Star formation in the Leading Arm of the Magellanic Stream

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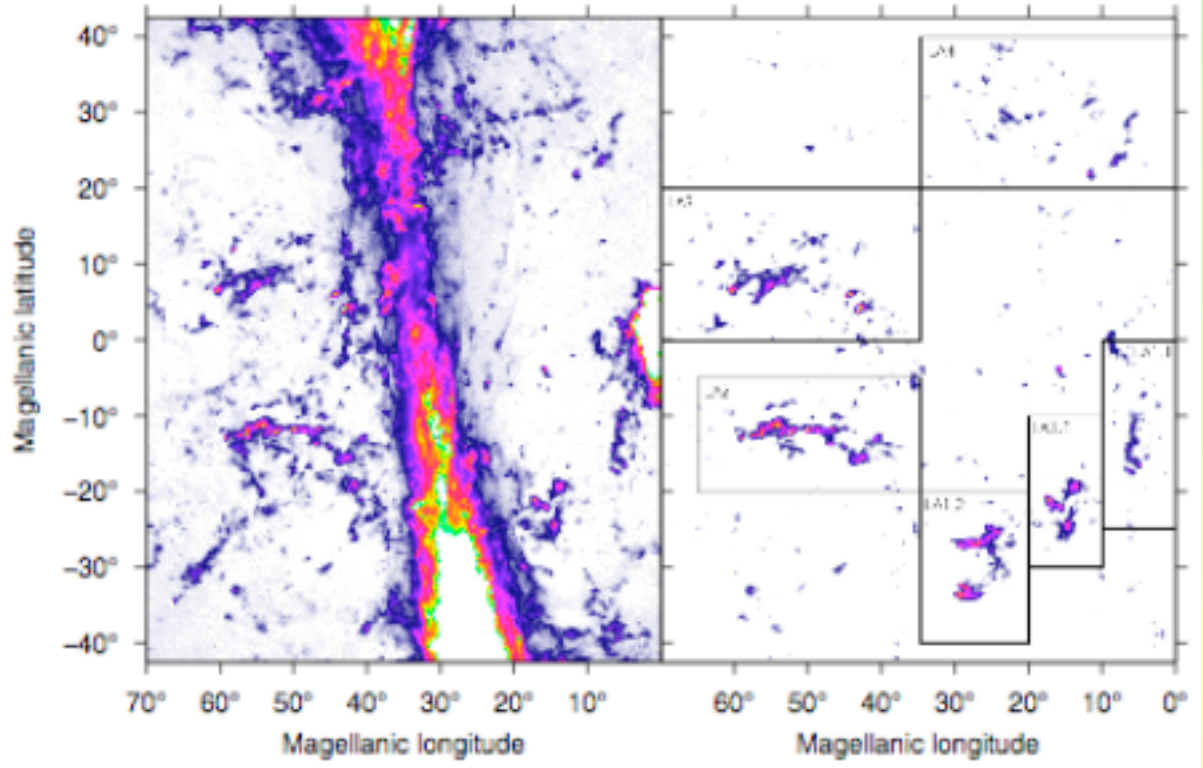
The complex Magellanic Cloud comprises an ensemble of tidal structures

HI tidal features known as Magellanic Stream, Bridge, Leading Arm

Interplay between Clouds and Milky Way, and the formation of these structures are under debate

The Leading Arm of the Magellanic Stream



Four substructures

No known stellar component

(Venzmer et al. 2012, A&A, 547, A12)

drag by Milky Way gaseous disk

(McClure-Griffith et al. 2008, ApJ, 673, L143; Ventzmer et al. 2012)

drag force due to MW hot halo

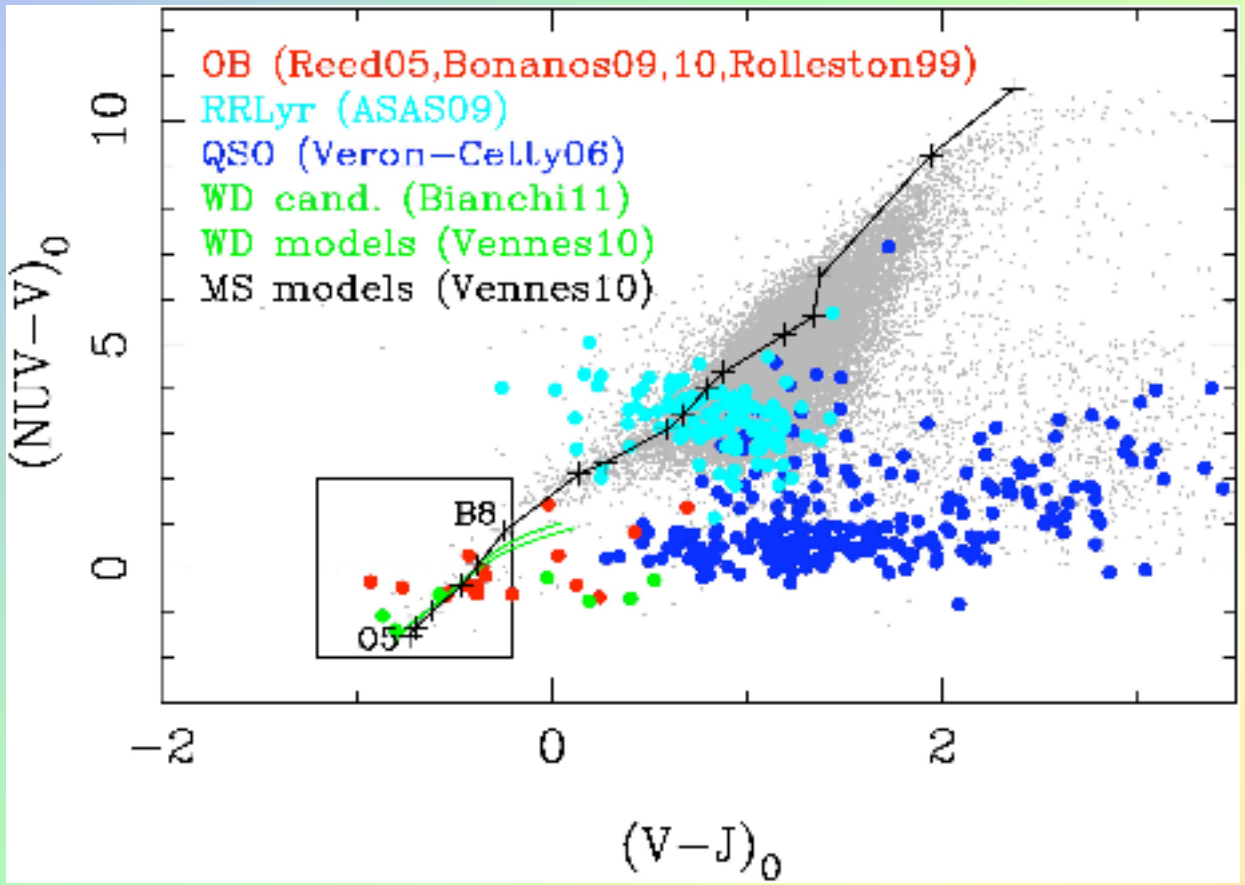
(Diaz & Bekki 2011, PASA, 28, 117)

Young stars in the MC system

(Casetti-Dinescu et al. 2012, ApJ, 753, 123)

NUV	-	GALEX DR5
		(Bianchi et al. 2011, MNRAS, 441, 2770)
J	-	2MASS
		(Skrutskie et al. 2006, AJ, 131, 1163)
V	-	APASS
		(Henden et al. 2011, AAS, 218, 126.01)
pm	-	SPM4
		(Girard et al. 2011, AJ, 142, 15)

Color selection



$(NUV-V)_0$=[-2,2]

$(V-J)_0$=[-1.2,-0.2]

$e(NUV-V)_0$<0.1

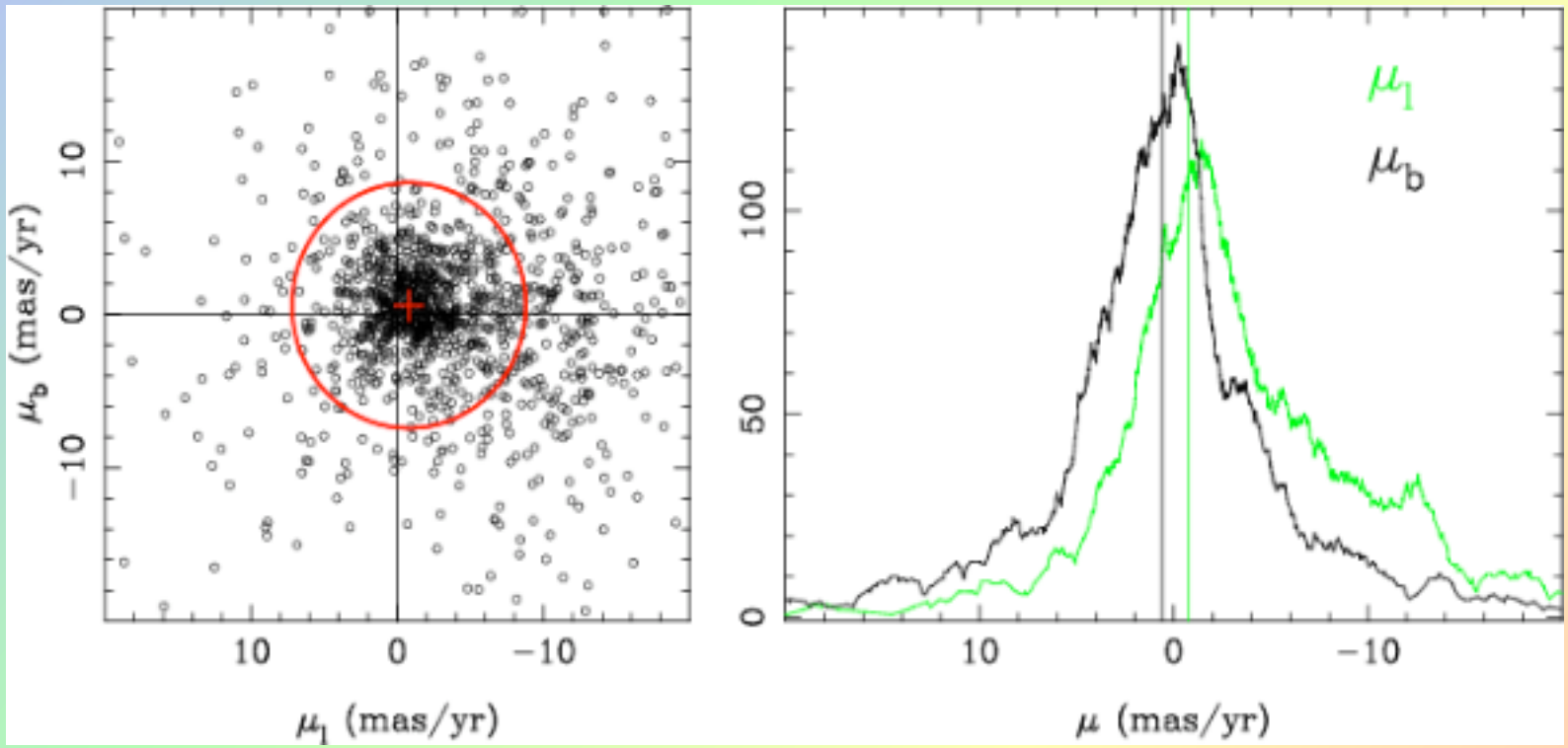
eJ<0.15

E(B-V)<0.5

Magnitude selection

V_0=[13,17]

Proper motion selection



pm < 8 mas yr^{-1}

epm < 4 mas yr^{-1}

567 young OB star candidates

7900 deg² area

(periphery of the Clouds, the Bridge, the Leading Arm, part of the Magellanic Stream)

1- SMC wing, two branches
2- narrow path from SMC wing eastward toward LMC
3- clumps of stars at the ends of the LMC bar
4- scattered candidates in the Magellanic Stream
5- overdensities in the Leading Arm

Spectroscopic follow-up to confirm their nature, and to better characterize these structures (kinematics, distance, metallicity, age)

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PILOT PROJECT

Young stars in the Leading Arm (LA)

1) prove their membership

recent star formation in the LA!

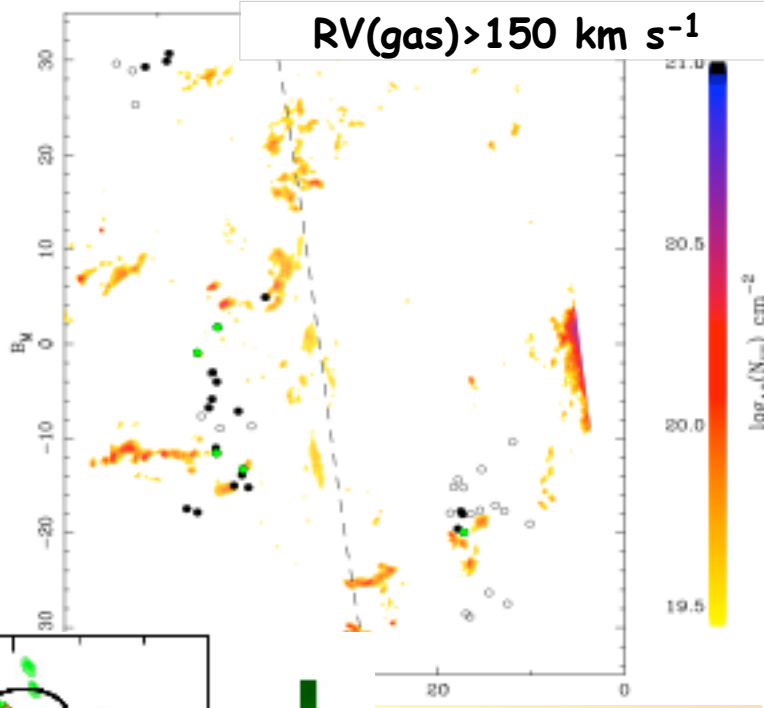
Constrain the hydrodynamical interplay between MW and LA gas

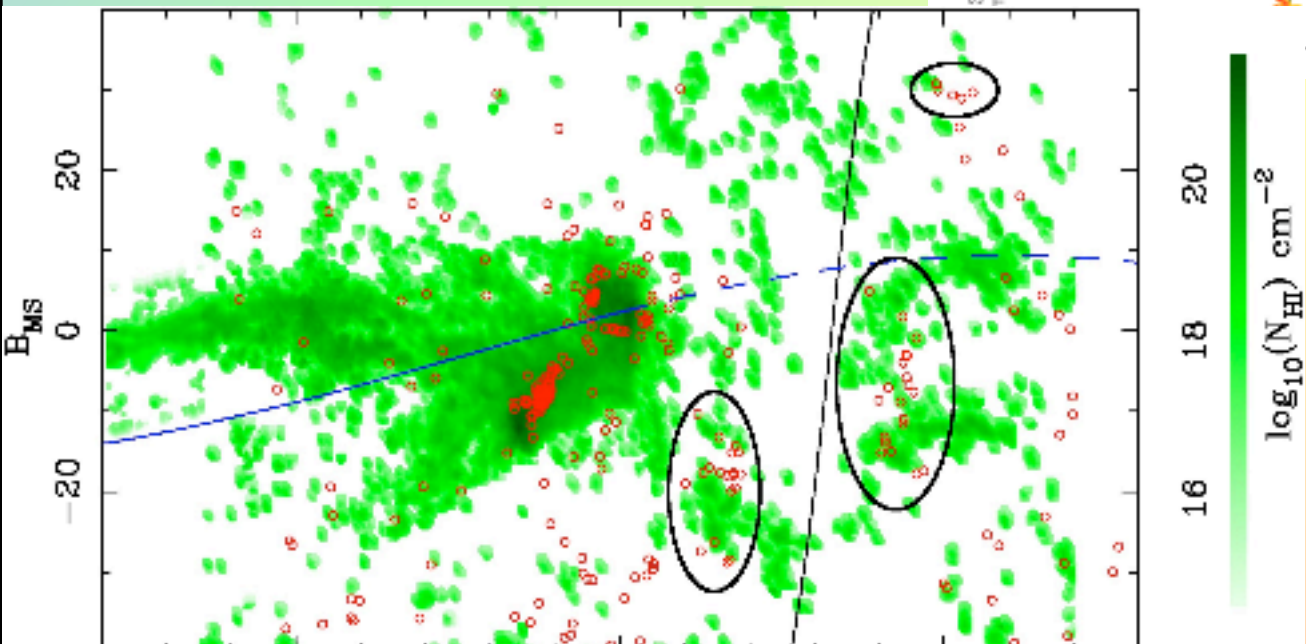
2) estimate distance

(estimates from HI kinematics: 20-50 kpc)

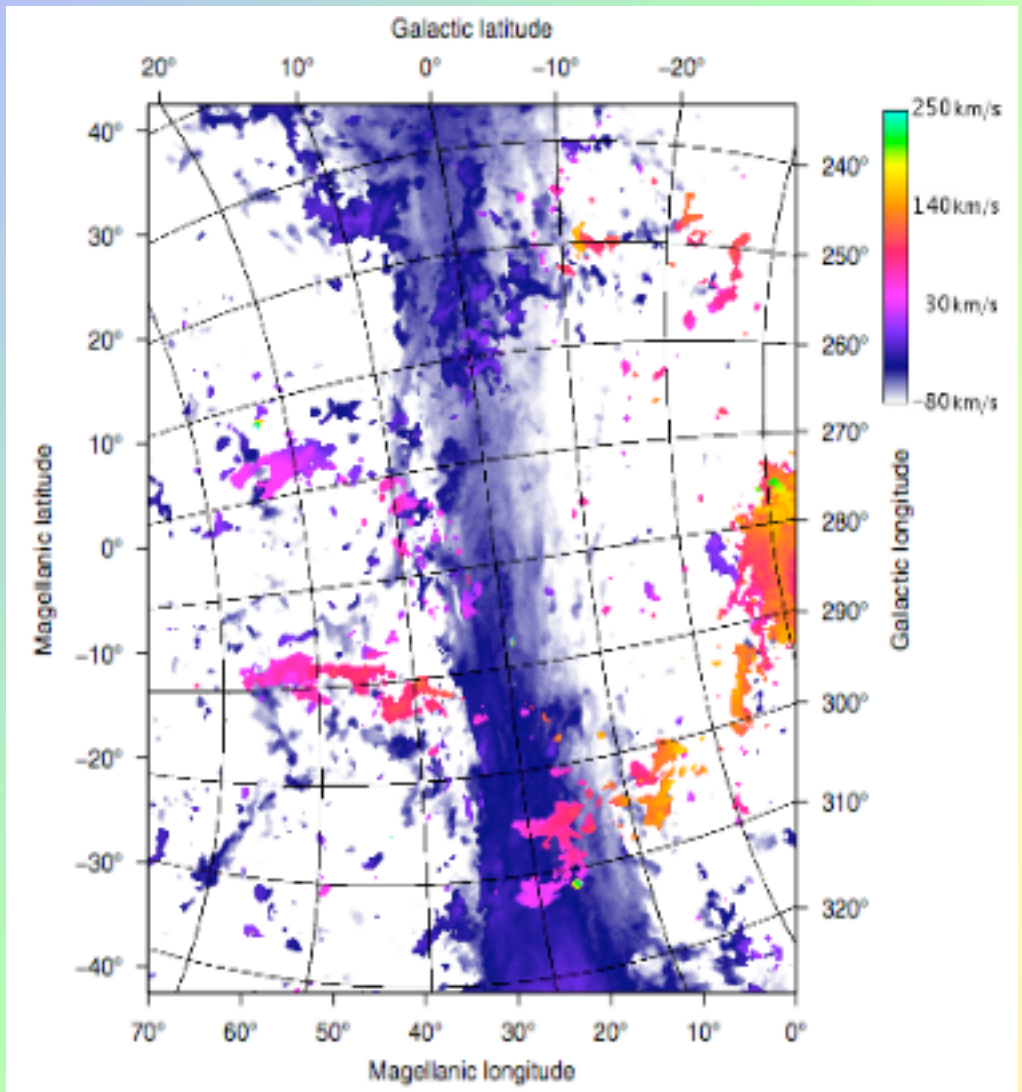
43 OB star candidates in three overdensities

Data collected on April 1-2, 2013
IMACS@Baade, LCO
1A resolution
3700-5300A range





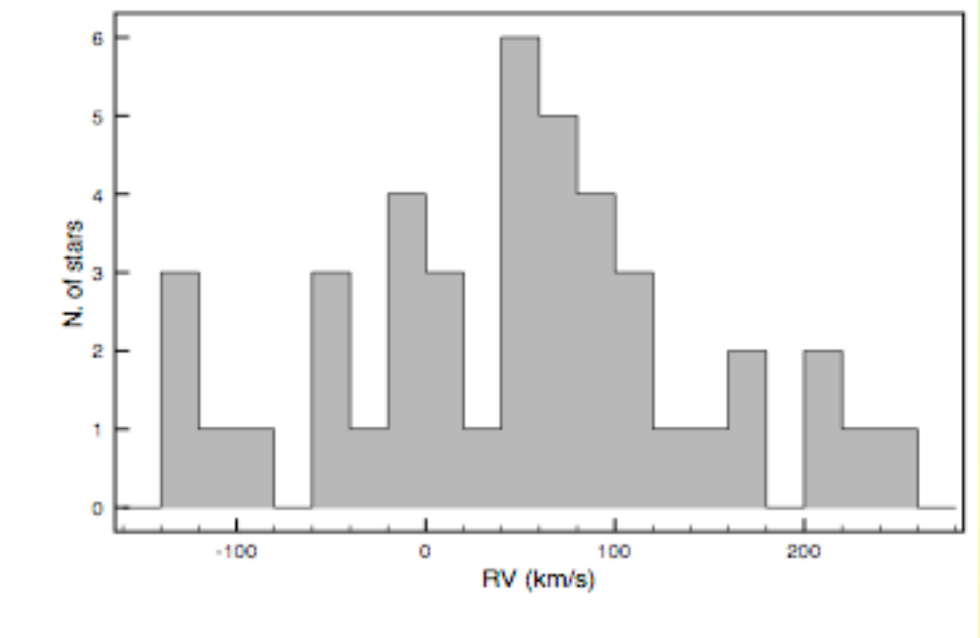
RADIAL VELOCITIES



(Venzmer et al. 2012)

Besançon model predicts
no Galactic star with
RV > 100 km s^{-1}
at d > 3 kpc

RADIAL VELOCITY RESULTS



Most (≈40%) dsB's are in close binary systems

(e.g., Maxted et al. 2001, MNRAS, 326, 1391)

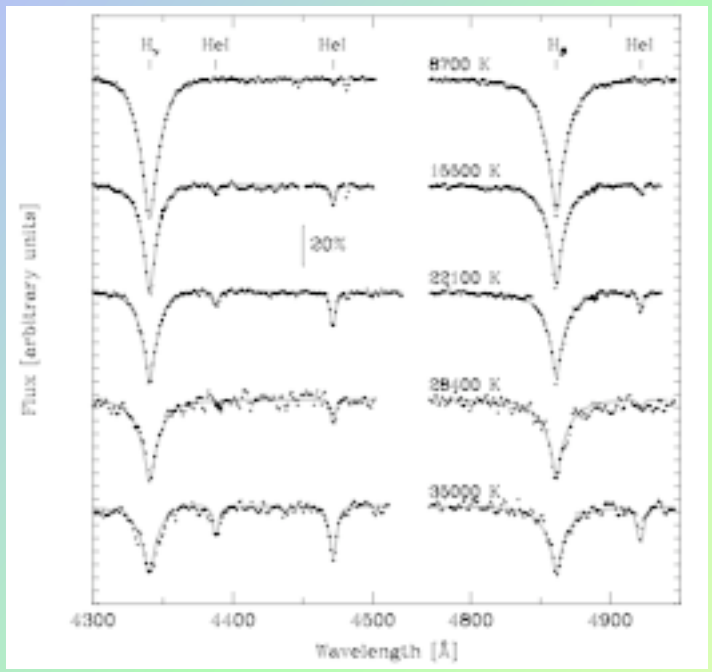
With RV variations up to 100 km s^{-1}

(e.g., Morales-Rueda et al. 2003, MNRAS, 326, 752)

Most (≈70%) of O stars are binaries, with strong preference for short periods and uniform mass ratio distribution

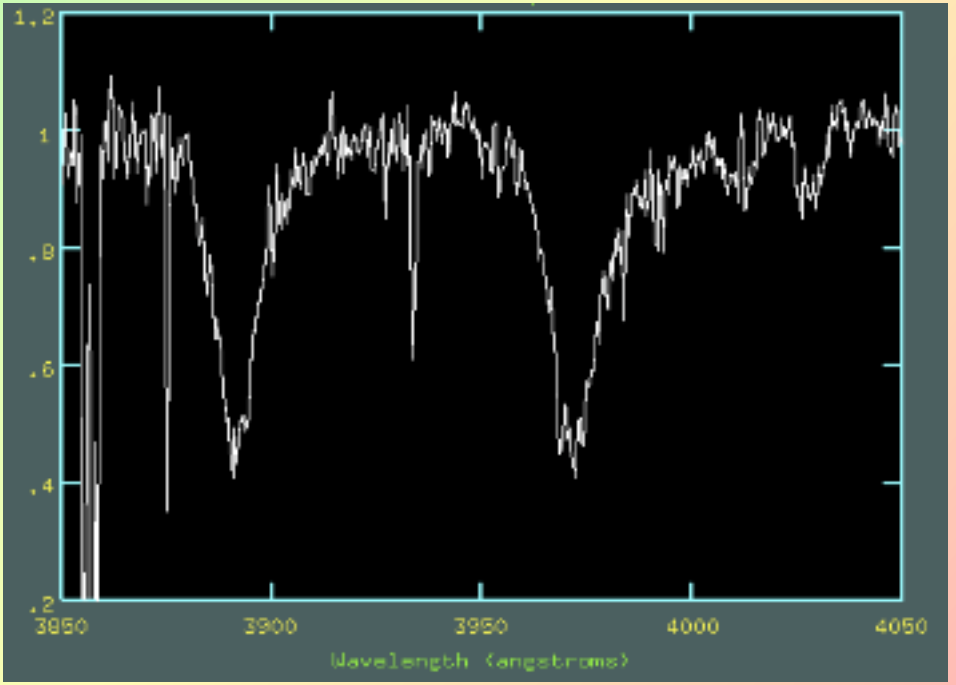
(Sana et al. 2012, Science, 337, 444)

Stellar parameter measurements



Fit of Balmer lines to derive temperature and gravity

(e.g., Moni Bidin et al. 2012, A&A, 547, A109)



RV=171 km s^{-1}

Fast rotation: likely a MS star

(sdB's are not fast rotators)