The La Silla Classical Nova Campaign

A.Ederoclite[1], E.Mason[1]

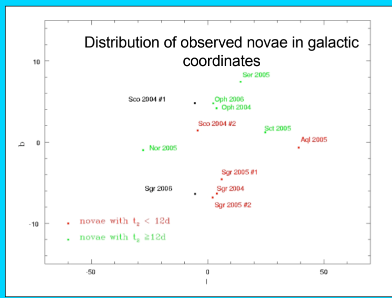
[1]E.S.O. - European Southern Observatory

During two years (from Mar 2004 to Mar 2006), we carried out a Target of Opportunity campaign at ESO - La Silla Observatory using FEROS, the high resolution spectrograph on the 2.2m-telescope.
Classical Novae magnitude at maximum and early decline (V ~ 6 - 13mag) are such that they can be easily observed in high-resolution spectroscopy on a small telescope.

Using the 2.2+FEROS, we have been able, for the first time, to gather an homogeneous data set of high-resolution (R~48000) classical nova spectra which covers the wavelength range 3900 - 9200 Å. The high resolution is necessary to provide detailed kinematic informations about the ejecta.
Here we present the preliminary results about our sample of twelve galactic novae observed during this campaign.

The following table reports the main observational characteristics of the observed objects.
Photometric characteristics (t0 time of maximum light, t2 time to decrease 2 mag from maximum, t3 time to decrease 3 mag from maximum, mmax magnitude at maximum and mV,15 magnitude 15 days after maximum) have been derived from the literature (I.e. mainly from IAUC and, occasionally, from the AAVSO database).
During our Target of Opportunity campaign, each nova was observed for, at least, four epochs at maximum light and early decline. Each spectrum was analyzed with IRAF and classified according to Williams et al. (1991, 1994). In the last column we report the classification and, in brackets, the number of days after maximum light.

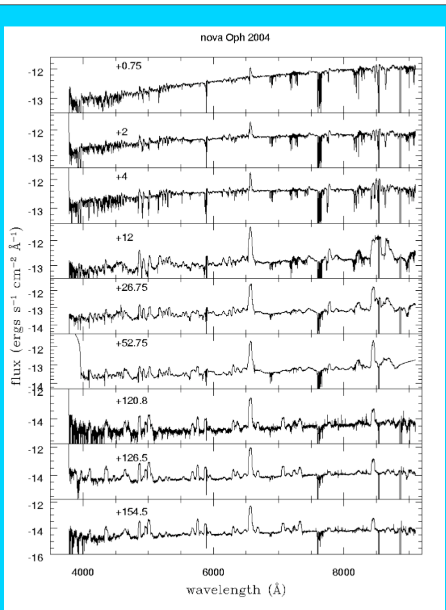
Nova name	t0	t2	t3	mmax	mV,15	Evolution
Sgr 2004 (v5114 Sgr)	Mar16, 2004 ()	11 ± 1	21 ± 1	8	N/A	P_{fe}(+1 +2 +9) P^o_{fe}(+23) A^o_o(+32) A_o(+57)
Oph 2004 (v2574 Oph)	Apr16.403,2004 (2453111.903)	16 ± 8	32 ± 8	10.29	12.0 ± 0.5	P? (+0.75) P^o_{fe} (+2 +4 +12 +26.75 +52.75) A^o_o (120.8 126.5 154.5)
Sco 2004 #1 (v1186 Sco)	N/A	N/A	N/A	N/A	N/A	A^o_o **
Sco 2004 #2 (v1187 Sco)	Aug 5.840, 2004 (2453223.34)	7.5 ± 2.5	20 ± 5	9.63	12.5 ± 0.5	P^o_{na} (+6.25 +9.25) A^o_n (+17.25) P^o_n (+31.25) N^o_o (+43.25 +54.25 +55.25)
Nor 2005 (v382 Nor)	Mar20.0338,2005 (2453449.538)	16 ± 4	24 ± 8	9.8	11.5 ± 0.5	P^o_{fe} (+5.5) A^o_{fe} (+16.5) P^o_{he} (+40.25 +71.25 +111.2) N^o_o (+157) A^o_o(+159)
Ser 2005 (v378 Ser)	Apr4.353, 2005	45 ± 10	90 ± 10	11.5	13 ± 1	P^o_{ca} (+1) P^o_{fe}(+25) A^o_n (+73 +74 +95) N_o(+143 +143.8 +174.8)
Sgr 2005 #1 (v5115 Sgr)	Mar30.127, 2005	8.0±8.0	16.0 ± 8.0	7.7	11.0 ± 0.5	P^o_{fe}(+6.5) A^o_n (+30.25) N^o_o(+47.25 +78.25 +79.25 +147.2 +149)
Aql 2005 (v1663 Aql)	Jun10.226, 2005 (2453531.726)	8.0 ± 2.0	24.0 ± 2.0	10.5	13.0 ± 0.5	P_{fe} (+7.25) P^o_c (+28) A^o_a (+94.75 +108.8)
Sgr 2005 #2 (v5116 Sgr)	Jul5.085, 2005 (2453644.889)	6.0 ± 6.0	24.0 ± 6.0	7.2	10.0 ± 1.0	P_{fe} (+2.25) A^n_n (+21.25) N^o_o(+59 +82)
Sct 2005 (v476 Sct)	Oct1.389, 2005 (2453644.889)	12.0 ± 2.5	N/A	9.9	13.5 ± 0.5	P^o_c (+3.75) P^o_{fe} (+11.75) N^o_o (+35.75)
Oph 2006 (v2575 Oph)	Feb 12.328, 2006 (2453778.829)	32.0 ± 8.0	72.0 ± 8.0	11.07	12.5 ± 0.5	P^o_{fe} (+2) P^o_c(+31.25 +33.25) *
Sgr 2006 (v5117 Sgr)	Feb19.34, 2005 (2453785.84)	N/A	N/A	8.6	N/A	P_{fe} (+2) P^o_{fe}(23.25) *



•These novae were observed at the end of the campaign, so we coulnd not guarantee the needed coverage
** this nova was not observable during the early phase.

Nova Name	EB-V	MMRD_mag	dist_MMRD (kpc)	dist_BdV (kpc)	dist_avg (kpc)
Sgr 2004 (v5114 Sgr)	0.5	-8.6	9.00	6.00	7.50
Oph 2004 (v2574 Oph)	0.74	-8.3	17.55	15.79	16.67
Sco 2004 #1 (v1186 Sco)	0.5	N/A	N/A	N/A	N/A
Sco 2004 #2 (v1187 Sco)	1.37	-8.8	6.44	7.86	7.15
Nor 2005 (v382 Nor)	1.44	-8.3	4.99	4.47	4.73
Ser 2005 (v378 Ser)	0.61	-7.1	21.36	30.31	25.84
Sgr 2005 #1 (v5115 Sgr)	0.47	-8.8	9.98	14.83	12.41
Aql 2005 (v1663 Aql)	N/A	-8.8	N/A	N/A	N/A
Sgr 2005 #2 (v5116 Sgr)	0.32	-8.9	10.36	11.67	11.01
Sct 2005 (v476 Sct)	0.79	-8.6	15.65	29.27	22.46
Oph 2006 (v2575 Oph)	1.34	-7.4	6.86	8.21	7.54
Sgr 2006 (v5117 Sgr)	0.76	N/A	N/A	N/A	N/A

Interstellar extinction was determined by the use of the KIλ 7699 line (Munari & Zwitter 1998). The commonly used NaD lines could not be used because they were saturated. The distance was determined using of the Maximum Magnitude vs. Rate of Decline (MMRD) relationship by Della Valle & Livio (1995) and the Buscombe - De Vaucouleurs relation (Buscombe - De Vaucouleurs 1955).



An example of a series of spectra from data set

Our future study will inllude:
•Characterization of physical properties of the ejecta
•Analysis of the kinematic of the ejecta
•Detailed analysis of the [OI] lines
•Analysis of the homogeneity of the ejecta
•Determination of the dynamics and chemistry via Monte Carlo spectral syntheis code

References

Buscombe, W. & de Vaoucouleurs, G. 1955, Observatory, 75, 170
Della Valle, M. & Livio, M. 1995, ApJ, 452, 704
Munari, U. & Zwitter, T. 1997, A&A, 318, 269
Williams, R.E., et al. 1991, ApJ, 376, 721
Williams, R. E., Phillips, M. M. & Hamuy, M. 1994, ApJS, 90, 297