



11075 - The 2006 outburst of RS Oph - Second epoch HST observations of evolving structures

Cycle: 15, Proposal Category: GO/DD

(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) V-RS-OPH	WFPC2	3	21-May-2007 18:50:04.0	yes

3 Total Orbits Used

ABSTRACT

We propose to use second epoch HST DD time to perform high resolution optical imaging of the 2006 outburst of the Recurrent Nova RS Ophiuchi, which underwent its last recorded outburst in 1985. In this system, high velocity ejecta from a WD near the Chandrasekhar mass impact the companion red giant wind, setting up shock systems analogous to those in SNR. Our first epoch observations in July 2006 (day 155) revealed for the first time what appear to be the sub-arcsecond optical counterparts of the "jets" we have observed in the radio. A striking similarity to the double rings of SN 1987A is however evident. In addition, previously unseen structures ~ 1 arcsec to the East and South are apparent. In addition to determining the true source geometry and disentangling the contributions different regions of the source make to unresolved spectra, the specific aims of our second epoch observations are to determine (i) the expansion rate of the inner extended features, allowing comparison with simple shock models and helping to constrain the distance to RS Oph; (ii) whether the eastern "arc" and southern "blob" show any motion, helping to determine whether they are the result of previous outbursts, and (iii) the rate of change of emission in the observed lines, for direct comparison with shock models, and also to compare with the overall changes in line fluxes seen in infrared, optical and uv spectroscopy. Our work on RS Oph has far wider-ranging importance which includes furthering our understanding of the outbursts of novae, the structure of red giant winds, jet ejection and collimation in astrophysical sources, the progenitors of Type Ia supernovae and the evolution of supernova remnants. Continued HST observations complement our multi-frequency observing campaign, in particular our unrivalled coverage of this event with VLBI.

OBSERVING DESCRIPTION

Our previous HST DD time (Prop. ID 11004) detected the remnant in [OIII] and [NeV] using ACS/HRC. Here we propose only to observe the [OIII]5007A line with the PC of WFPC2 and F502N filter. The total extent of the remnant, assuming constant expansion velocity since our July 2006 observations, is around 1 arcsec.

The central source is bright ($V=11.3$ currently, from AAVSO) comprising strong lines plus M0III-M4III stellar continuum dominating $\lambda > 4000\text{\AA}$ with an additional blue continuum source (Bohigas et al. 1989). Use of the ETC suggests that saturation would occur in exposures of greater than $\sim 60\text{s}$. We therefore choose exposure times of 30s to avoid this possibility for the majority of our exposures. In order to detect fainter features (the true evolution of the surface brightness being unknown) we perform three longer exposures of 260s each on the third orbit. As we are obtaining multiple exposures, we have not used CR-Split. To reject spurious ghosts etc, we repeat the RS Oph observations at a position 3 arcsec offset in both X and Y after the first orbit

In order to accomplish effective PSF subtraction, we have chosen a bright reference source near to RS Oph, and although we are using narrow band imaging where colour effects should not be so great (plus it would be very difficult to choose a source with very similar colour to RS Oph), this is also a late-type stellar source (HD162215, K0V, $V=9.32$, $B=10.52$). We therefore propose to perform a similar set of observations to those of RS Oph, again looking to get as good SNR as we can but taking care not to saturate the individual exposures. Exposure time of 4s gives 51% saturation according to the ETC.

References:

Bohigas et al., 1989, MNRAS, 238, 1395

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Visit	Proposal 11075, Visit 01										Mon May 21 22:50:12 GMT 2007	
	Diagnostic Status: No Diagnostics											
	Scientific Instruments: WFPC2											
	Special Requirements: (none)											
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous			
	(1)	V-RS-OPH	RA: 17 50 13.2020 (267.5550083d)				V=4.3		Reference Frame: SIMBAD			
			Dec: -06 42 28.48 (-6.70791d)									
			Equinox: J2000									
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.											
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]		Orbit	
	1		(1) V-RS-OPH	WFPC2, IMAGE, PC1	F502N				30.0 Secs X 18		[1]	
									[==>(Copy 1)]			
									[==>(Copy 2)]			
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	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
Exposures (continued)	2		(1) V-RS-OPH	WFPC2, IMAGE, PC1	F502N		POS TARG 3,3		30.0 Secs X 18	[2]
									[==>(Copy 1)]	
									[==>(Copy 2)]	
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									[==>(Copy 18)]	
	3		(1) V-RS-OPH	WFPC2, IMAGE, PC1	F502N		SAME POS AS 2		260.0 Secs X 6	[3]
									[==>(Copy 1)]	
									[==>(Copy 2)]	
									[==>(Copy 3)]	
									[==>(Copy 4)]	
									[==>(Copy 5)]	
									[==>300.0 Secs (Copy 6)]	





