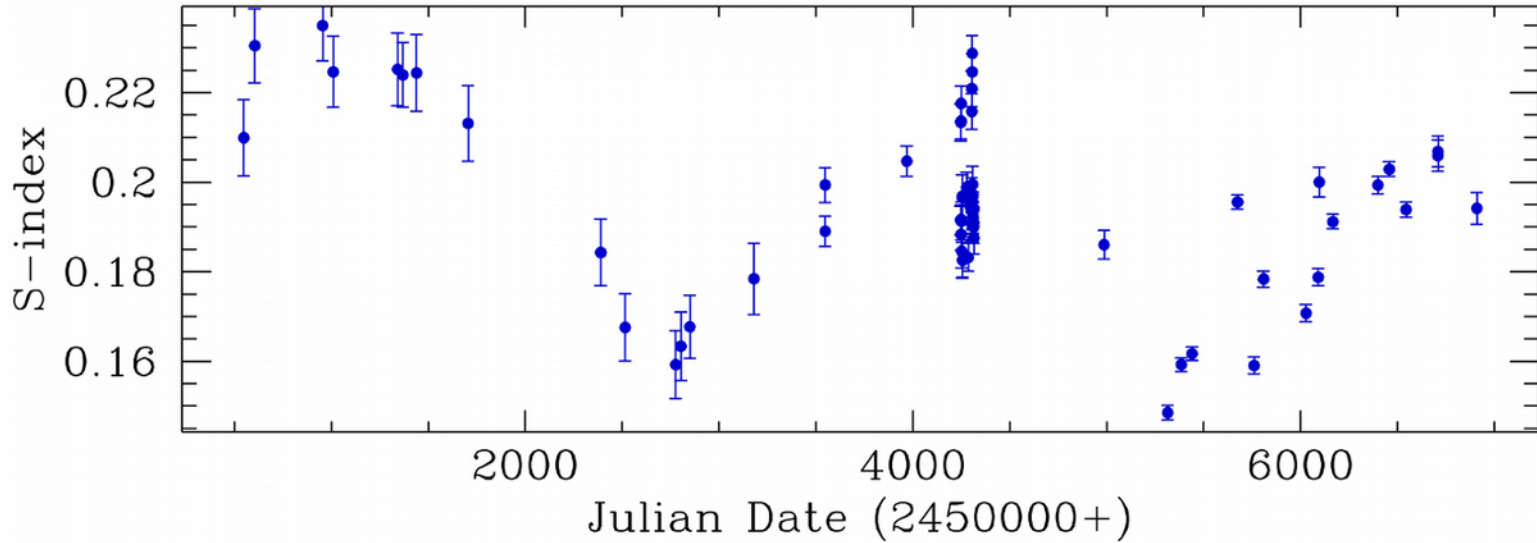
Context for the solar cycle



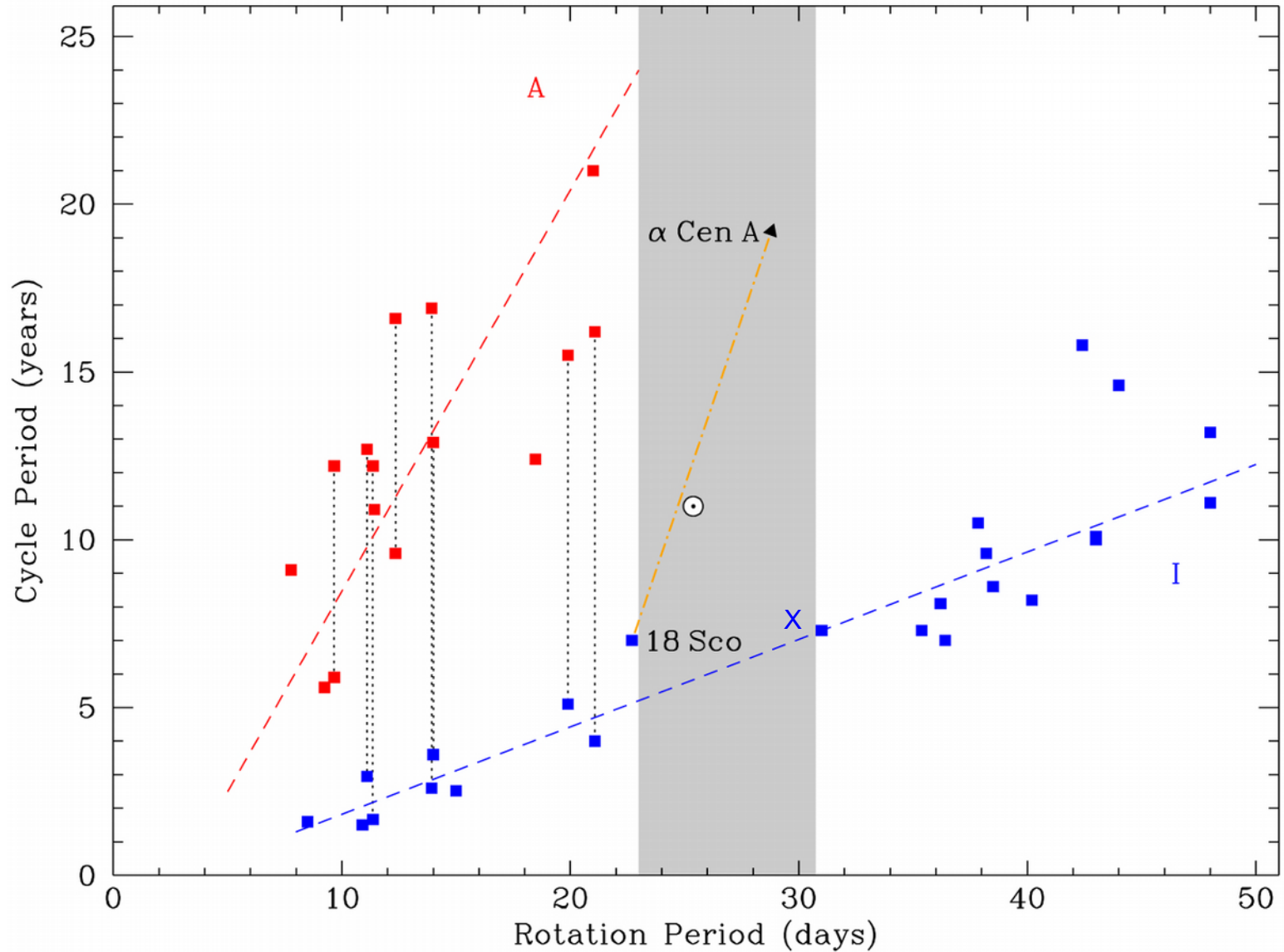
Kepler solar analog



Kepler solar analog



Kepler solar analog





Donald J. Trump 
@realDonaldTrump



Following

A change in differential rotation at $Ro \sim 1$ pushes stars across the V-P gap, rapidly decreases spot area, then disrupts magnetic braking at $Ro \sim 2$. So sad!



2.8K



6K



Donald J. Trump 
@realDonaldTrump



Following

The Sun is in a transitional evolutionary phase, and its 11-year activity cycle may represent a special case of stellar dynamo theory. That's what people are telling me!



2.8K



6K



Donald J. Trump 
@realDonaldTrump



Following

Future tests of this scenario will come from constraints on differential rotation, asteroseismology of Mt. Wilson sample, and ZDI with PEPSI @LBT. Best ever!



2.8K



6K

