University of Colorado
Boulder, Colorado 80309-
0019

Final Technical Report: NAG 5-78

PI: C.D. Garmany, U. of Colorado

Title: B Supergiants in Open Clusters and Associations

Summary

This is the final report on project NAG5-78, "IUE Observations of B Supergiants in the Large Magellanic Cloud", a collaborative effort between Garmany (U. of Colorado), Sonneborn (Goddard Space Flight Cneter) and Fitzpatrick (Princeton Univ.). We have observed over 90 B supergiants in the Large Magellanic Cloud with the IUE satellite, using the low dispersion mode. These stars were chosen because they resemble the precursor star to SN 1987a, and we saw the need for a data base in the continuing effort to understand why the precursor star was a blue, not a red supergiant. The observations have all been reduced and made into an atlas, and efforts to understand the evolutionary history of stars in this part of the H-R diagram are underway.

Description of the Research Project

The motivation behind this project included not only the explosion of SN 1987a, a formerly blue supergiant in the Large Magellanic Cloud, but also the subsequent discovery of an effect seen in the H-R diagram of LMC stars referred to as a "ledge" (Fitzpatrick and Garmany, 1990). It seems clear that understanding the supernova requires an explanation of this evolutionary significant feature which lies at about the same place as the location of the precursor star. One of us (Fitzpatrick) is involved in obtaining high quality optical spectra of B supergiants in the LMC; this project adds the ultraviolet data for the same set of stars.

The IUE observations were made over two years, and table 1 lists the stars and the particulars of the IUE observations. In addition to 81 stars discussed in the Fitzpatrick and Garmany paper, an additional 10 stars with peculiar characteristics were added to the observing list. All of the spectra have been reduced, and an atlas prepared of both the SWP and LWP images. This will eventually be published; at present we are working on interpretating the results.

The position of the stars observed in this program in the H-R diagram is shown in fig. 1. It is clear that our observations cover both the position of the supernova precursor and also the region of the empirical ledge discussed by Fitzpatrick and Garmany.

JOURNAL OF OBSERVATIONS, BI STARS IN THE LMC

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SK -65 19 LWP 15905 10 MIN 208 DN 36 DN SWP 36667 20 MIN 205 DN 19 DN
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Sk -66 50 LWP 17960 4:42 16:14 33 SWP 38846 17:06 16:31 182 17
SK -66 78 LWP 18166 11:30 13:58 0.30 173 190 38 SWP 39130 32:00 14:30 0.55 237 18
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SK -66 107 SWP 36424 71 MIN 210 LWP 15681 18 185 B5 + O?
SK -66 118 LWP 15754 8 MIN 220 DN 49 DN SWP 36555 20 MIN 190 DN 40 DN FPM-1.9
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SK -67 66 SWP 36421 40 MIN 204 DN LWP 15678 11 198
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SK -67 110 SWP 39415 12:00 12:48 1.75 341 220 19 LWP 18536 6:00 13:24 1.90 236 45
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2:37 1.95 320 s/o 235 21
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LWP 18058     15:42        195          46
SWP 36449     48 MIN   186 DN    18 DN
SWP 36450     20 MIN   150 DN    17 DN
SWP 36451     39 MIN   140 DN    32 DN * repeat 7/31
SWP36773       70:00    1.5 OVER 25 DN (SEE JUNE 11, PREV. OBS)
SWP 36452     34 MIN   167 DN    22 DN
SWP 36441    20 MIN    150 DN    17 DN  EXP CUT BY 4 MIN, SHIFT END
SWP 36439    70 MIN    150 DN    19 DN
SWP 36440    25 MIN    195 DN    18 DN
SWP36765       29:00    178 DN   21 DN
SWP 36453     18 MIN   130 DN    17 DN
SWP 36437    75 MIN    190 DN    17 DN
SWP 36448    100 MIN   185 DN    25 DN
SWP 36438    30 MIN    190 DN    18 DN
LWP 18059      13:06      FPM=1.6    240 45
SWP 39055       23:36     213           18

SWP36762       32:00    210 DN   22 DN
SWP 39056      23:18       229           18
SWP 36552    148 MIN   ***        **    165 DN   24 DN   (below 1580A only)

LWP 18060      15:18      230           35

SWP 36557     58 MIN   190 DN    24 DN    FPM=0.08
SWP 39057      31:42      188           23
SWP 39058      22:24      223           21
SWP 39064      48:00   192       40
SWP 39063      31:18 86        20
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LWP15953      16       208 DN    43

LWP 18170    13:12    20:38  0.08 215          36
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SWP 36390     40:00  1.9     195        88
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LWP 15673    10       192
SWP 36392     35:00  0.1     150        25

LWP 17912    30 min   17:00  0.93 180          50
LWP15955      11       208       36

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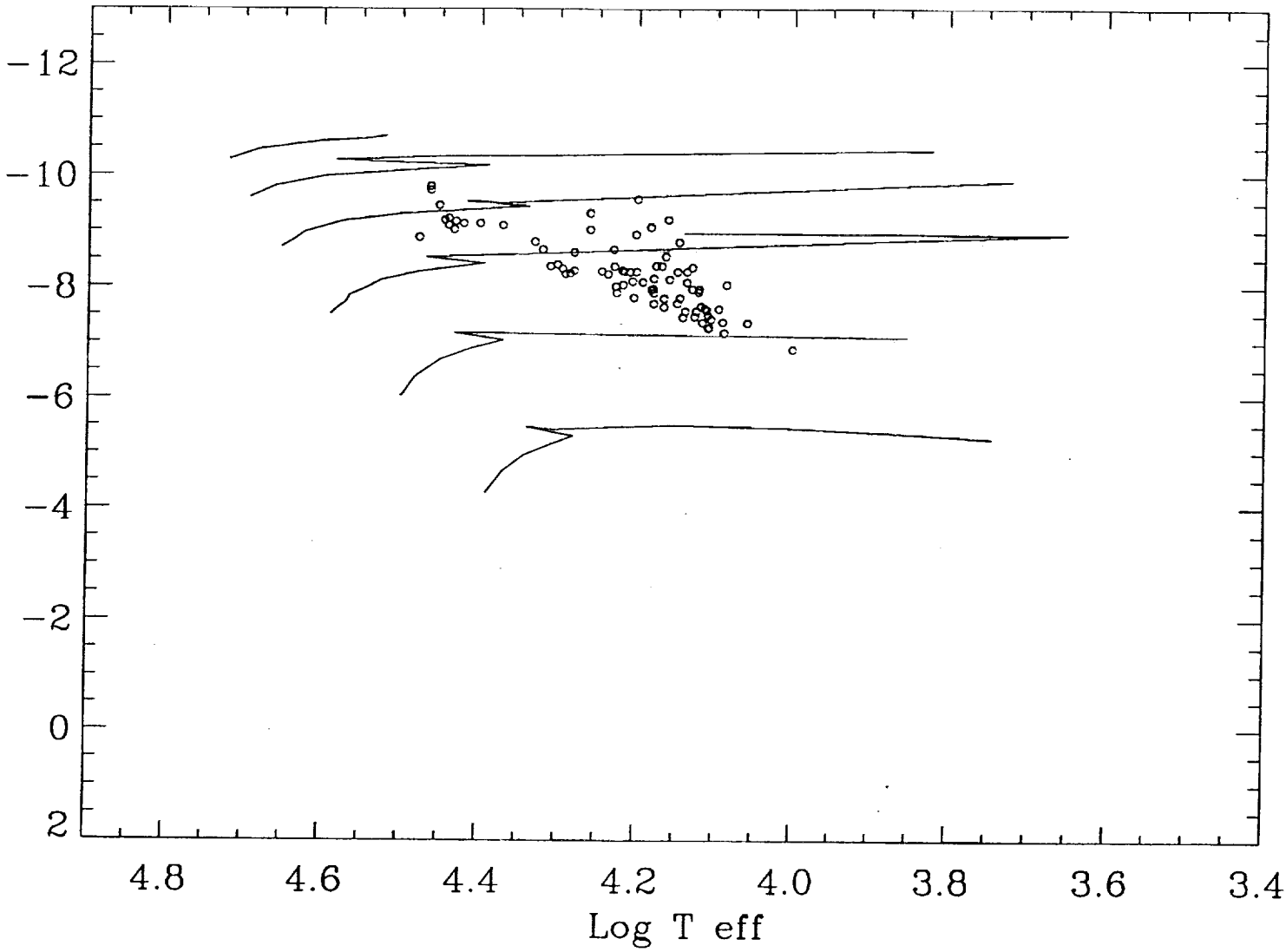
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