



12303 - HST/COS FUV Spectroscopy of the Nearby Solar Twin 18 Scorpii: Exploring the Last Missing Spectral Region to Probe its Chromosphere and Transition Region and to Compare Them to the Sun's

Cycle: 18, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
01	(1) NSV-7577	COS/FUV COS/NUV	2	16-Dec-2010 21:13:37.0	yes

2 Total Orbits Used

ABSTRACT

We propose to carry out FUV spectrophotometry with COS/HST for an in-depth study of the chromosphere & transition region (TR) of the solar twin 18 Sco. This 5th mag G2 V star is an important star as a nearly perfect match to the Sun and is known as the "Closest-ever Solar Twin" (Porto de

Mello & da Silva 1997). 18 Sco has nearly identical physical properties (e.g. SpType, Mass, Teff, L, R, log g, [Fe/H], Ca II HK, Lx, rotation, etc.) to the Sun. Recent studies of Ca II HK emission from Lowell Observatory (J. Hall, priv. comm.) indicate Ca II emissions are close to the Sun's and undergo a solar-like ~7-11 yr magnetic activity cycle. The proposed observations (using two consecutive HST orbits) are a crucial part of our ongoing "Sun in Time" program of solar-type stars across the electromagnetic spectra. We are proposing to utilize the enhanced FUV sensitivity of HST/COS (with the G 130M/G 160M elements) to obtain high S/N medium resolution, FUV (1150-1750Å) spectrophotometry of the only remaining unexplored spectral region of this important star. The FUV region contains many crucial chromospheric and TR emission diagnostics including C III 1175A, Si III 1206A, Ly-a 1215A, N V 1240A, OI 1305A, C II 1335A, Si IV 1400A, C IV 1550A, He II 1640A, C I 1660A as well as many other weaker emissions. These line emissions originate from plasmas from 8,000 K to 300,000 K, and are vital for understanding the star's magnetically heated chromosphere and TR. We plan to analyze this spectrum to determine the physical properties of 18 Sco's corona, TR and chromosphere and, importantly, to compare these line strengths and ratios to the corresponding FUV line emissions of the Sun (e.g. SUSIM, SOLSTICE) at a similar magnetic activity phase.

This study provides an important check on the magnetic behavior of our present Sun and solar like stars. For example, is our Sun "normal" for its age and mass? If confirmed as a precise match to our Sun (and the data obtained thus far look like it is), 18 Sco would be important for follow-up studies in asteroseismology, extrasolar planet searches, and could serve as a surrogate for the "Night-Time Sun." In addition, as noted by Turnbull (2004), 18 Sco is one of the most promising nearby candidates for hosting life based on analysis of the HabCat list of stars. In spite of extensive observations at many other wavelengths, the best yet solar twin - 18 Sco - has not been observed in the FUV region where the most powerful diagnostic emission lines are located. With the planned COS spectroscopy, we will at long last complete the spectral coverage of this important solar twin.

OBSERVING DESCRIPTION

We plan to observe 18 Sco with both the G140L and G130M spectral elements to provide thorough coverage of the FUV region, while at the same time returning good spectral resolution on important emission lines such as Lyman alpha and O I 1310.

Proposal 12303 - Visit 01HST/COS FUV Spectroscopy of the Nearby Solar Twin 18 Scorpii: Exploring the Last Missing Spectral Requi...

Fri Dec 17 02:13:45 GMT 2010

Visit	Proposal 12303, Visit 01, implementation Diagnostic Status: No Diagnostics Scientific Instruments: COS/NUV, COS/FUV Special Requirements: (none)									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
	(1)	NSV-7577	RA: 16 15 37.2703 (243.9052929d) Dec: -08 22 9.99 (-8.36944d) Equinox: J2000	Proper Motion RA: 230.77mas/yr Proper Motion Dec: -495.53mas/yr Parallax: 0.07194" Epoch of Position: 2000	V=5.5+/-	Reference Frame: ICRS				
	<i>Comments: General object info retrieve from Simbad. Proper Motions and Parallax obtained from "Hipparcos, the New Reduction" catalog of van Leeuwen, 2007.</i>									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(1) NSV-7577	COS/NUV, ACQ/SEARCH, PSA	G285M 2850 A	SCAN-SIZE=3; STEP-SIZE=1.767			0.1 Secs [==>]	[1]
	2		(1) NSV-7577	COS/NUV, ACQ/PEAKXD, PSA	G285M 2850 A				0.1 Secs [==>]	[1]
	3		(1) NSV-7577	COS/NUV, ACQ/PEAKD, PSA	G285M 2850 A	NUM-POS=5; STEP-SIZE=0.9; CENTER=FLUX-W T-FLR			0.1 Secs [==>]	[1]
	4		(1) NSV-7577	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FLASH=YES; FP-POS=1; BUFFER-TIME=50 0			780 Secs [==>830.0 Secs]	[1]
	5		(1) NSV-7577	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FLASH=YES; BUFFER-TIME=50 0; FP-POS=3			766 Secs [==>843.0 Secs]	[1]
	6		(1) NSV-7577	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=70 0; FLASH=YES; FP-POS=1			900 Secs [==>]	[2]
	7		(1) NSV-7577	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=70 0; FLASH=YES; FP-POS=3			900 Secs [==>]	[2]
	8		(1) NSV-7577	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=70 0; FLASH=YES; FP-POS=4			900 Secs [==>]	[2]

