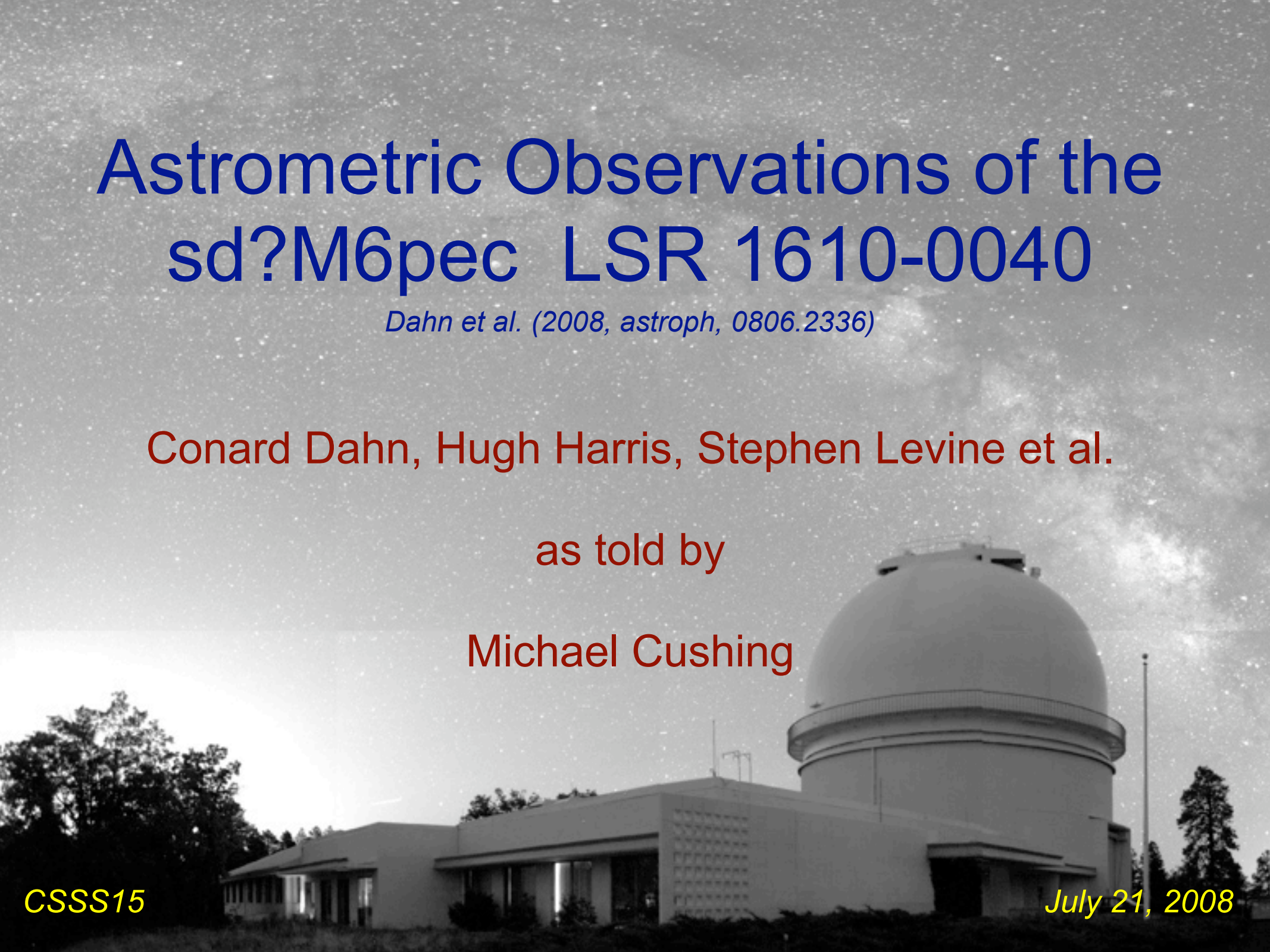
Astrometric Observations of the sd?M6pec LSR 1610-0040

Dahn et al. (2008, astroph, 0806.2336)

Conard Dahn, Hugh Harris, Stephen Levine et al.

as told by

Michael Cushing

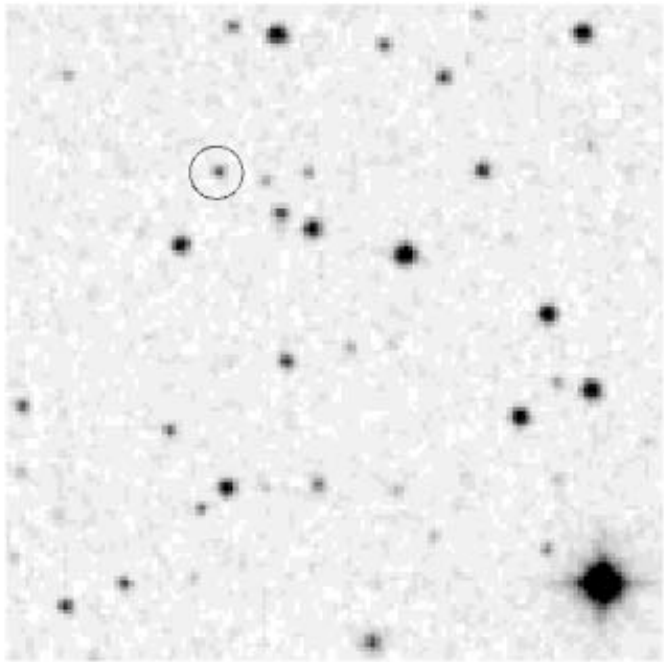


CSSS15

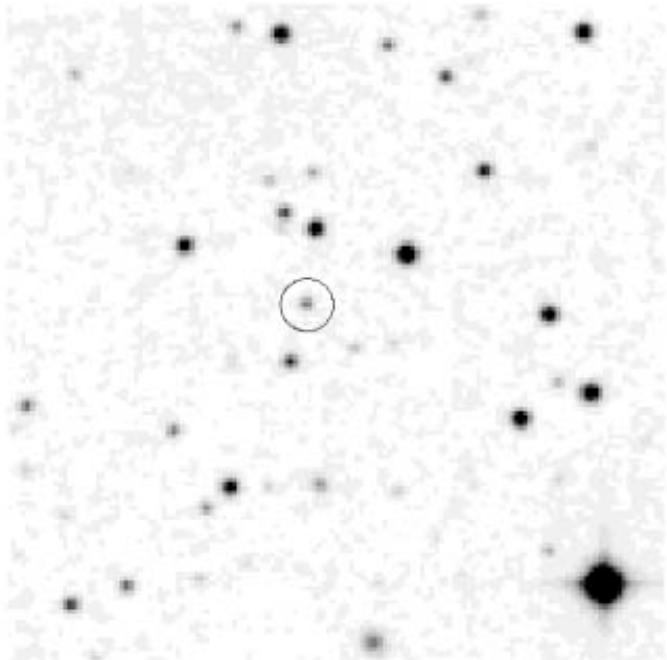
July 21, 2008

History of LSR 1610

LSR 1610 was discovered by Lepine et al. as a high proper motion star (μ=1.46 arcsec / yr).



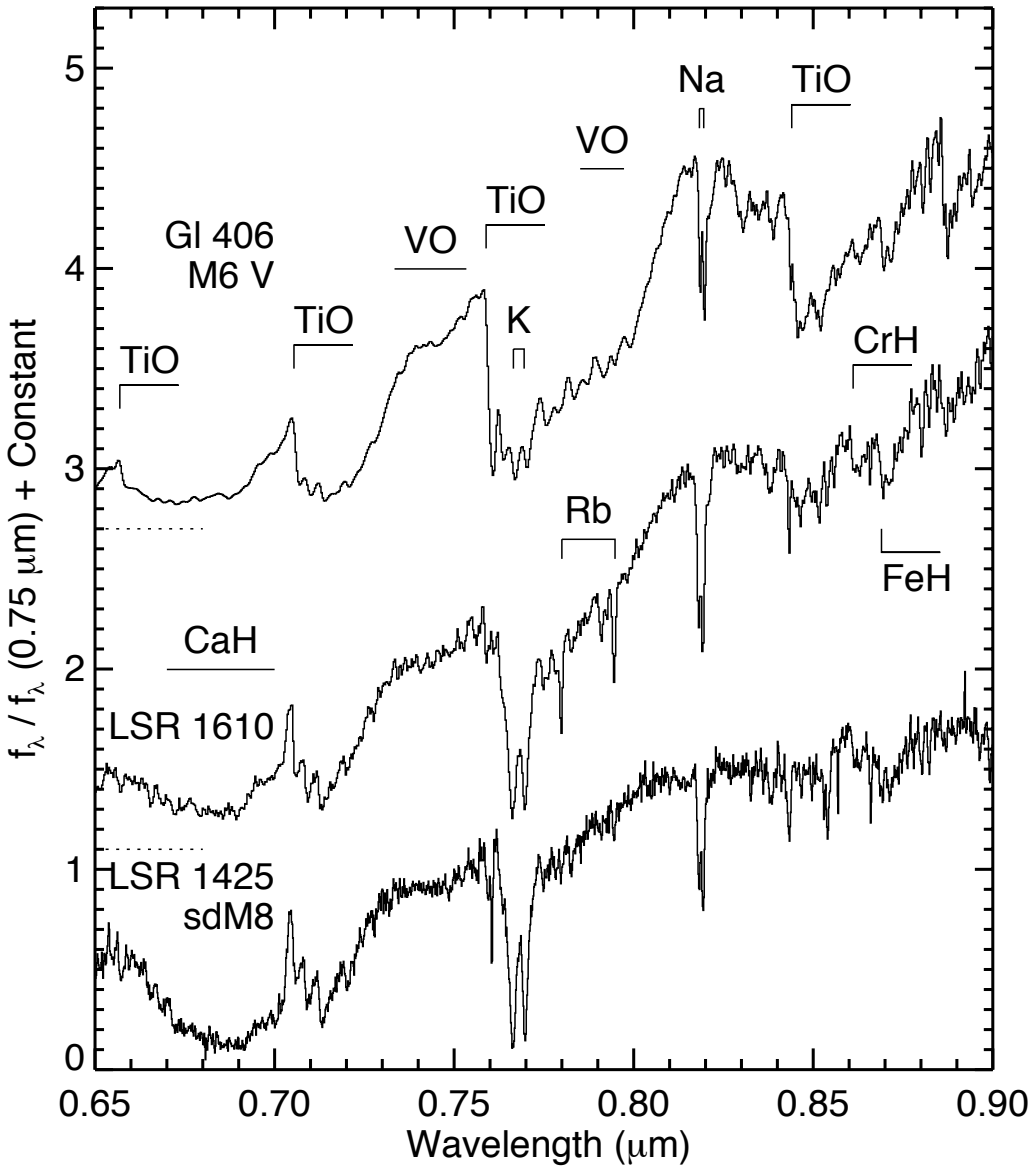
POSS–I red image (1953)



POSS–II red image (1992)

Lepine et al. (2003, ApJ, 591, L49)

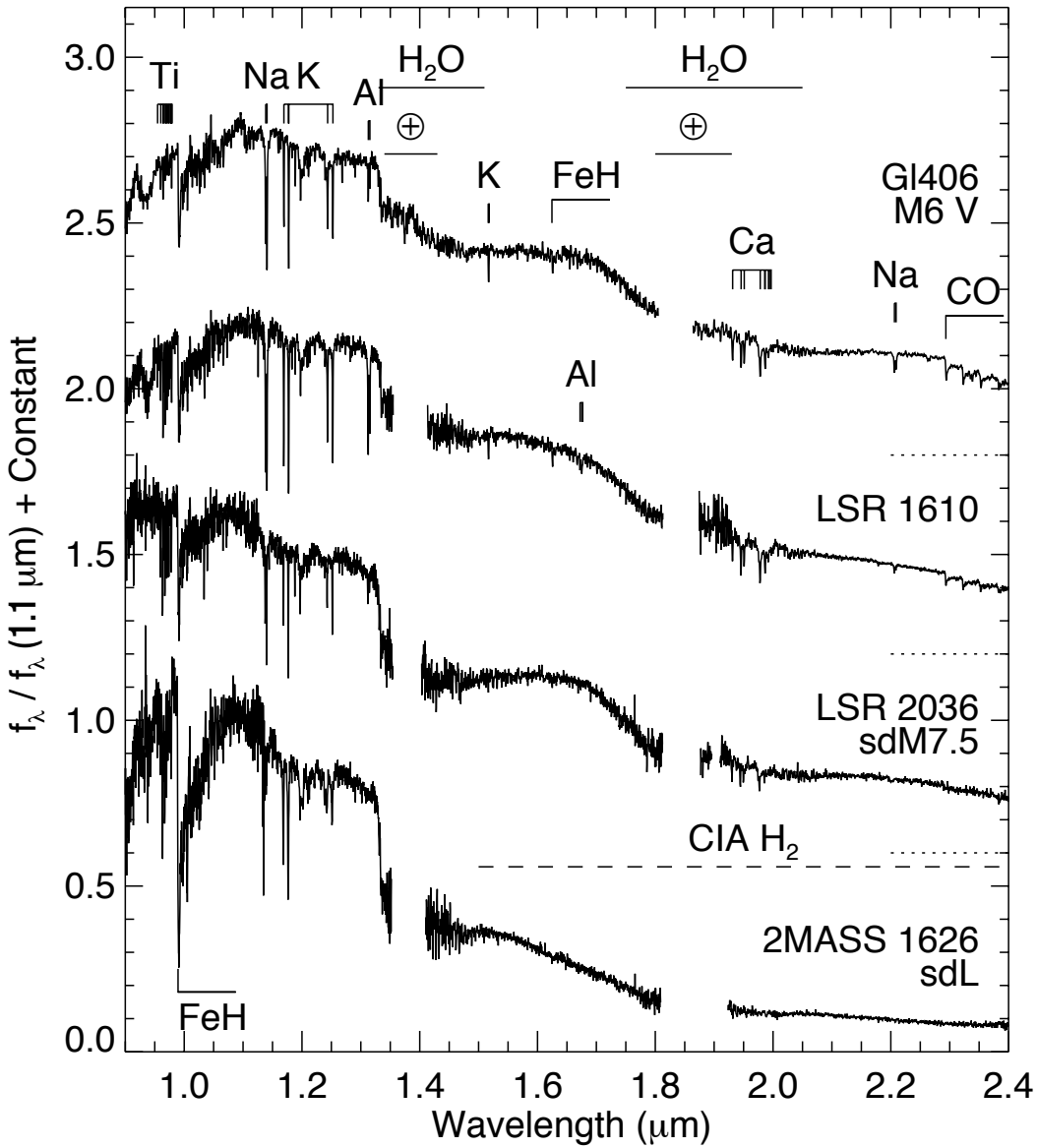
History of LSR 1610, sdL



Lepine et al.→sdL

- Rb, CrH, FeH → L dwarf
- CaH, TiO, VO → subdwarf
- Redder than LSR 1425 (sdM8)

History of LSR 1610, sd/dM6



Cushing & Vacca (2005, AJ, 131, 1797)

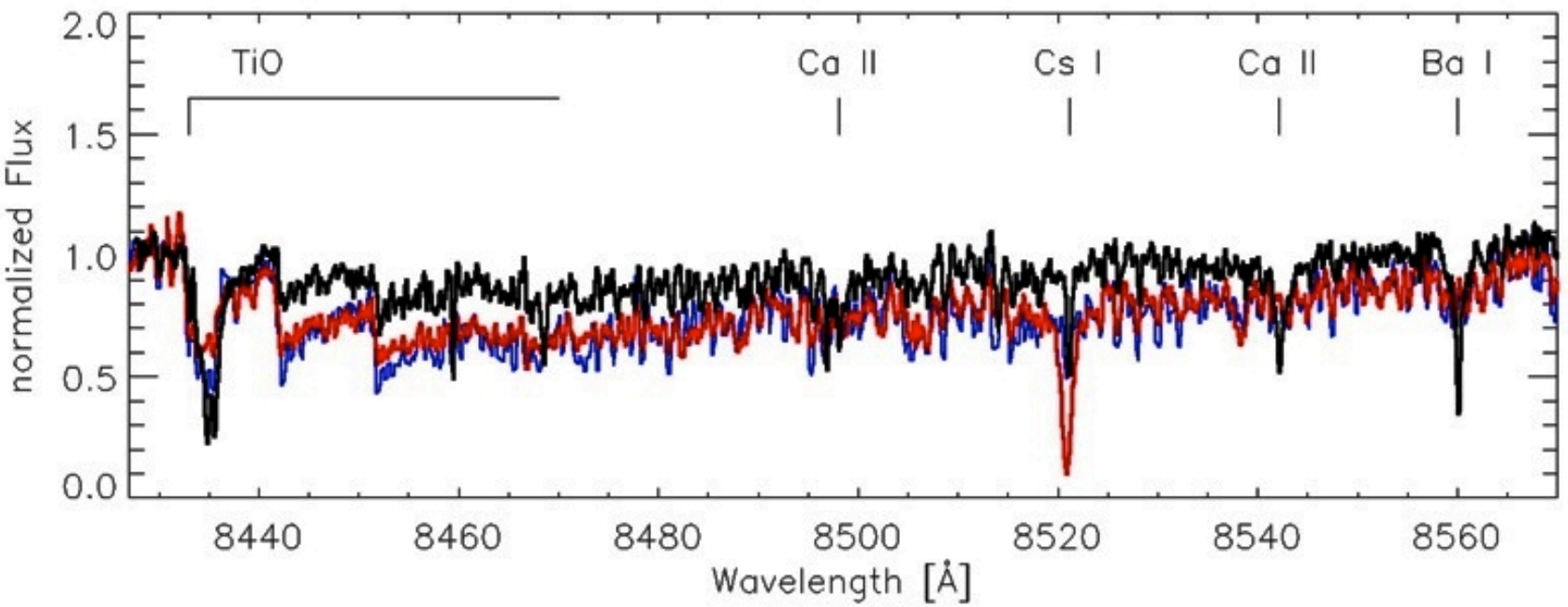
Cushing & Vacca → sd/dM6

- SED, CO, Ca, Na, K → dM
- Ti, CIA H_2(?) → sdM
- 0.93 μm band, Al → ?

History of LSR 1610, sd/dM6

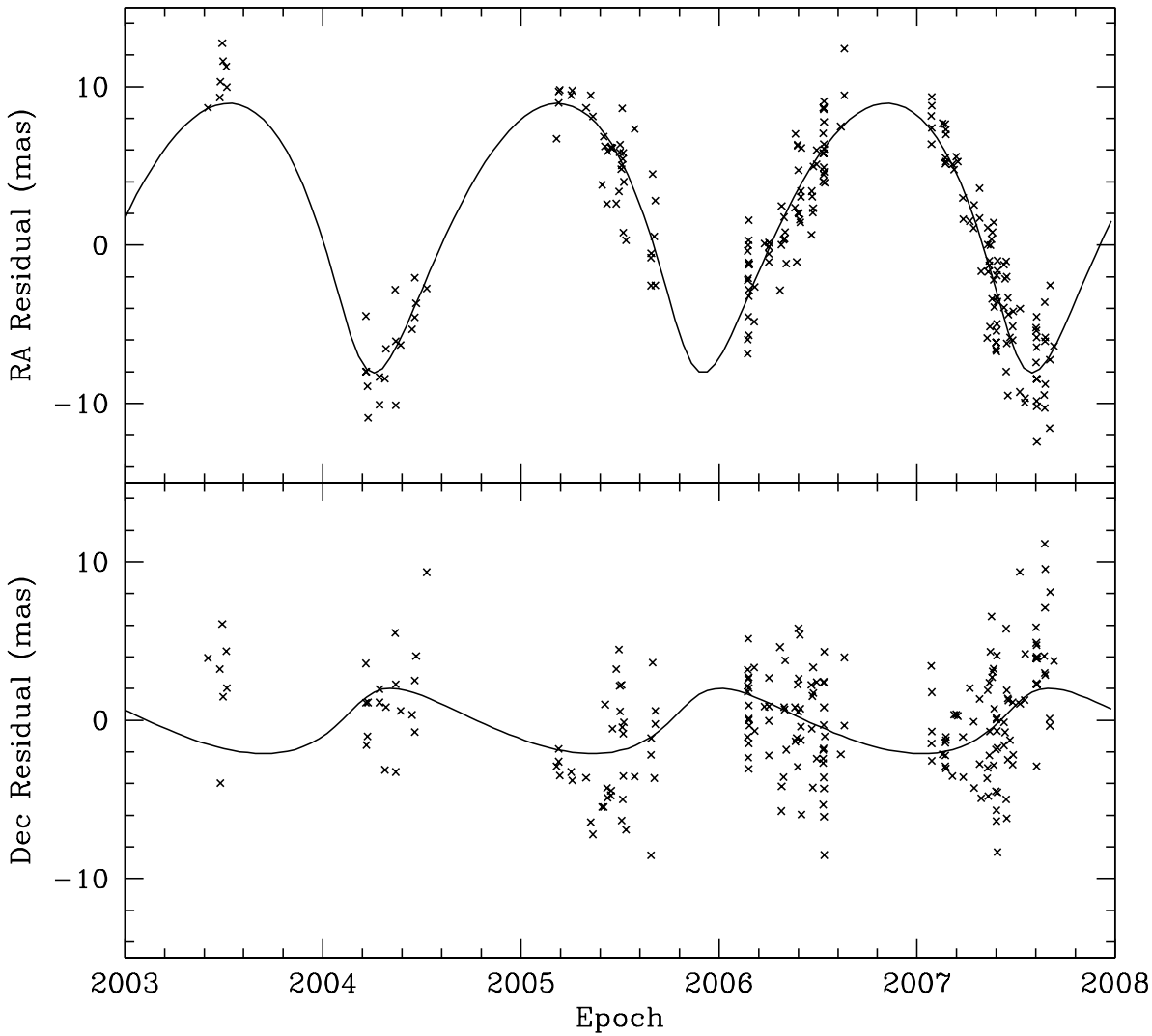
Reiners & Basri came to a similar conclusion based on high resolution red optical spectra.

LSR 1610, GI 406 (M6 V), 2M 1439 (L1)



Reiners & Basri (2005, AJ, 131, 1806)

Astrometric Observations

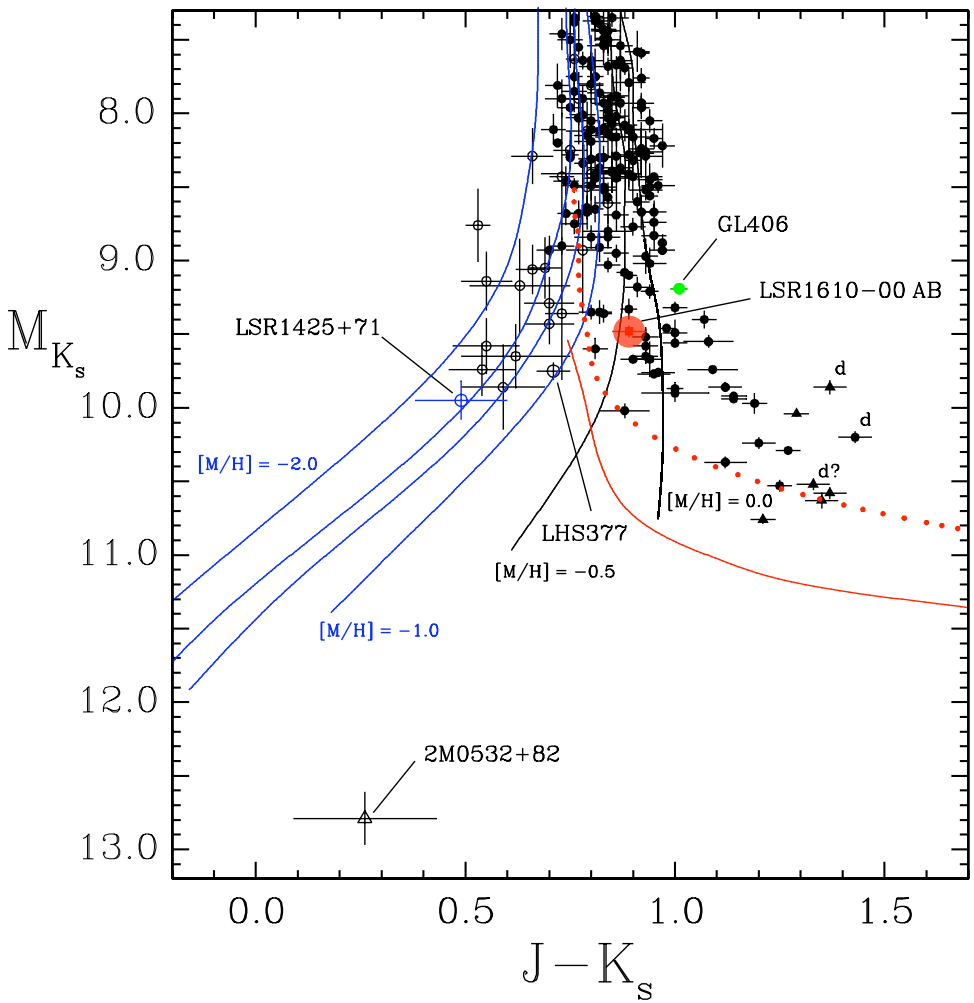


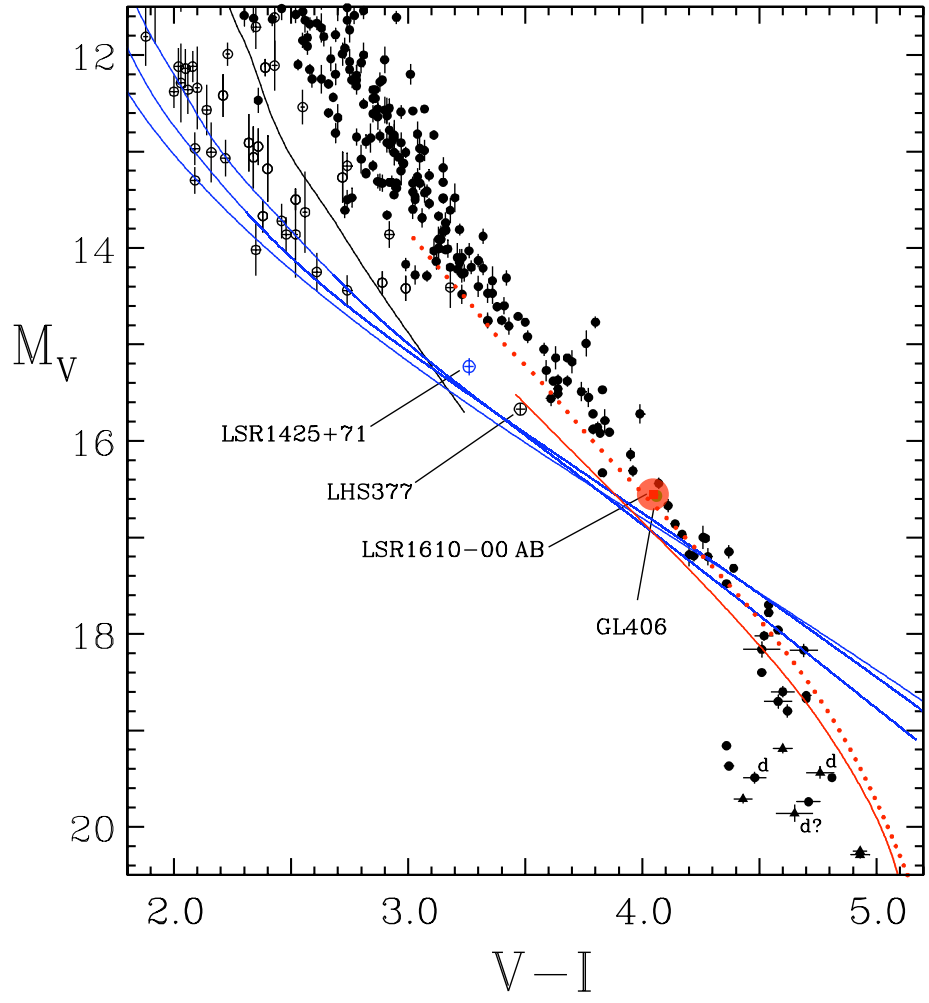
- Parallax observations of LSR 1610 at the USNO began in June 2003 and consist of 219 observations over 4 yrs.
- Residuals to parallax and proper motion fits indicate that LSR 1610 is a (unresolved) binary.

Astrometric Observations

Result	Value
d	32.3 pc
M_V(A+B)	16.56 mag
U	+36 km s^{-1}
V	-232 km s^{-1}
W	-61 km s^{-1}

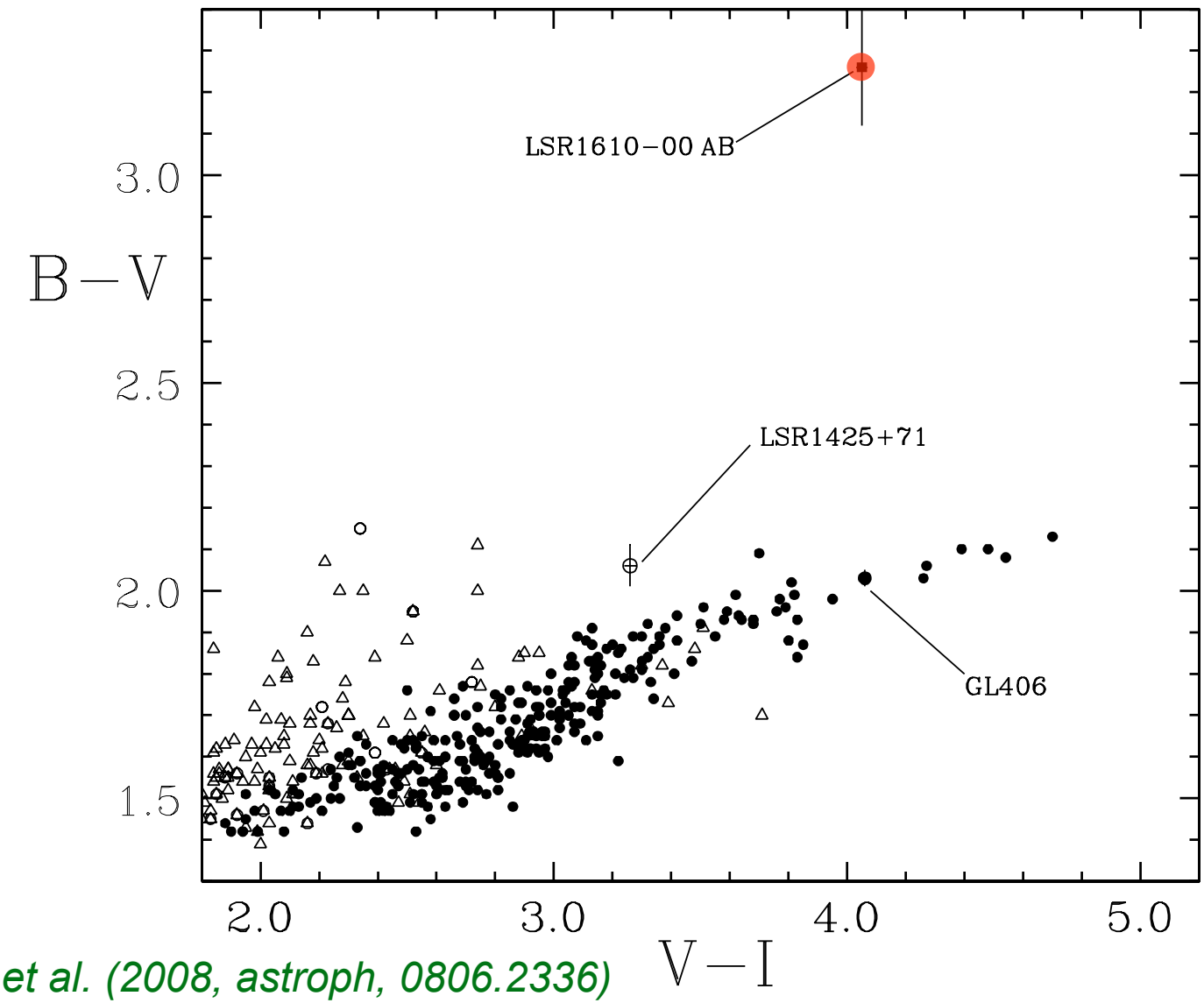
LSR 1610 looks normal in Color-Magnitude Diagrams





Dahn et al. (2008, astroph, 0806.2336)

LSR 1610 is very red in B-V



Dahn et al. (2008, astroph, 0806.2336)

Astrometric Observations

- Residuals to the parallax and proper motion fits indicate that LSR 1610 is a (unresolved) binary.

- The photocentric orbital parameters are:

Result	Value
Period	1.66 yr
α	8.91 mas
a	0.276 AU
i	*83 deg*
e	*0.444*

Viable LSR 1610 Components

- Assuming LSR 1610A dominates the total light, $M_A \sim 0.095\ M_\odot$ using the NIR MLR of Delfosse et al. (2000)

Viable LSR 1610 Components

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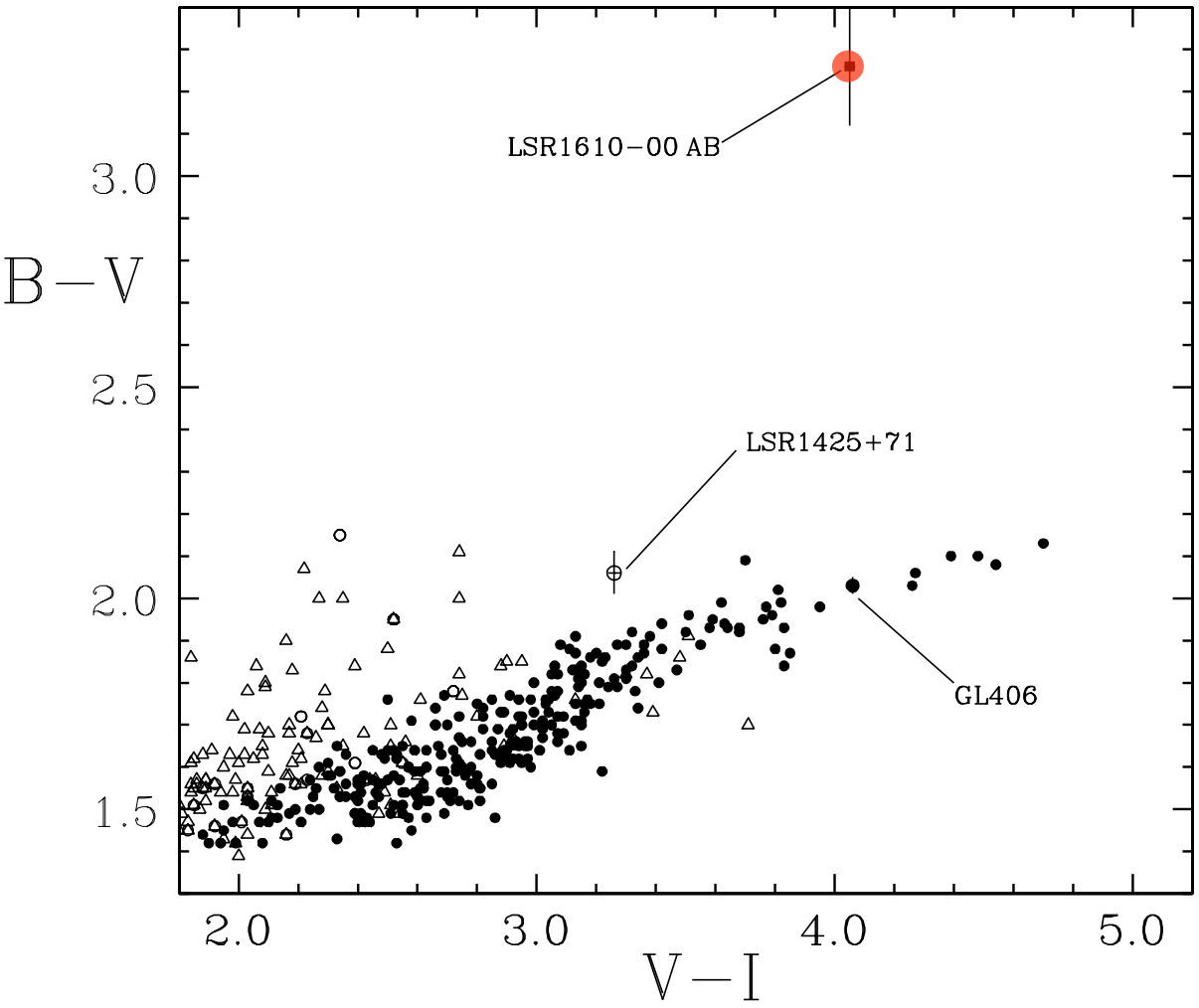
Dark Secondary	Dim Secondary
$I_B / (I_A + I_B) = 0.0$	$I_B / (I_A + I_B) = 0.1$
$M_A = 0.095\ M_\odot$	$M_A = 0.095\ M_\odot$
$M_B = 0.059\ M_\odot$	$M_B = 0.082\ M_\odot$

Can its binarity explain spectral peculiarities of LSR 1610A?

- Peculiar abundances point to accretion of material, but LSR 1610B is too low mass to be a WD.

- Start with a 0.05 $M_{\odot}$ star with [Fe/H] ~ -2 and accrete <0.05 $M_{\odot}$ from a massive AGB star. Results in enhanced Ti, C, Na and Al, etc.

LSR 1610 is very red in B-V



AlH band heads at ~400 nm?