UVIT/AstroSat Studies of Stellar Populations in NGC 362: Detection of Blue Lurkers in a Globular Cluster

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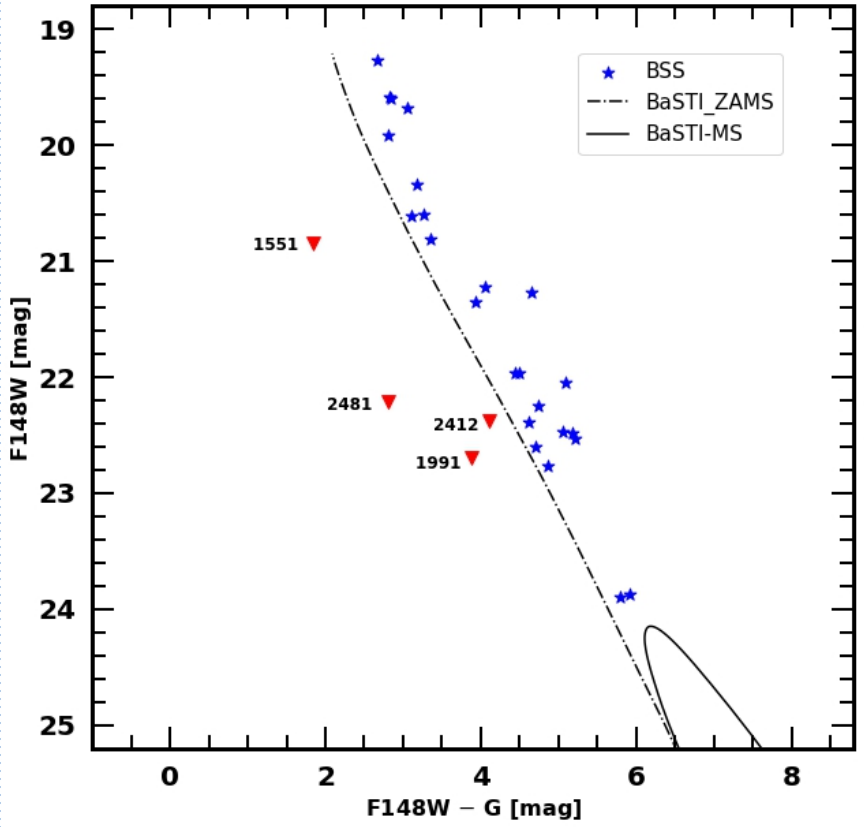
Nicolaus Copernicus Astronomical Center,

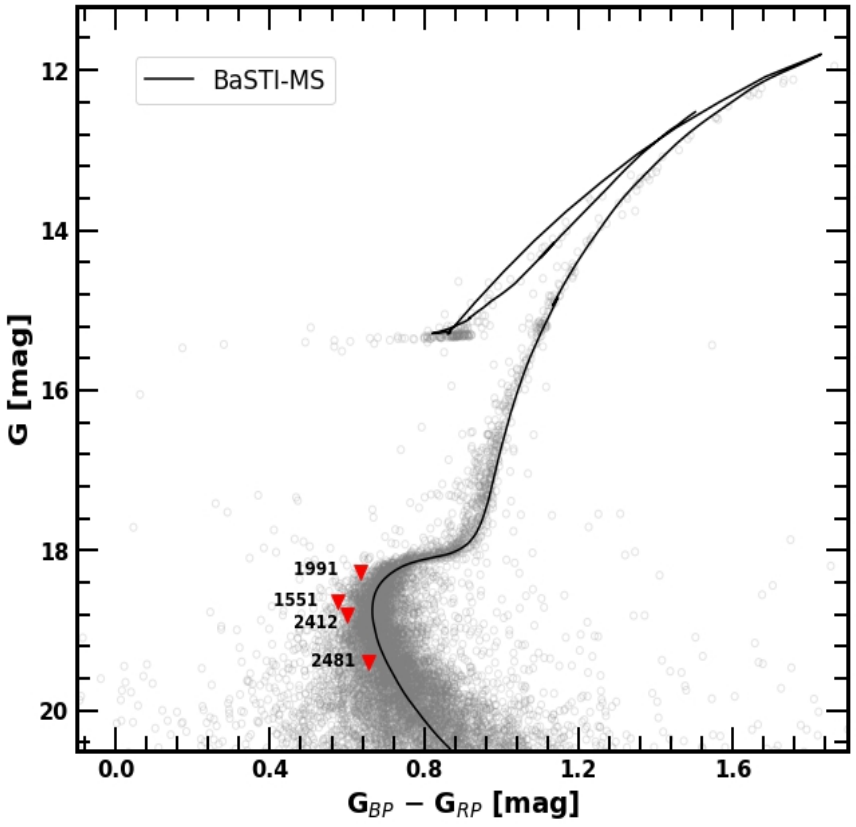
Warsaw, Poland

Arvind K. Dattatrey

Aryabhatta Research Institute of Observational Sciences, India

Selection of Blue lurkers





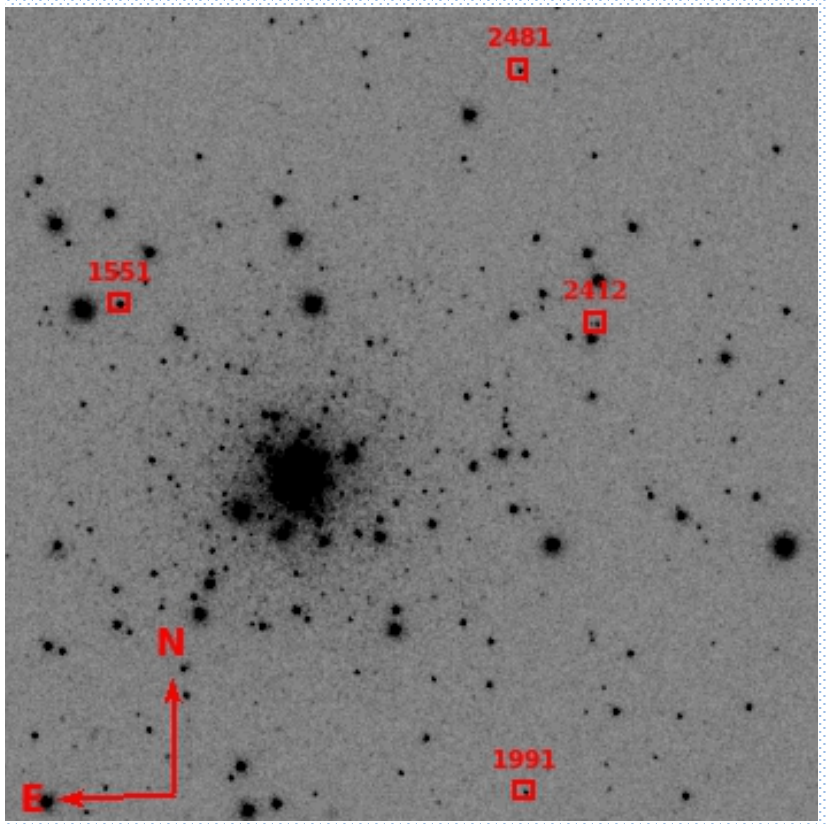


Figure 1. Left: UV-optical CMD (F148W vs F148W − G) for the cluster NGC 362. The probable four BL candidates, bluer than the zero-age main sequence (ZAMS), are displayed with red down-triangle symbols. Right: The optical CMD (G vs G_{BP}- G_{RP}) of the cluster NGC 362.

Results:

Spectral Energy Distribution

TABLE 4.1: The best-fit parameters of the cool and hot components. Here, T_{eff} is the effective temperature in K, χ^2_r is reduced χ^2, luminosity, radius, and mass are in the solar unit, V_{gf} & V_{gfb} are the visual goodness of fit parameters, N_{fit} is the total number of points taken in to account during the fitting. The last two columns list the mass and age of cool and hot companions.

Name	RA	DEC	T_{eff} (K)	Log g	χ^2_r	$L/L_\odot$	$R/R_\odot$	V_{gf}	V_{gfb}	N_{fit}	Mass ($M_\odot$)	Age (Myr)
1551A	15.89396	-70.81936	6750^{+125}_{-125}	3.0	58.76	$2.45^{+0.009}_{-0.300}$	$1.15^{+0.005}_{-0.002}$	29.8	1.37	12/12	0.92	5500
1551B			35000^{+3000}_{-1000}	9.5		$1.45^{+0.292}_{-0.170}$	$0.04^{+0.003}_{-0.005}$				0.2	< 0.10
1991A	15.69960	-70.90077	6250^{+125}_{-125}	3.5	6.07	$3.21^{+0.181}_{-0.020}$	$1.53^{+0.001}_{-0.003}$	4.68	0.21	12/12	0.85	10000
1991B			14750^{+250}_{-500}	7.0		$0.34^{+0.0134}_{-0.010}$	$0.09^{+0.008}_{-0.003}$				0.18	∼ 4.0
2412A	15.65796	-70.82486	6500^{+125}_{-125}	3.5	4.39	$1.99^{+0.294}_{-0.121}$	$1.18^{+0.001}_{-0.002}$	4.37	0.88	12/12	0.87	8000
2412B			23000^{+500}_{-1000}	6.5		$0.22^{+0.011}_{-0.003}$	$0.05^{+0.005}_{-0.002}$				0.2	< 0.10
2481A	15.69260	-70.78316	6250^{+125}_{-125}	5.0	15.25	$1.02^{+0.270}_{-0.080}$	$0.90^{+0.015}_{-0.015}$	10.70	2.92	12/12	0.82	5500
2481B			14750^{+250}_{-750}	9.5		$0.40^{+0.085}_{-0.001}$	$0.10^{+0.013}_{-0.001}$				0.18	∼ 4.0

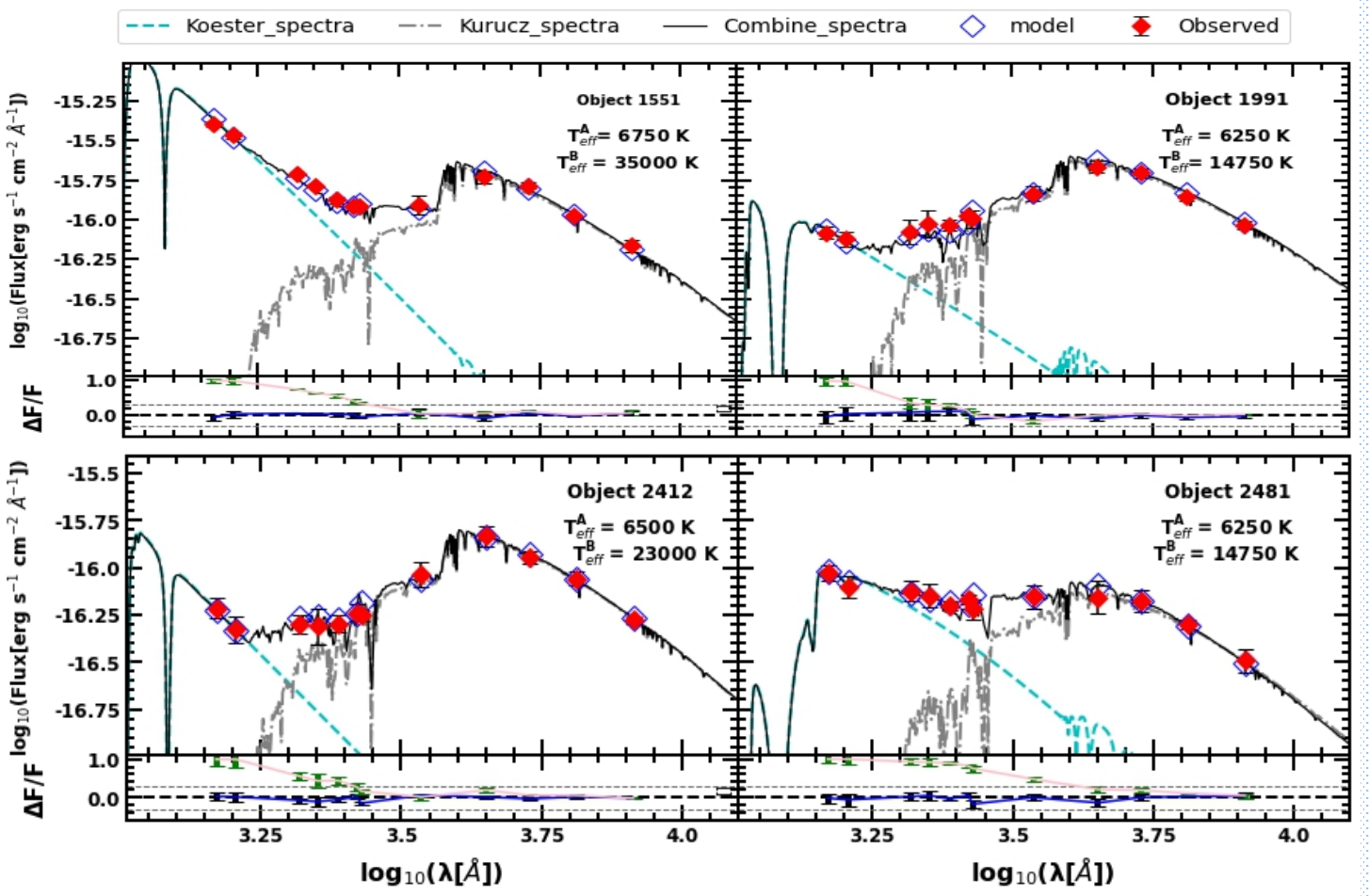


Figure 2. The SEDs of four FUV bright MS stars (1551, 1991, 2412, and 2481). The T_{eff} of the cool (A) and hot (B) components are displayed in each SED. The observed data points are represented by red solid-diamond points, while open blue diamond points represent the model points. Cyan, grey, and black curves represent the Koester, Kurucz, and combined spectra respectively. ΔF/F is the fractional residual.

Hertzsprung–Russell diagram

- **The four sources' positions in the cluster indicate they were formed through Case A/B mass transfer. Currently, the cluster is experiencing core collapse. The cooling age of the hot companions suggests recent formation. We propose that these binary systems originated during the core collapse and were expelled from the core due to gravitational interactions.**

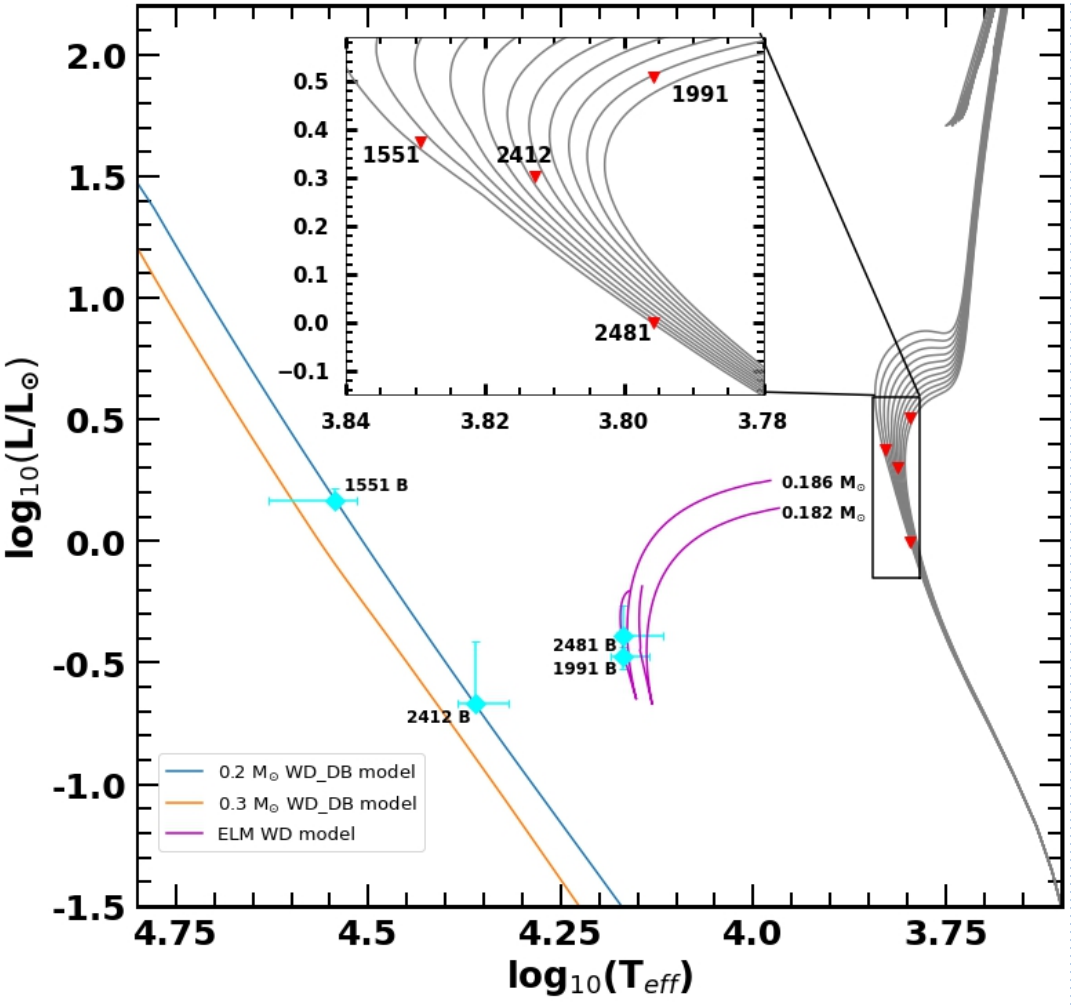


Fig. 4: The HR diagram of the cool and hot components. The grey, blue & orange, and magenta curves represent the BaSTI isochrones, the white dwarf model, and the ELM models, respectively.

Email: arvind@aries.res.in