

AN ATLAS OF STELLAR SPECTRA. II

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RESUMEN

En este trabajo se presentan los espectros de 35 estrellas. Hasta el momento se han publicado los espectros de un total de 50 estrellas obtenidos usando el nuevo Espectrofotómetro Michelson. Dos de los espectros anteriormente publicados se repiten en el presente trabajo debido a la introducción de nuevos datos. Los nuevos espectros se encuentran en el sistema de la primera parte de este *Atlas* y se presentan corregidos por la absorción atmosférica en líneas y bandas.

ABSTRACT

In this paper are published the spectra of 35 stars. There are now a total of 50 stars for which spectra obtained using new Michelson Spectrophotometer system are published. Two of the previously published spectra are repeated here because of the addition of significant new data. These new spectra are essentially on the system of the first installment of this *Atlas*, and are corrected for all significant atmospheric absorption bands and lines.

Key words: INFRARED — SPECTRA, STARS — INDIVIDUAL.

This publication is the second in a series which will impart the stellar spectra obtained with our newly-developed Michelson spectrophotometer system. This second installment of the *Atlas* includes spectra of 33 stars not previously published in this series, plus new spectra of two stars published before, but for which significant additional data are now available.

With this new publication, the *Atlas* now contains the spectra of a total of 50 stars. Table 1 provides an account of the stars which have been observed, and their spectral types. Although not all spectral types are yet included, the data do provide a reasonably representative sample of types from O to M, a few S stars and carbon stars, and several early-type emission-line and shell stars. These spec-

tra are available on digital magnetic tape from the Stellar Data Center at the Strasbourg Observatory in France. A description of the Michelson Spectrophotometer system and the data reduction procedures has been published separately (Johnson 1977).

The spectra for three stars (α Lyr, β Lyr, α Cyg) are shown in compressed form in Figures 1, 2 and 3. The compressed format permits an easier view of the entire spectrum but, of course, hides many of the details which are visible in a more expanded format. Figures 4 to 38 contain the expanded spectra of 35 stars. Interpretations of these spectra are being published separately.

The spectra are plotted as linear intensity graphs versus wavenumber in inverse micrometers (lower scale) and nanometers (upper scale).

TABLE I
THE OBSERVED STARS

| Star | Sp. Type | Star | Sp. Type | Star | Sp. Type | Star | Sp. Type |
|--------------------|-------------|-------------------|----------------|-------------------|----------|------------------------------------|----------|
| <i>Supergiants</i> | | | | | | | |
| λ Cep | O6 f | α Peg* | B9.5 III | θ^1 C Ori* | O6 p | R And* | S6,6e |
| ξ Ori† | O9.5 Ib | ϵ Cyg | K0 III | γ Cas* | B0 IV:e | χ Cyg | S7,1e |
| ϵ Ori | B0 Ia | β Gem* | K0 III | θ^1 D Ori* | B1 | | |
| P Cyg* | B1 ep | η Peg | K1 III | ϕ Per* | B2 pe | | |
| 55 Cyg | B3 Ia | α Boo | K2 III p | η UMa | B3 V | | |
| χ Aur | B5 Iab | α Ser | K2 III | ξ Peg* | B8 V | <i>Carbon Stars</i> | |
| HD 183143 | B7 Ia | γ^1 And | K3 II | α Lyr | A0 V | T Lyr* | C5,3 |
| β Ori | B8 Ia | α Tau† | K5 III | ξ Aql | A0 V:nn | W Ori* | C5,3 |
| α Cyg* | A2 Ia | β And | M0 III | α Aql | A7 IV, V | DS Peg | C6,3 |
| ϵ Aur | F0 Iap | α Peg* | M2 II-III | β Cas | F2 IV | | |
| α Per | F5 Ib | α Her A | M5 II | γ Ser | F6 V | | |
| δ Cep | F5-G1 Ib | g Her | M6 III | λ Ser | G0 V | | |
| γ Cyg | F8 Ib | R Cas* | gM7 e | BS 483 | G2 V | <i>Peculiar Eclipsing Binaries</i> | |
| β Aqr | G0 Ib | o Cet* | (gM9, at min.) | Sun‡ | G2 V | | |
| VV Cep | M2 Iep + B9 | | | 61 Cyg A | K5 V | β Lyr | B pe |

* This spectrum was published in the first installment of this *Atlas*.

† The spectrum of this star was published previously, but is republished here because of the addition of significant new data.

‡ The spectrum of the Sun, as reflected by the Moon and a satellite of Jupiter.

REFERENCES

- Johnson, H. L. 1977, *Rev. Mex. Astron. Astrof.*, **2**, 71.
 Johnson, H. L. 1977, *Rev. Mex. Astron. Astrof.*, **2**, 219.

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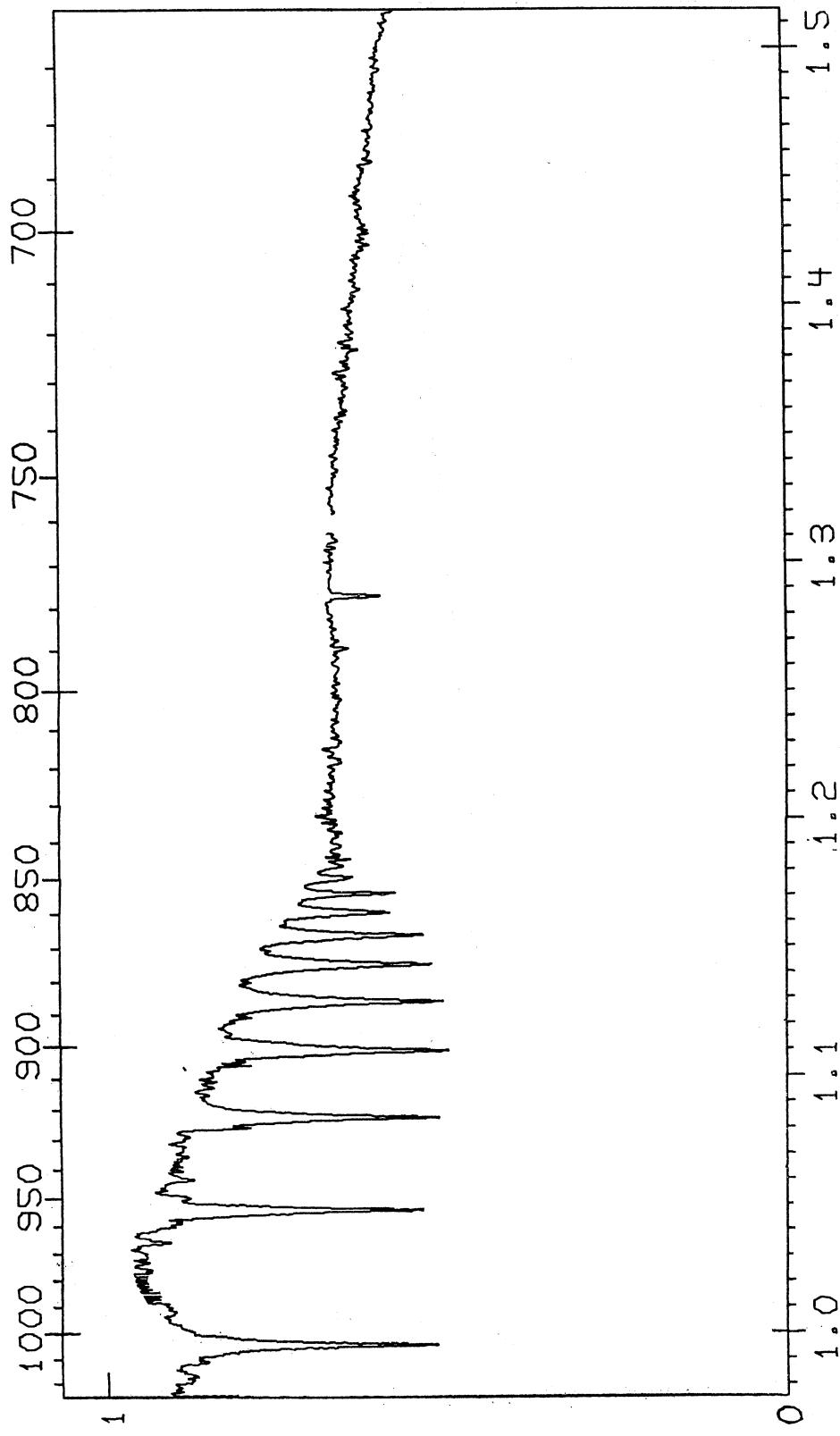
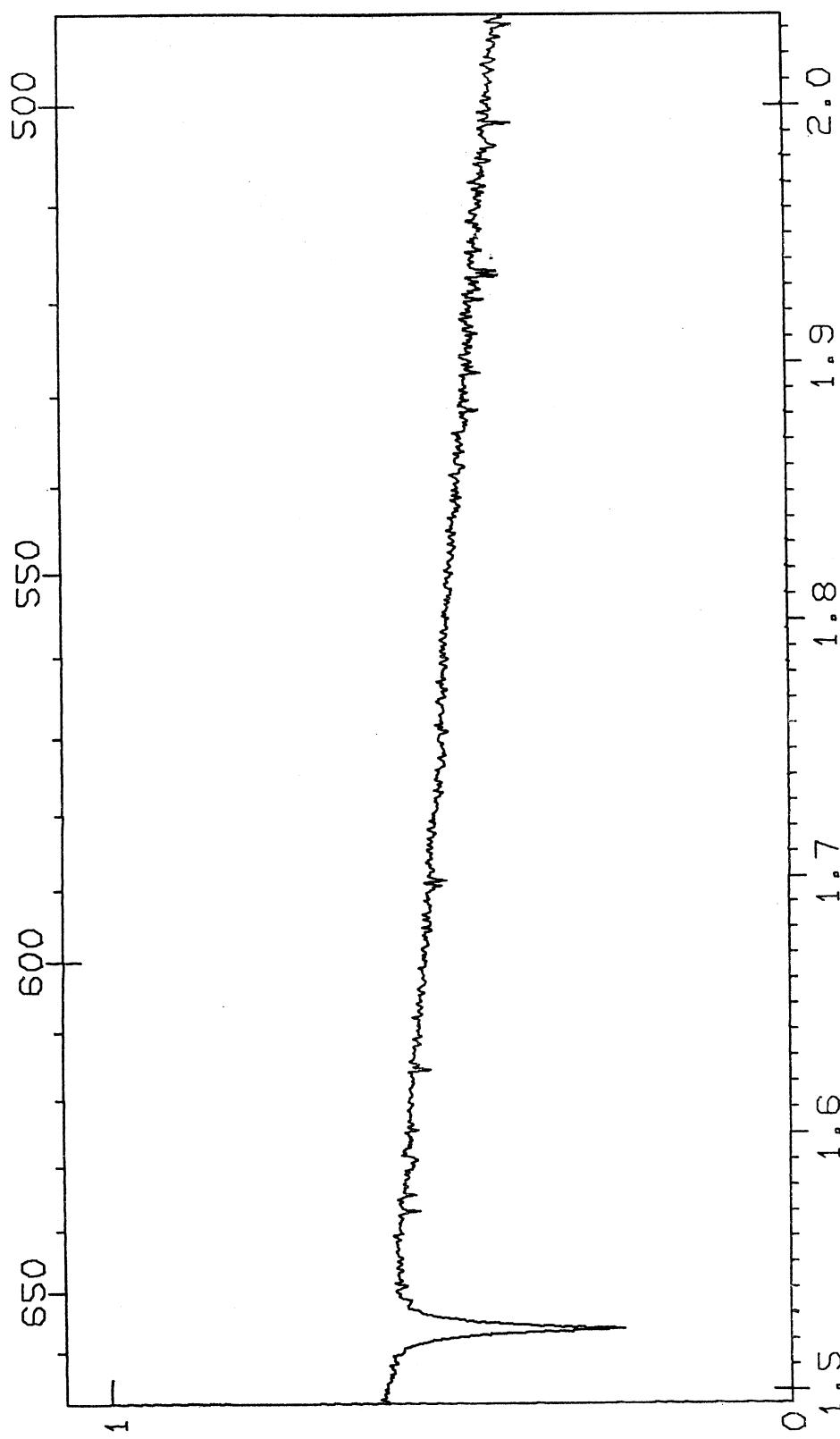


FIG. 1. The compressed spectrum of α Lyr.

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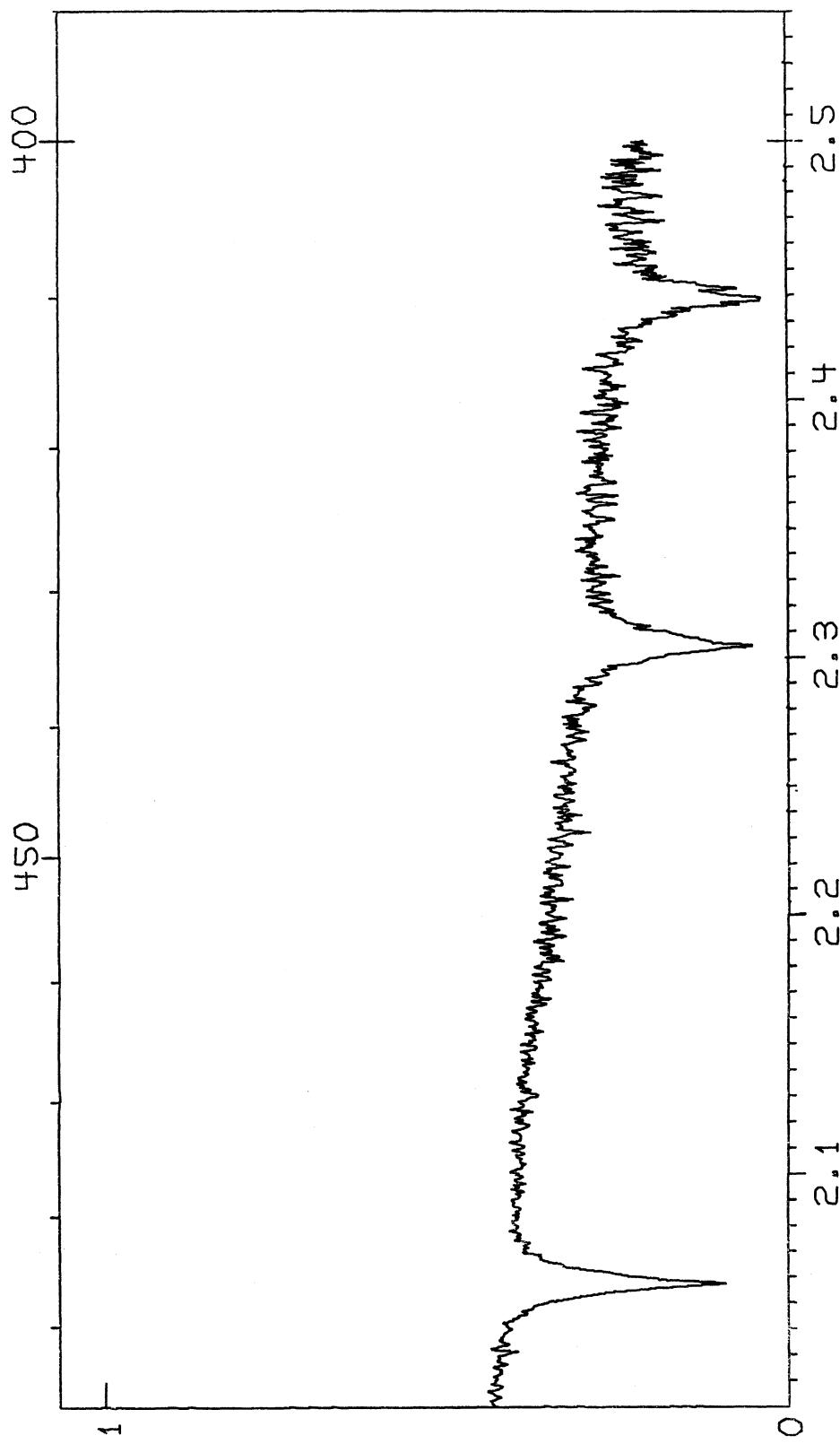
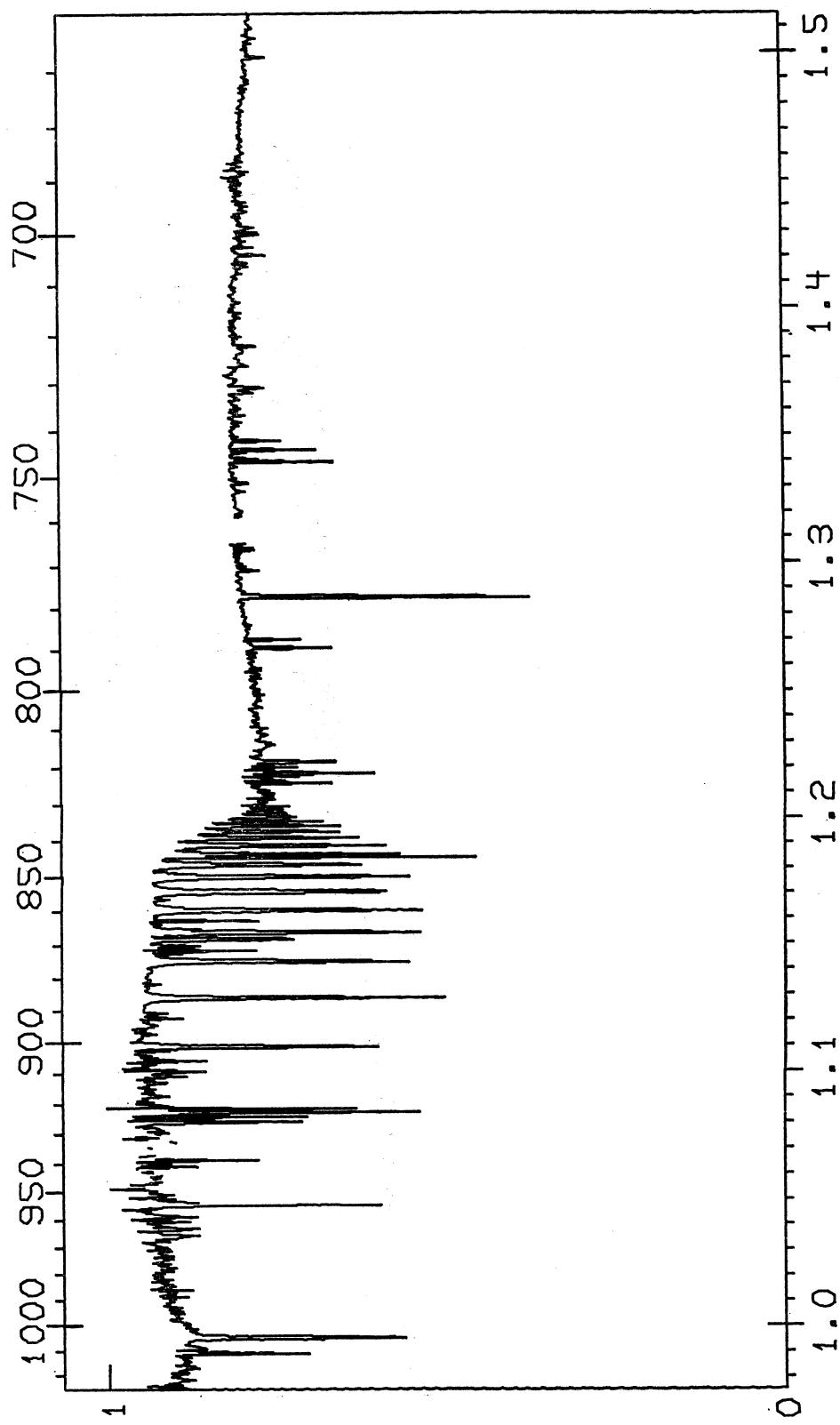


FIG. 1. The compressed spectrum of α Lyr.

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Fig. 2. The compressed spectrum of α Cyg.

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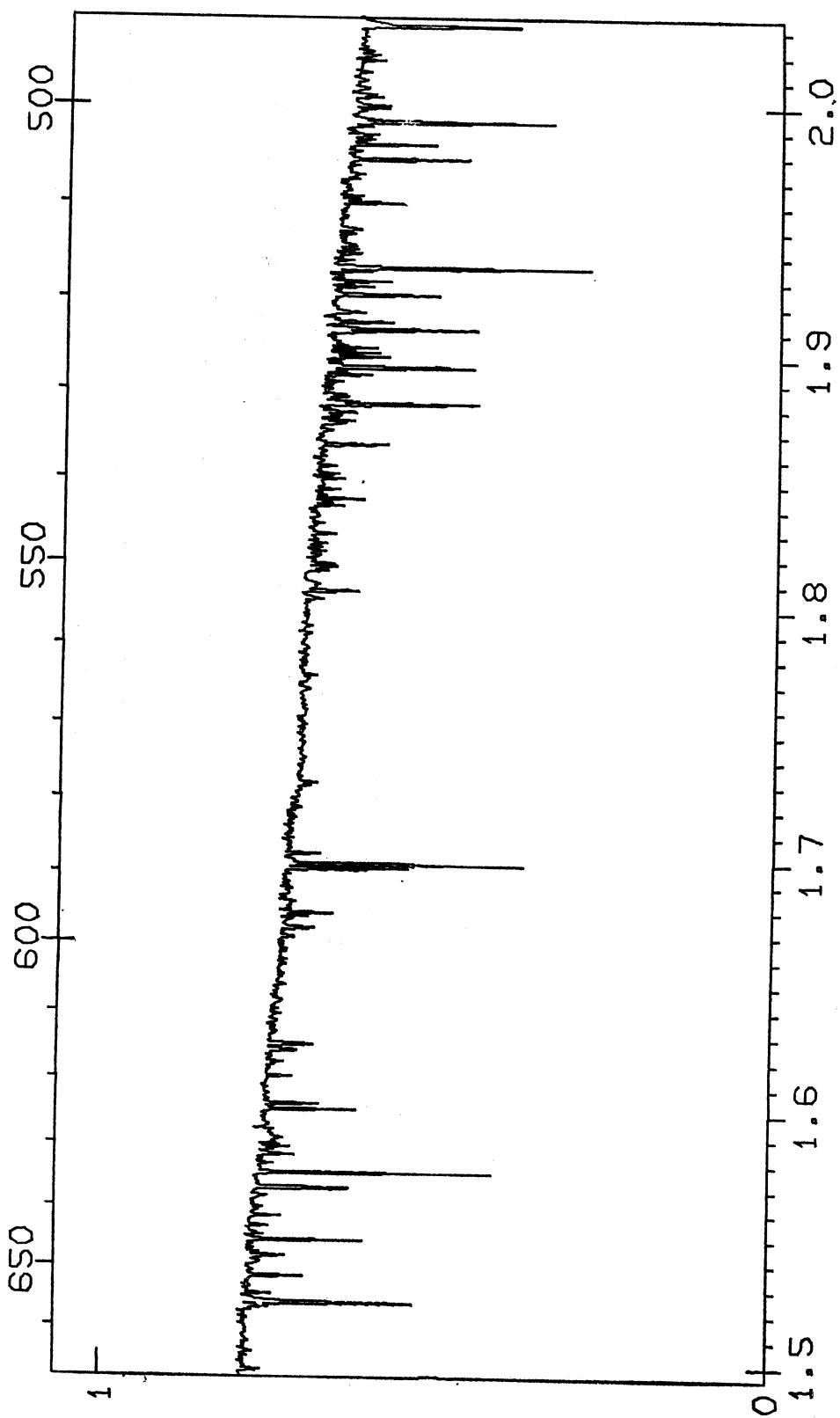
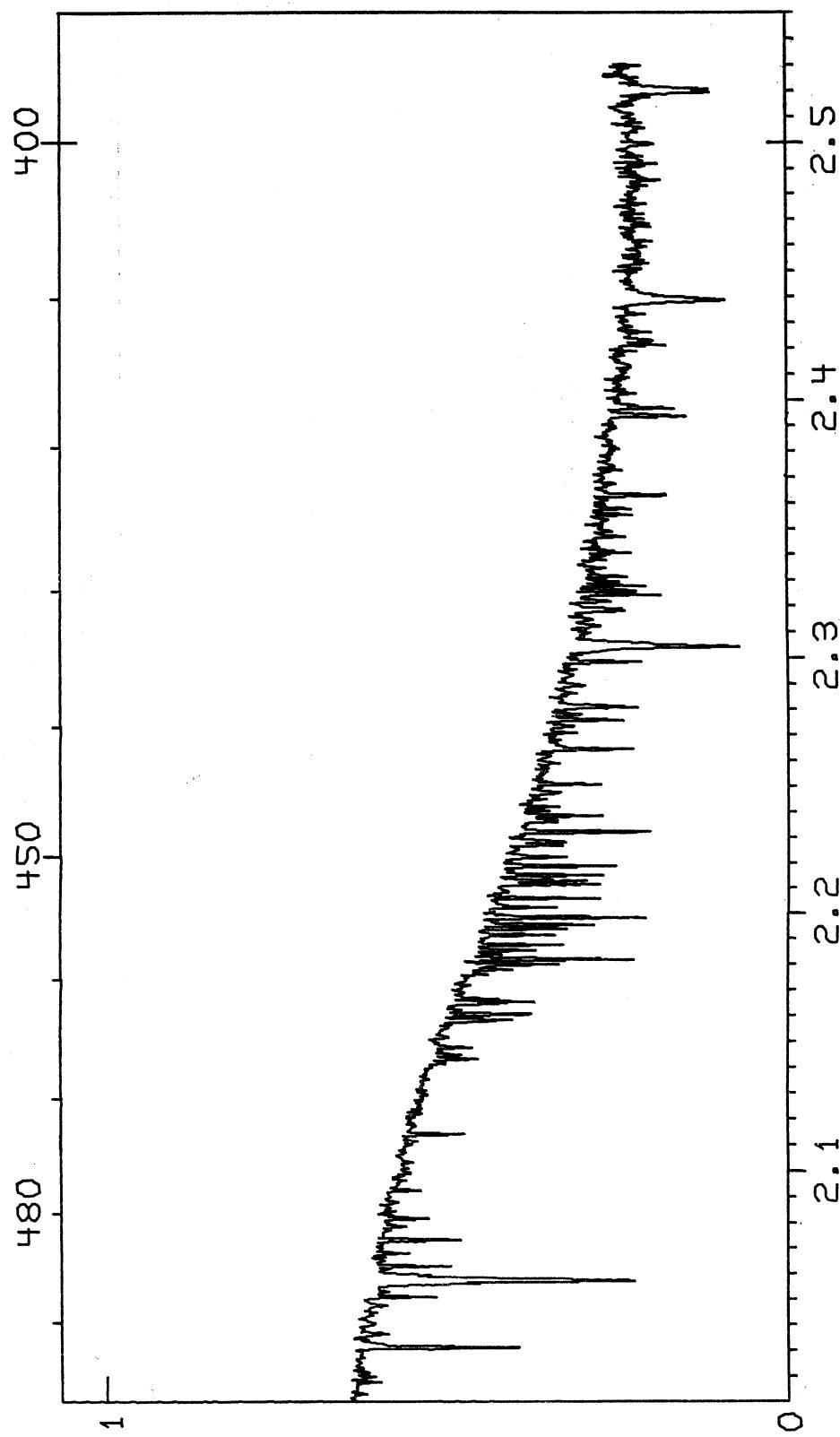


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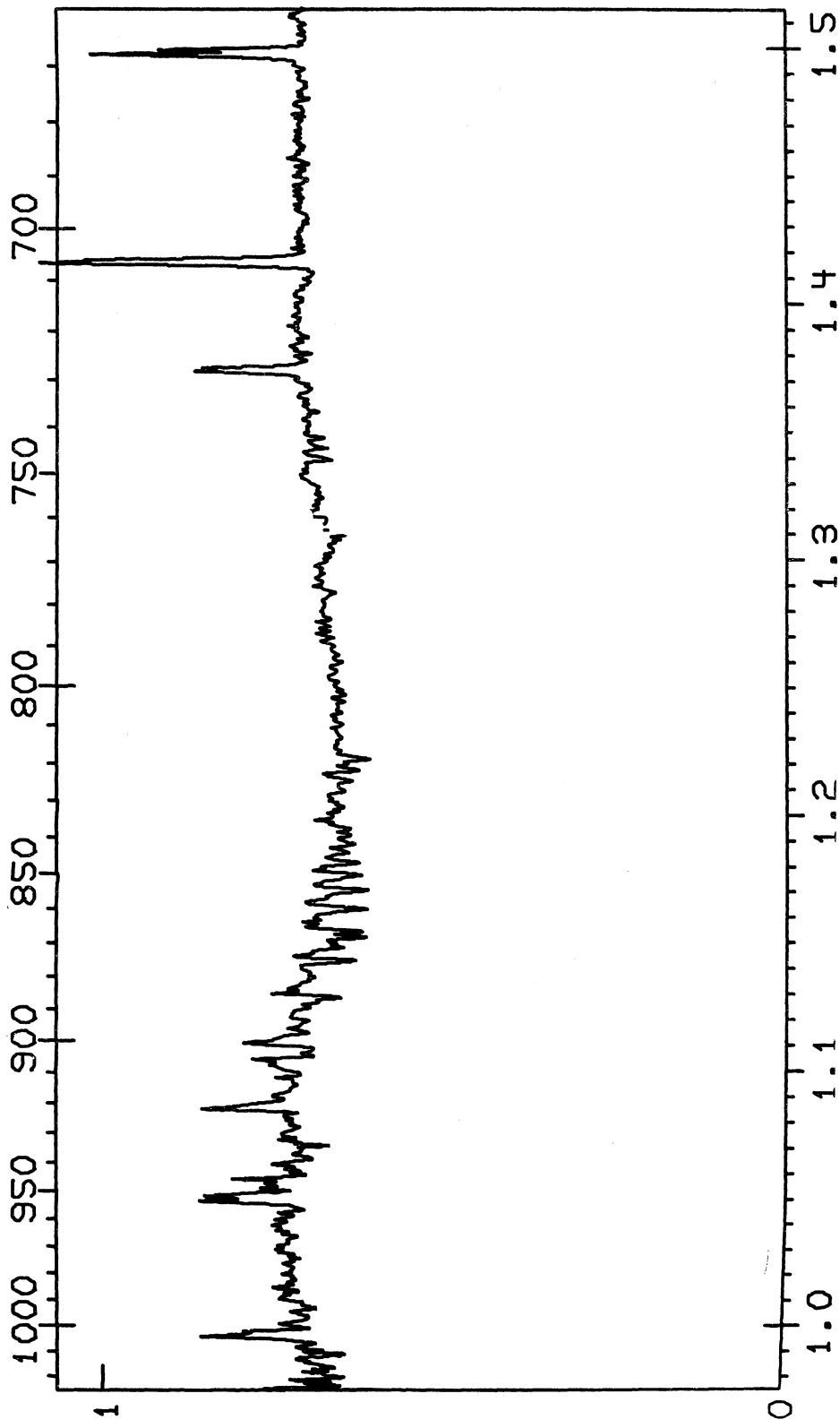


FIG. 3. The compressed spectrum of β Lyr.

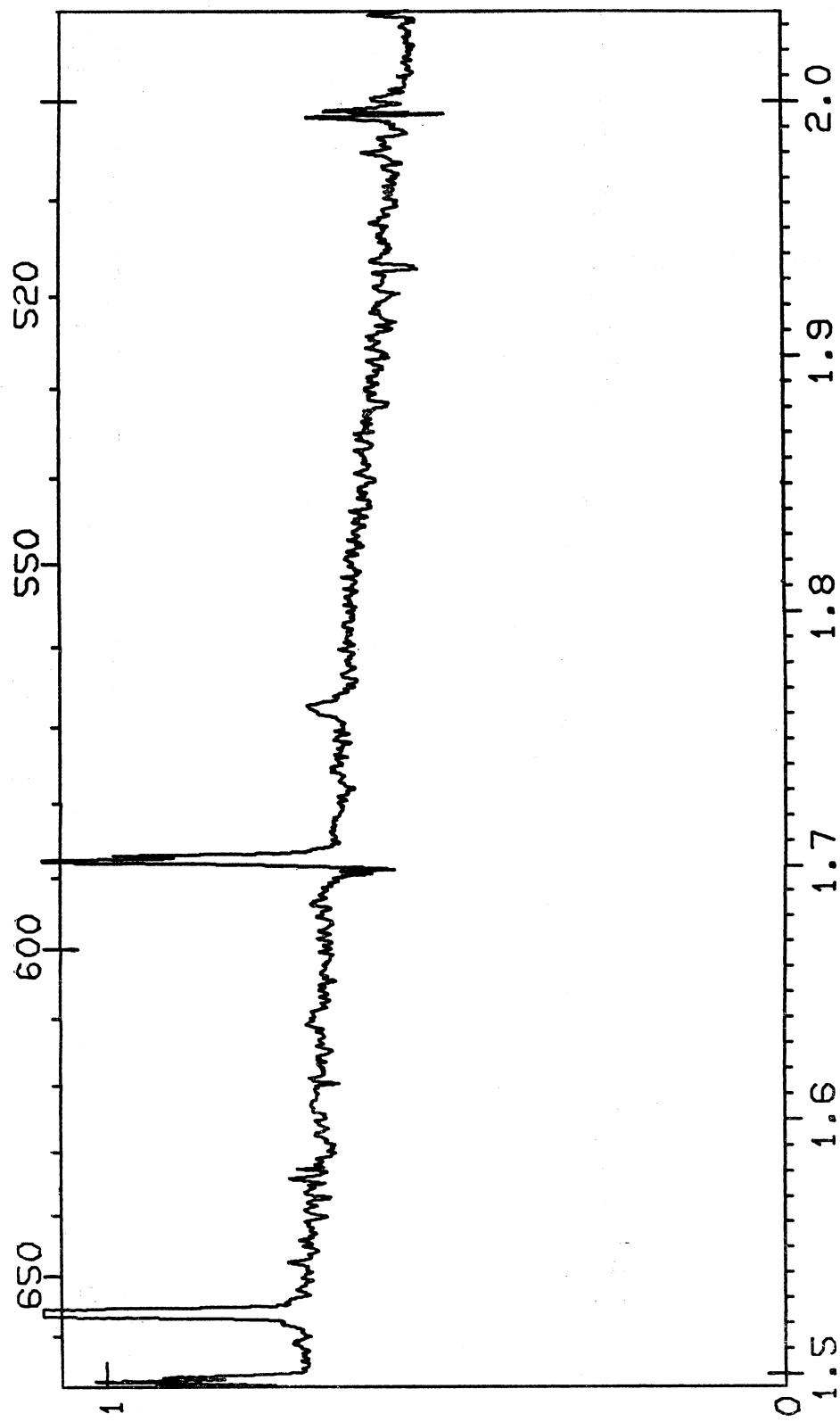


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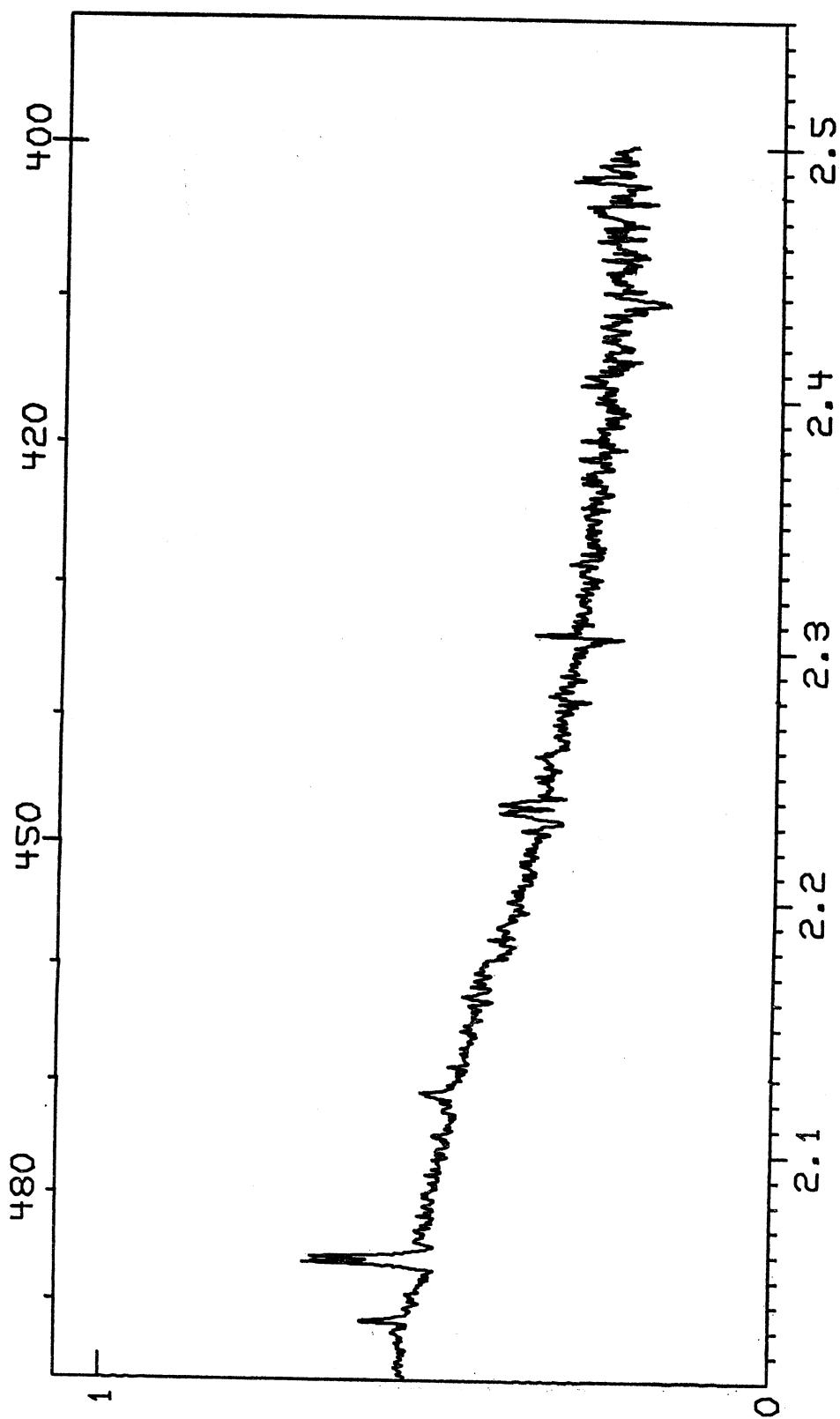
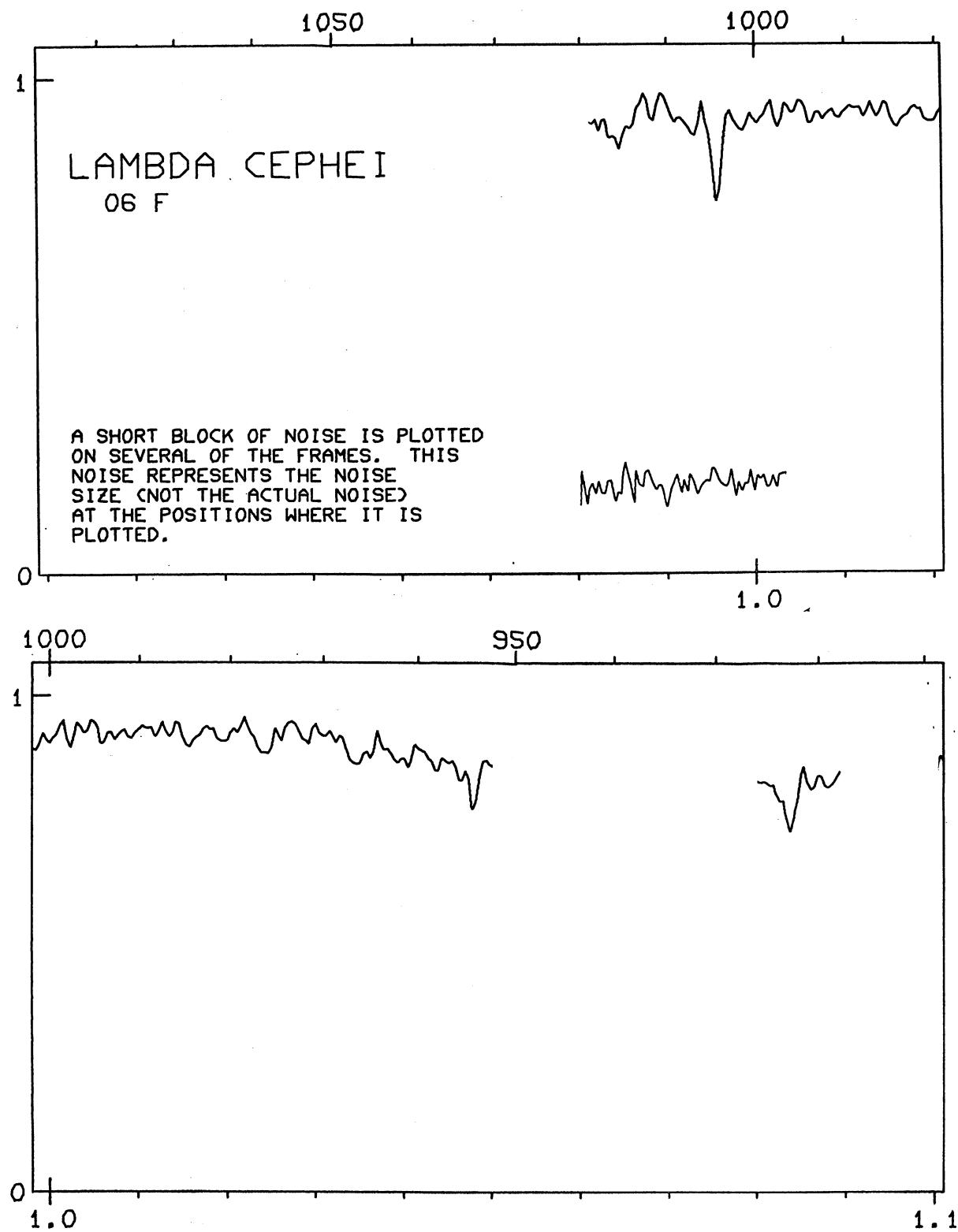
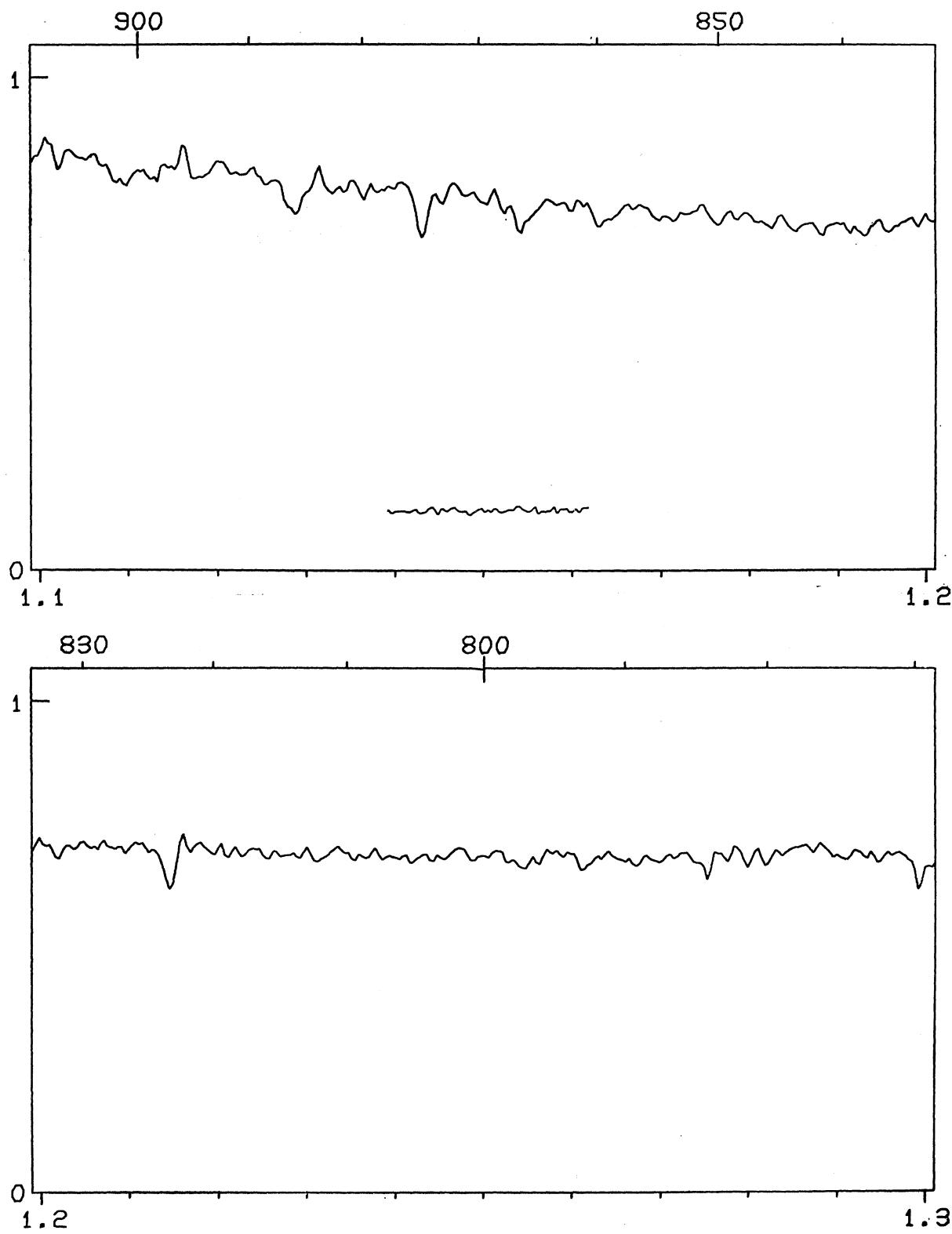


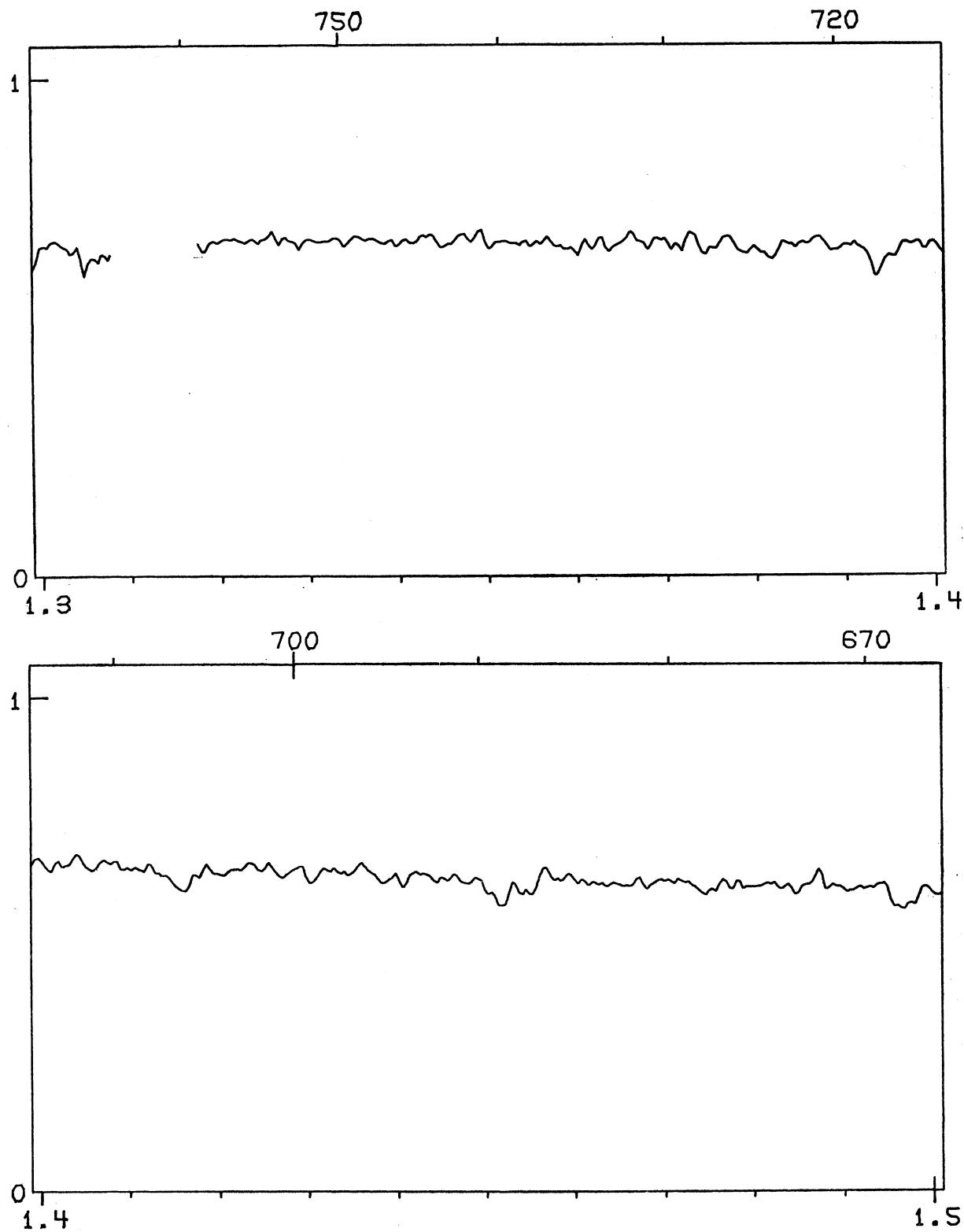
FIG. 3. The compressed spectrum of β Lyr.

FIG. 4. The spectrum of λ Cep.

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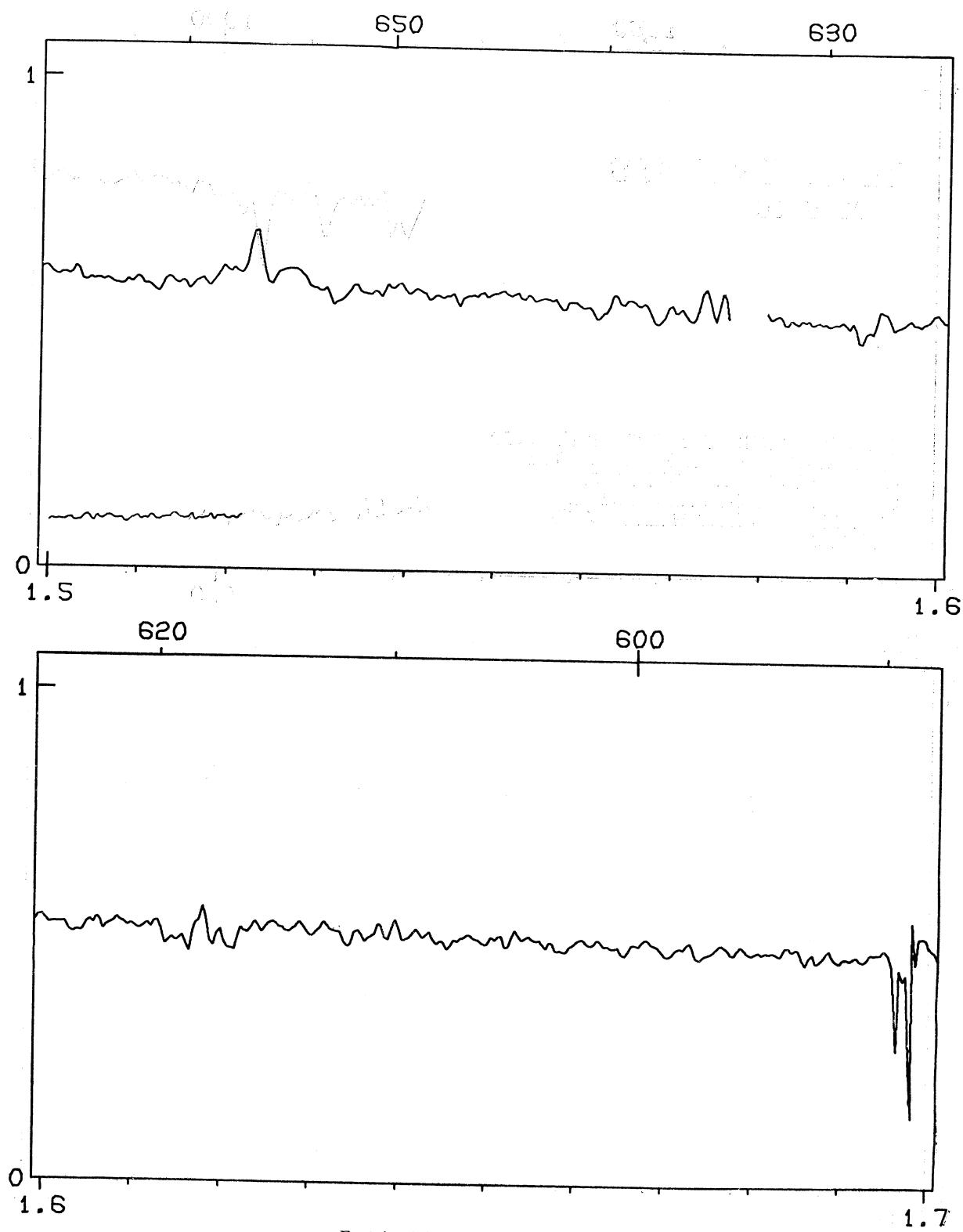
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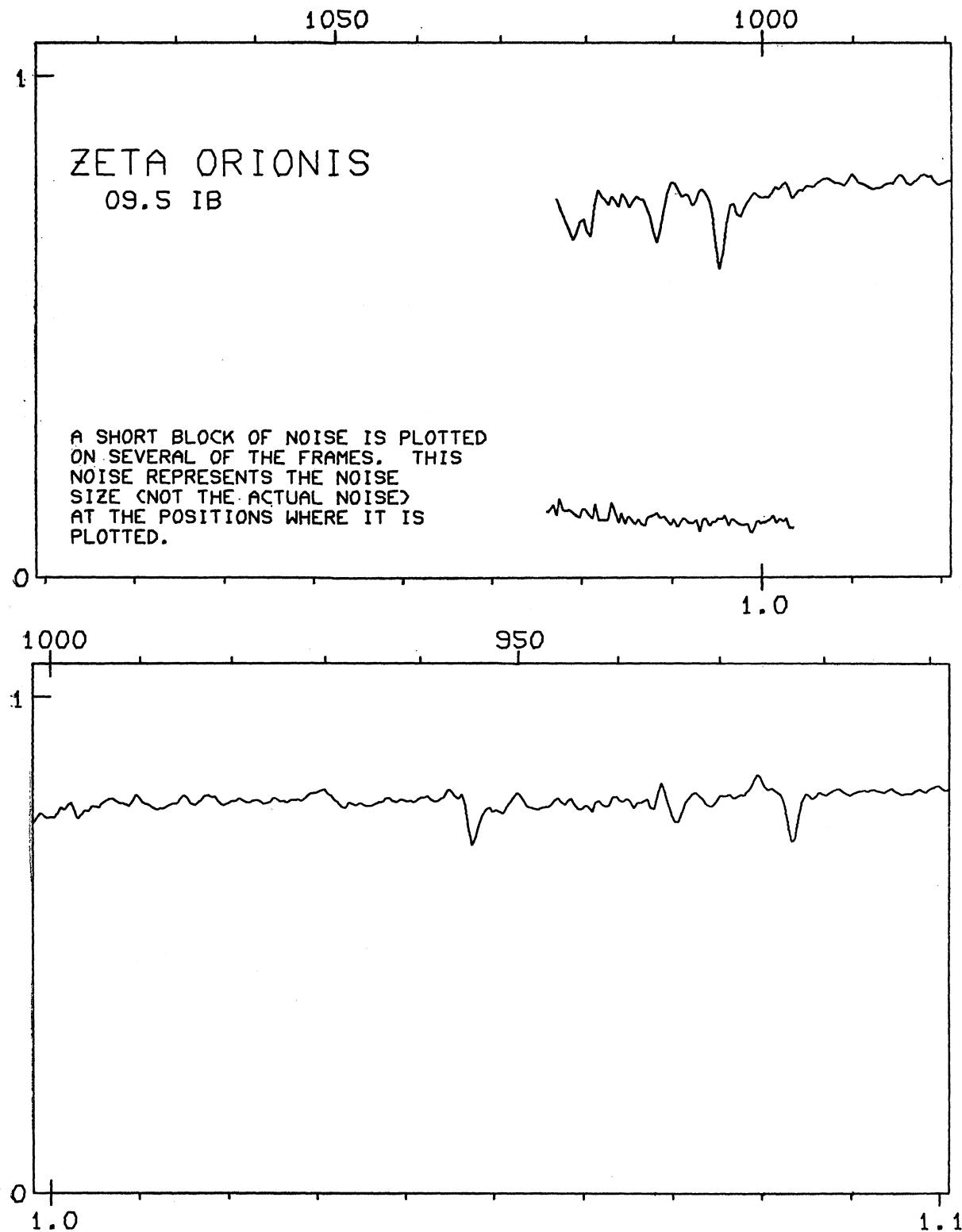
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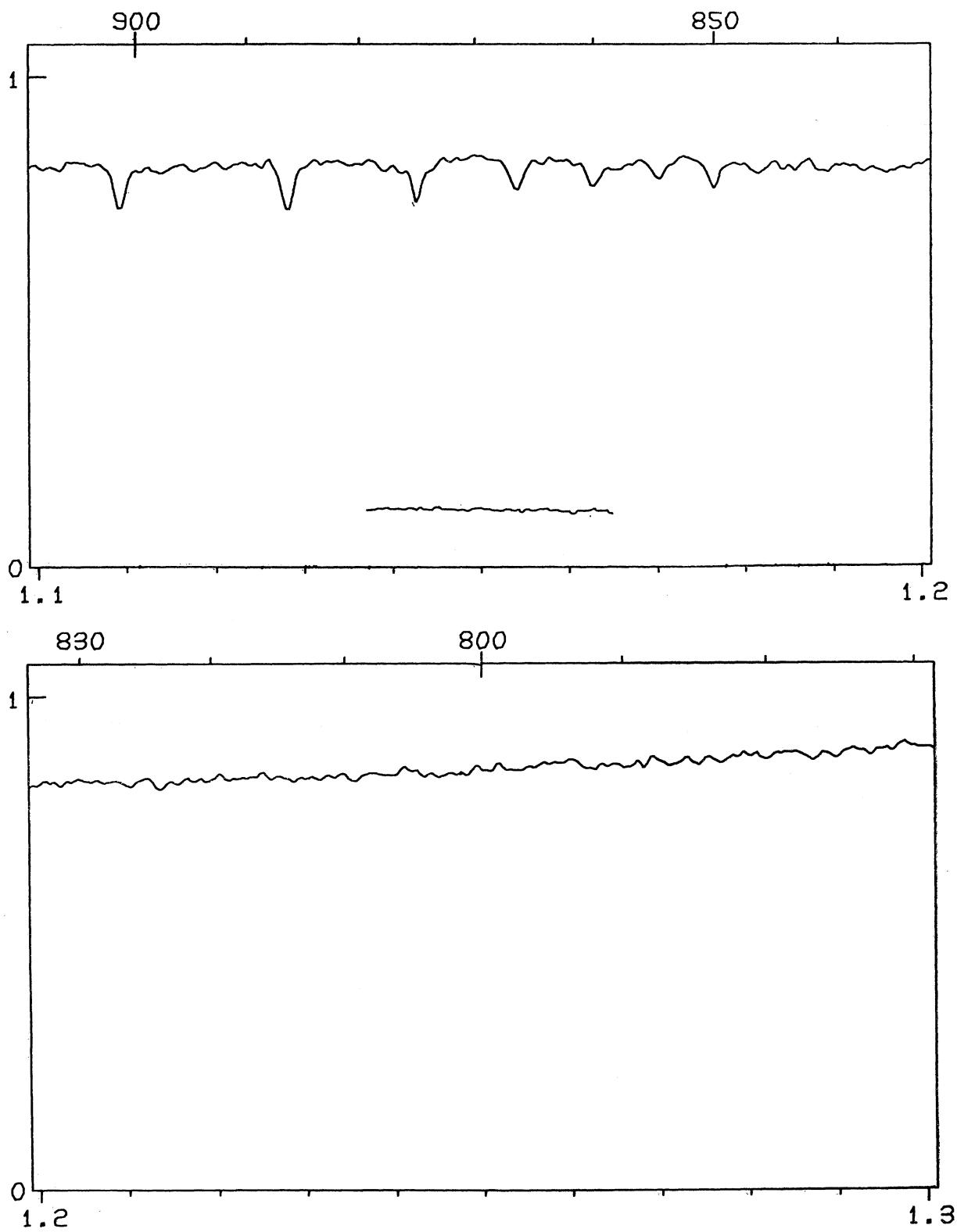
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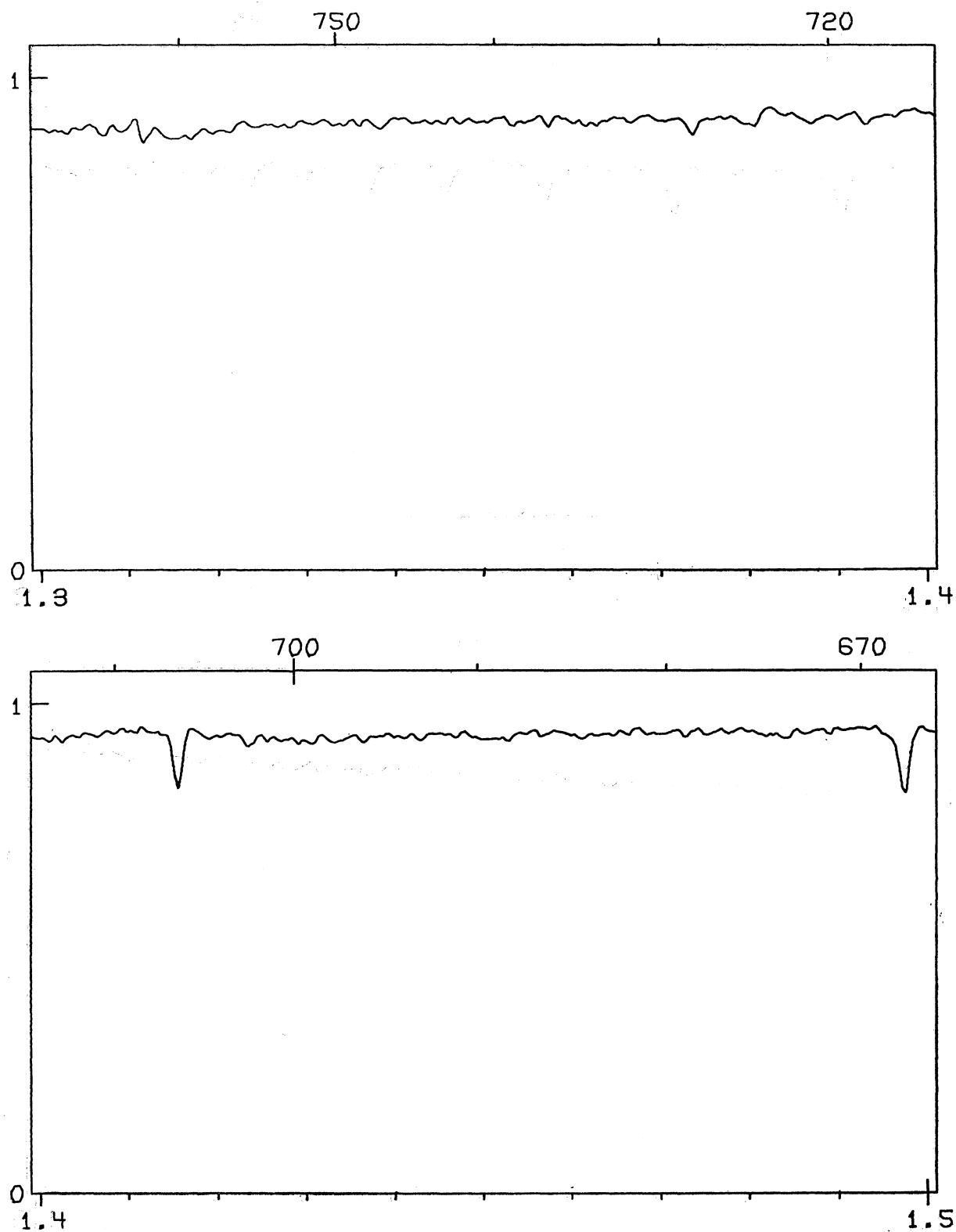
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FIG. 5. The spectrum of ξ Ori.

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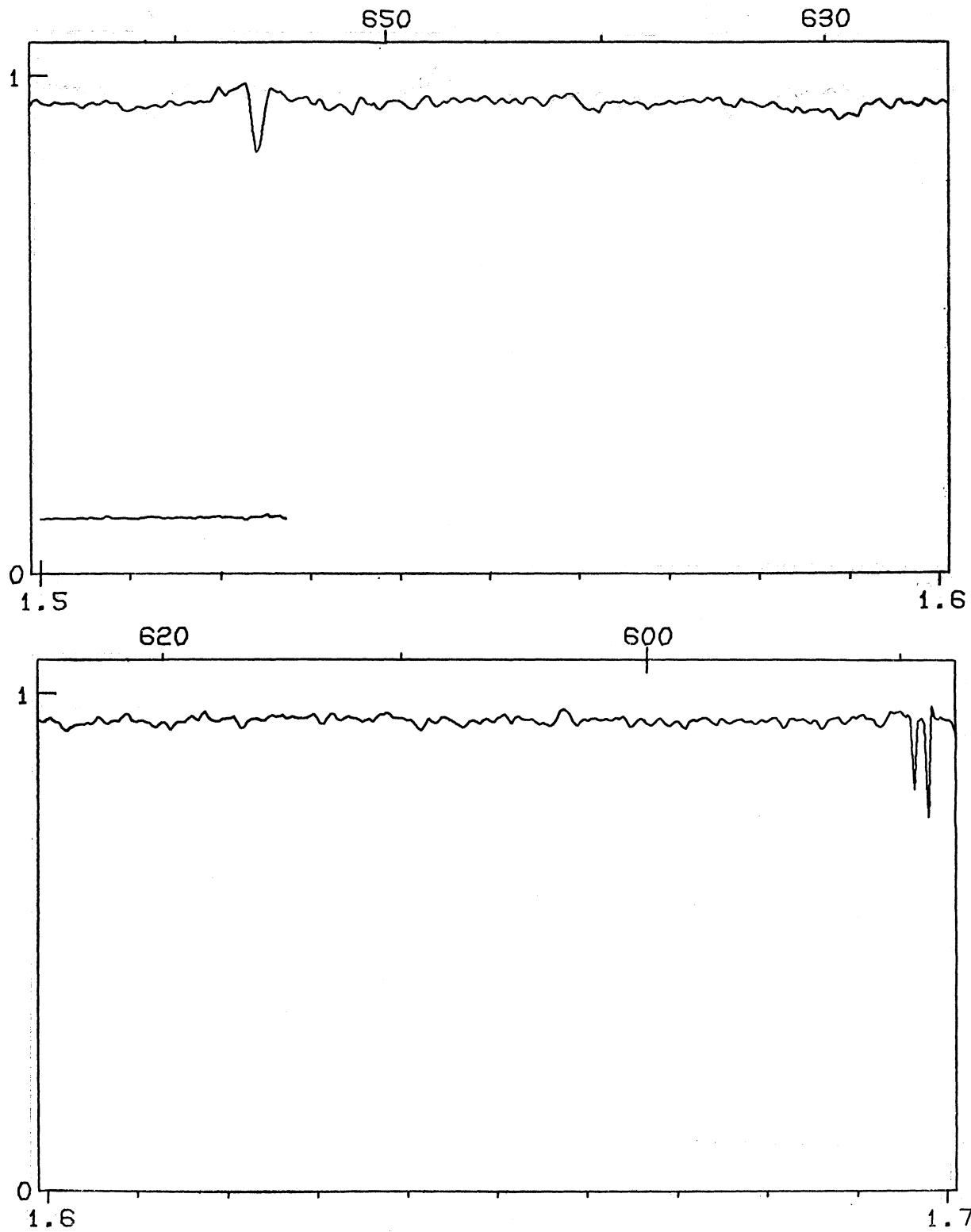
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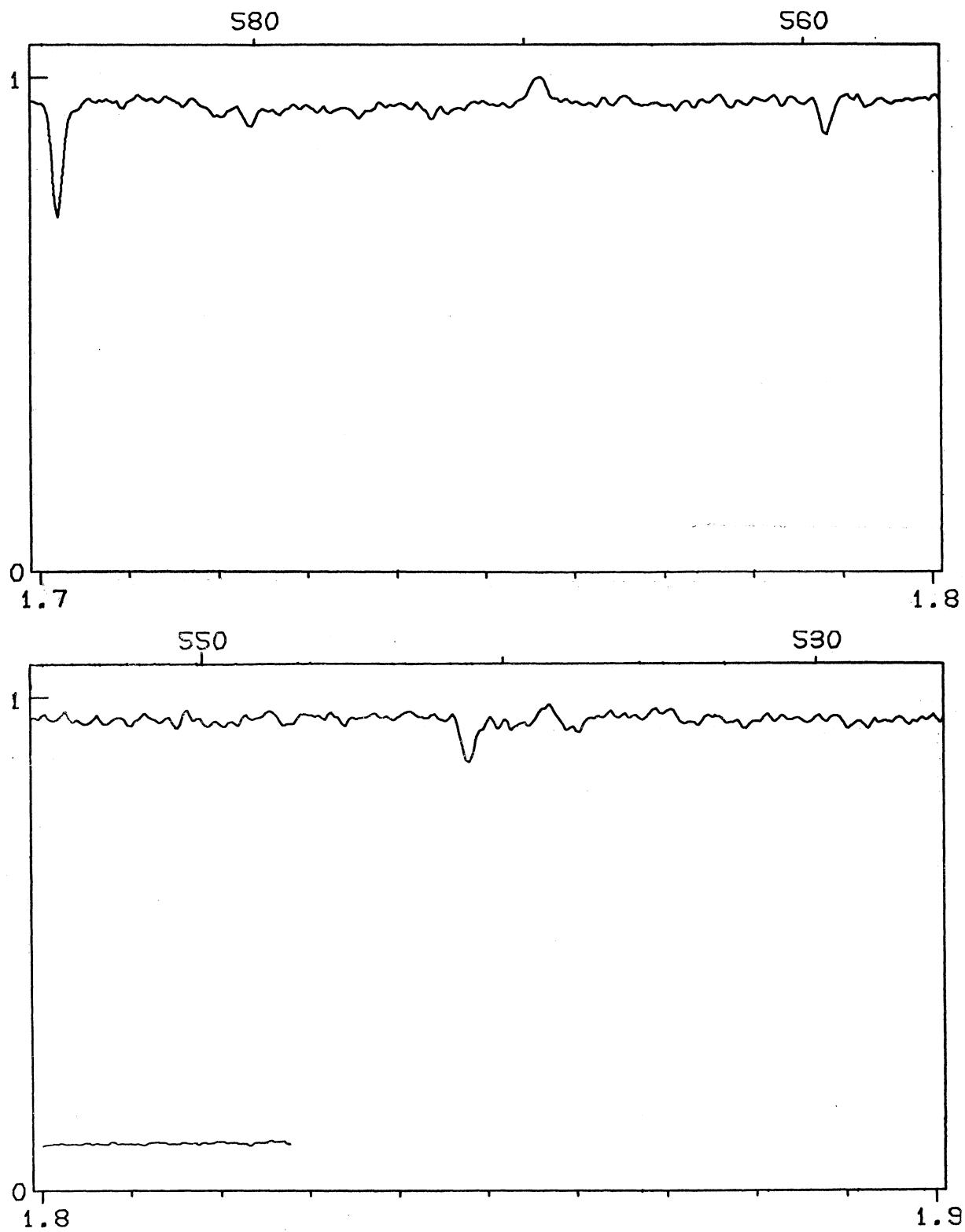
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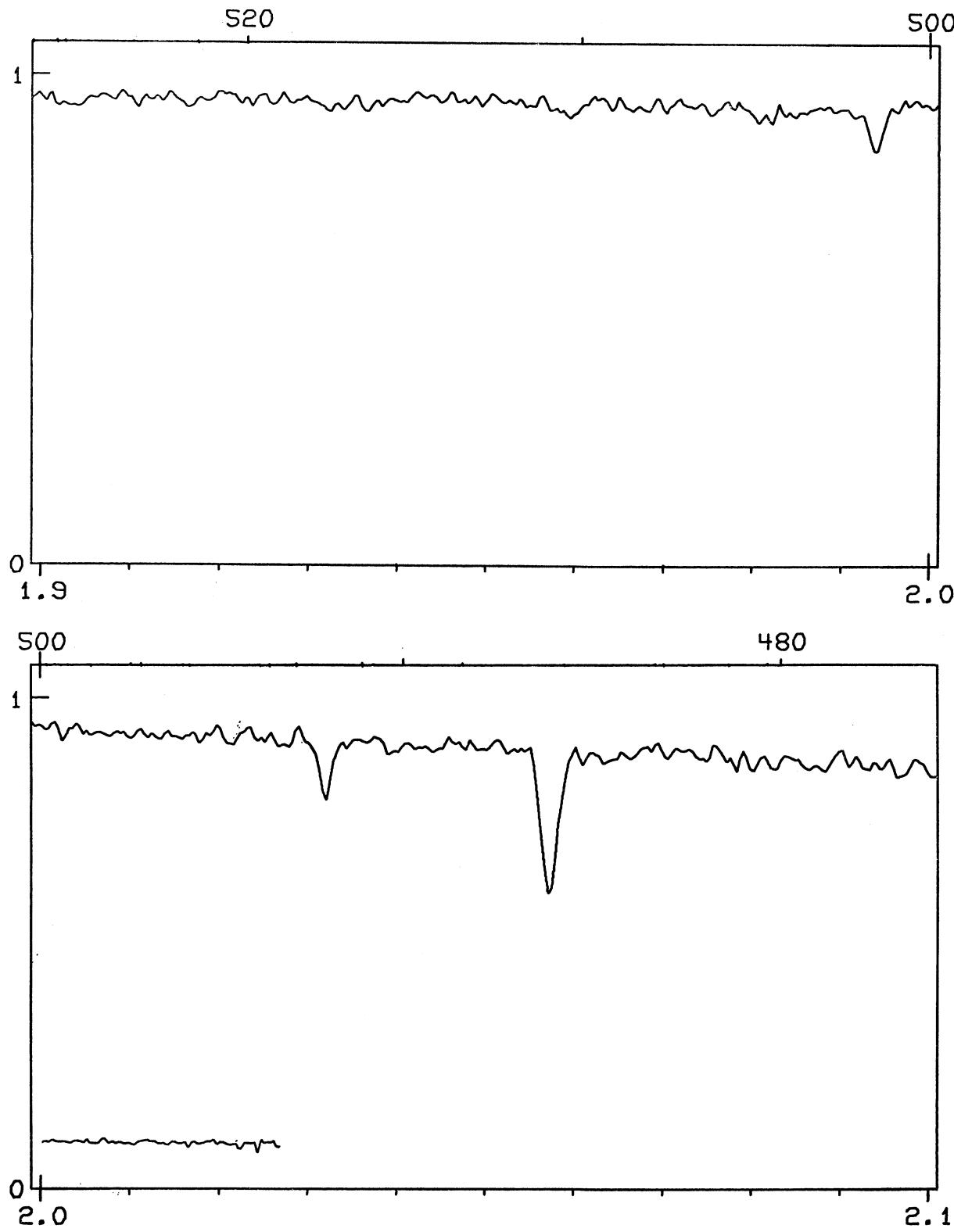
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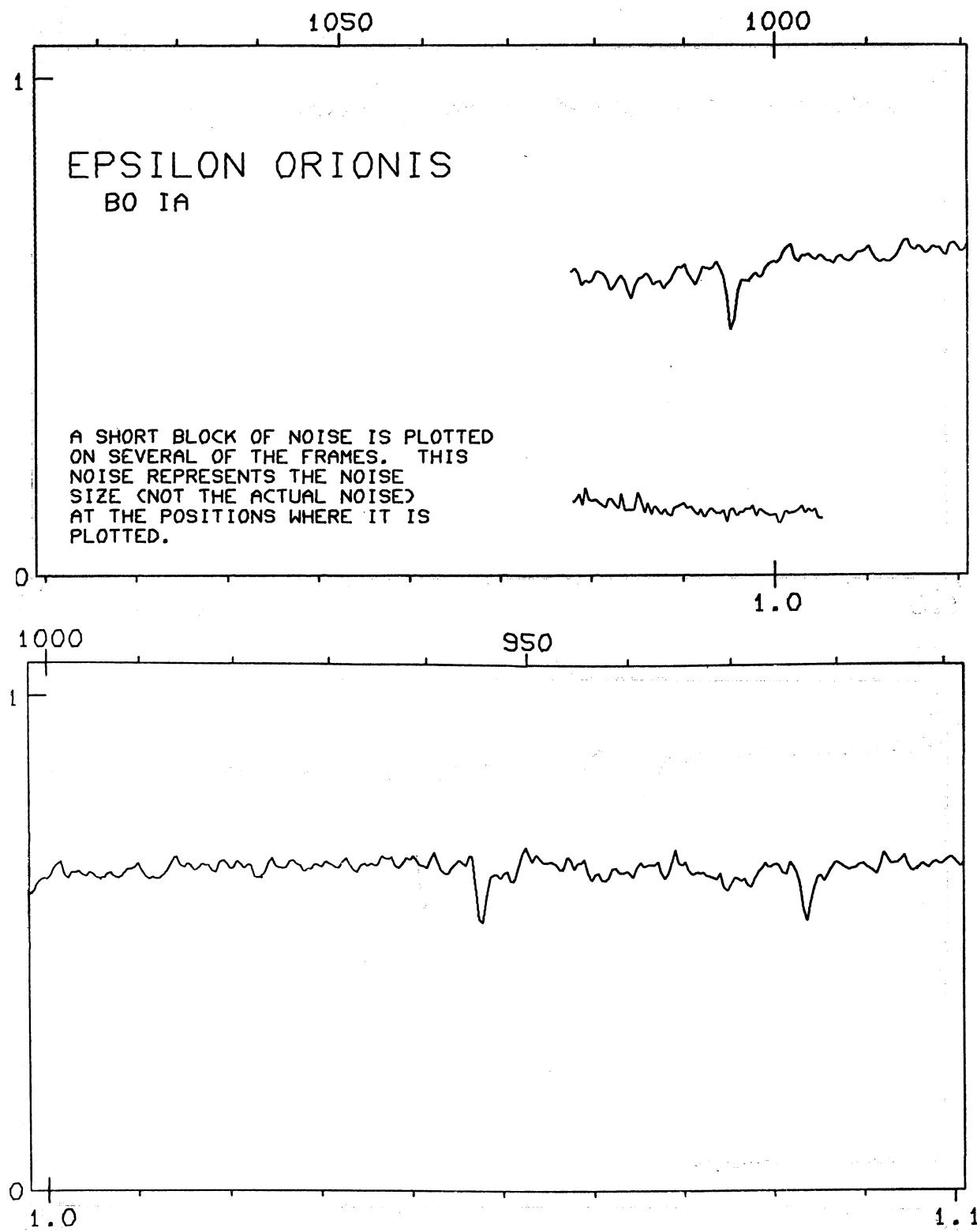
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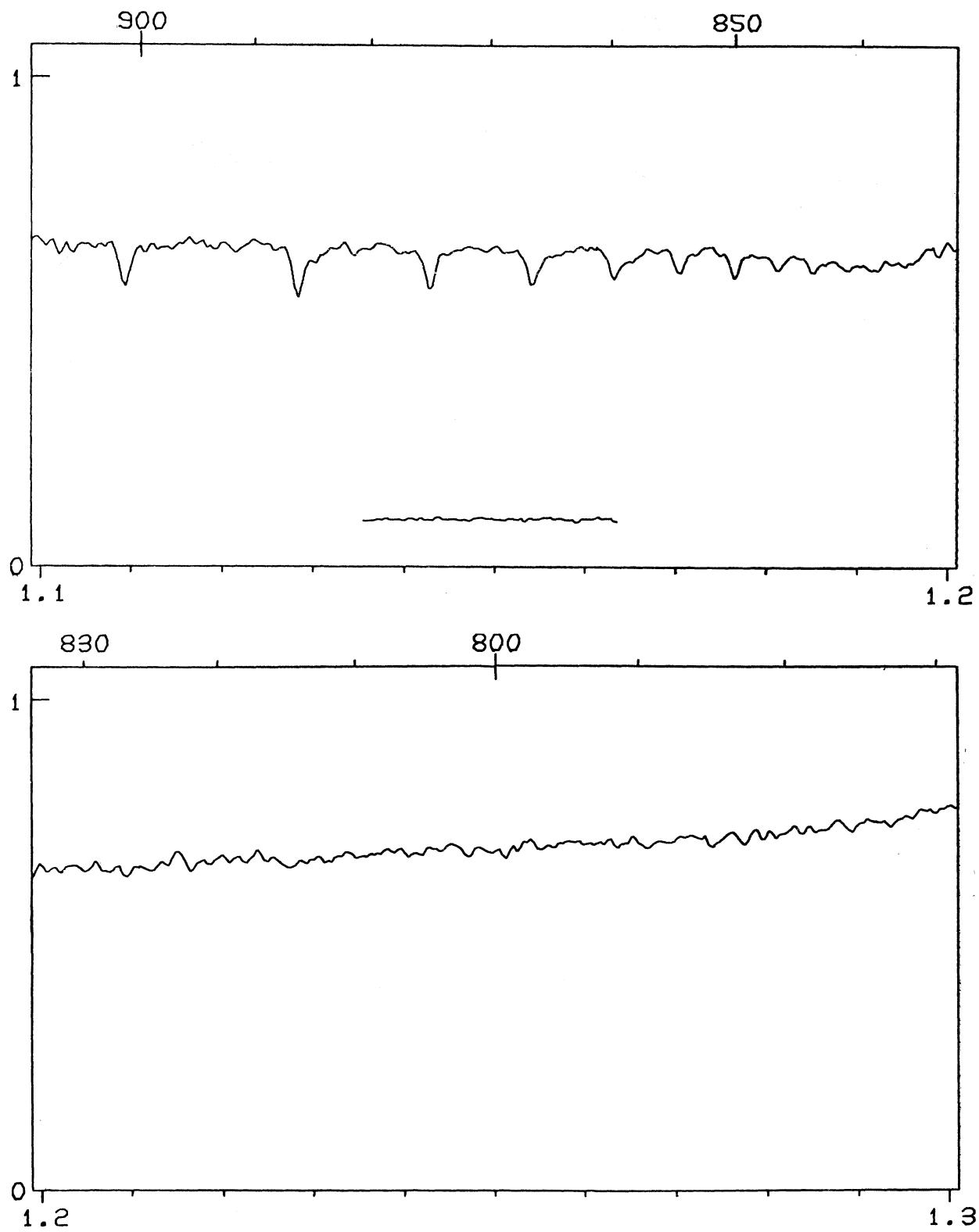
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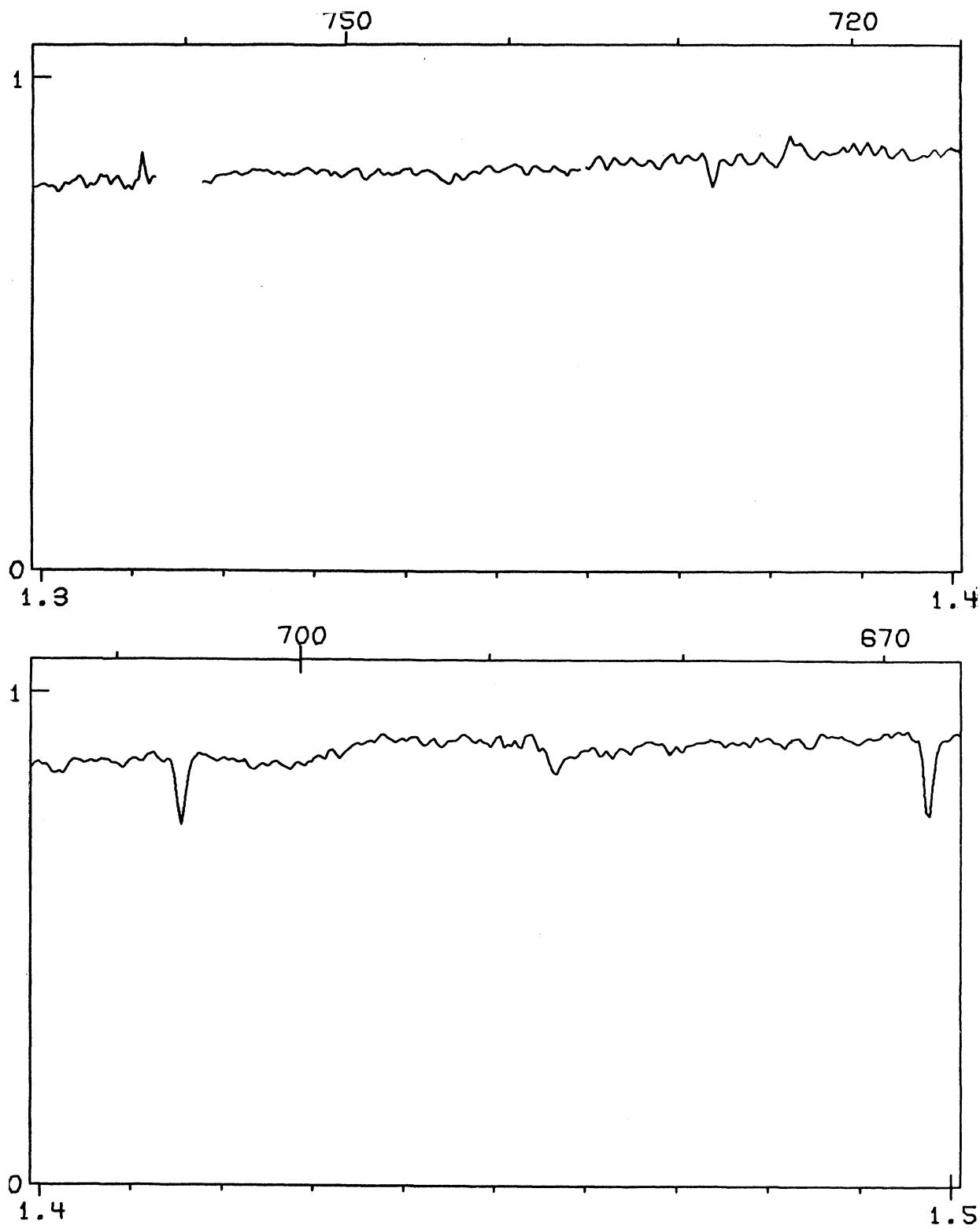
FIG. 5. The spectrum of ξ Ori.

FIG. 6. The spectrum of ϵ Ori.

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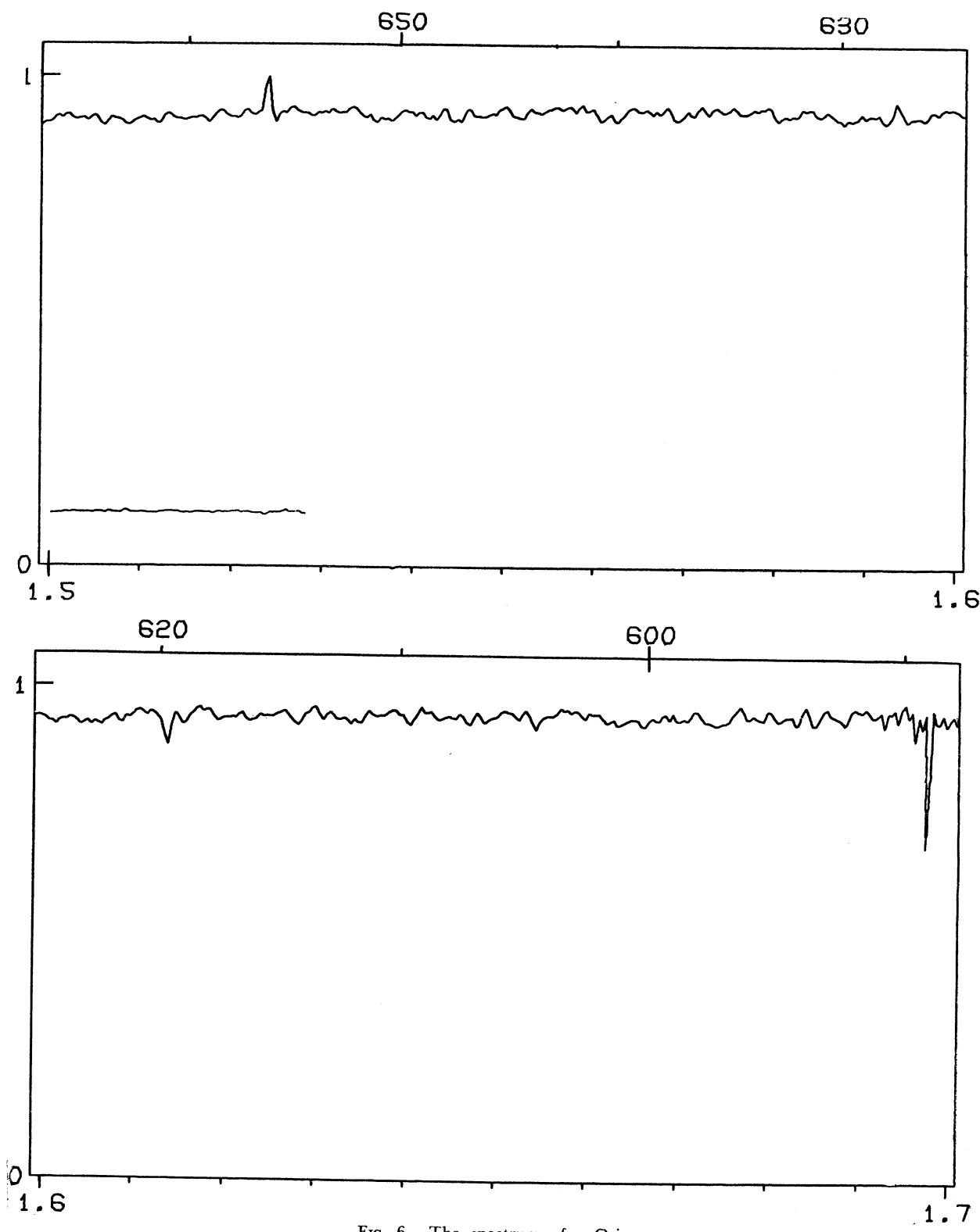
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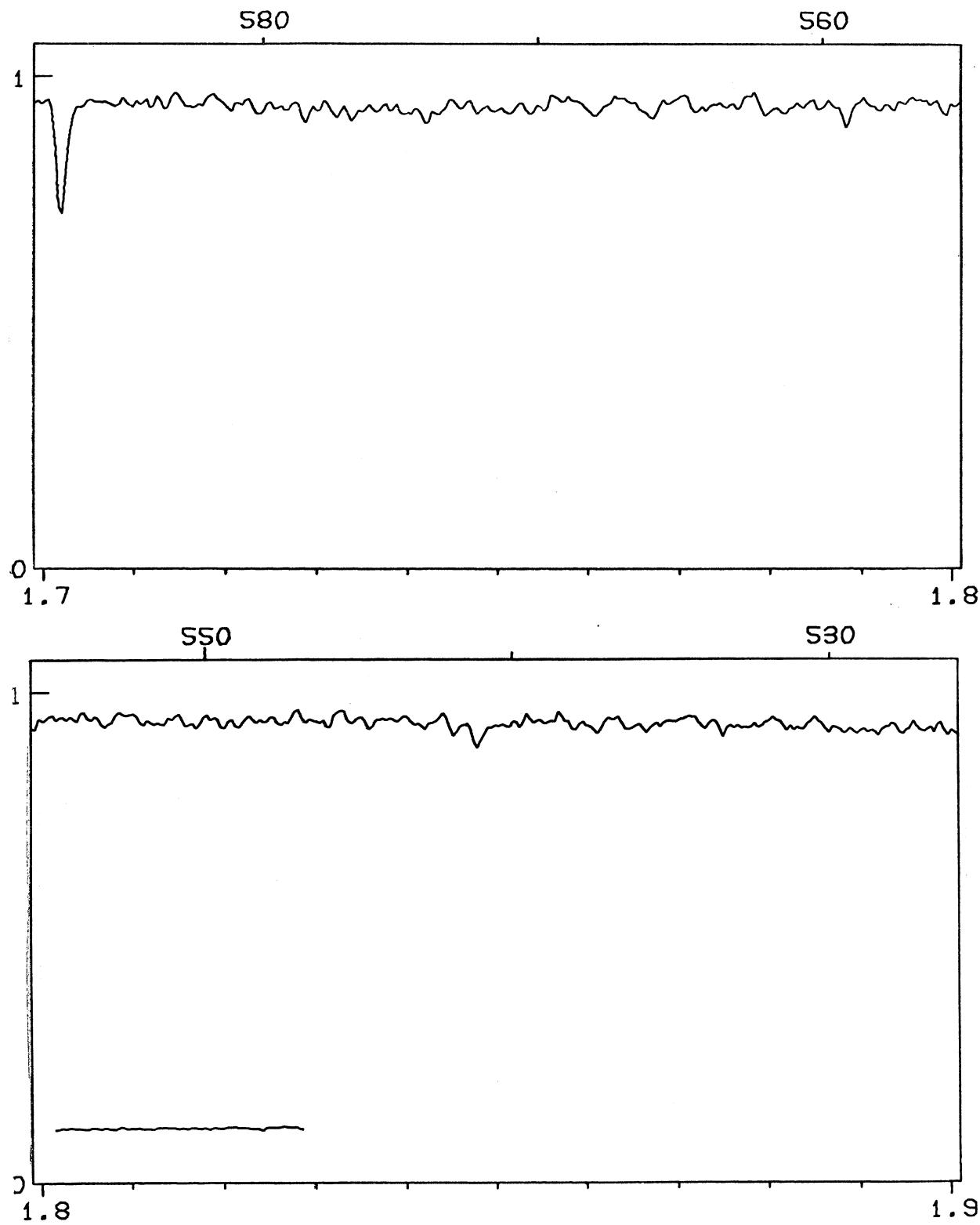
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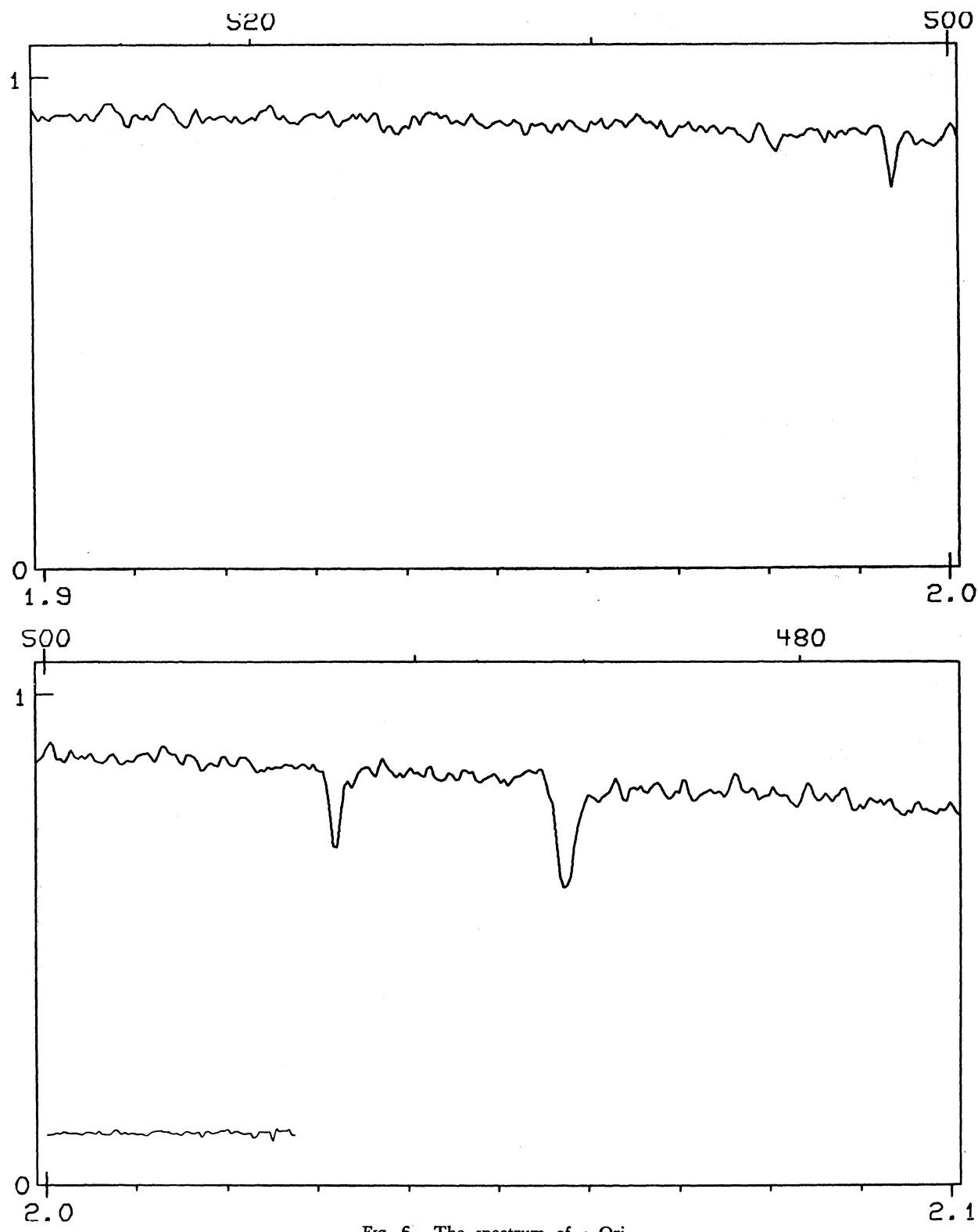
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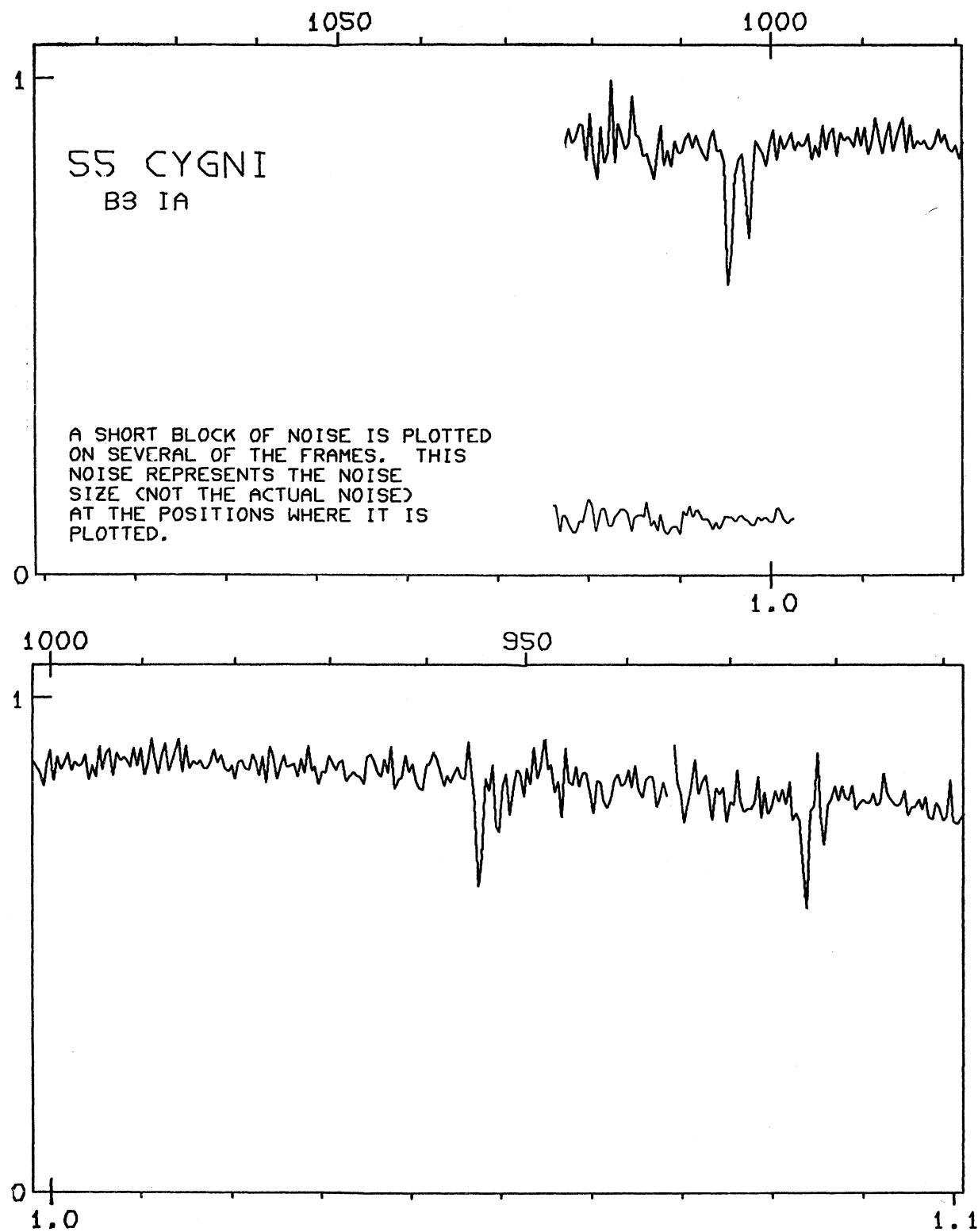


FIG. 7. The spectrum of 55 Cyg.

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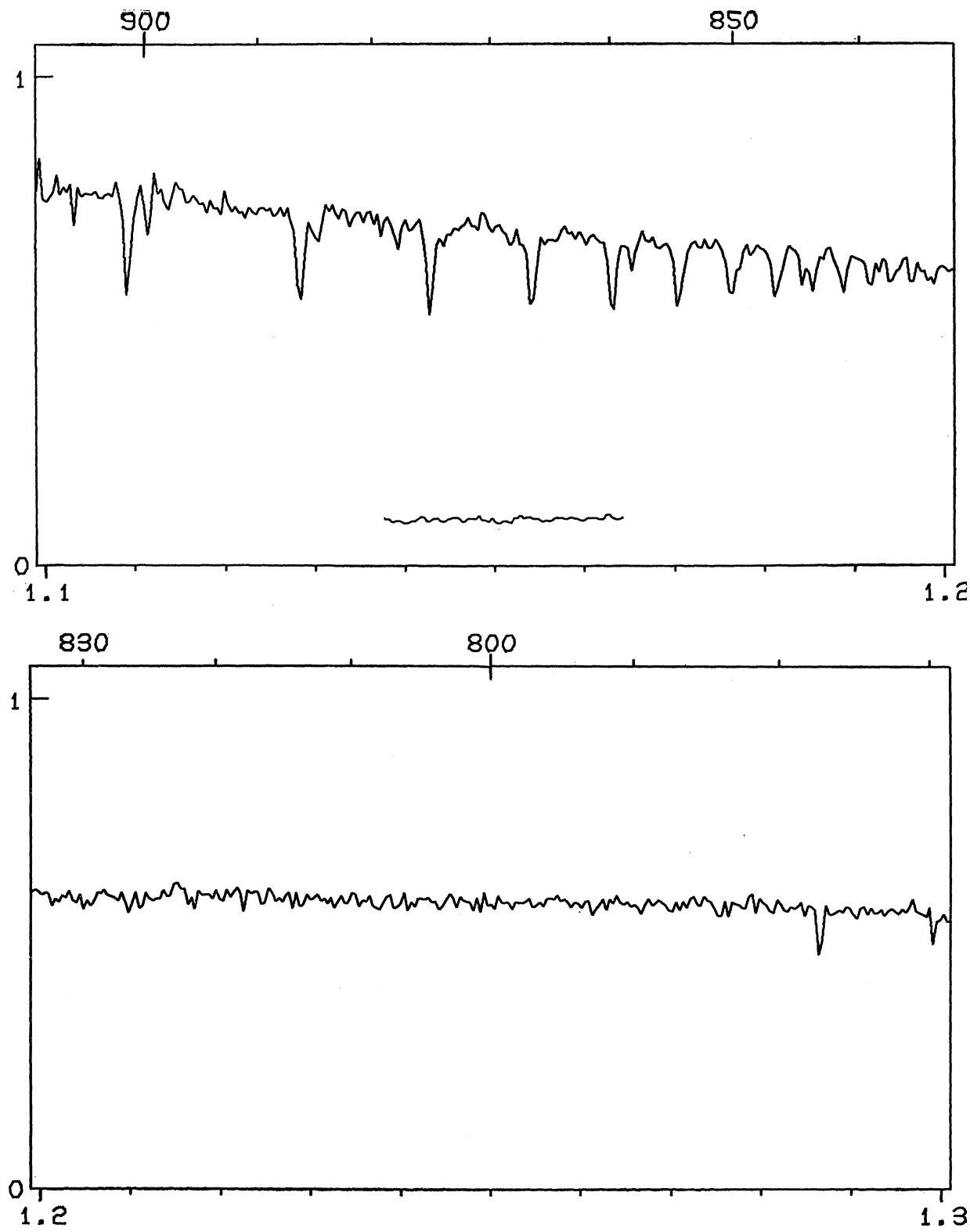


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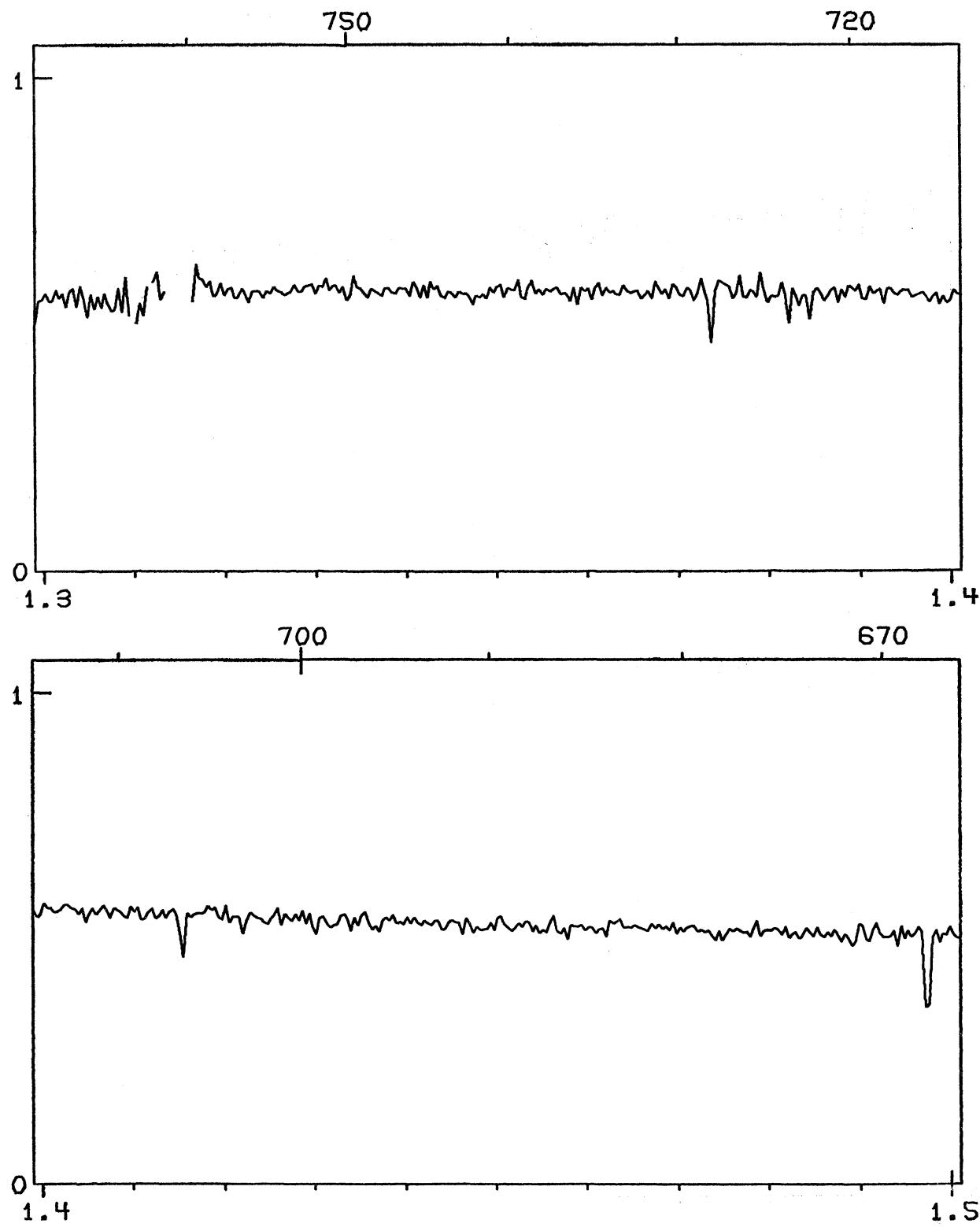


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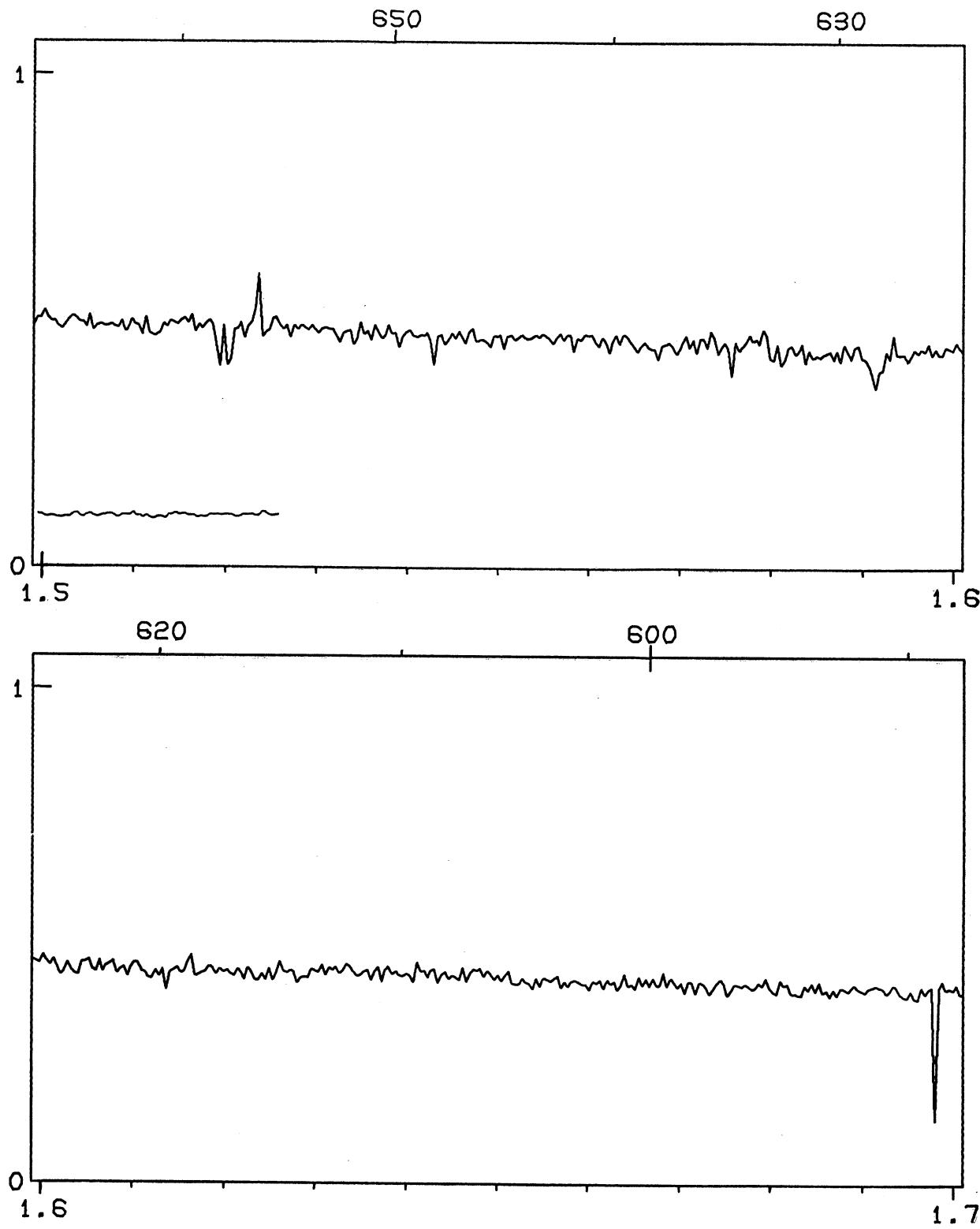


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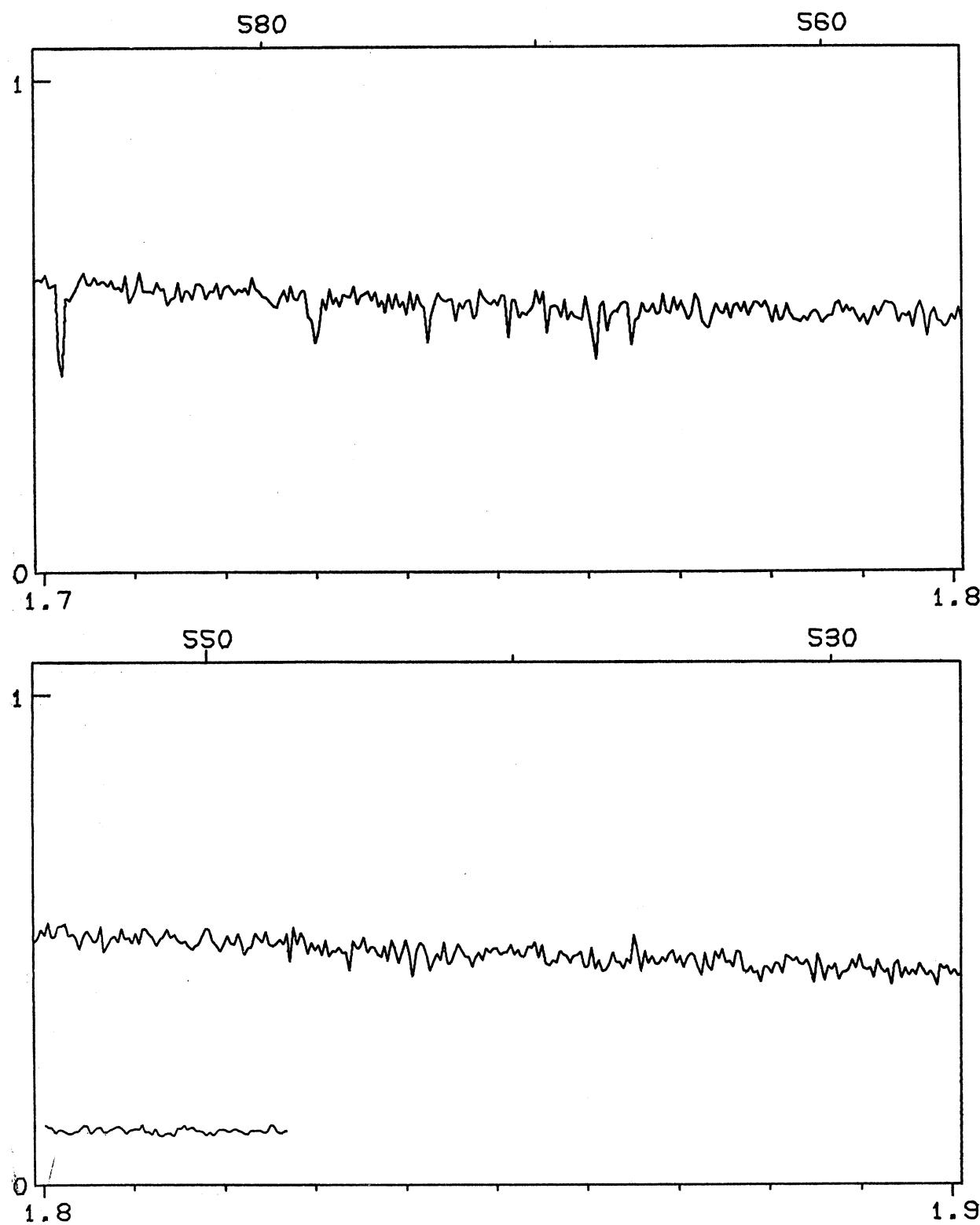


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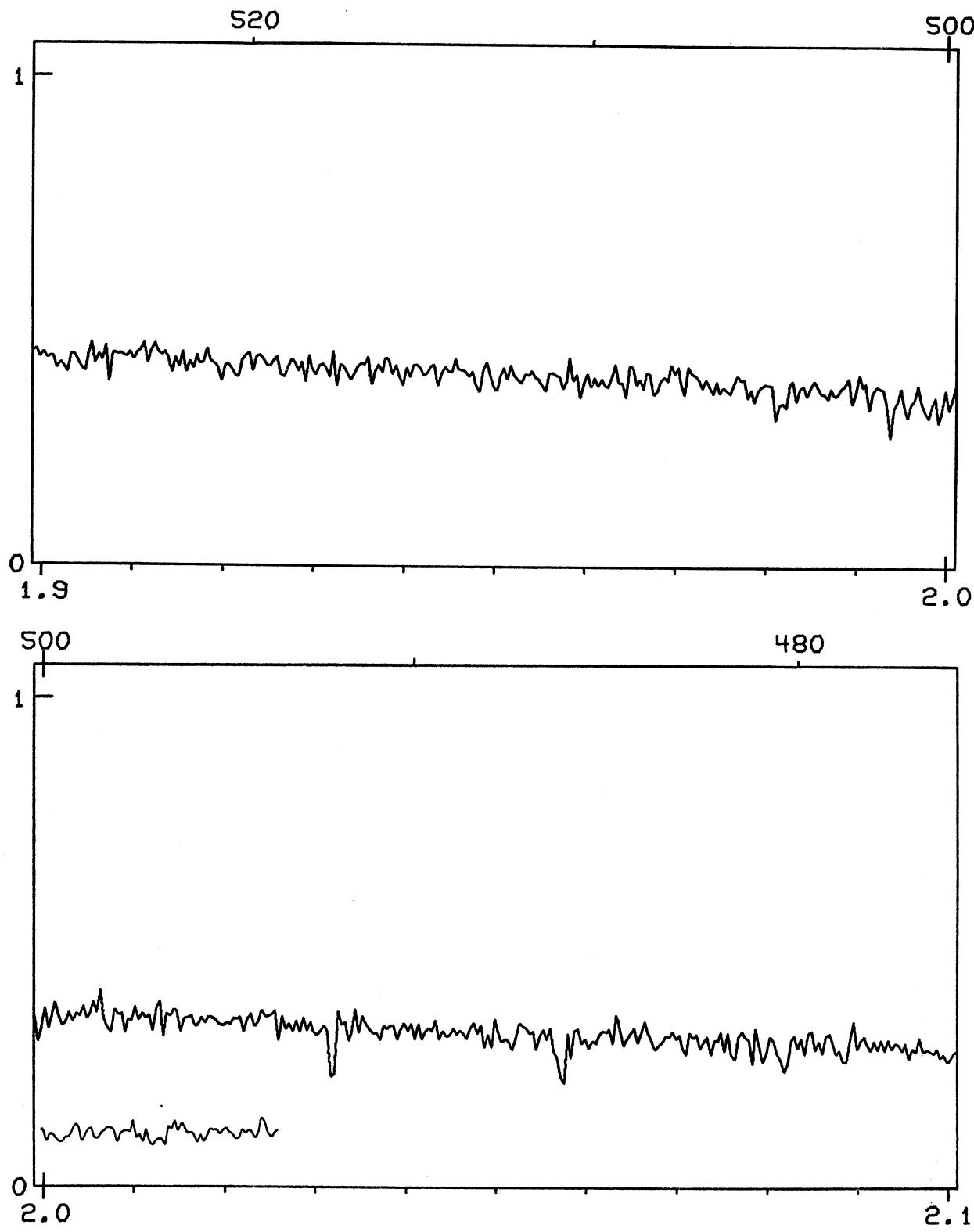
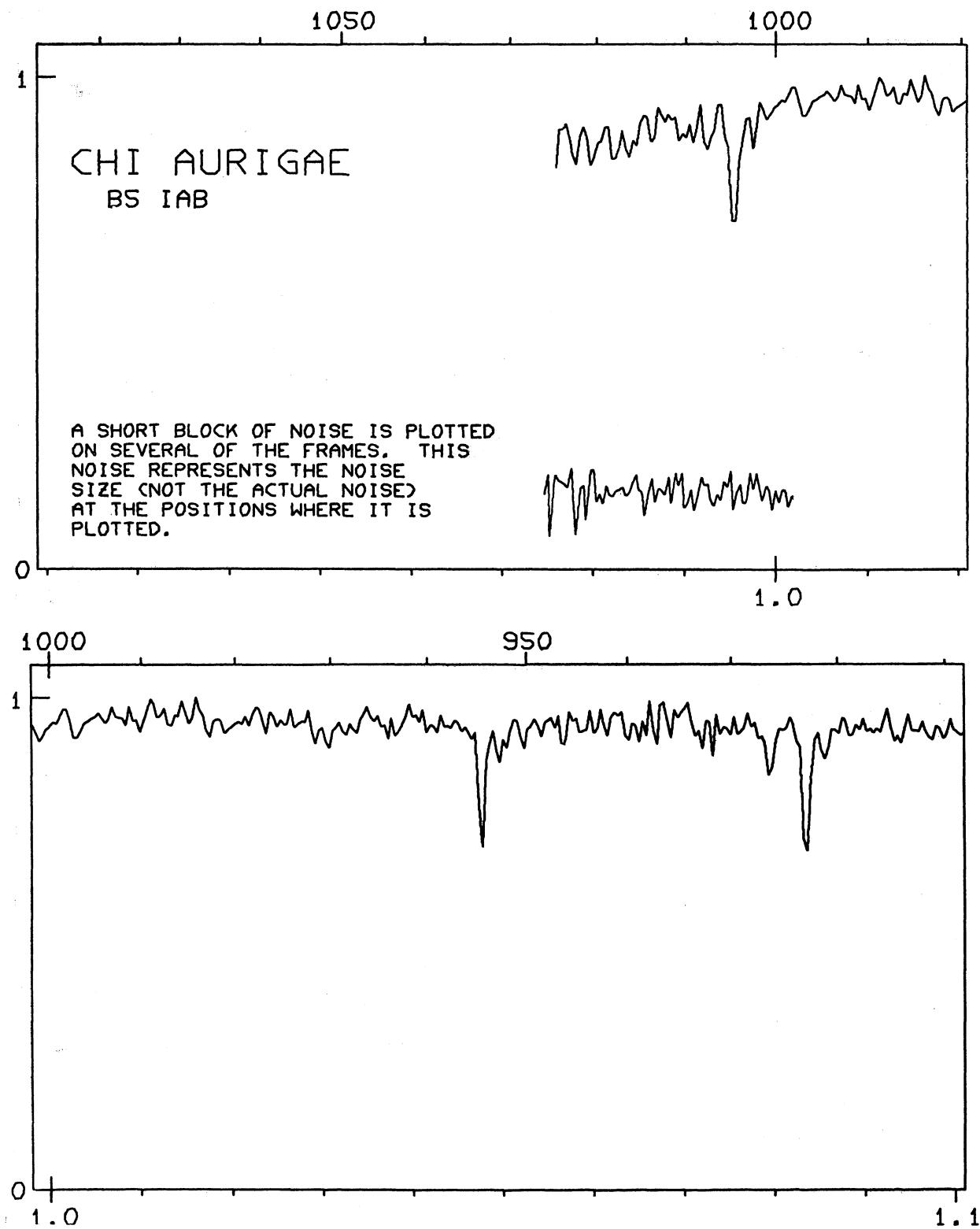
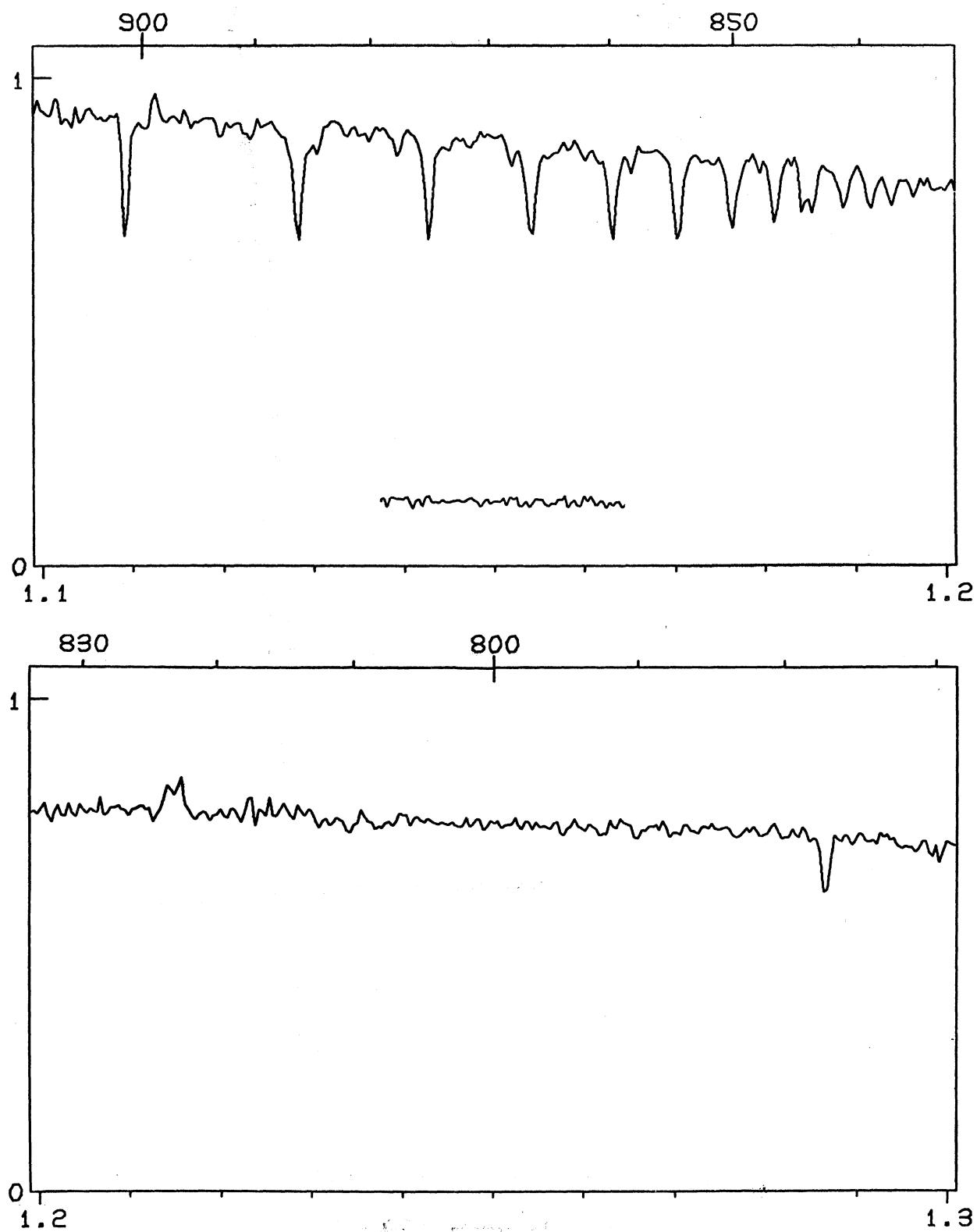


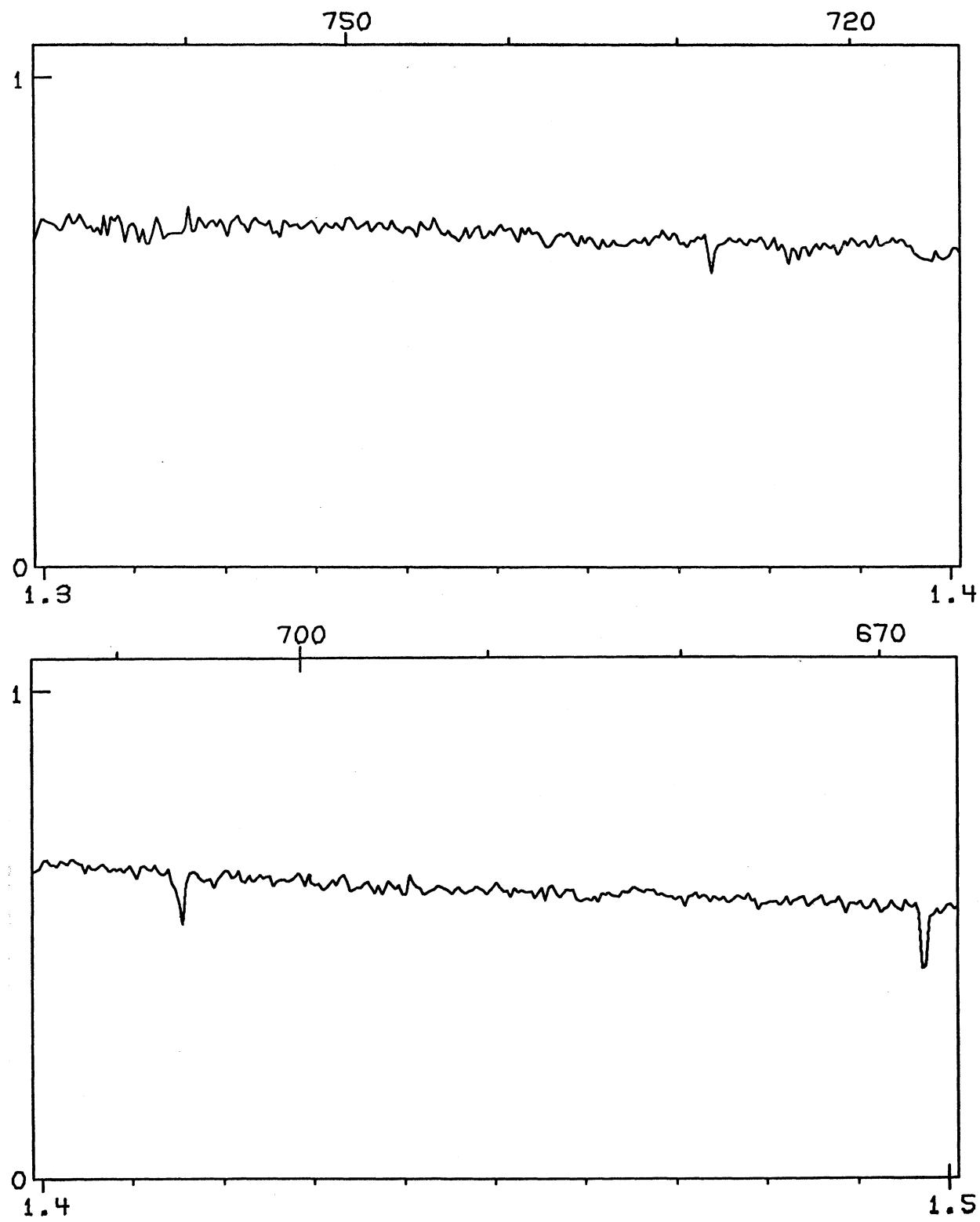
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FIG. 8. The spectrum of χ Aur.

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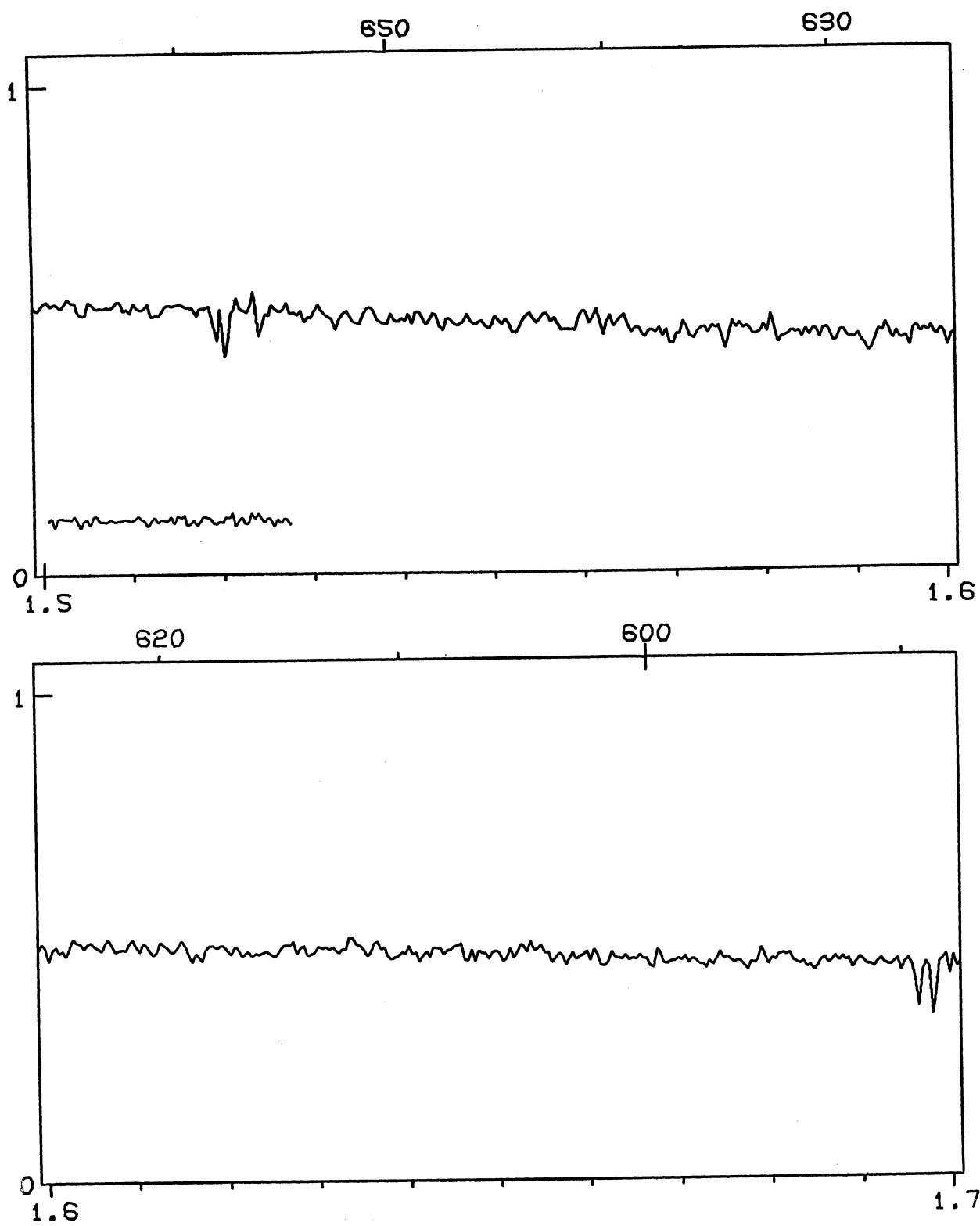
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FIG. 8. The spectrum of χ Aur.

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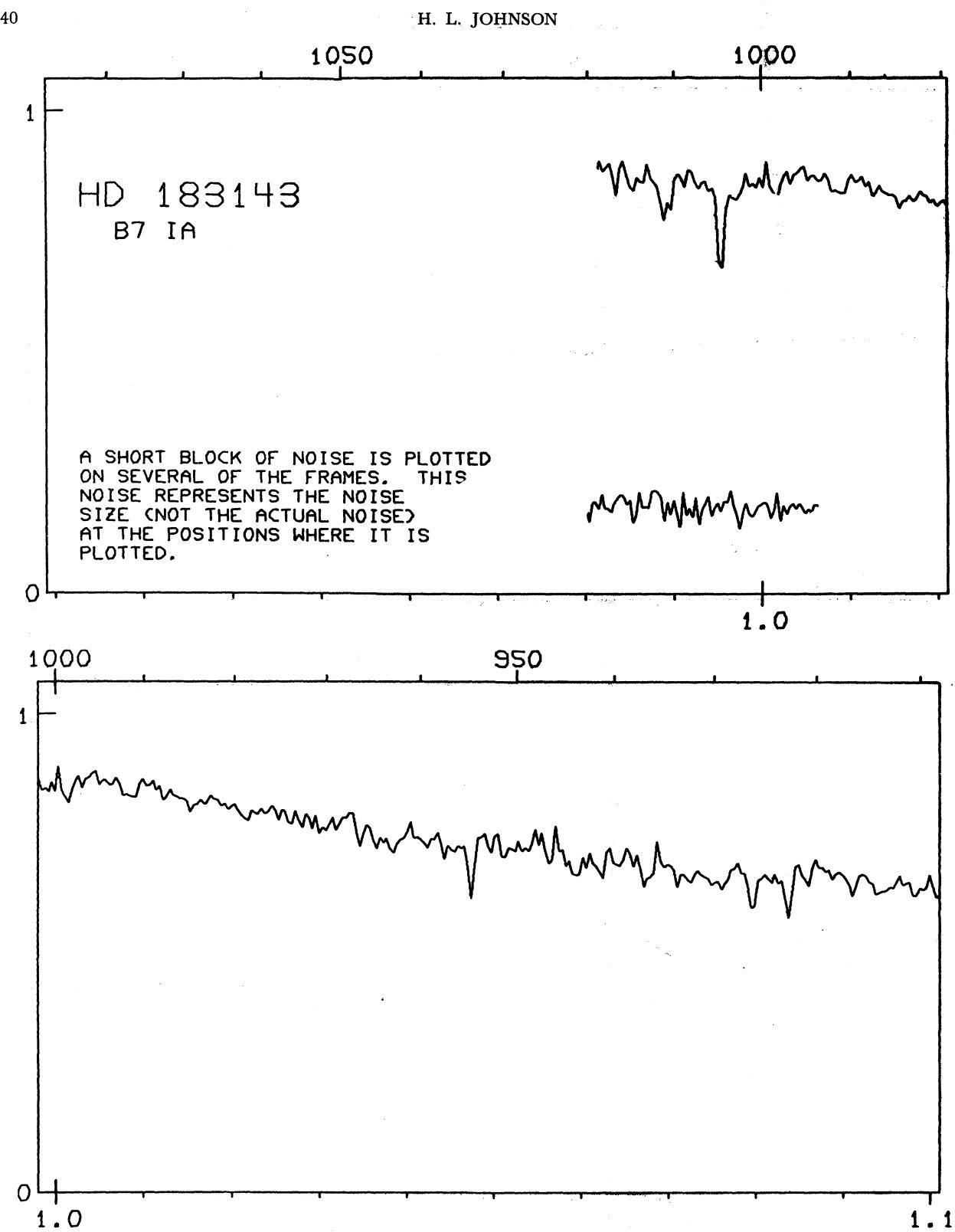


FIG. 9. The spectrum of HD 183143.

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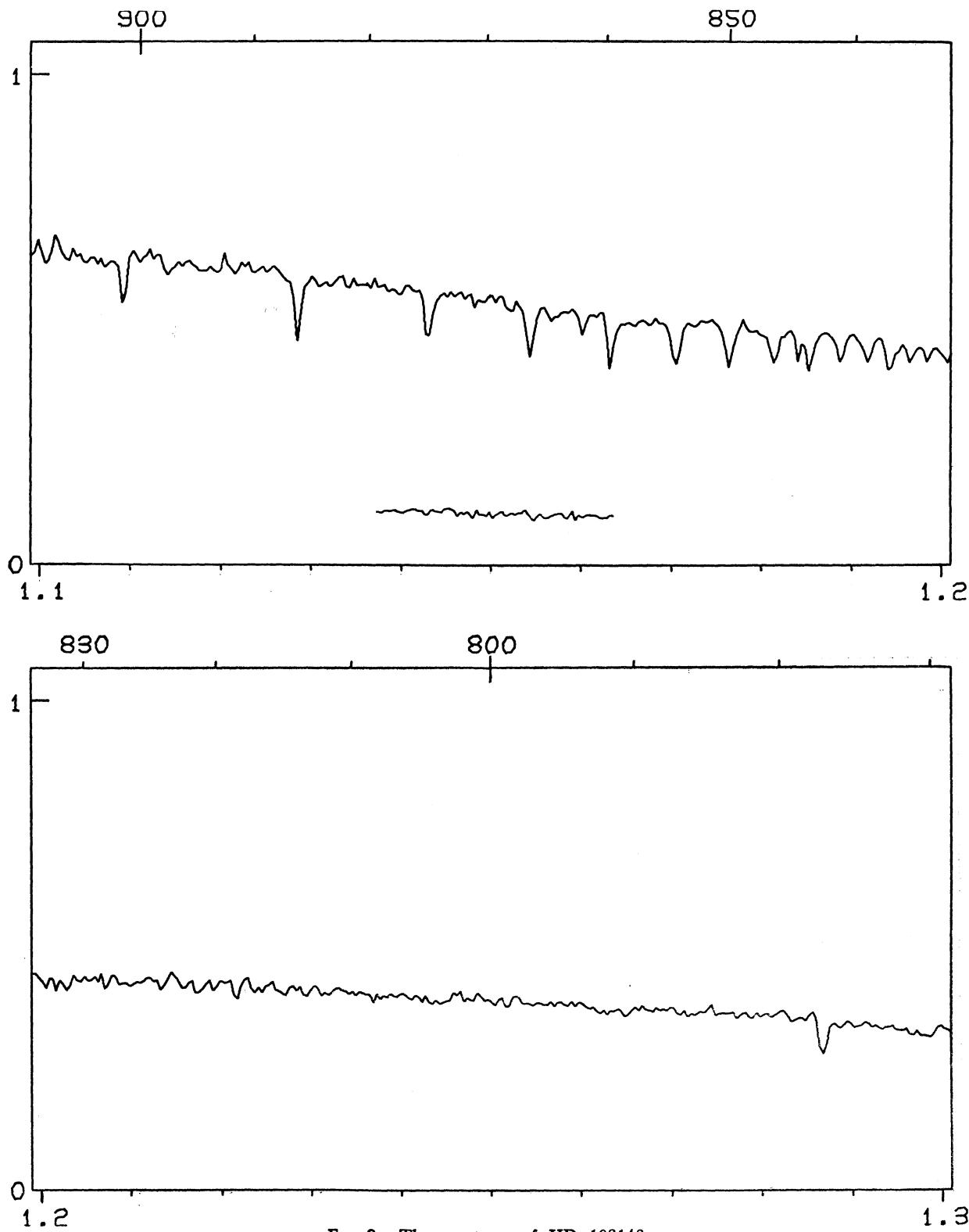


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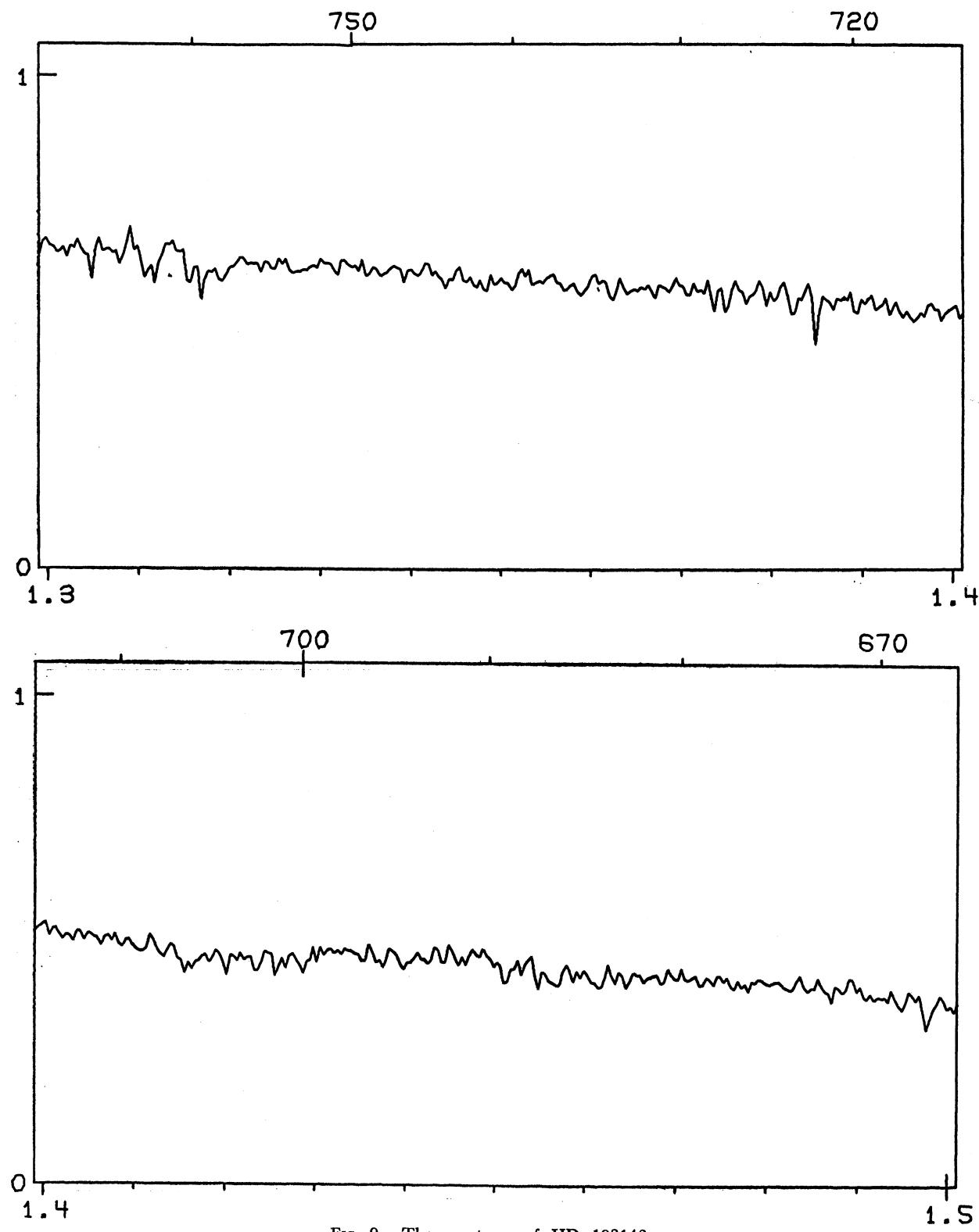


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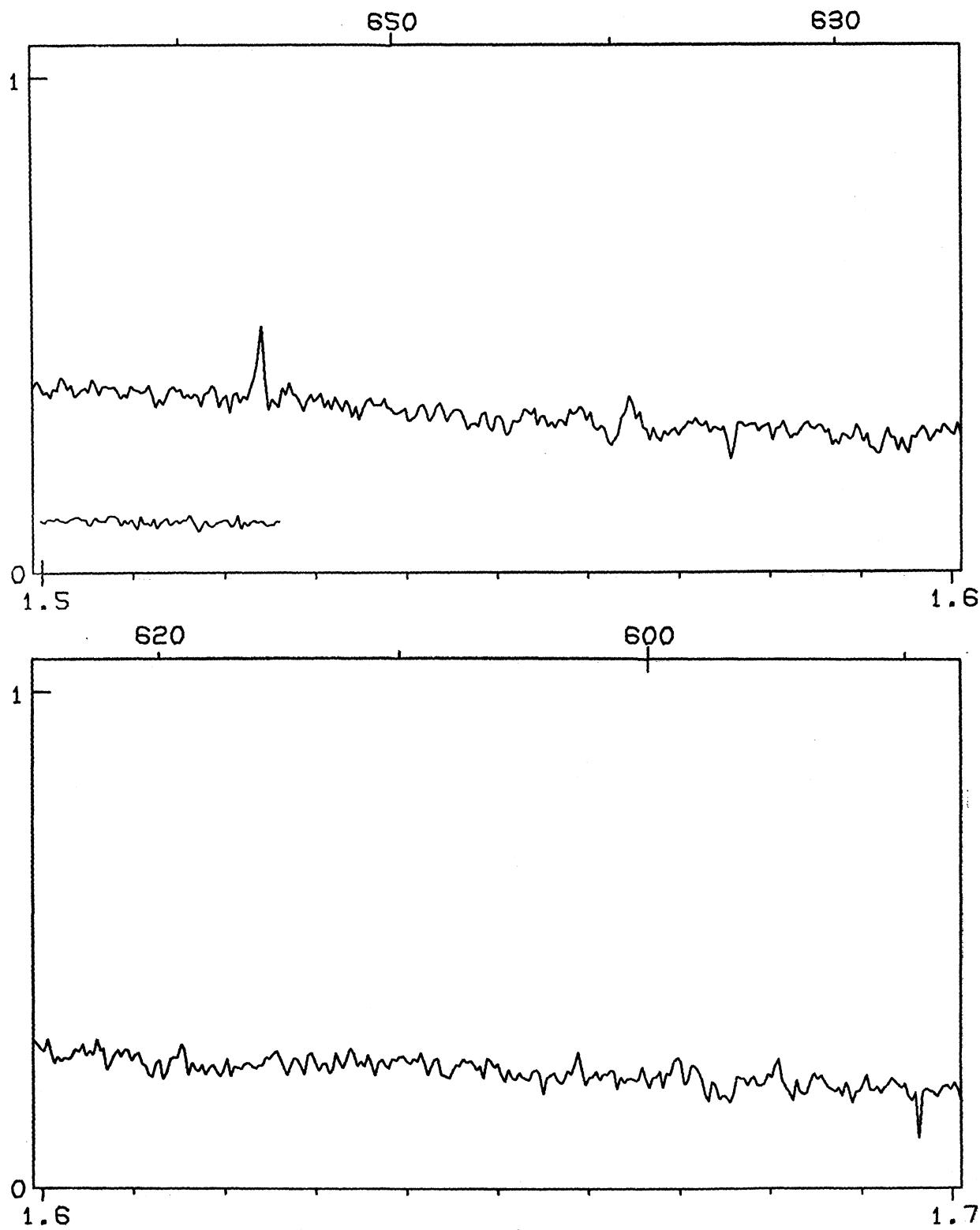
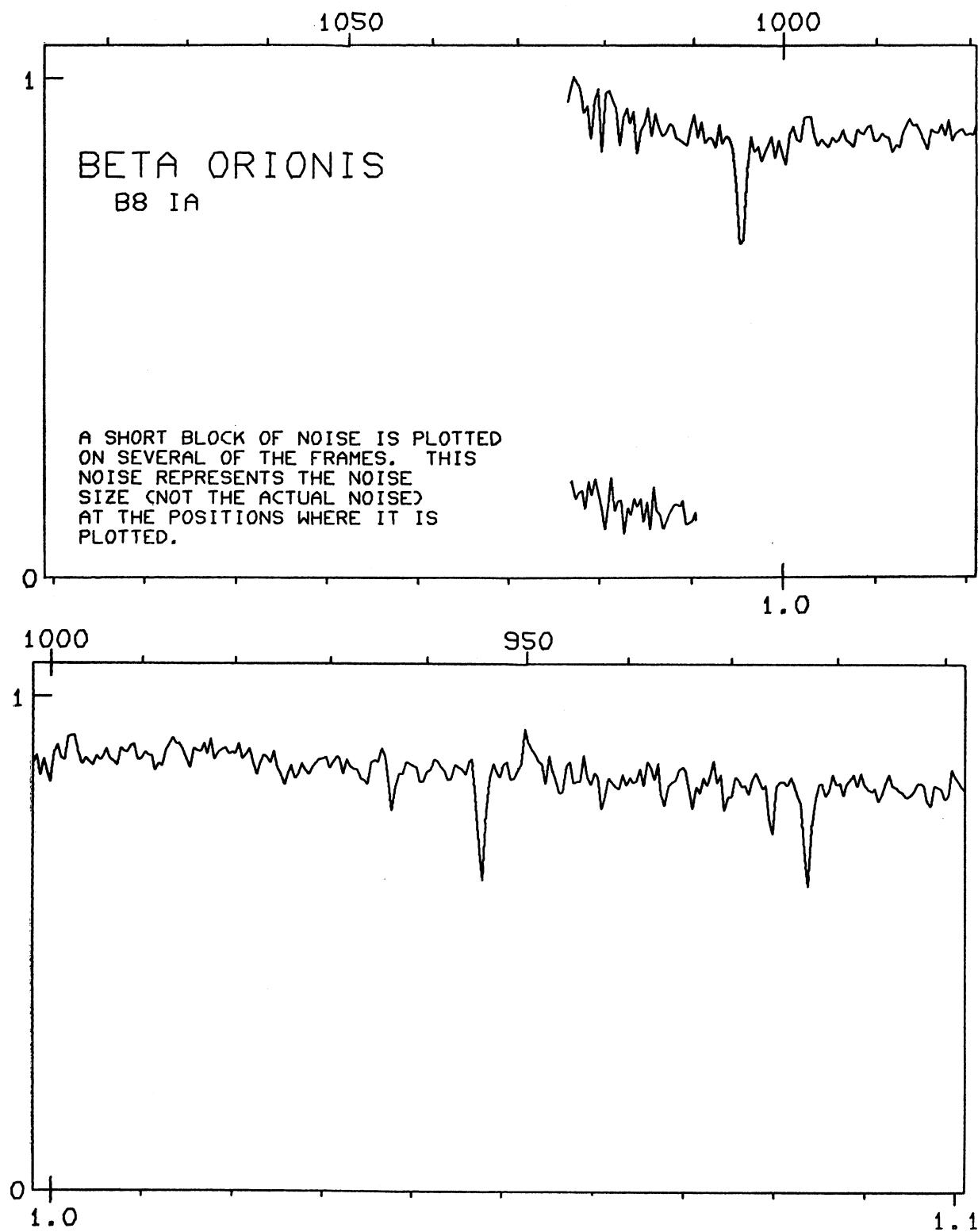
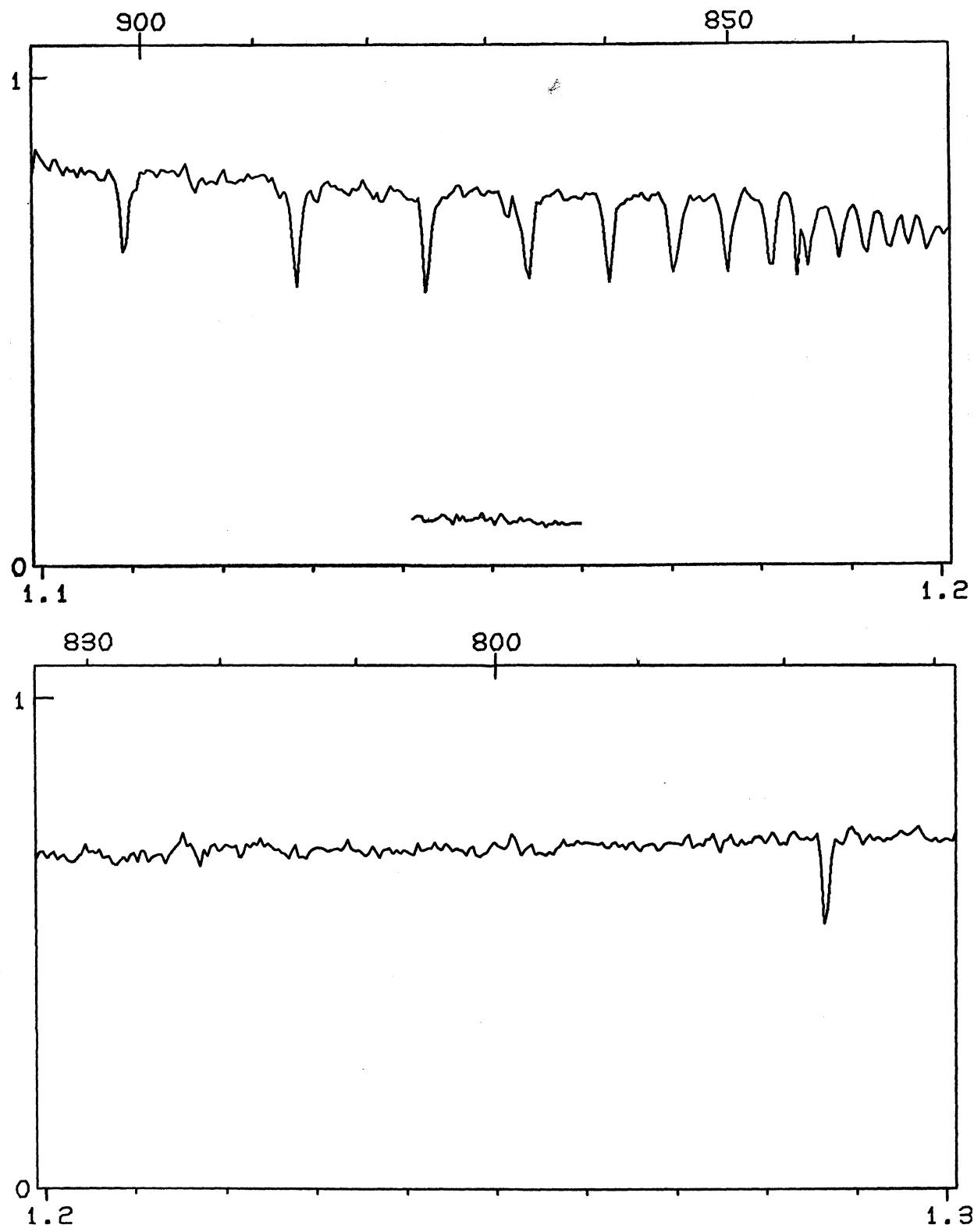


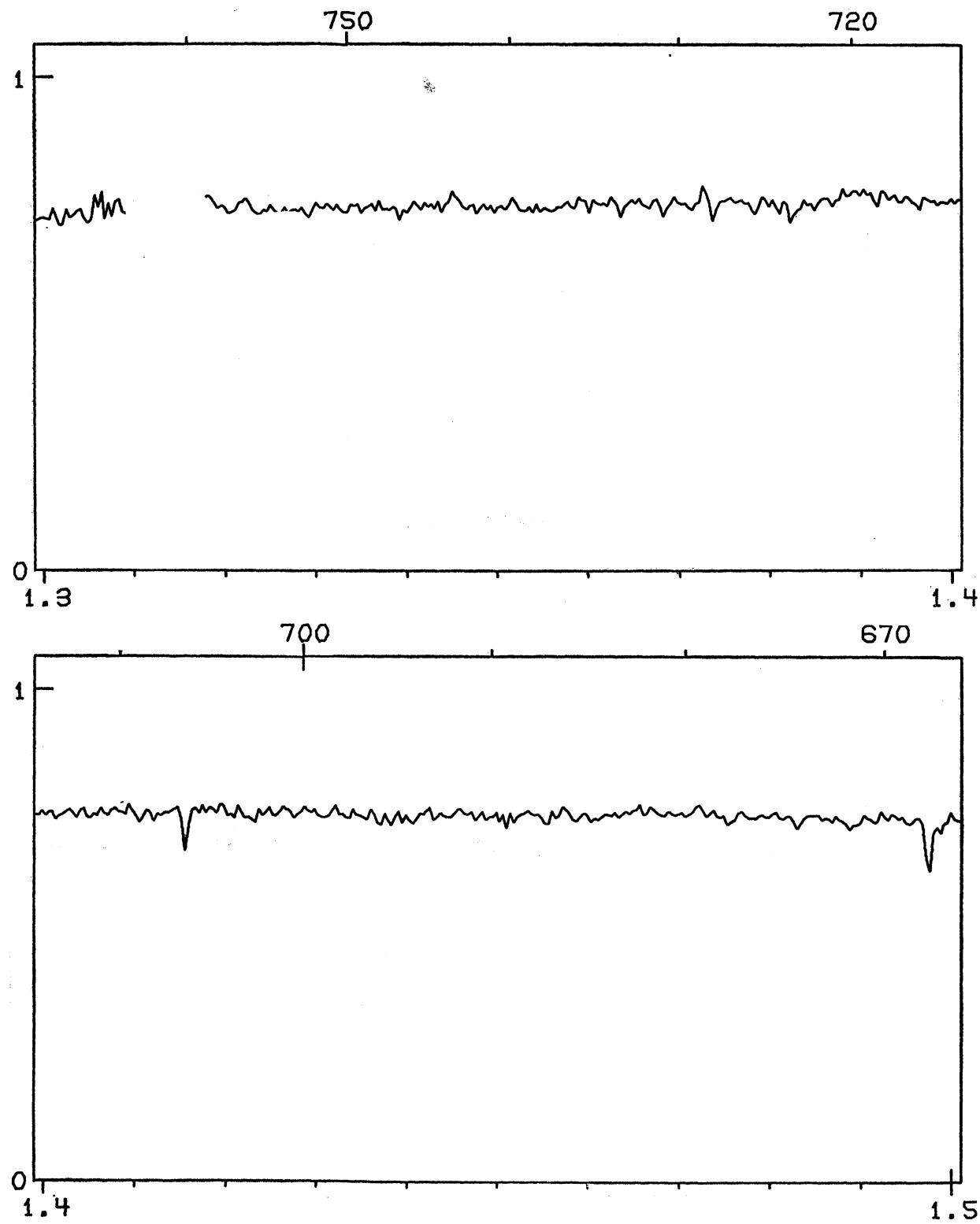
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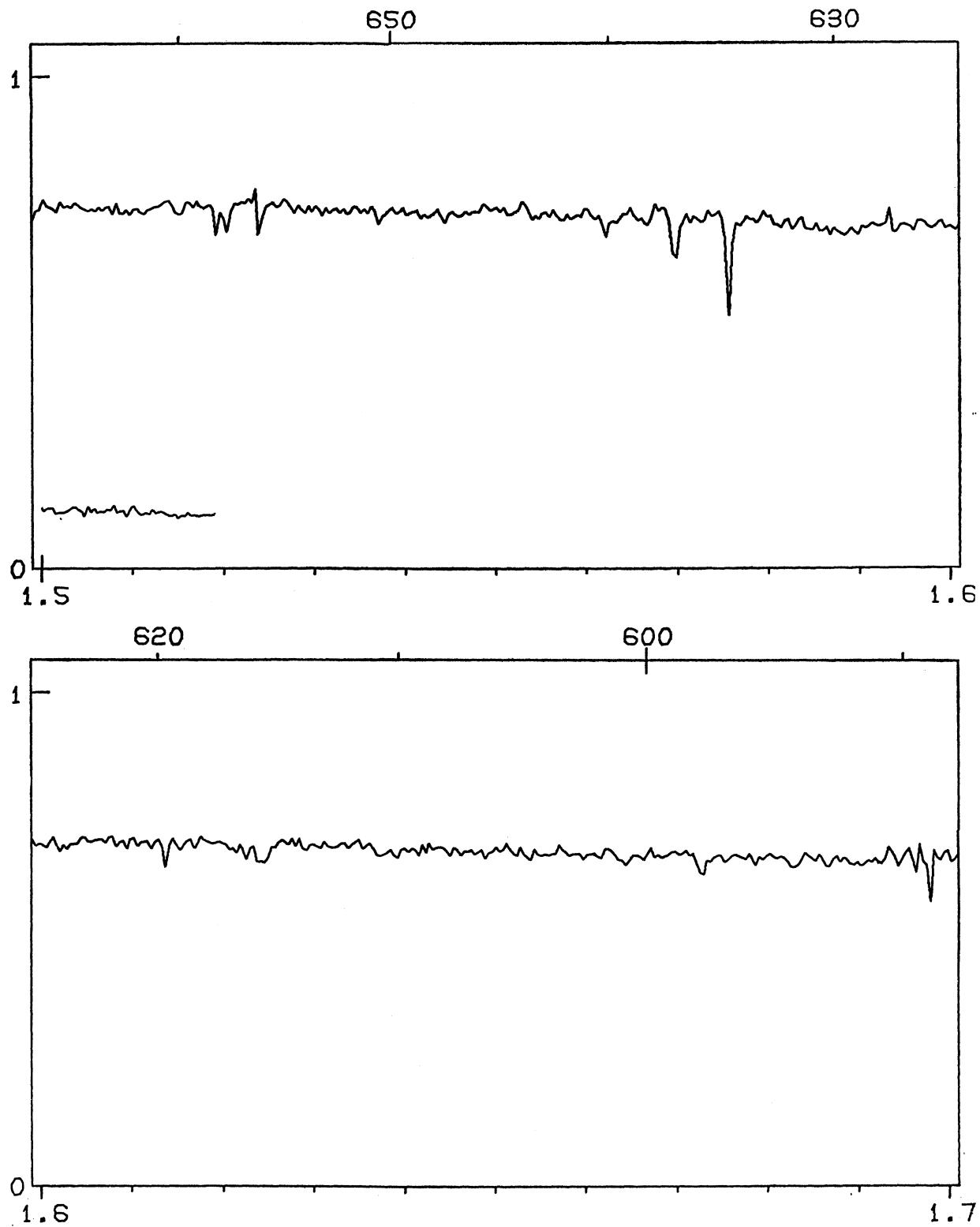
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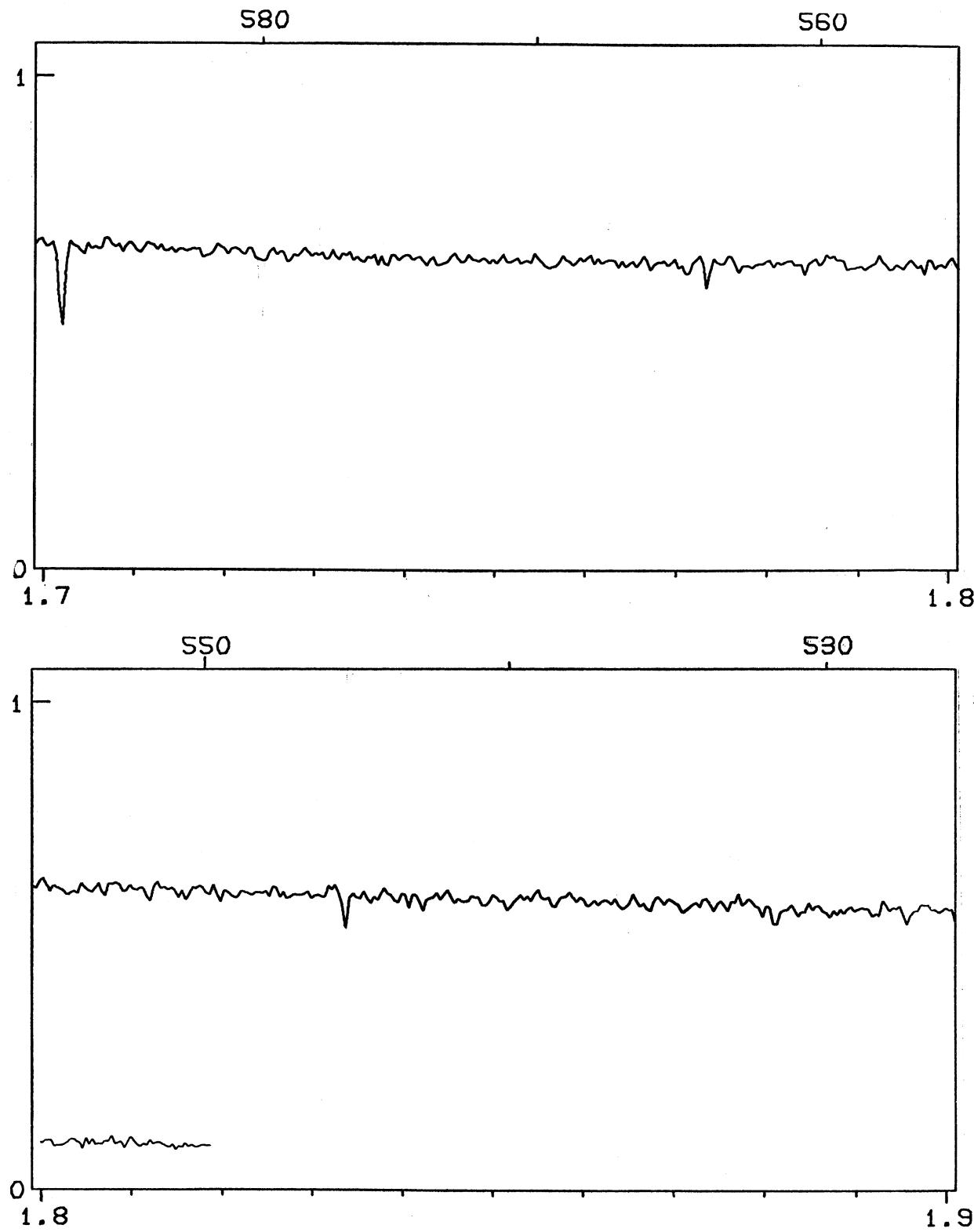
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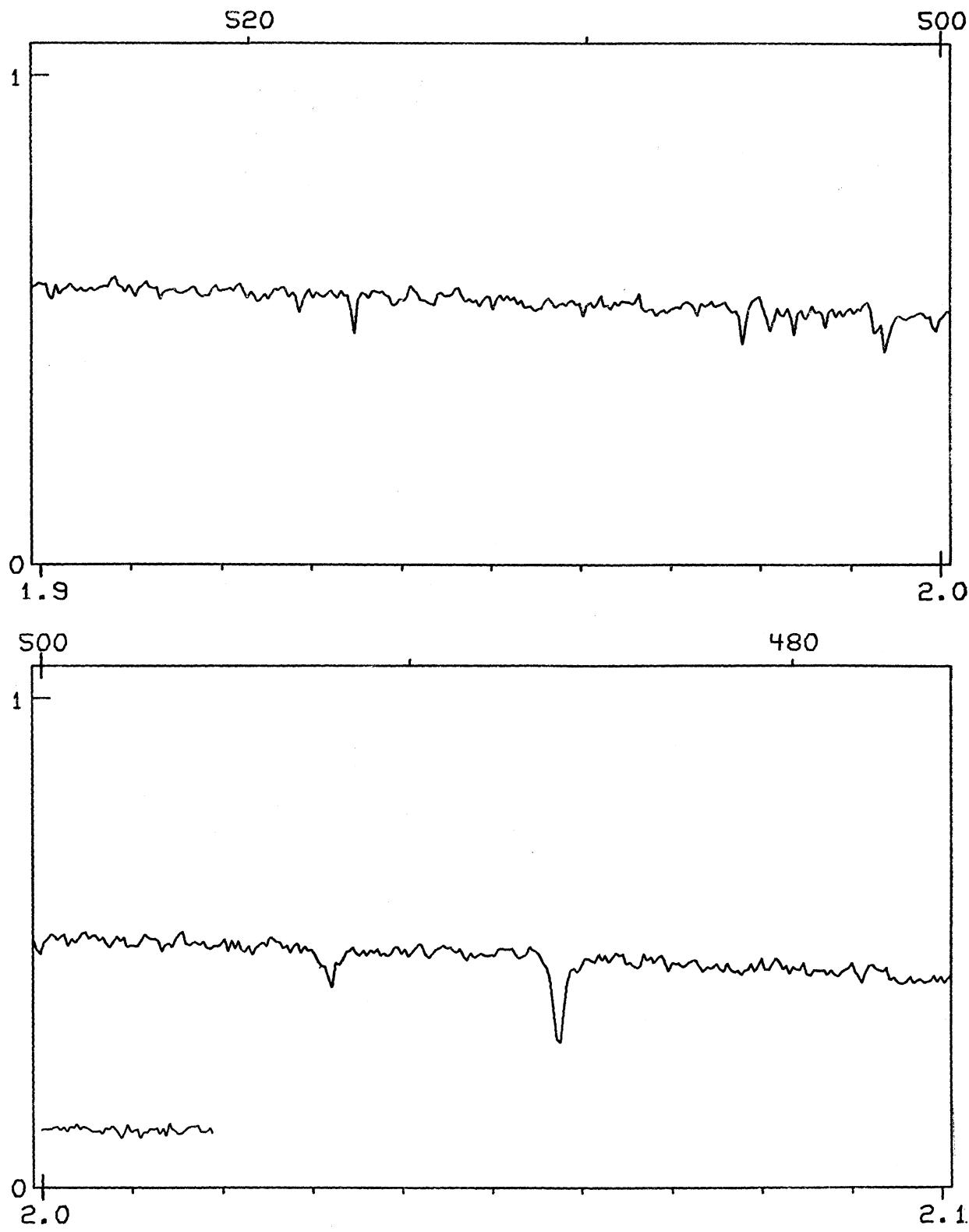
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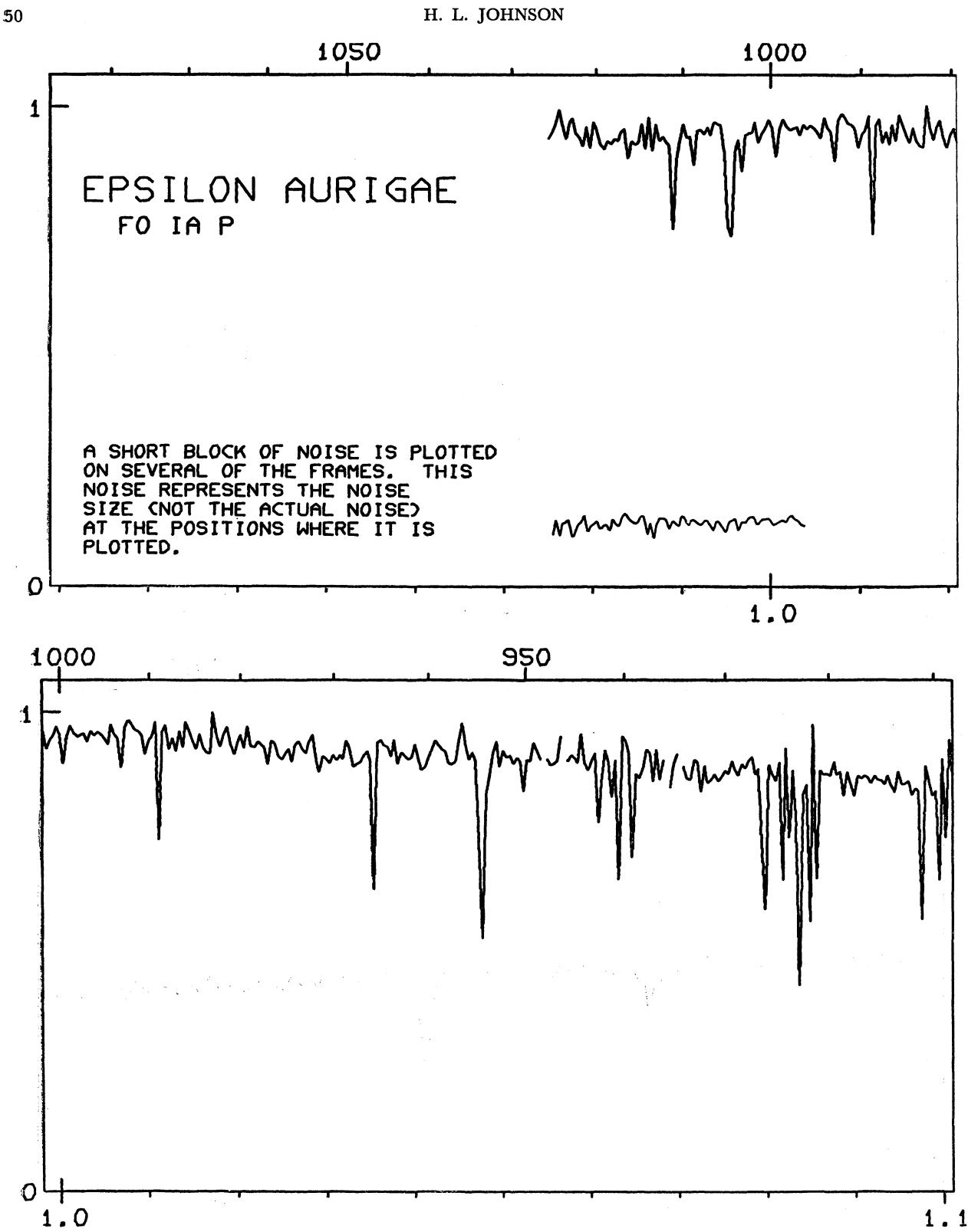
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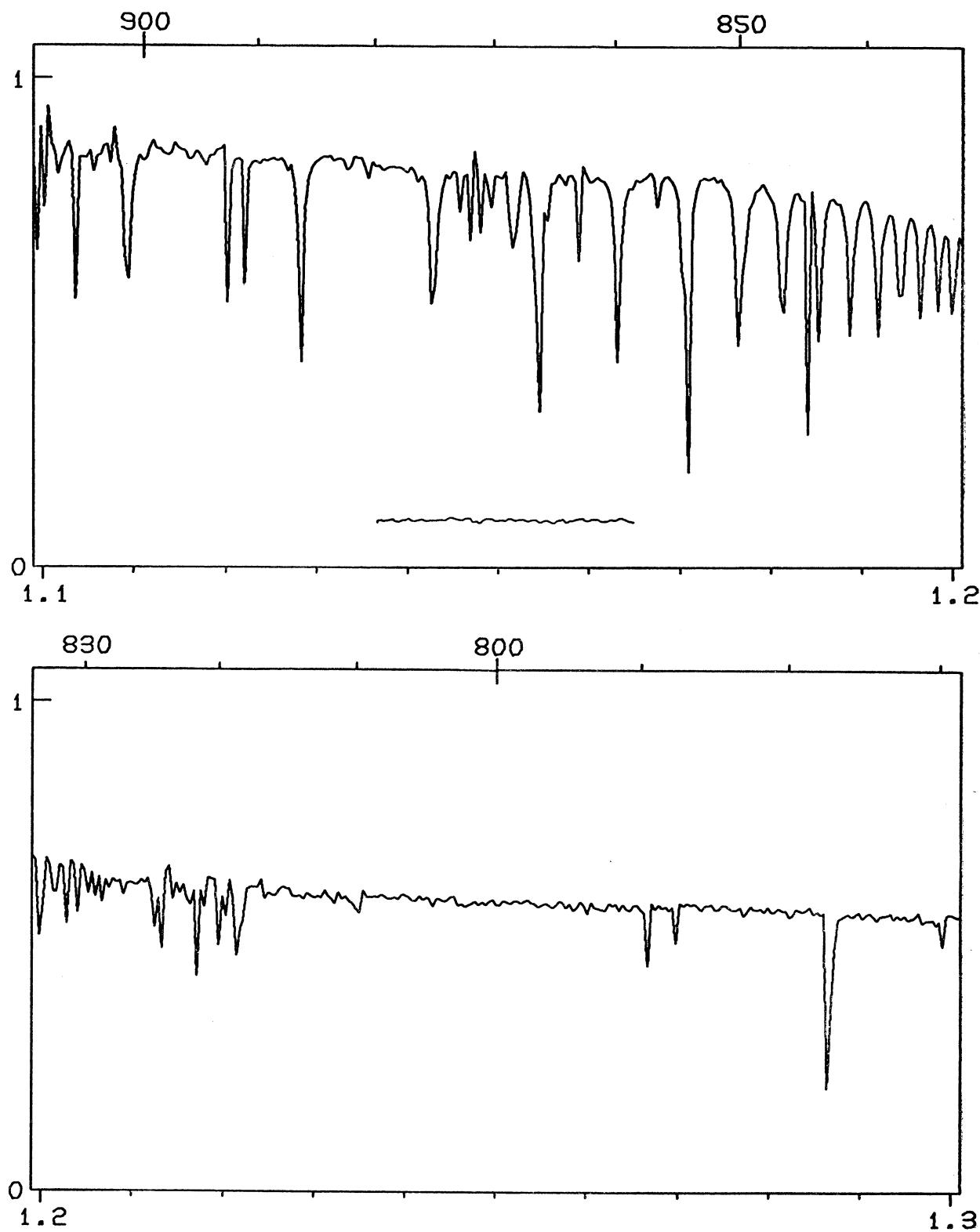
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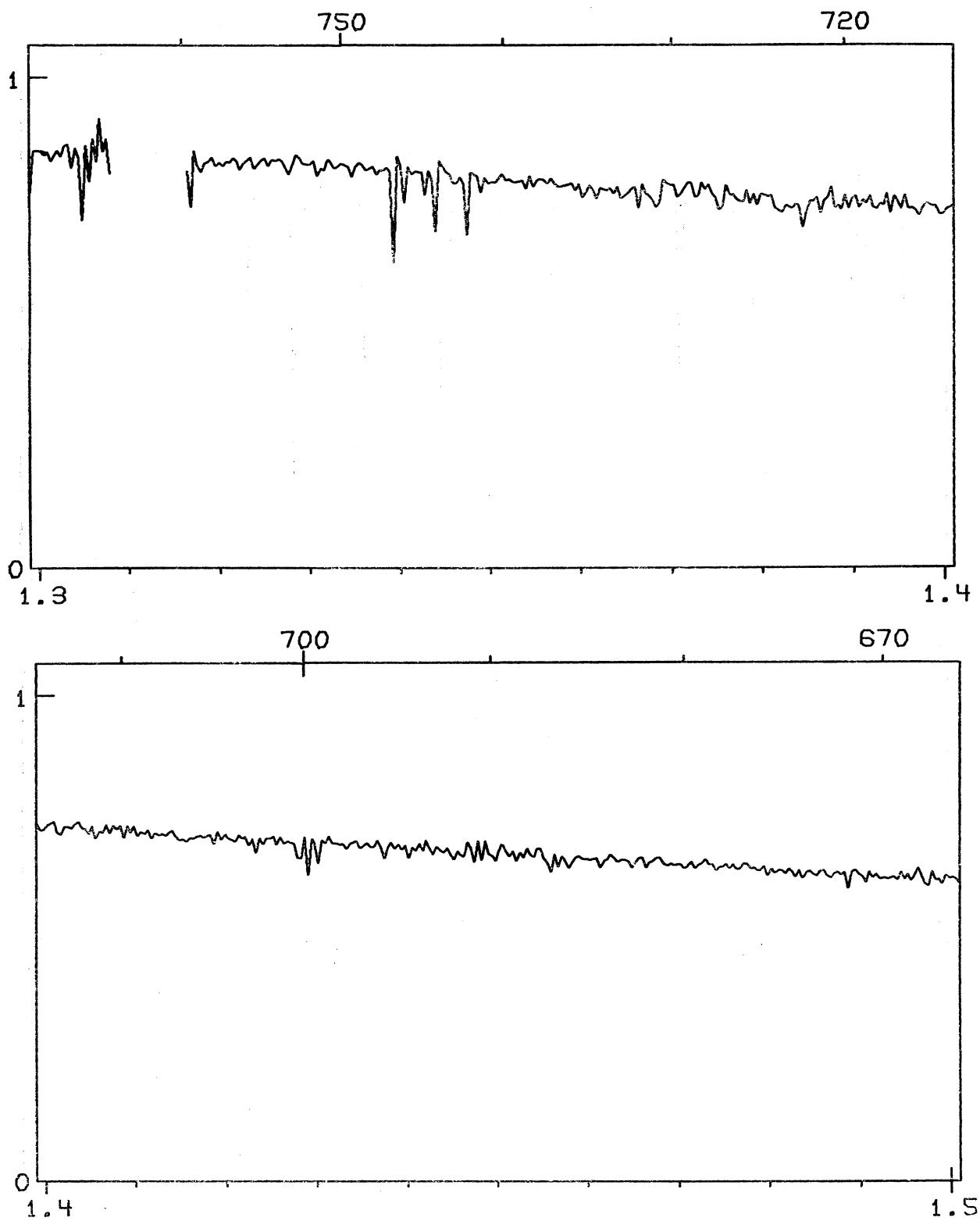
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FIG. 11. The spectrum of ϵ Aur.

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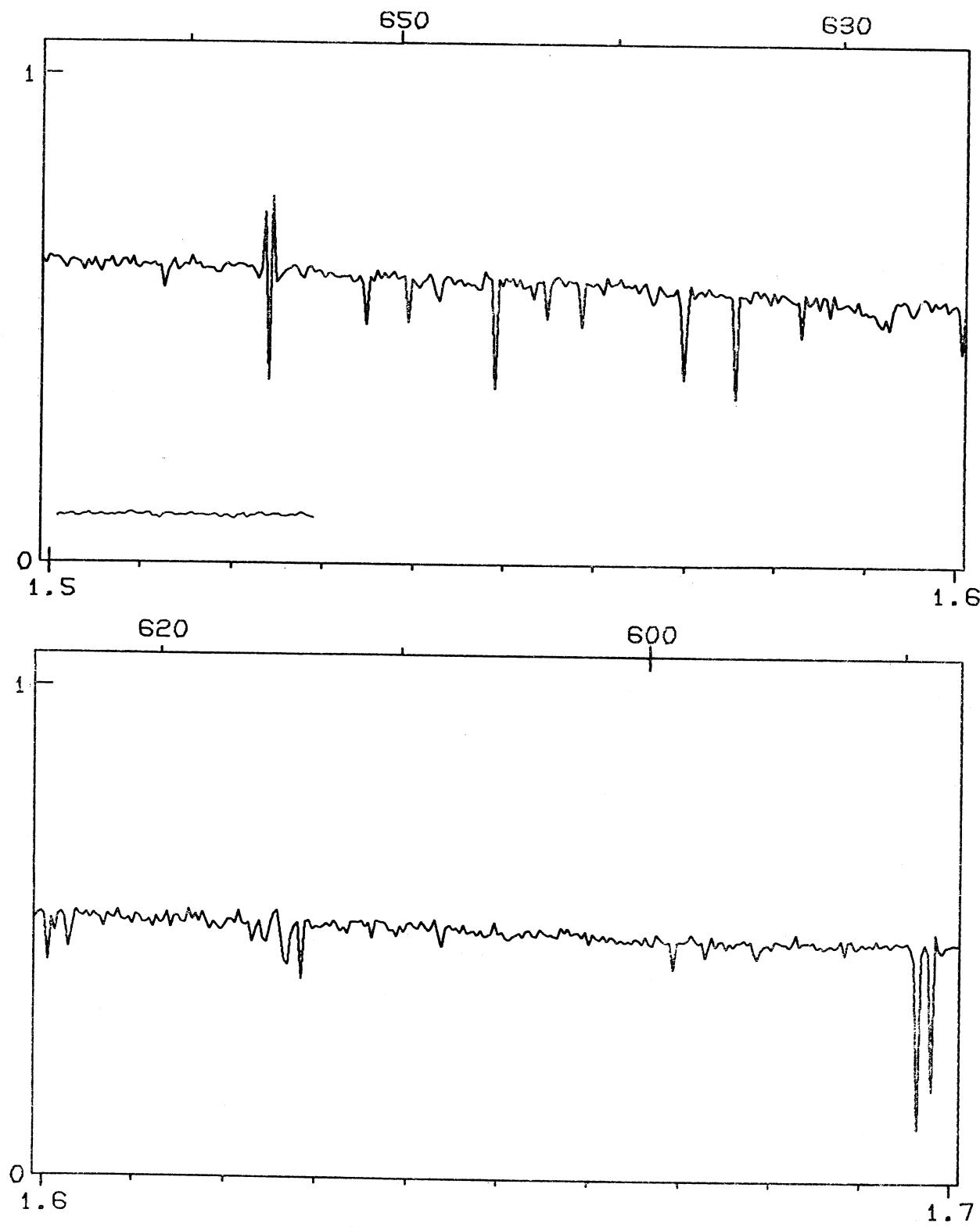
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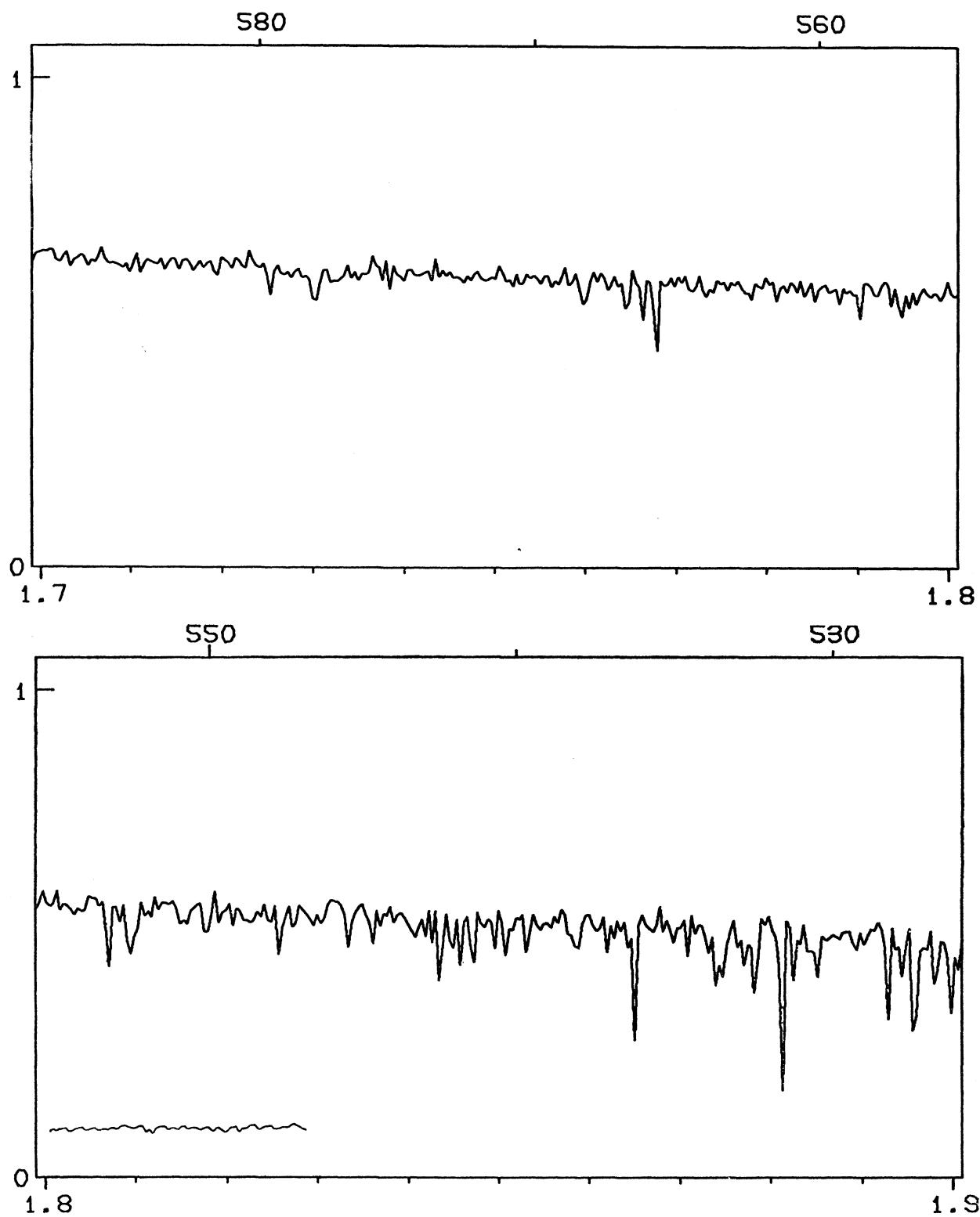
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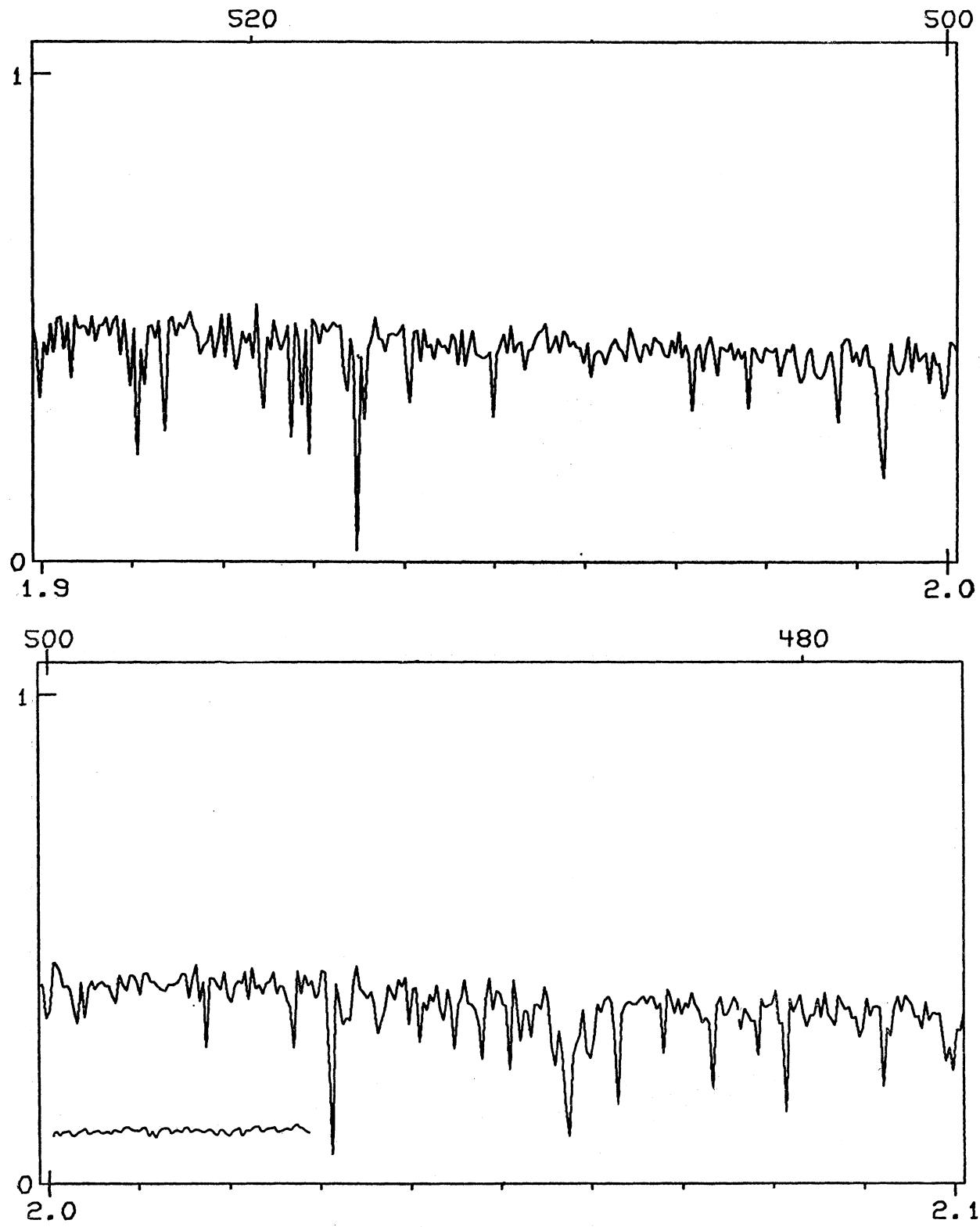
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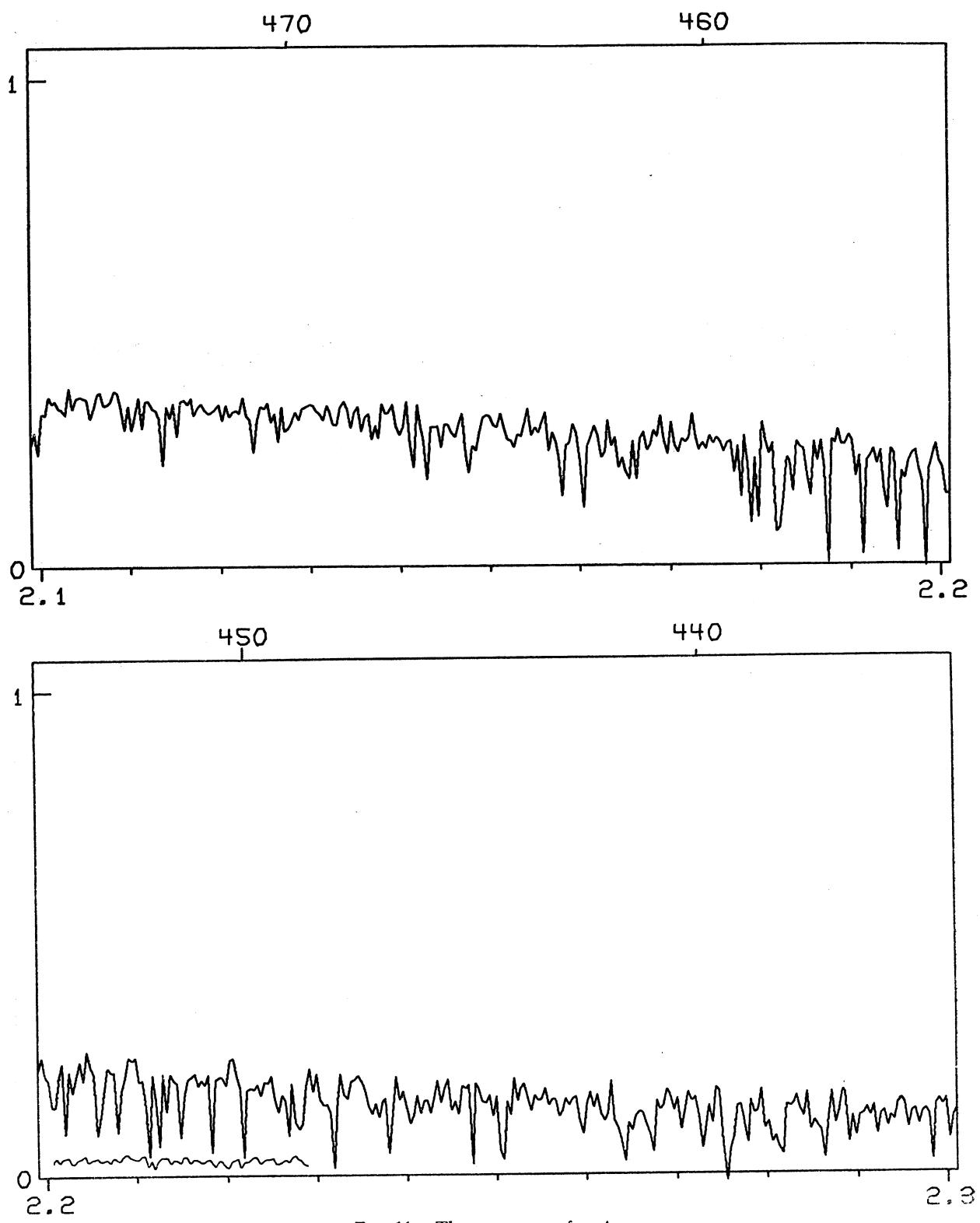
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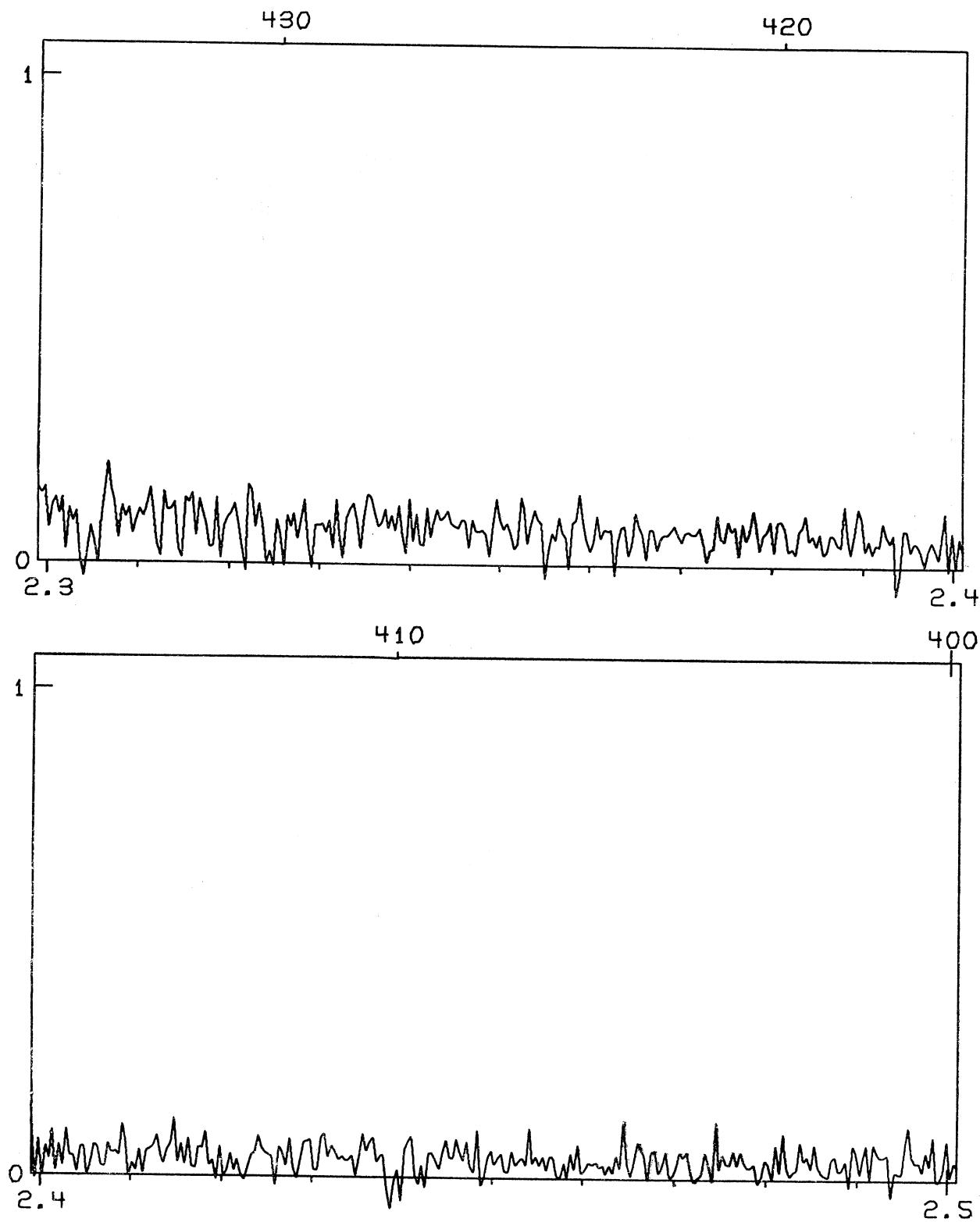
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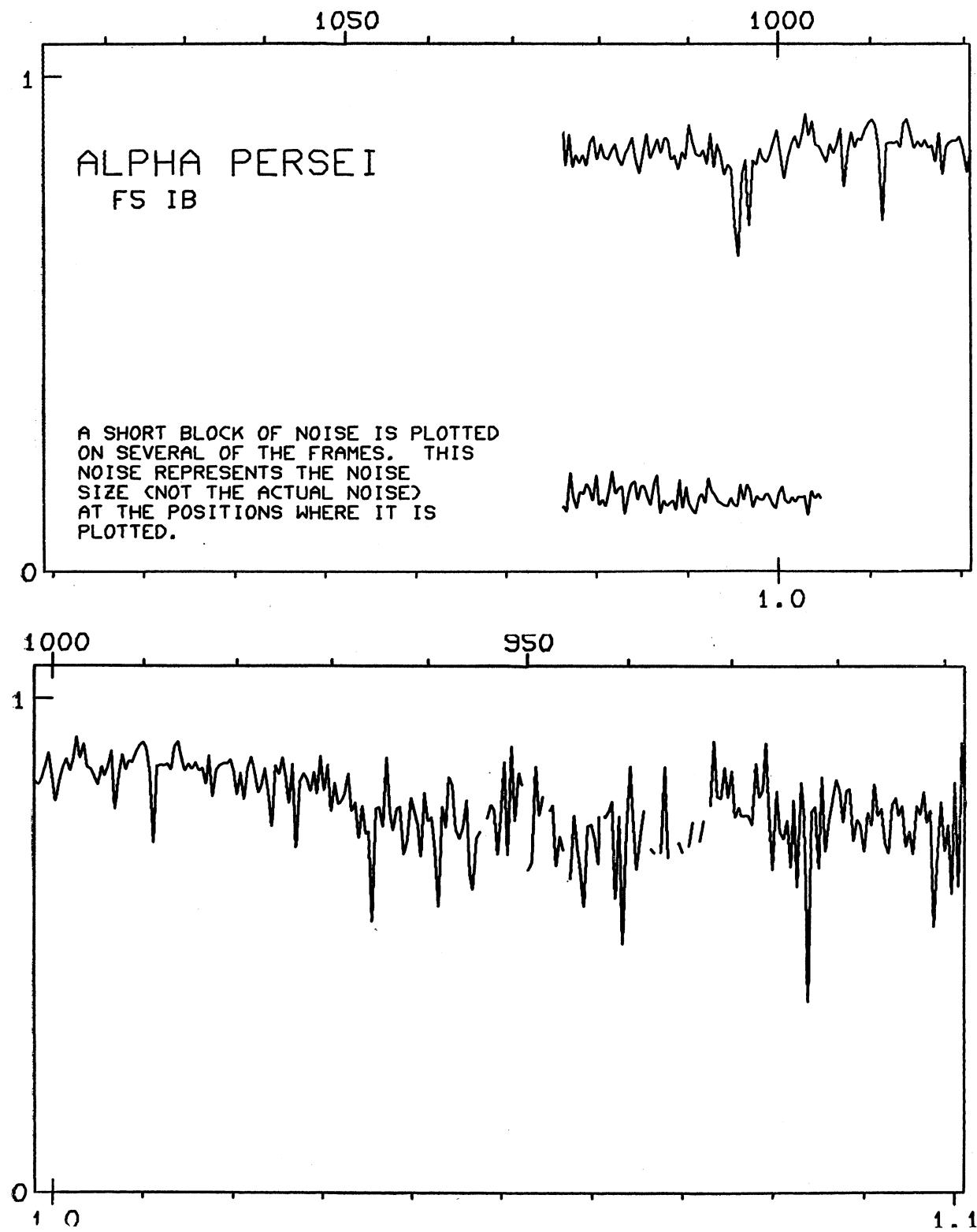
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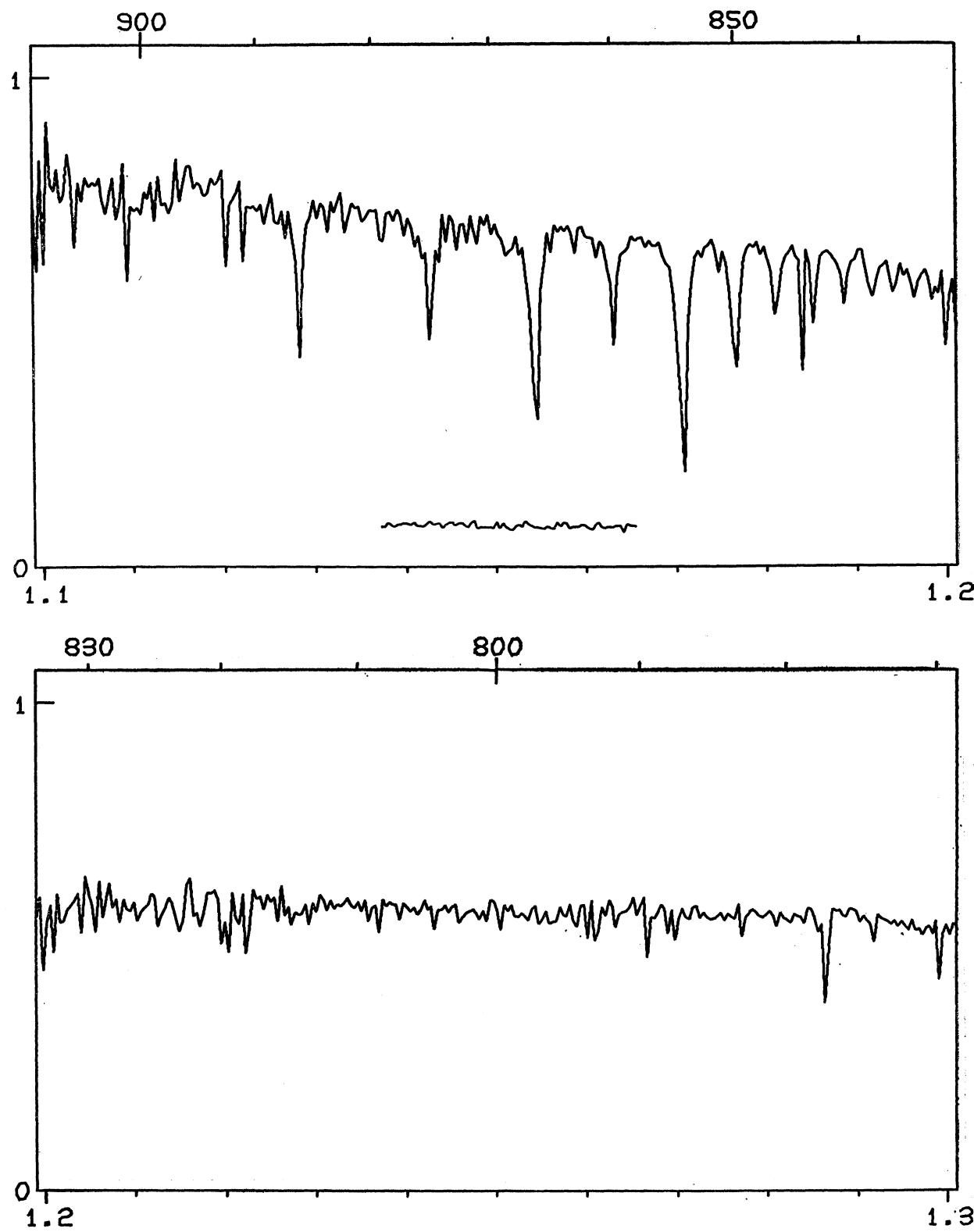
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FIG. 12. The spectrum of α Per.

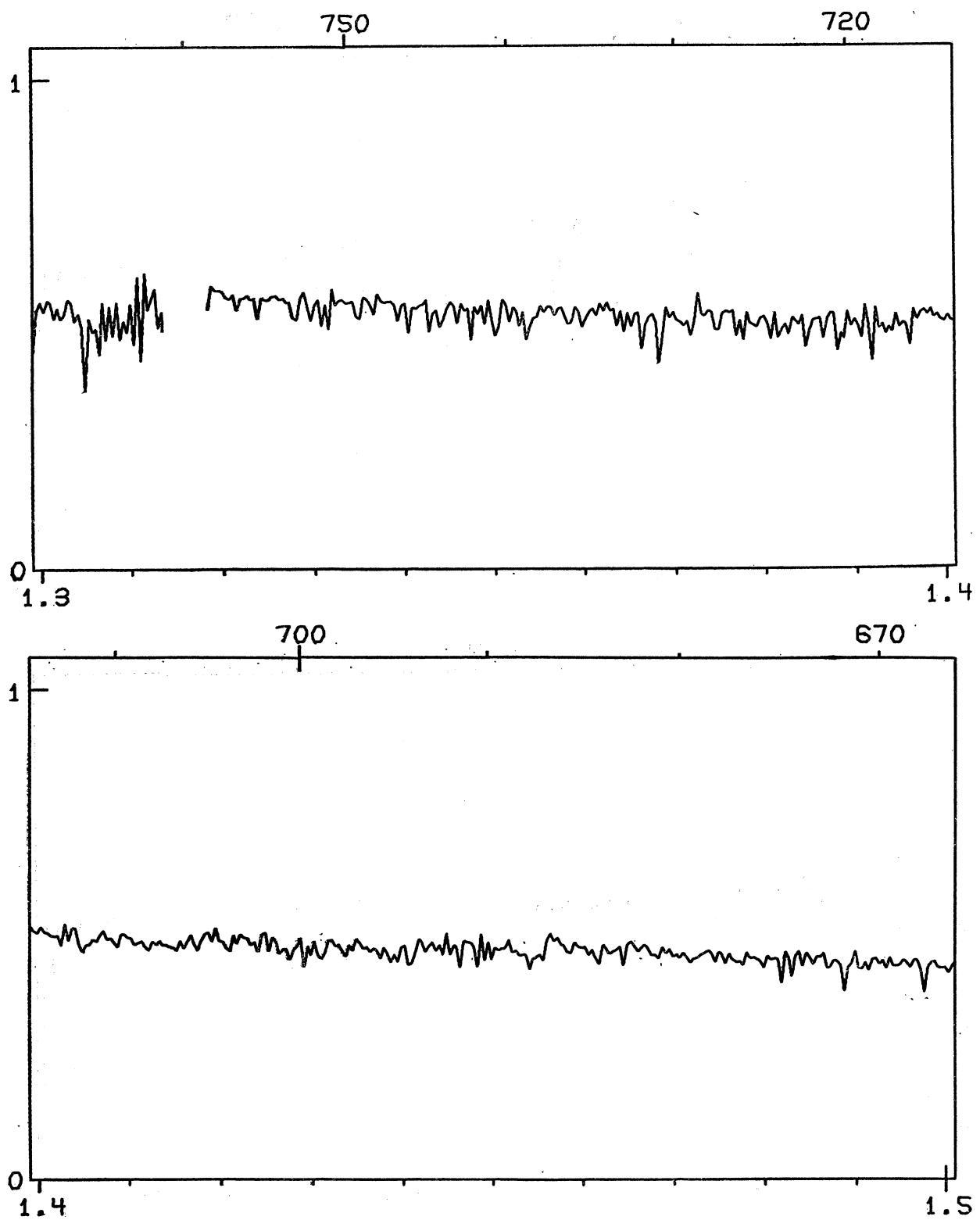
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FIG. 12. The spectrum of α Per.

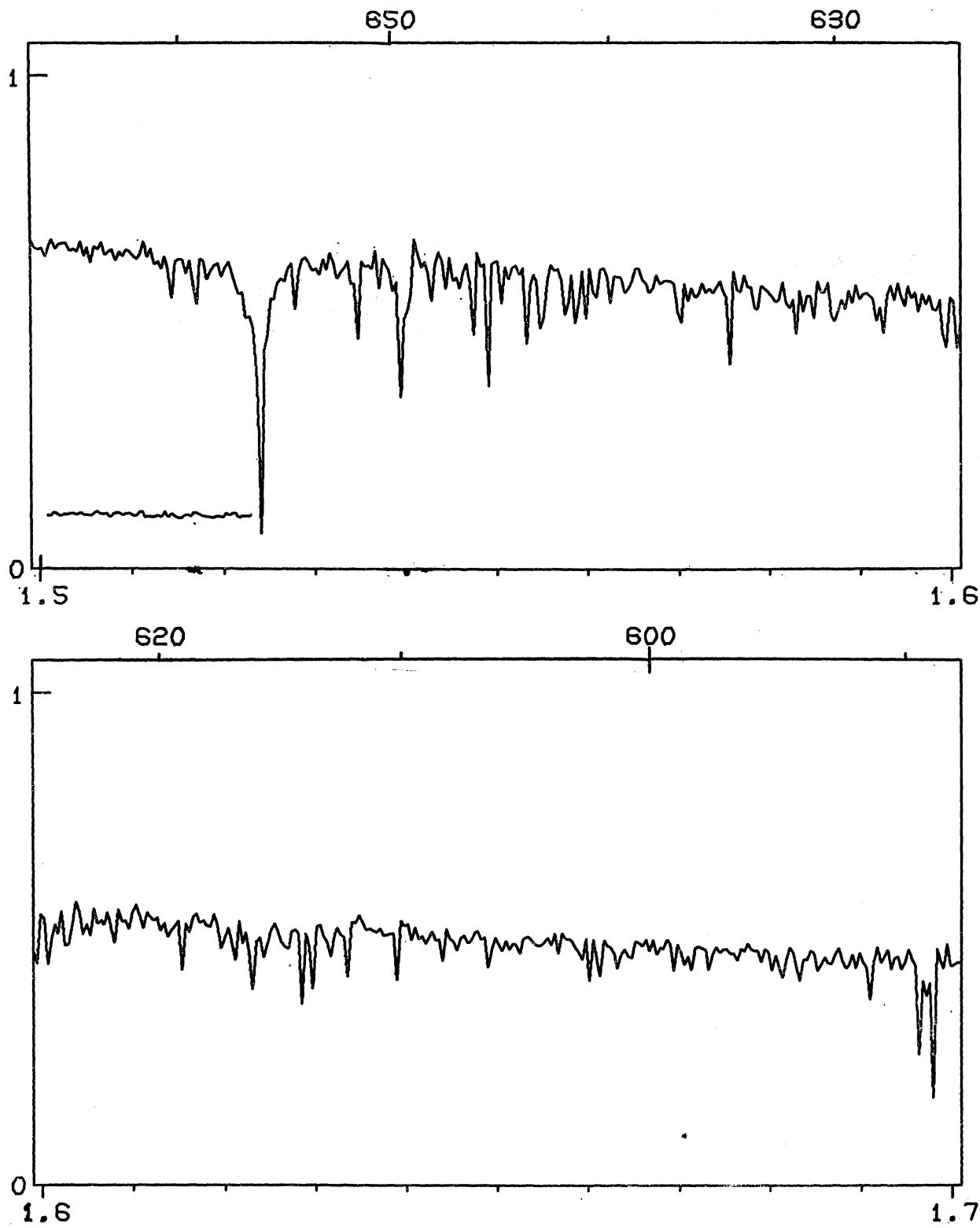
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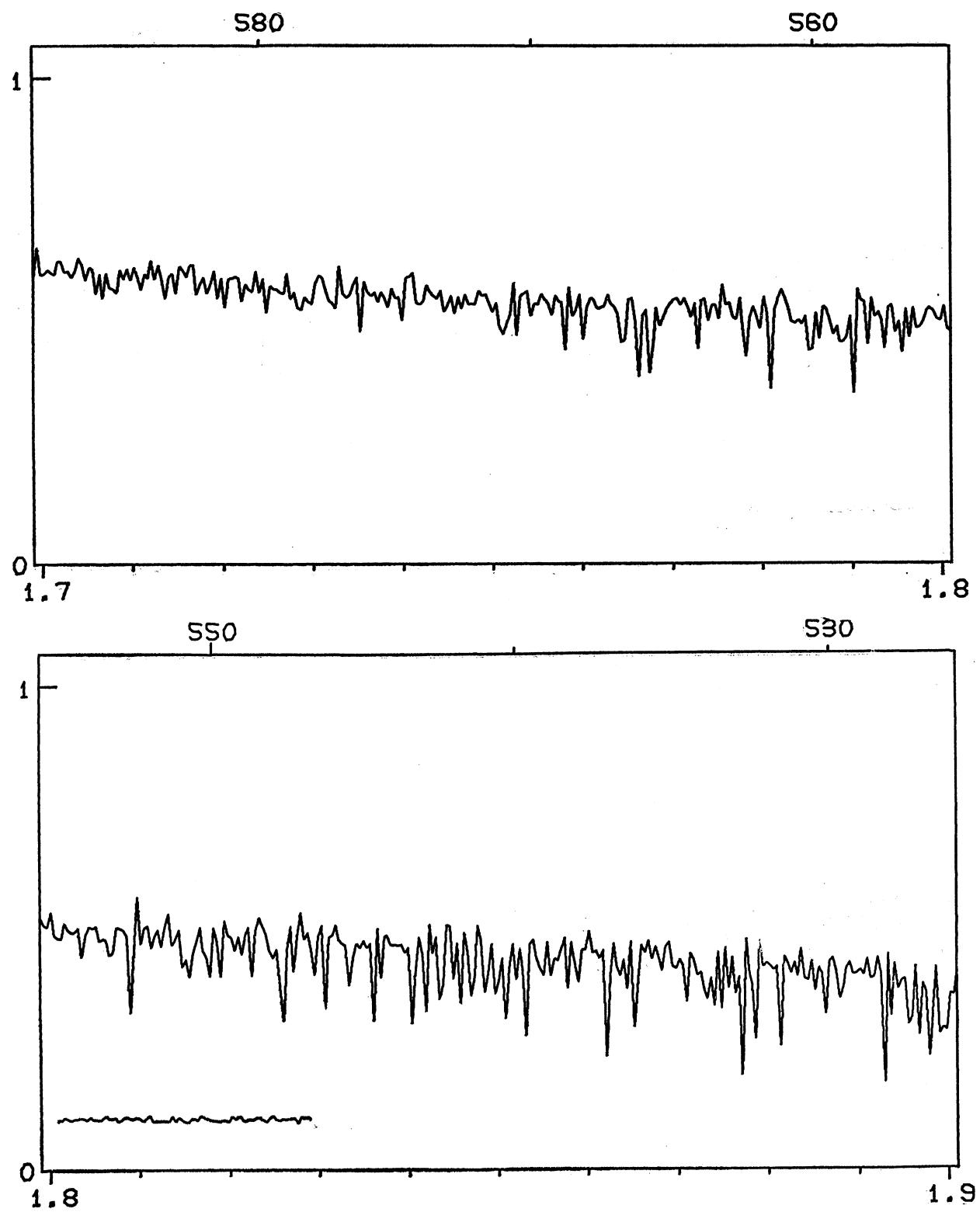
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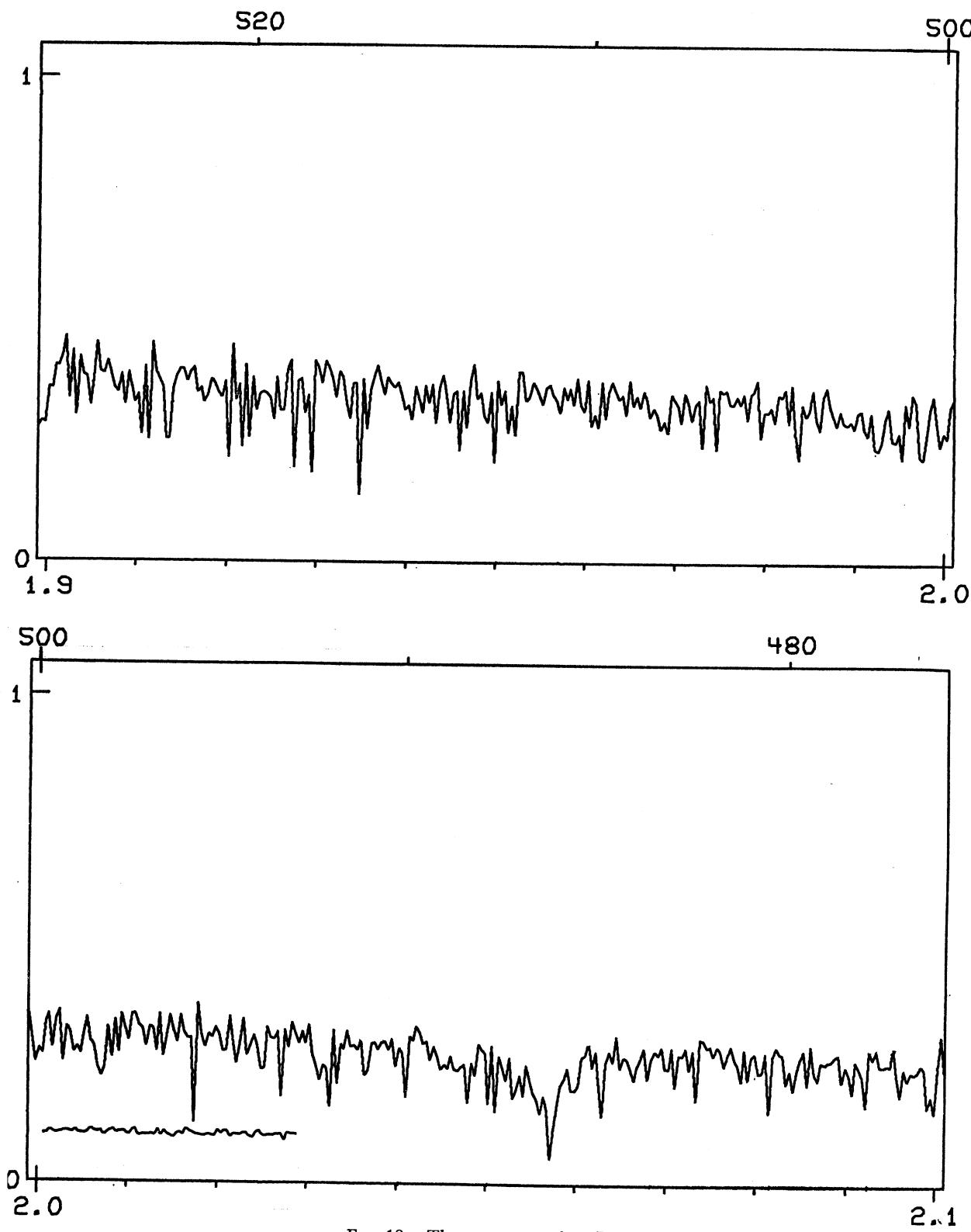
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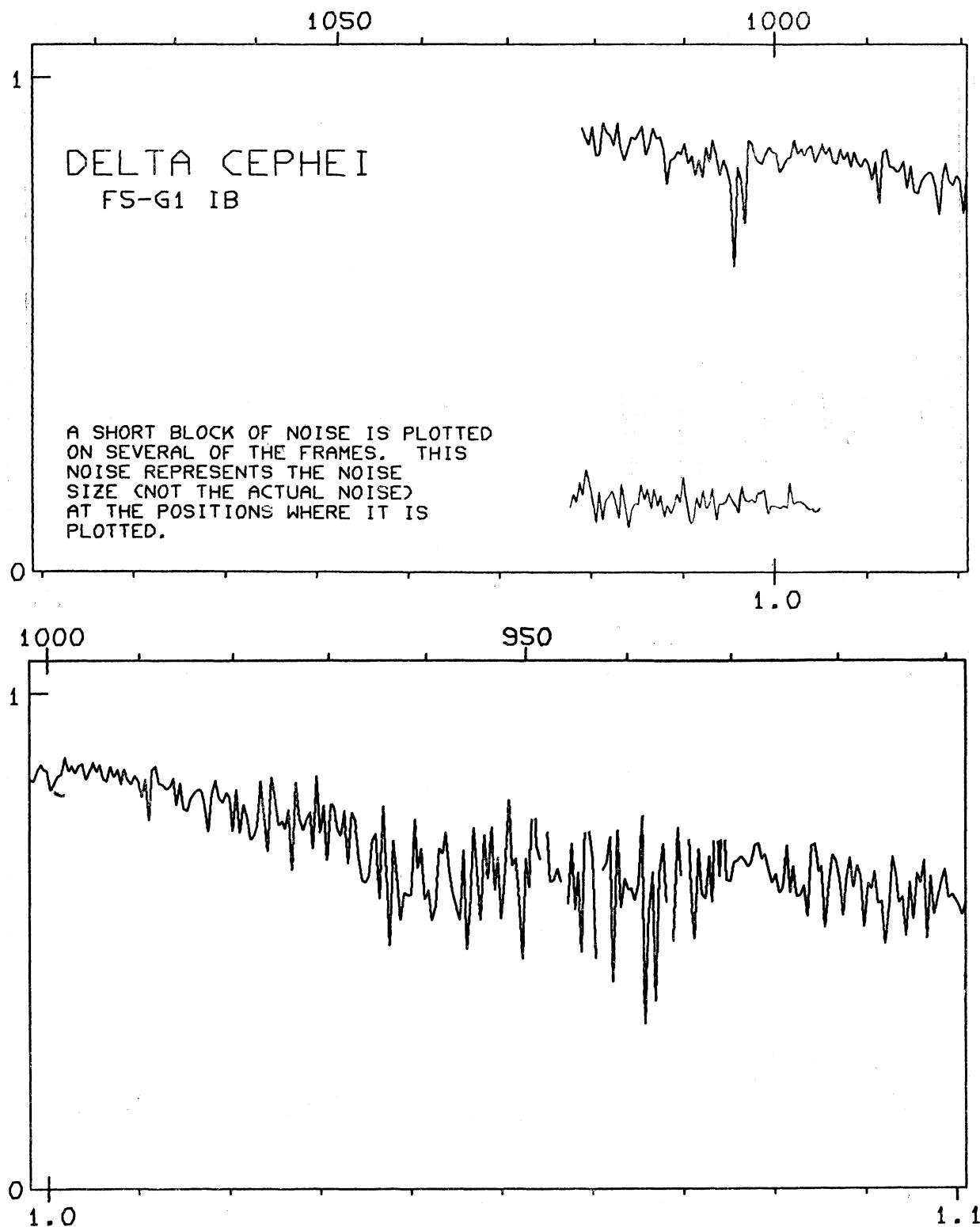
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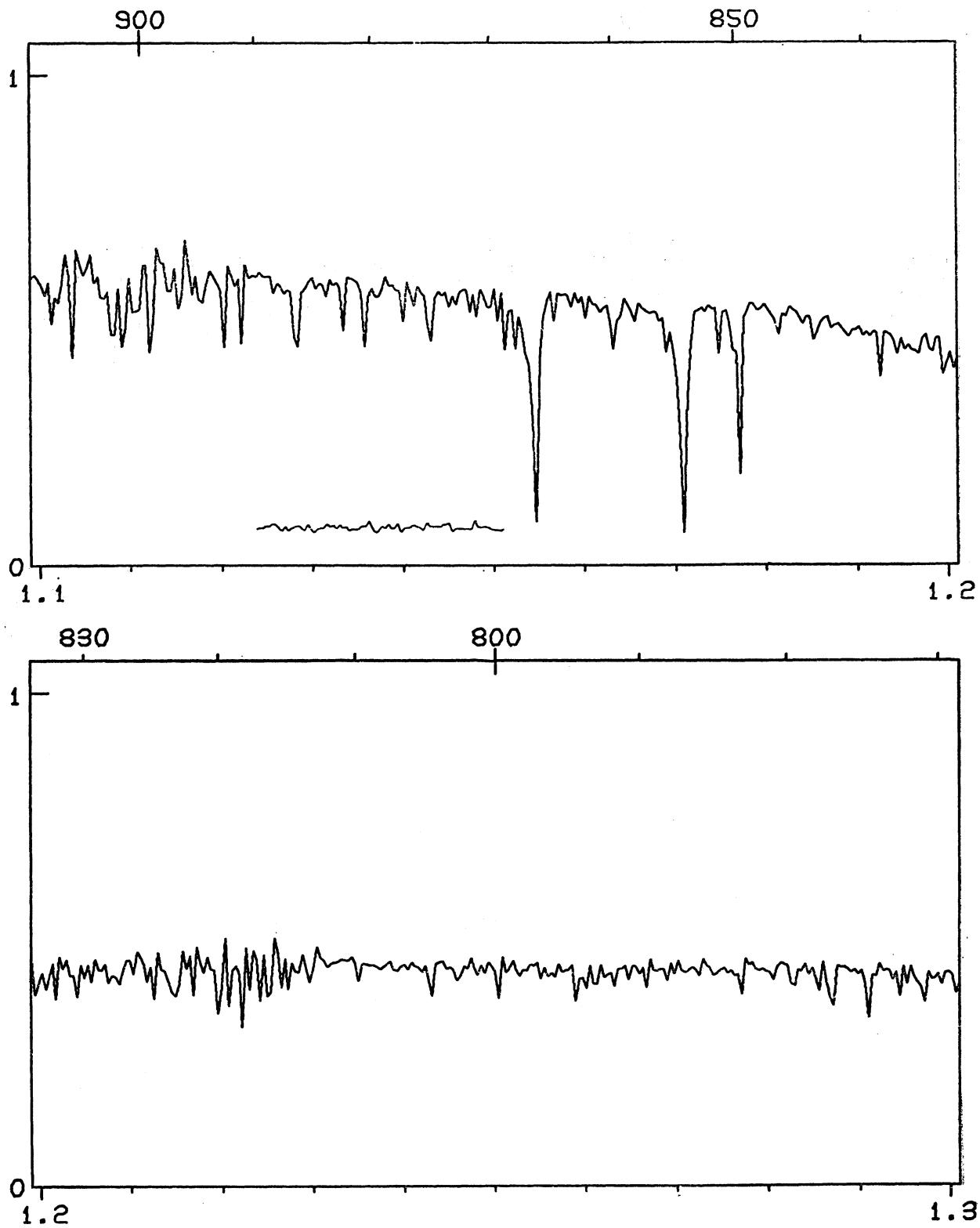
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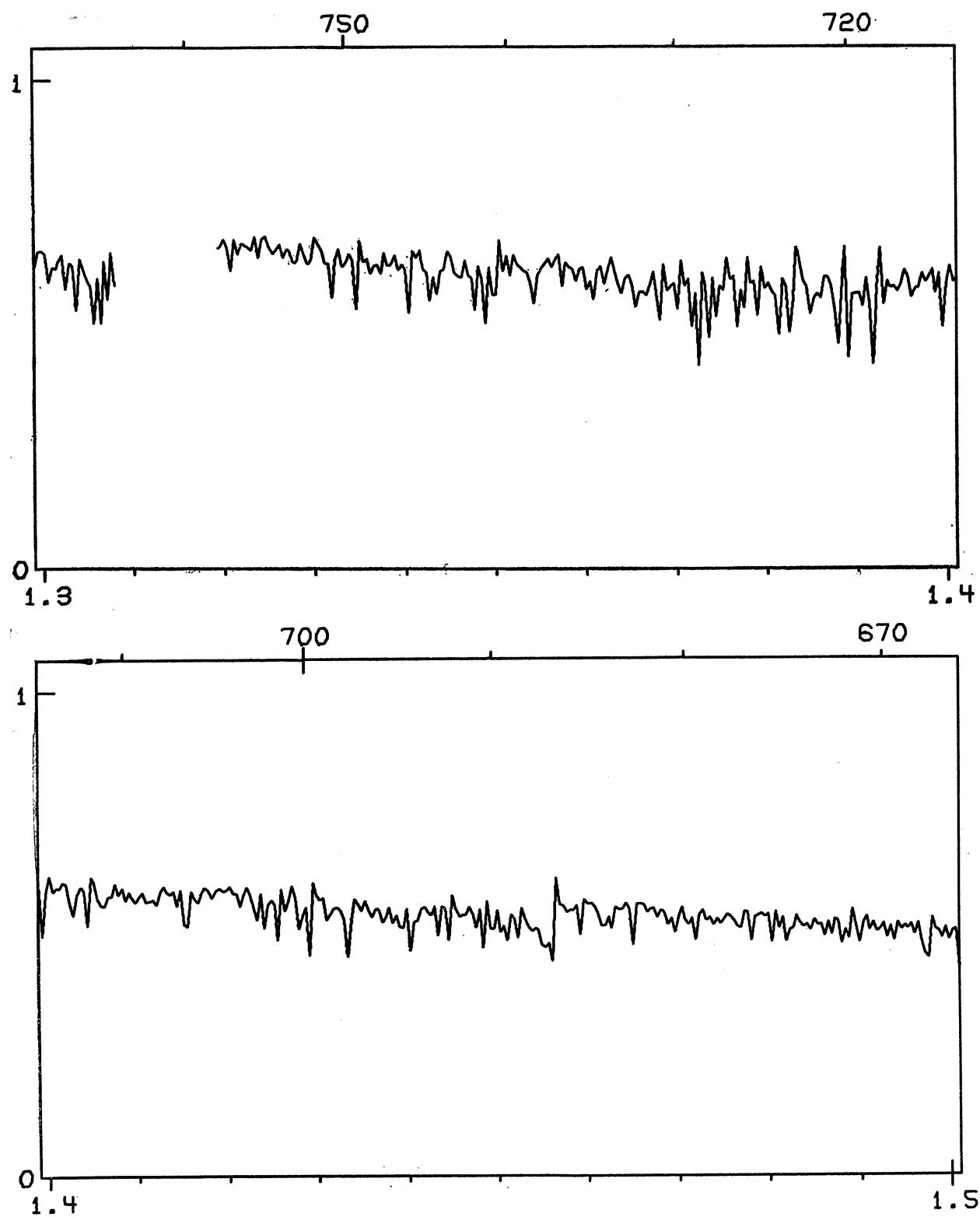
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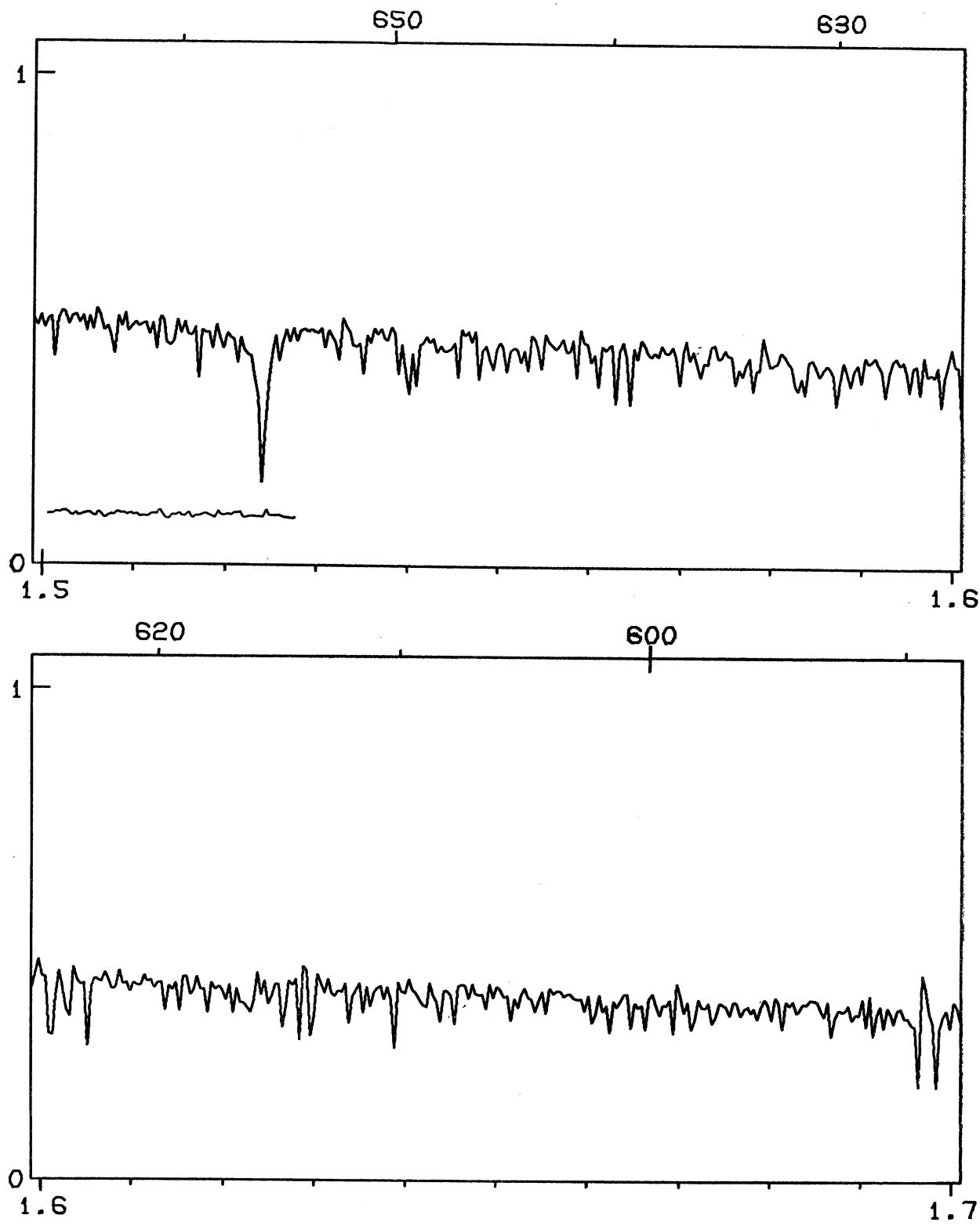
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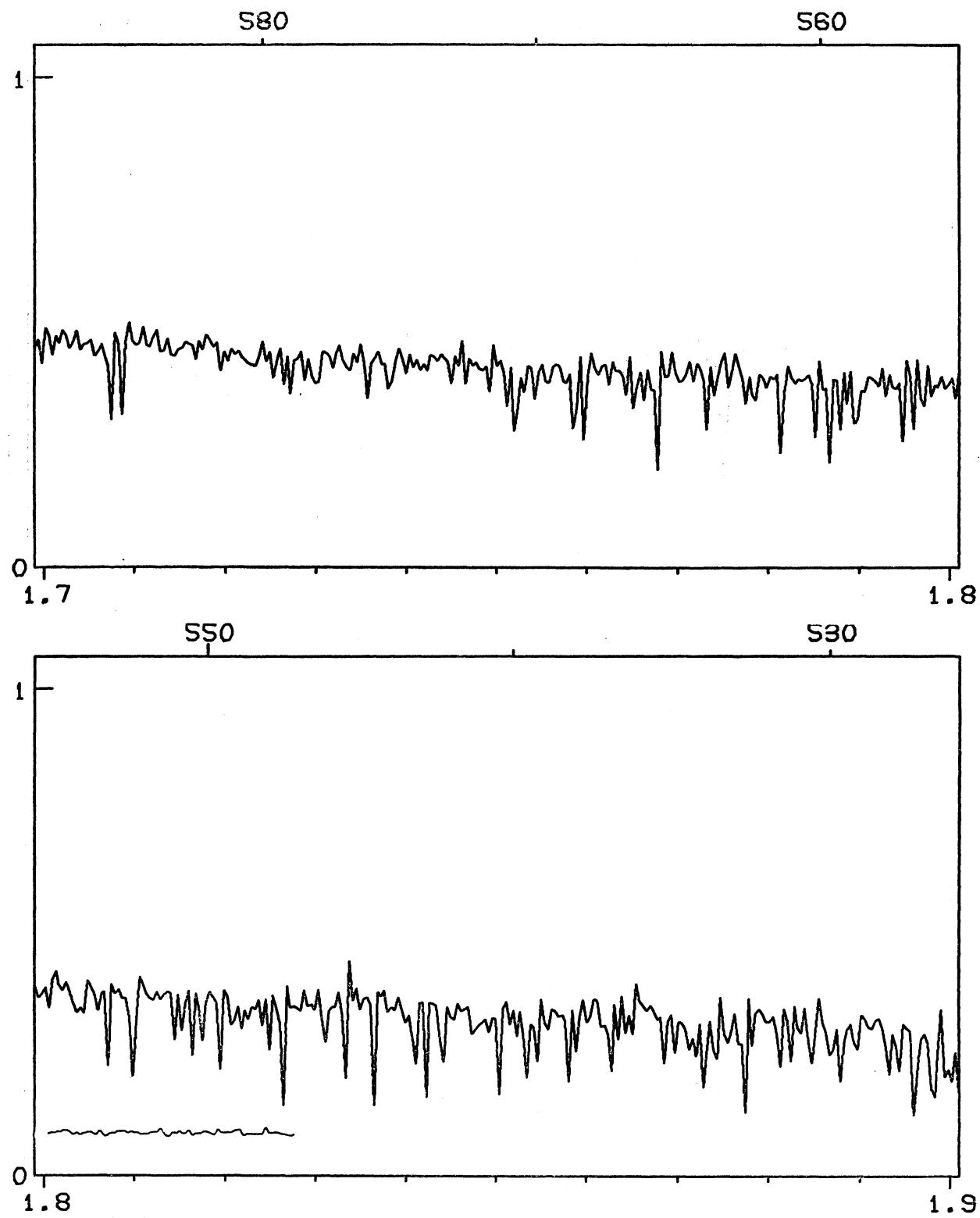
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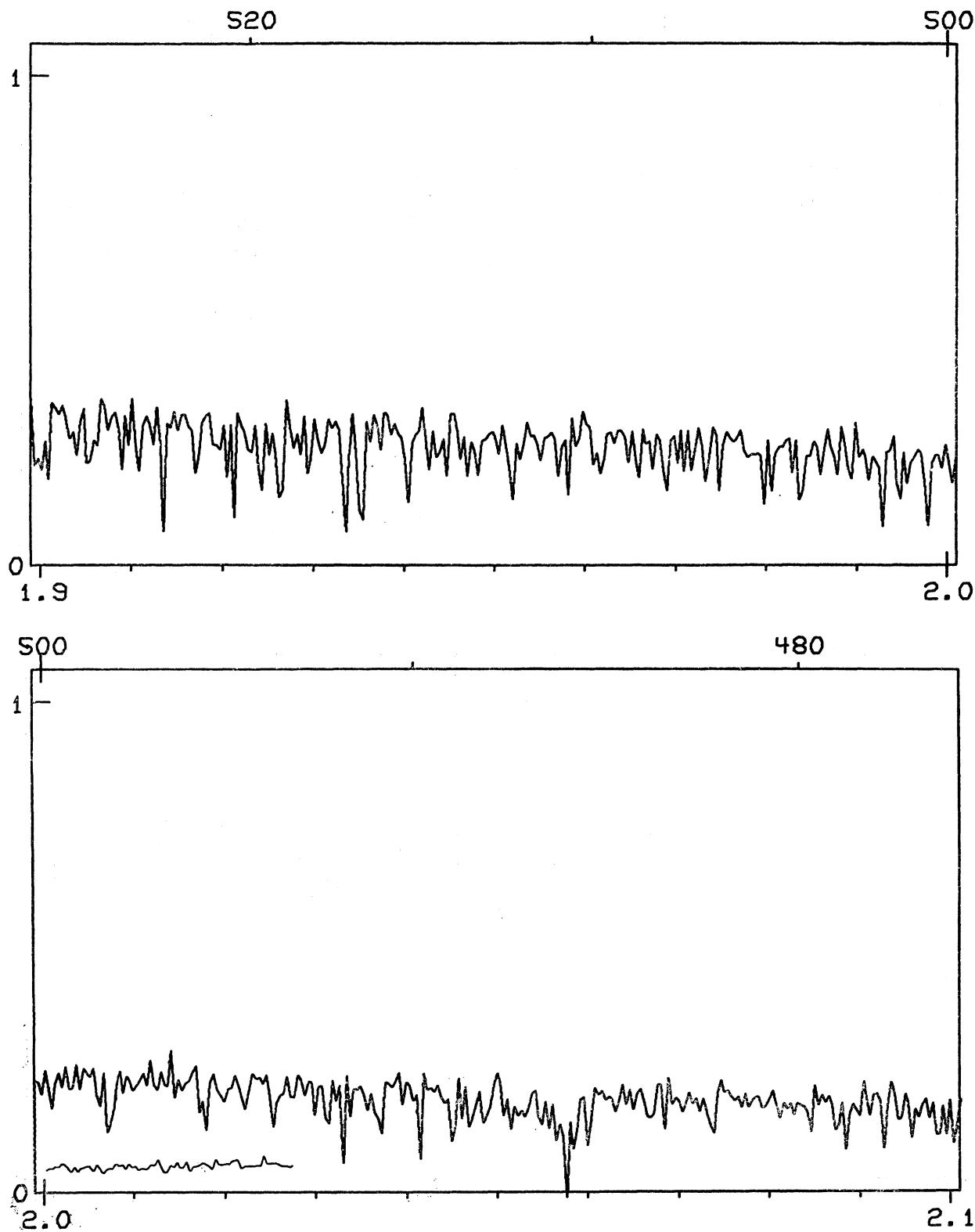
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FIG. 13. The spectrum of δ Cep.

FIG. 13. The spectrum of δ Cep.

ATLAS OF STELLAR SPECTRA

69

FIG. 13. The spectrum of δ Cep.

70

H. L. JOHNSON

1050

1000

GAMMA CYGNI
F8 IB

A SHORT BLOCK OF NOISE IS PLOTTED
ON SEVERAL OF THE FRAMES. THIS
NOISE REPRESENTS THE NOISE
SIZE (NOT THE ACTUAL NOISE)
AT THE POSITIONS WHERE IT IS
PLOTTED.

0

1.0

1000

950

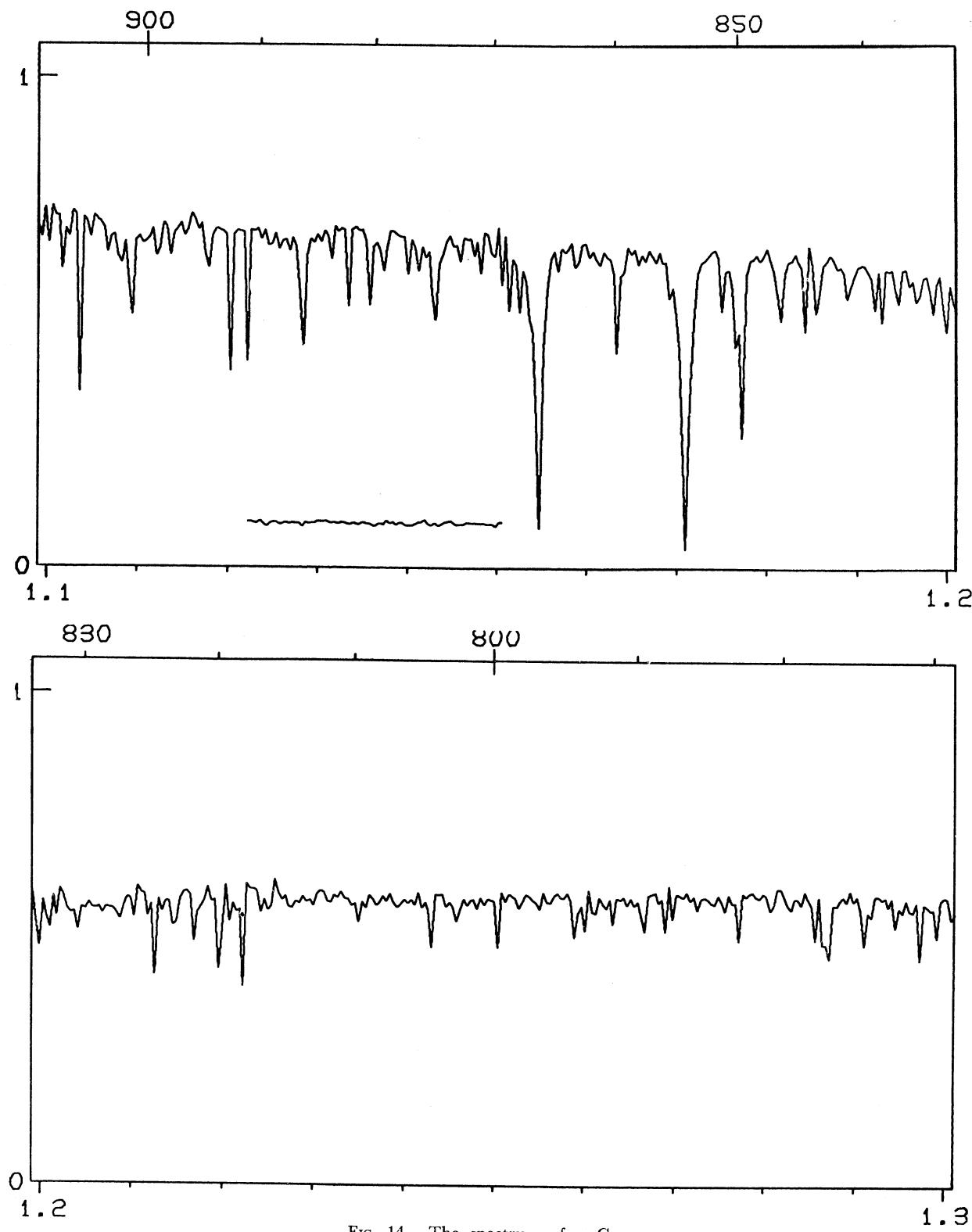
1

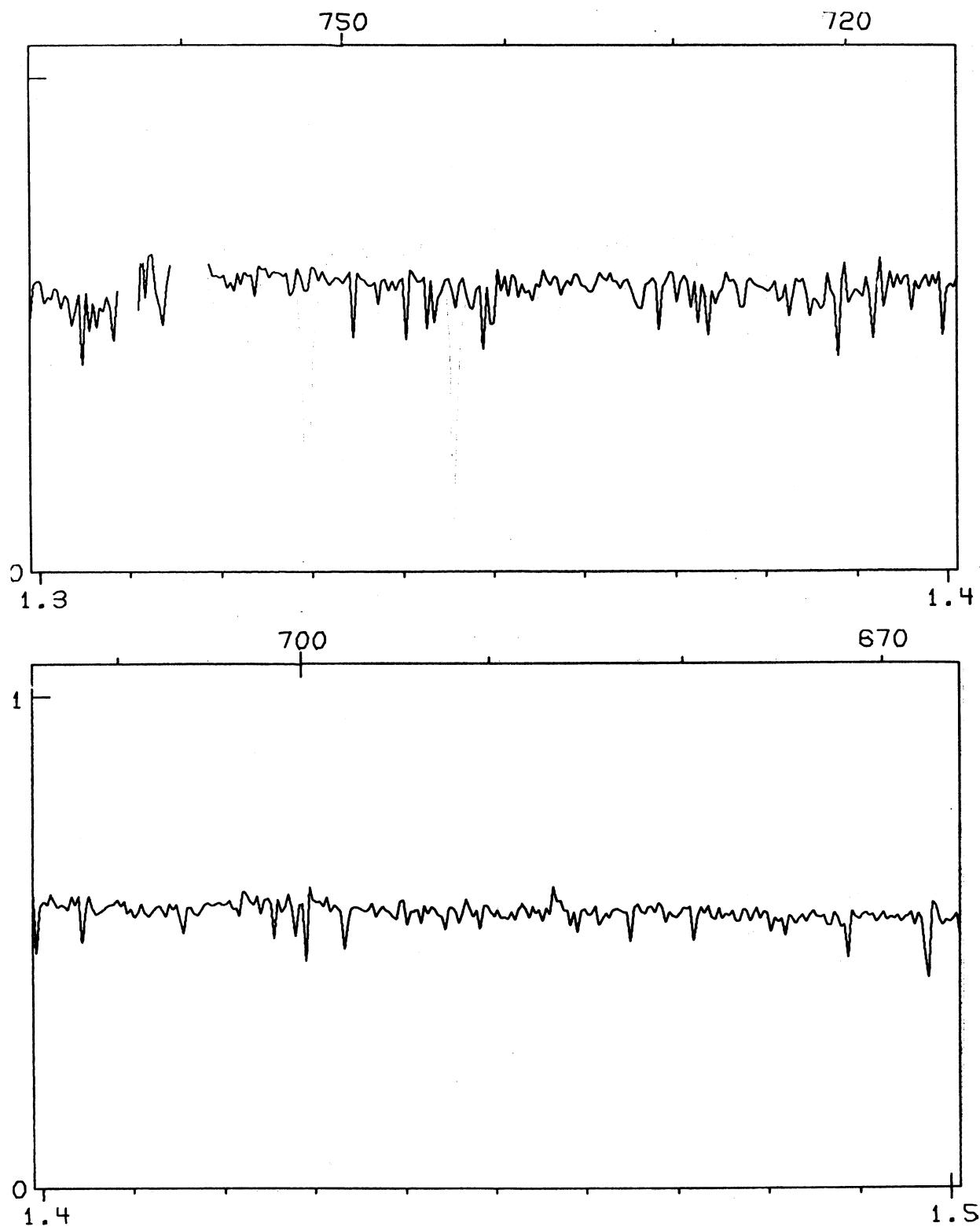
1.0

1.1

FIG. 14. The spectrum of γ Cyg.

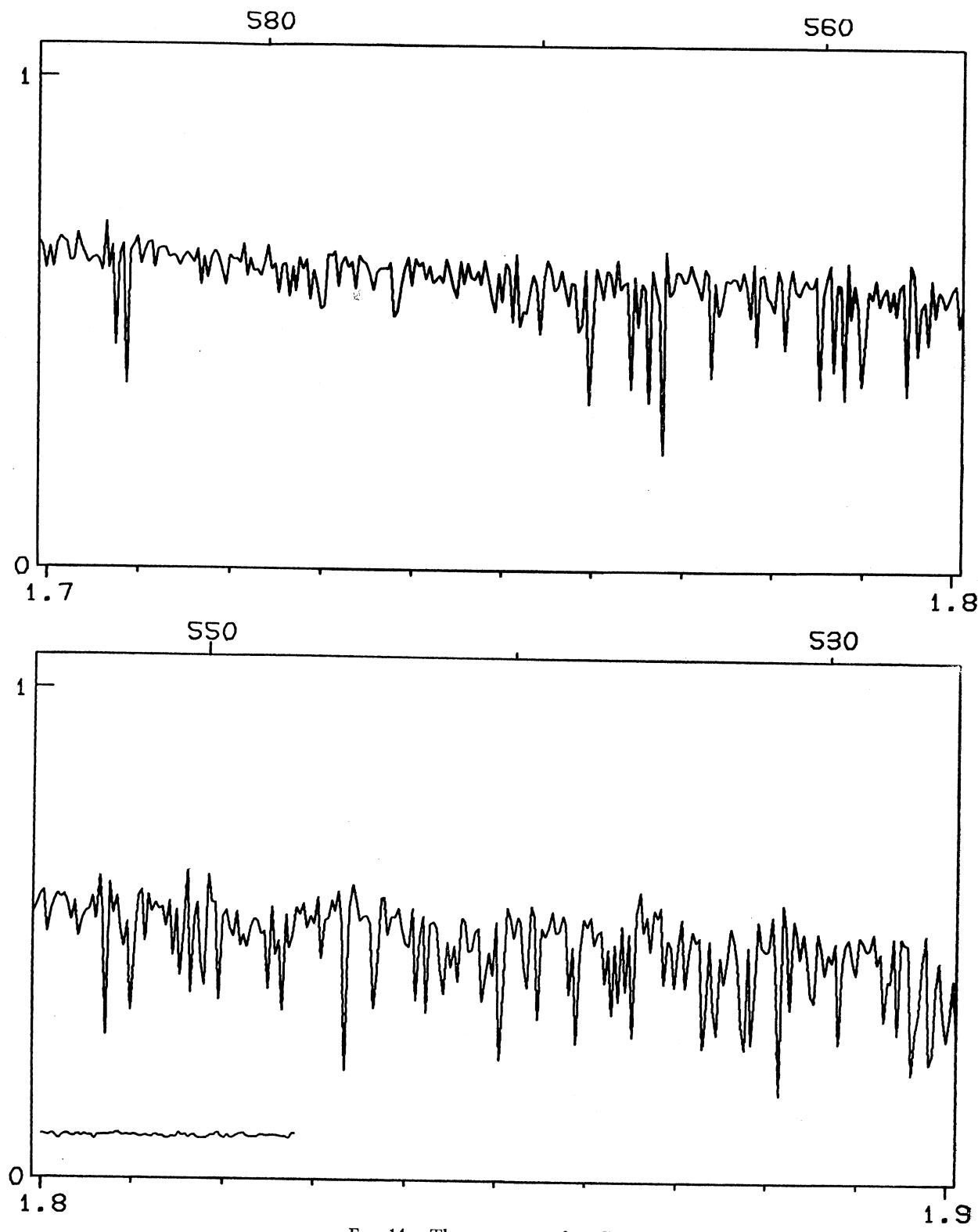
ATLAS OF STELLAR SPECTRA

FIG. 14. The spectrum of γ Cyg.

FIG. 14. The spectrum of γ Cyg.

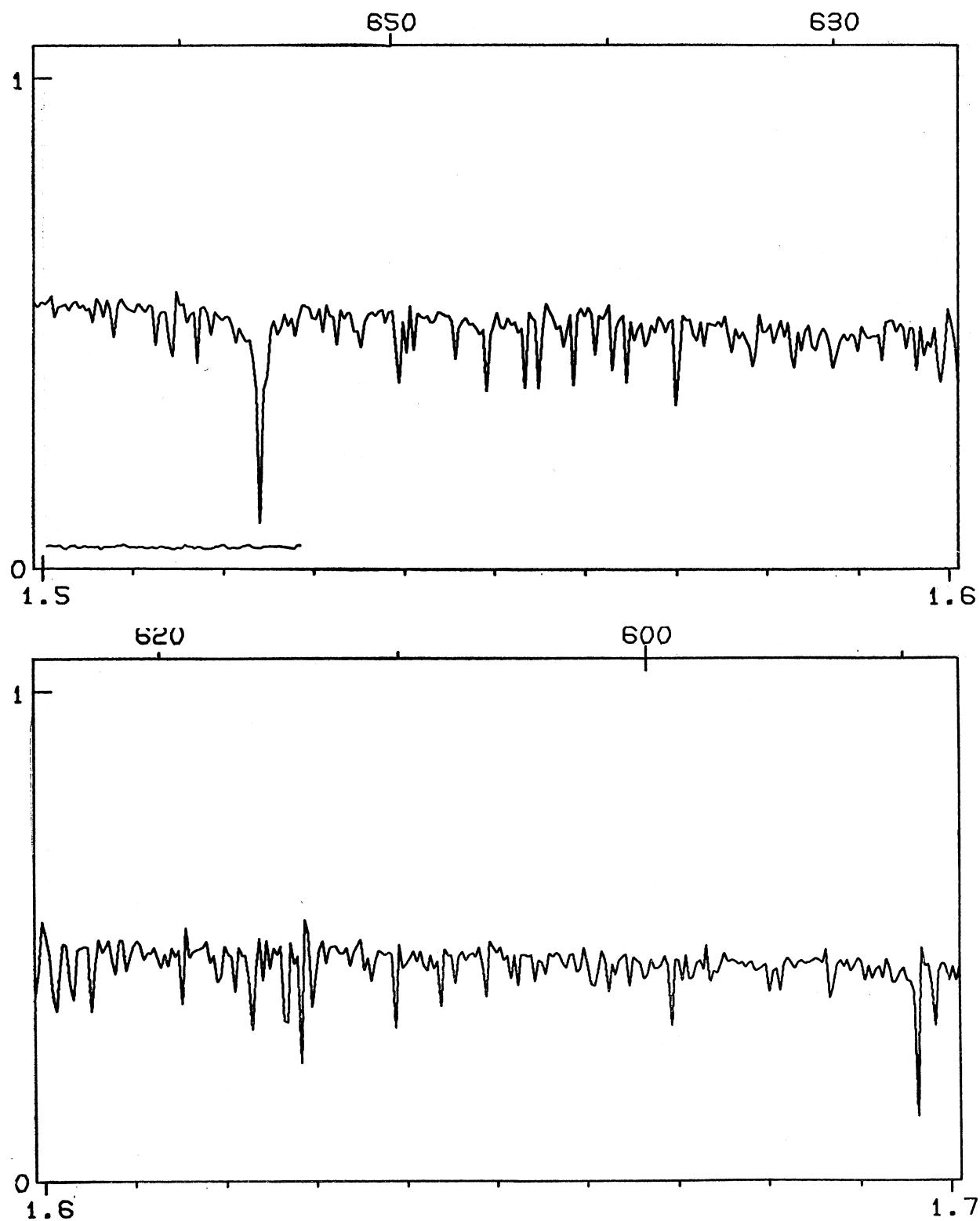
ATLAS OF STELLAR SPECTRA

73

FIG. 14. The spectrum of γ Cyg.

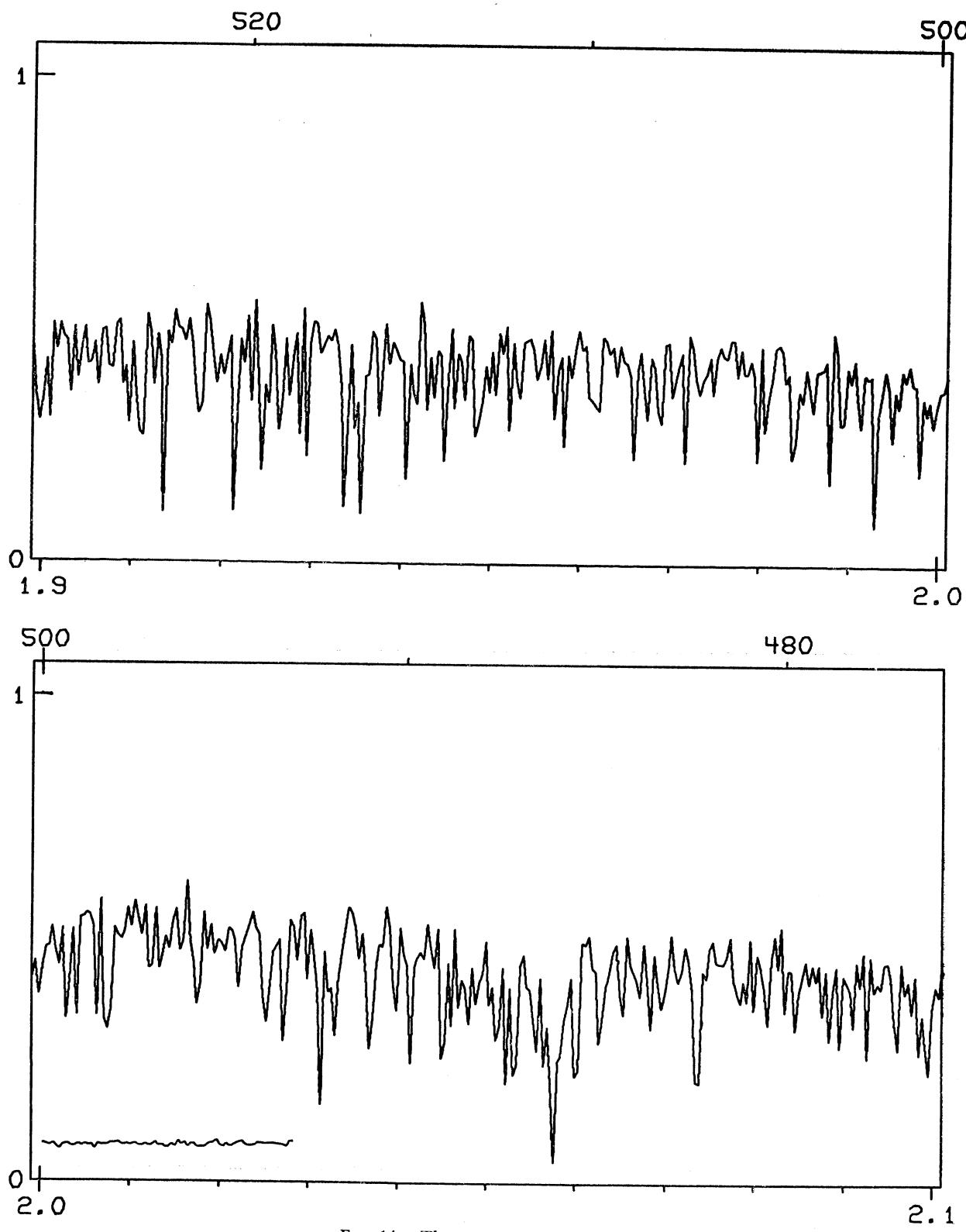
74

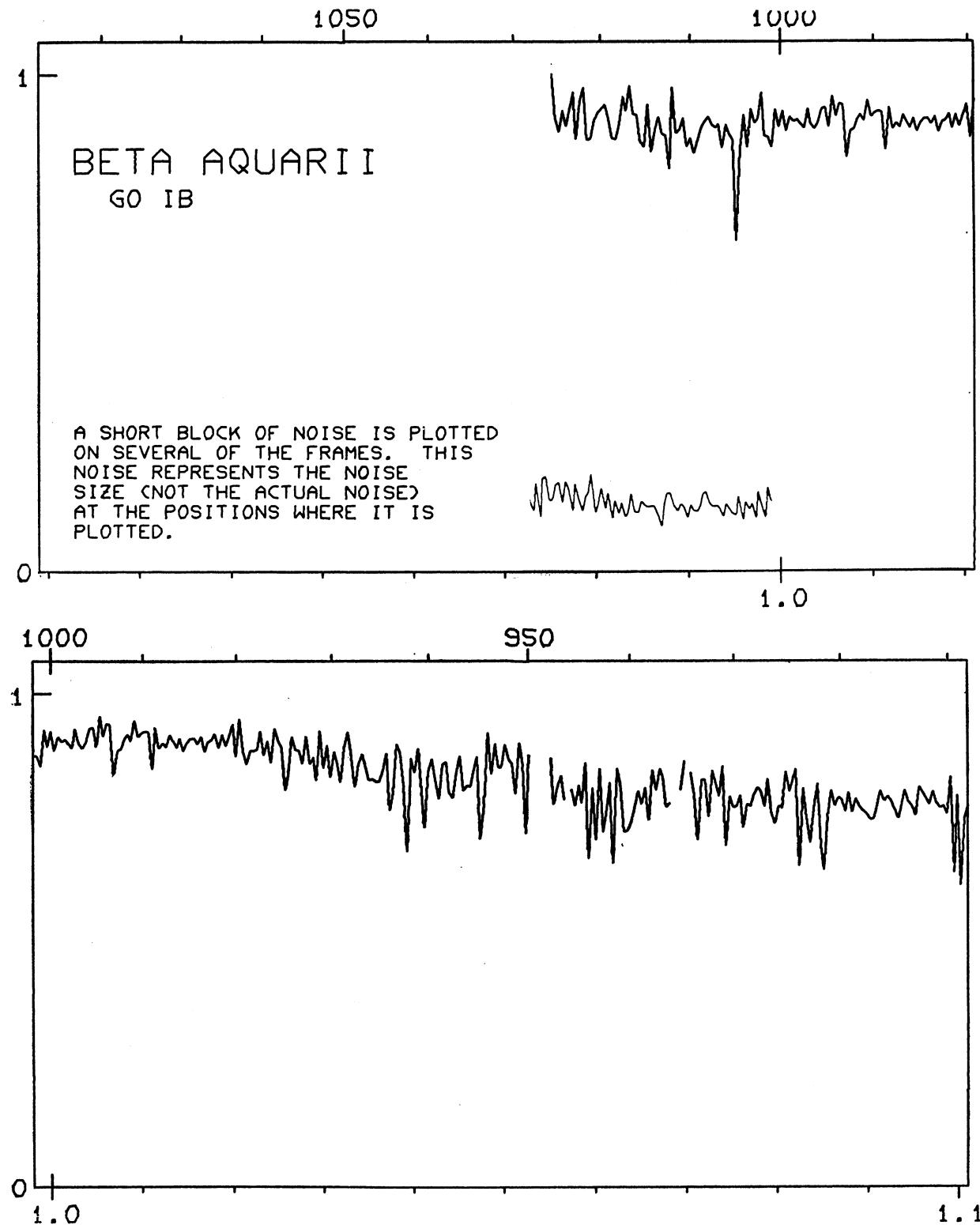
H. L. JOHNSON

FIG. 14. The spectrum of γ Cyg.

ATLAS OF STELLAR SPECTRA

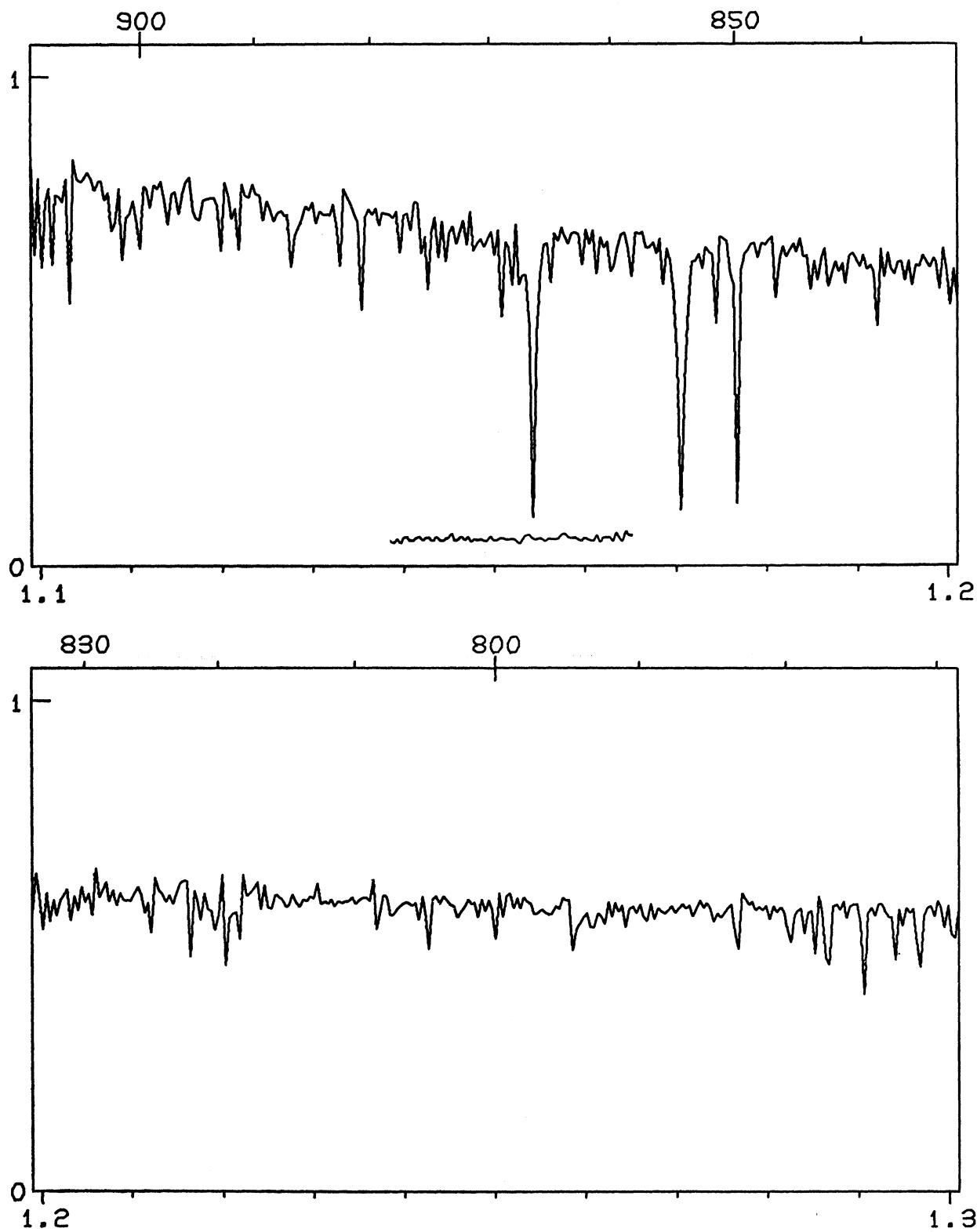
75

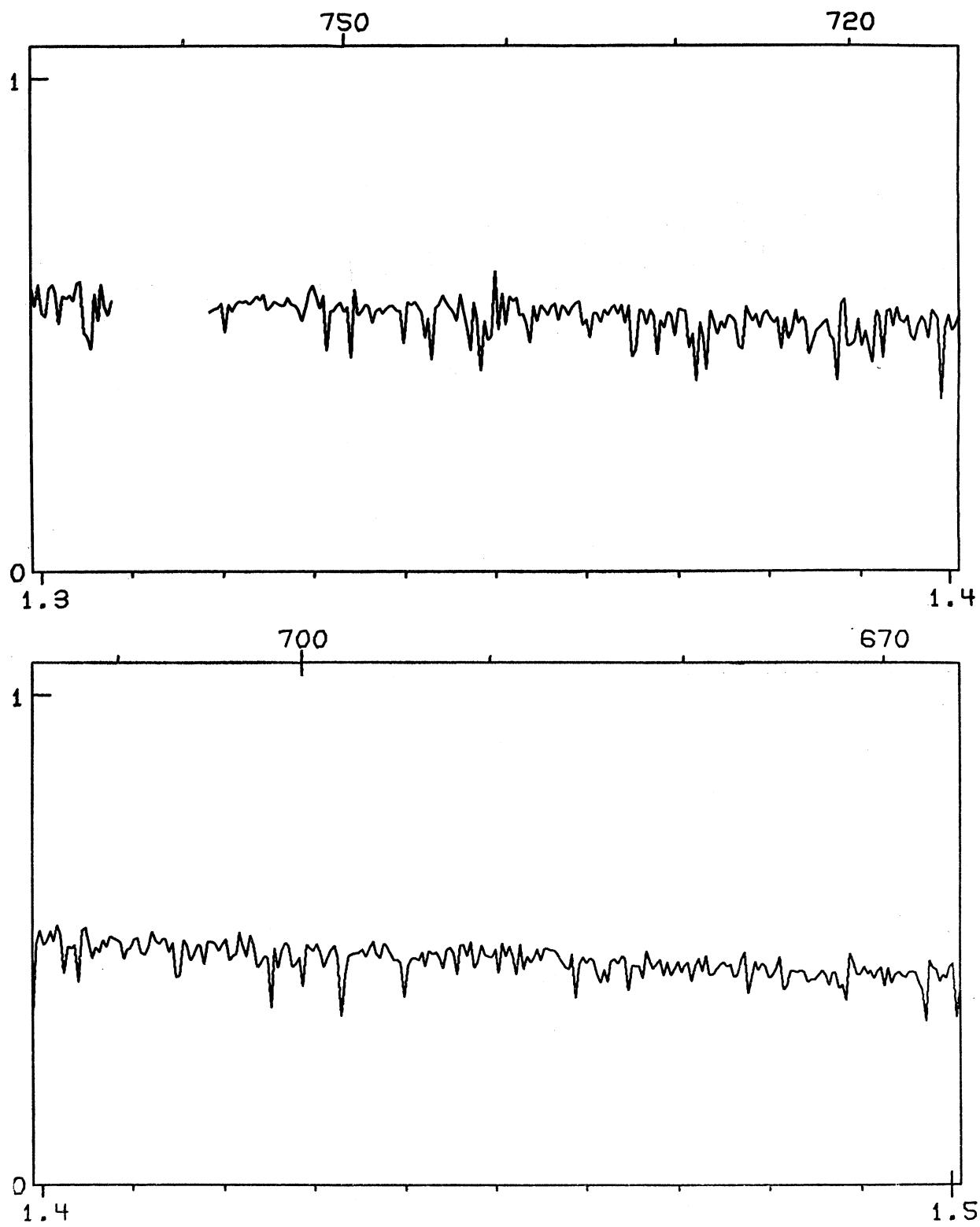
FIG. 14. The spectrum of γ Cyg.

FIG. 15. The spectrum of β Aqr.

ATLAS OF STELLAR SPECTRA

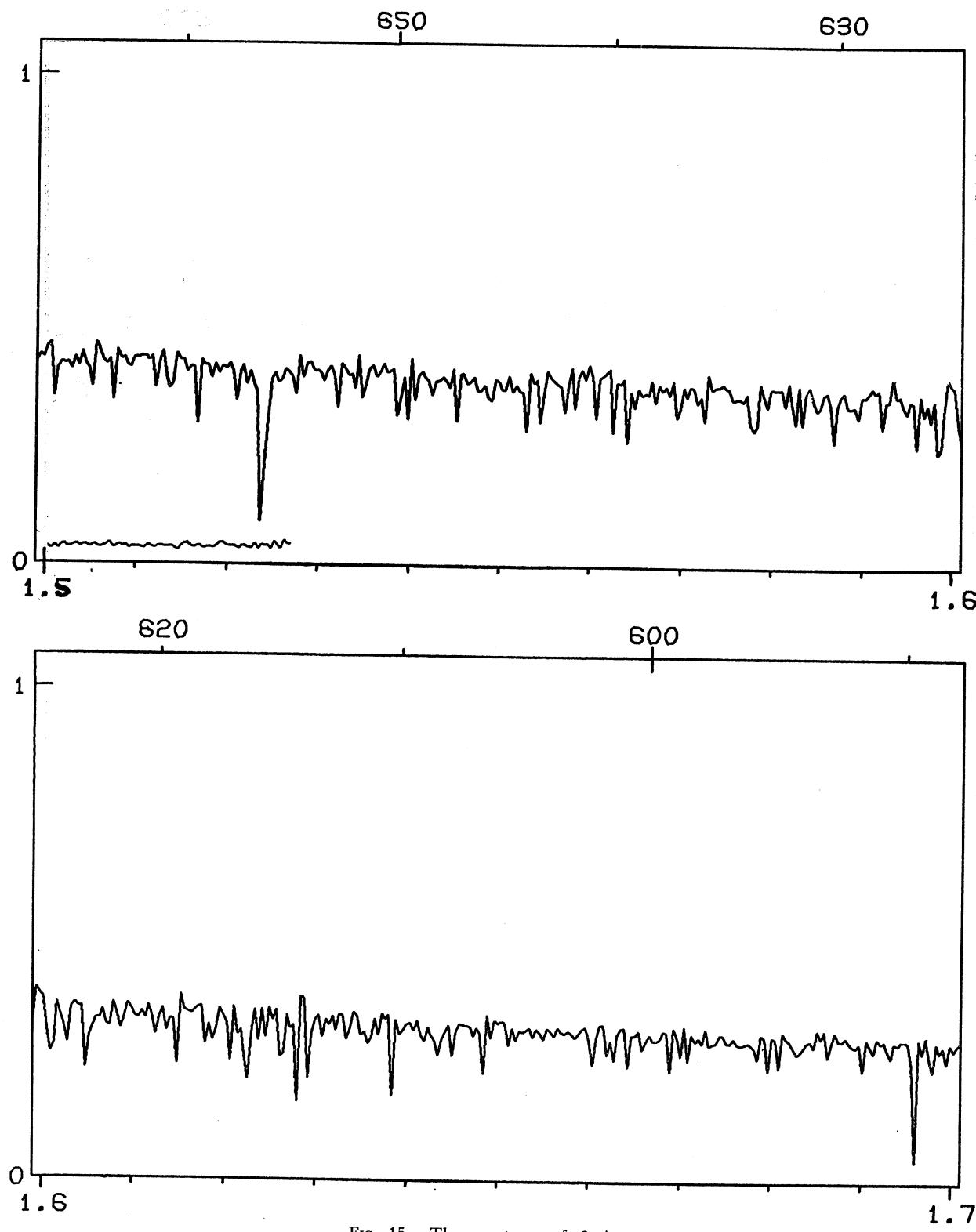
77

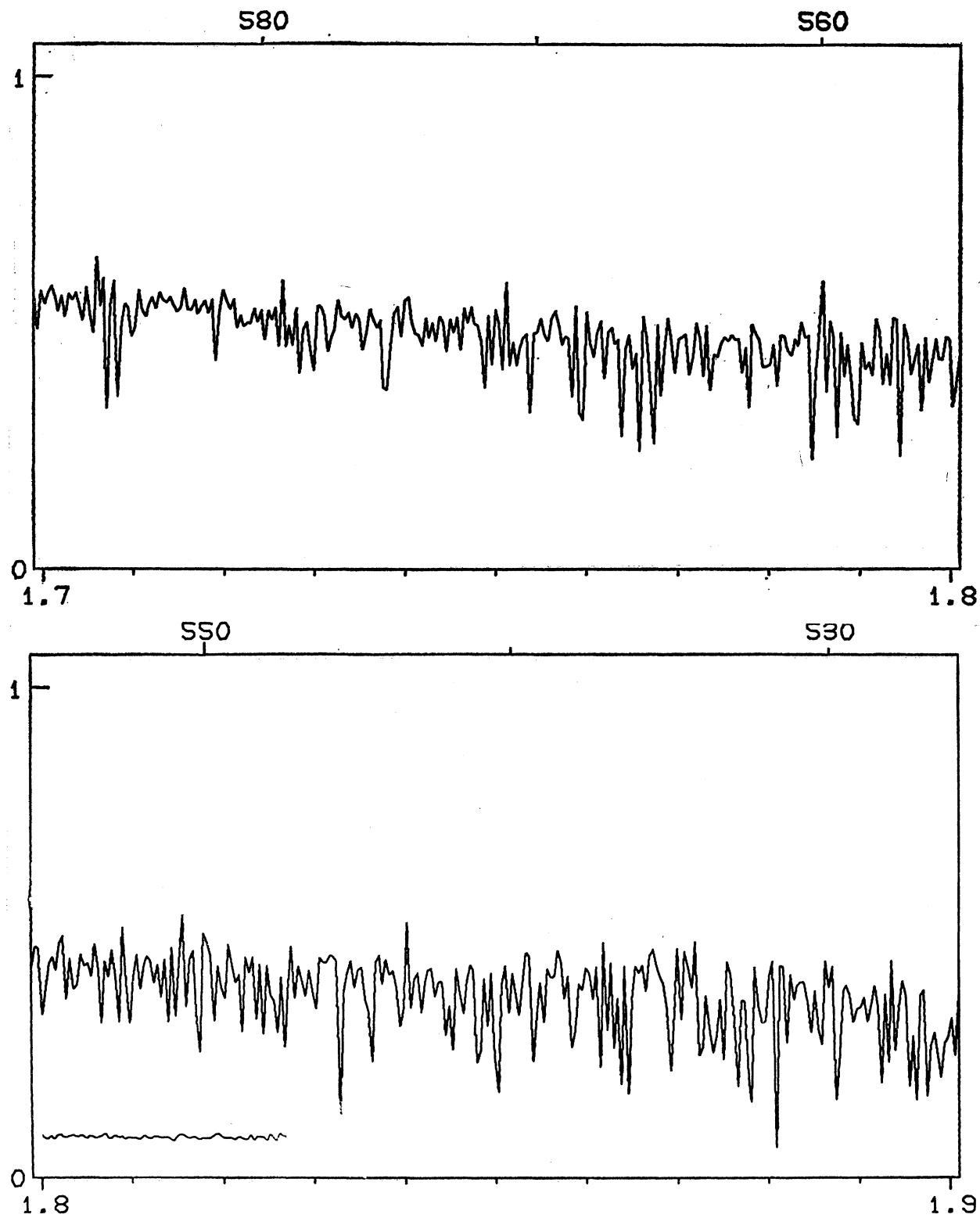
FIG. 15. The spectrum of β Aqr.

FIG. 15. The spectrum of β Aqr.

ATLAS OF STELLAR SPECTRA

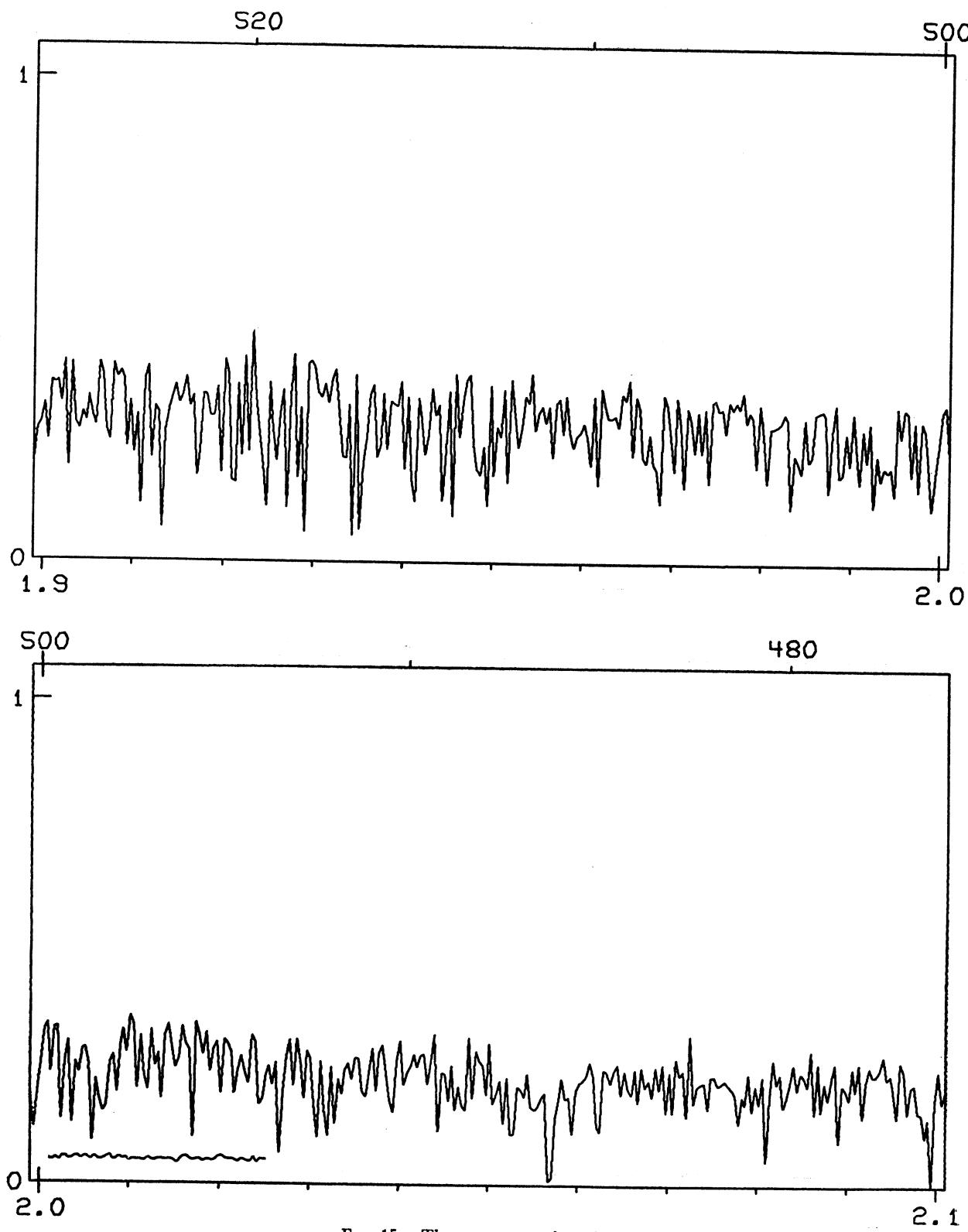
79

FIG. 15. The spectrum of β Aqr.

FIG. 15. The spectrum of β Aqr.

ATLAS OF STELLAR SPECTRA

81

FIG. 15. The spectrum of β Aqr.

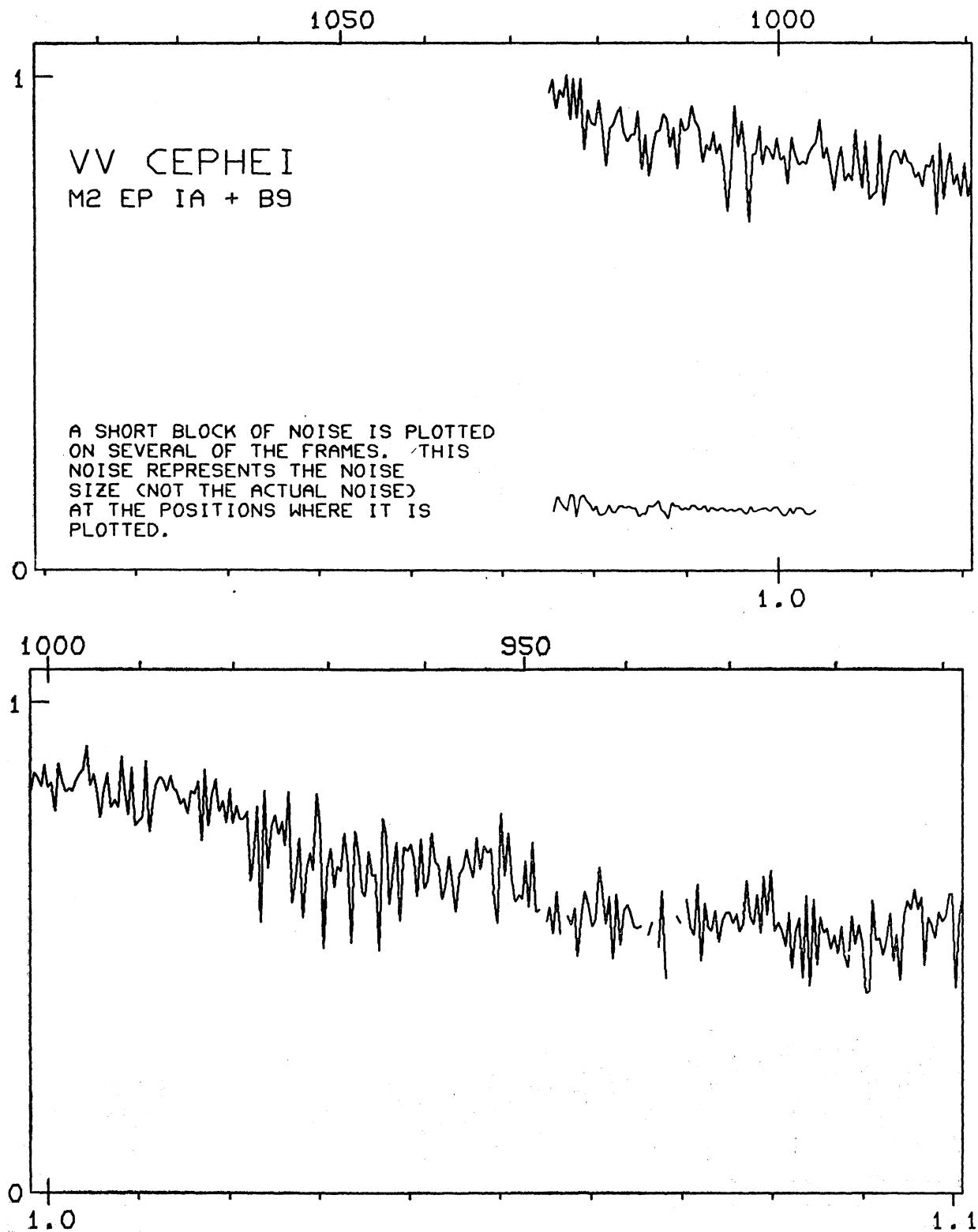


FIG. 16. The spectrum of VV Cep.

ATLAS OF STELLAR SPECTRA

83

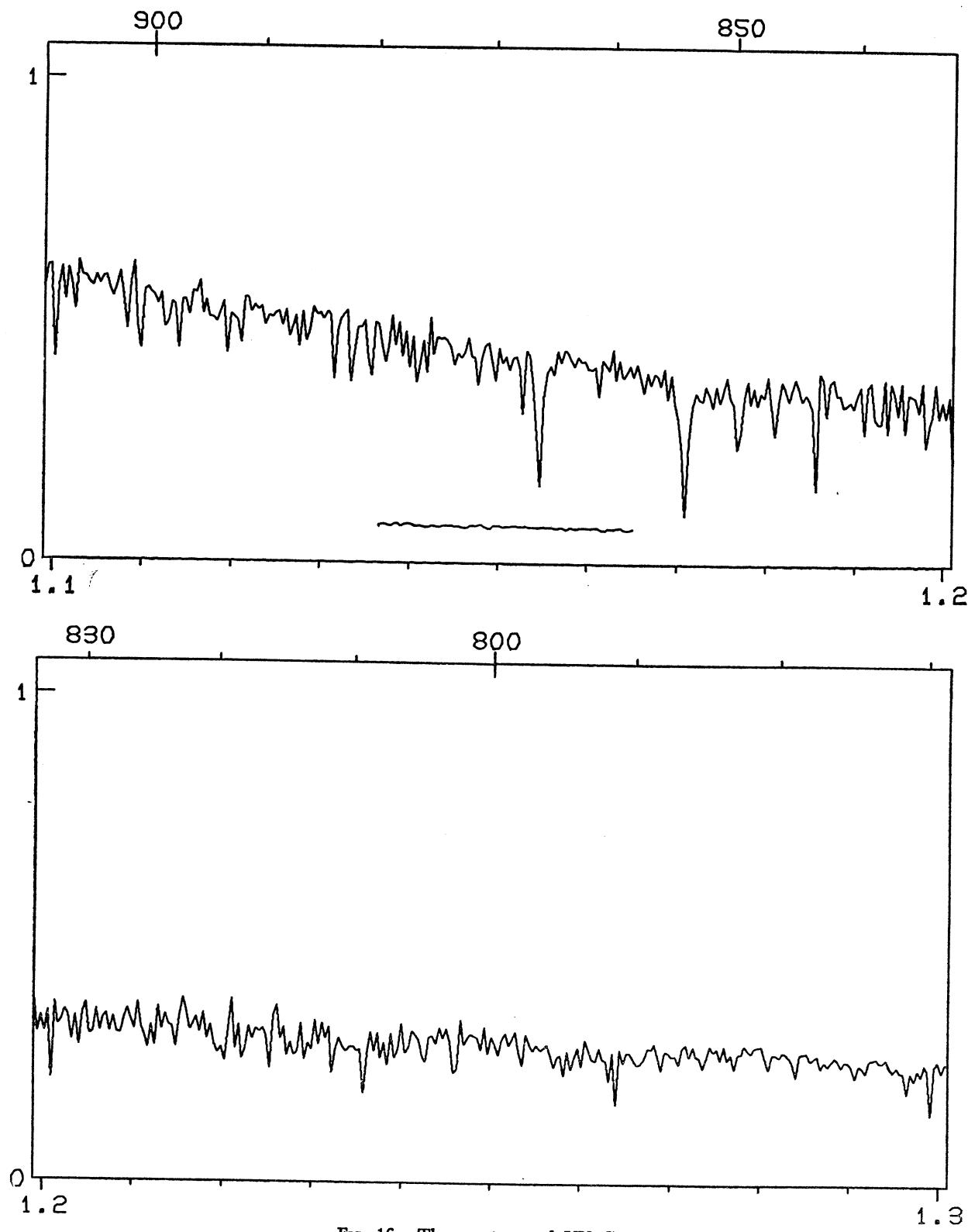


FIG. 16. The spectrum of VV Cep.

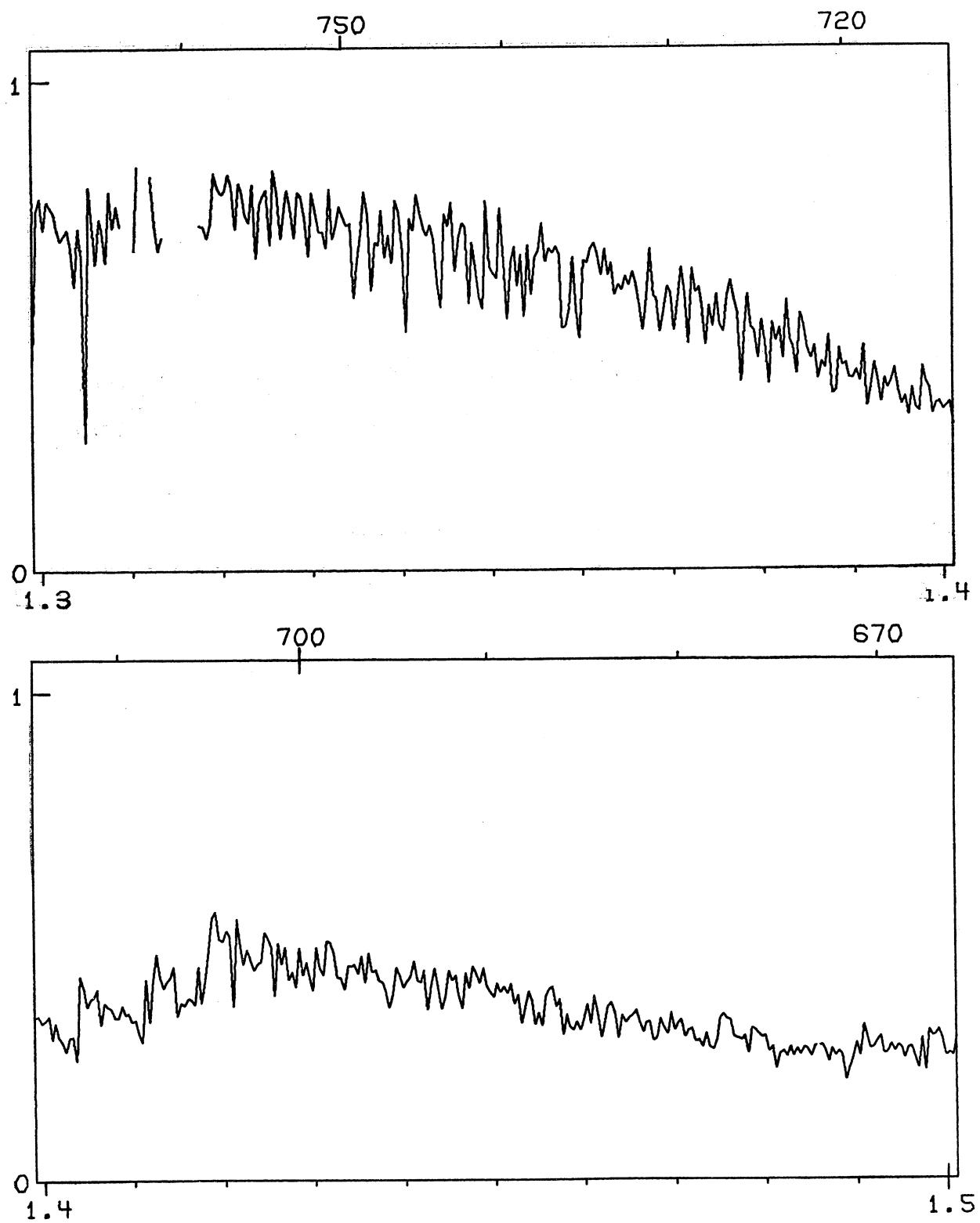


FIG. 16. The spectrum of VV Cep.

ATLAS OF STELLAR SPECTRA

85

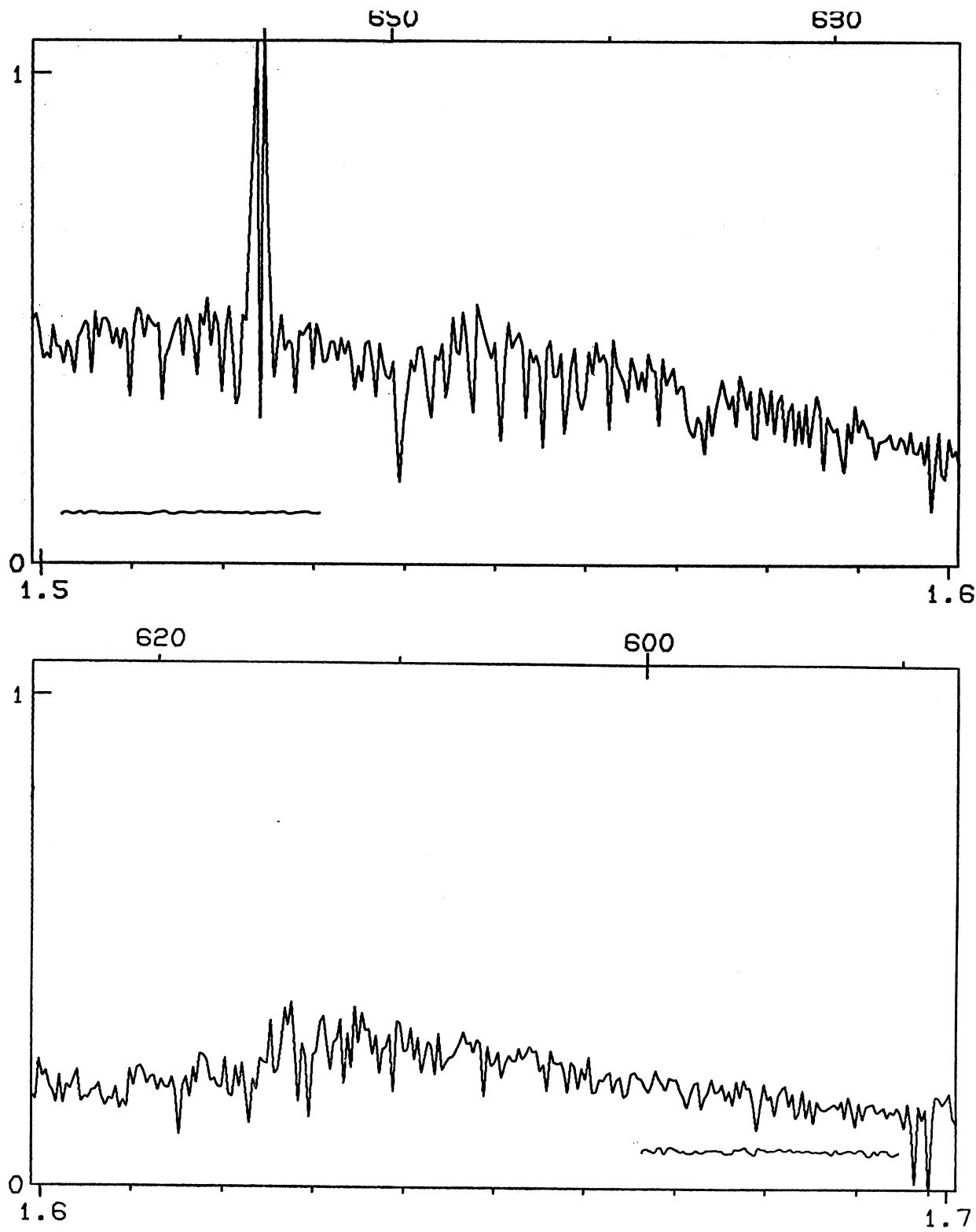
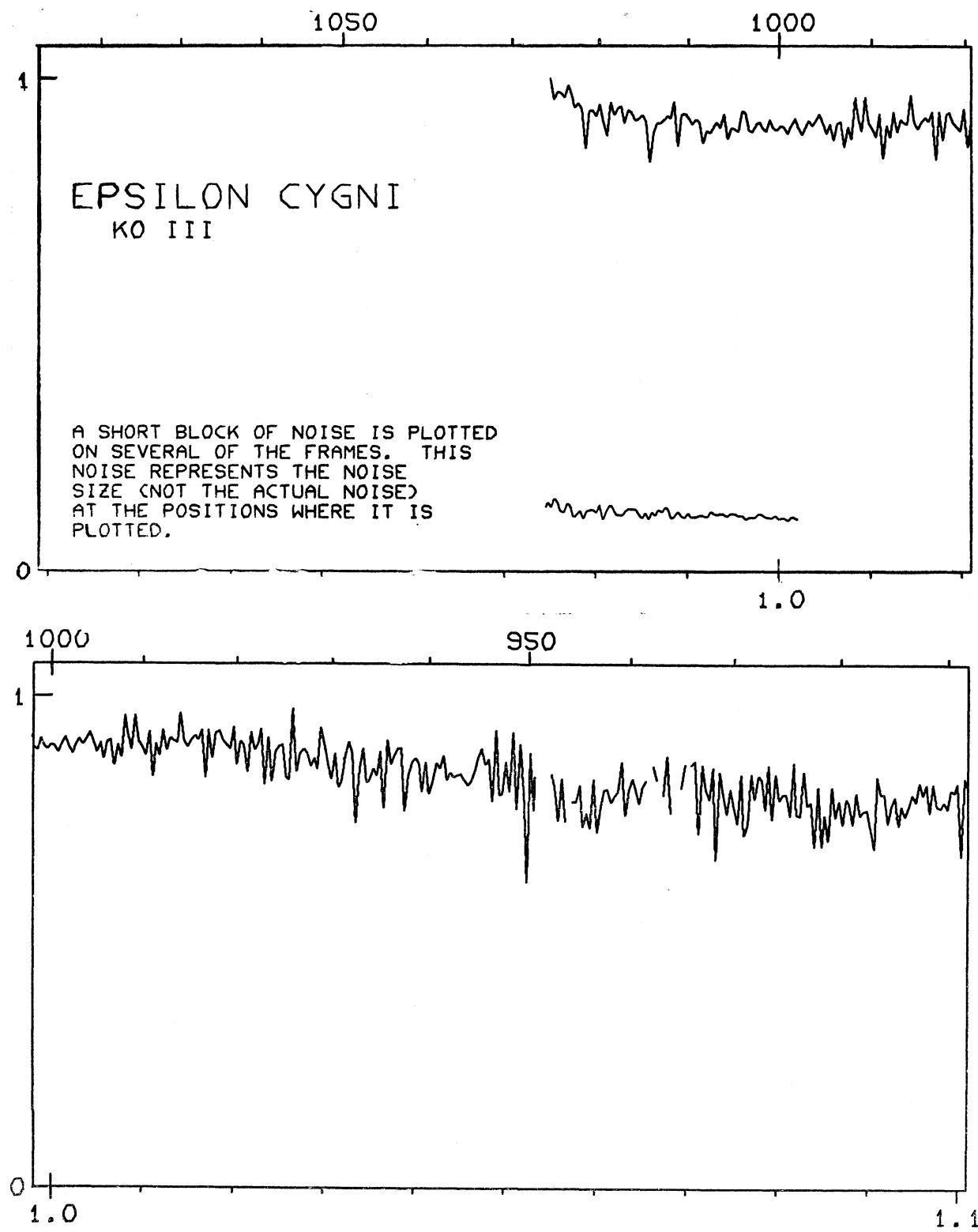
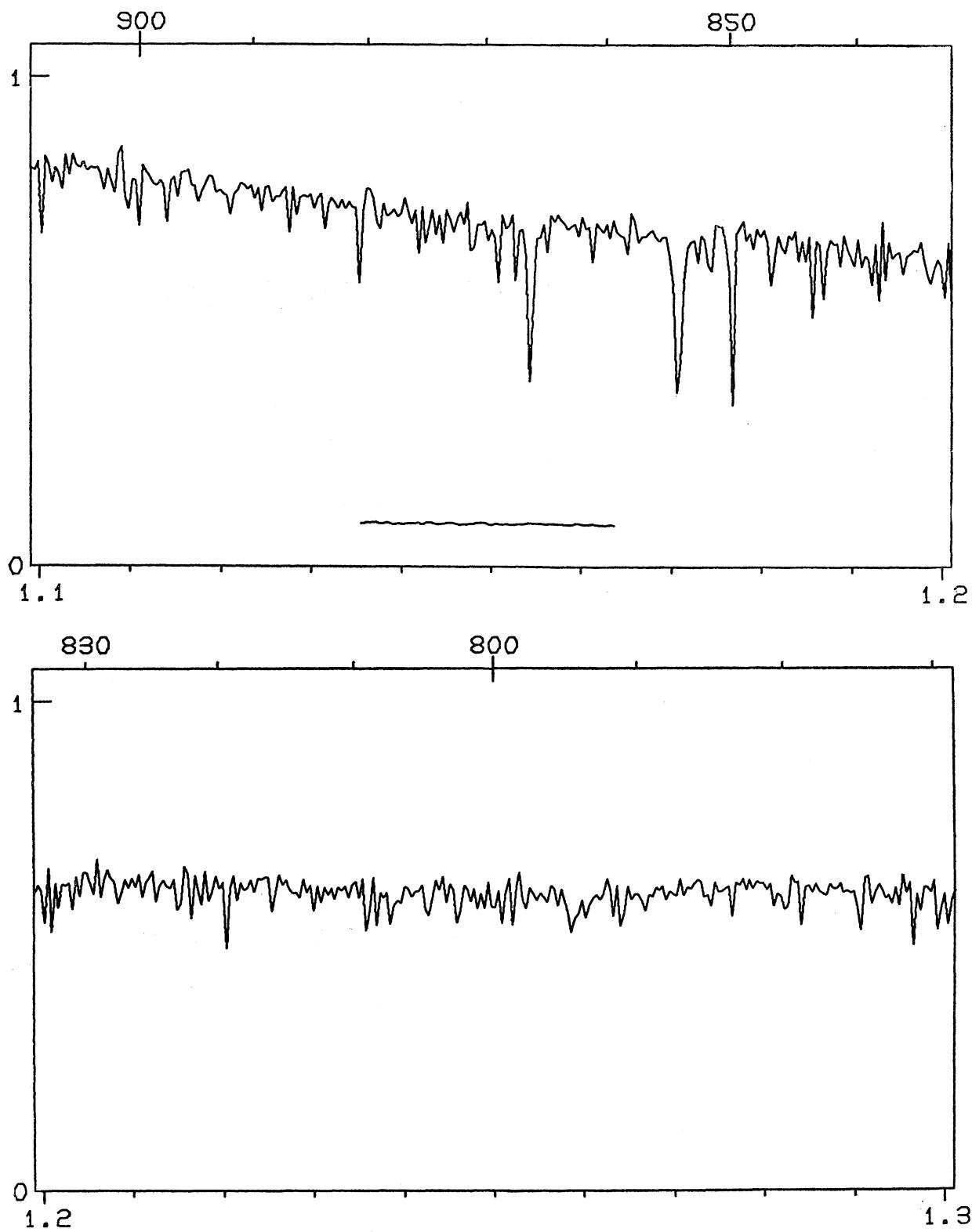


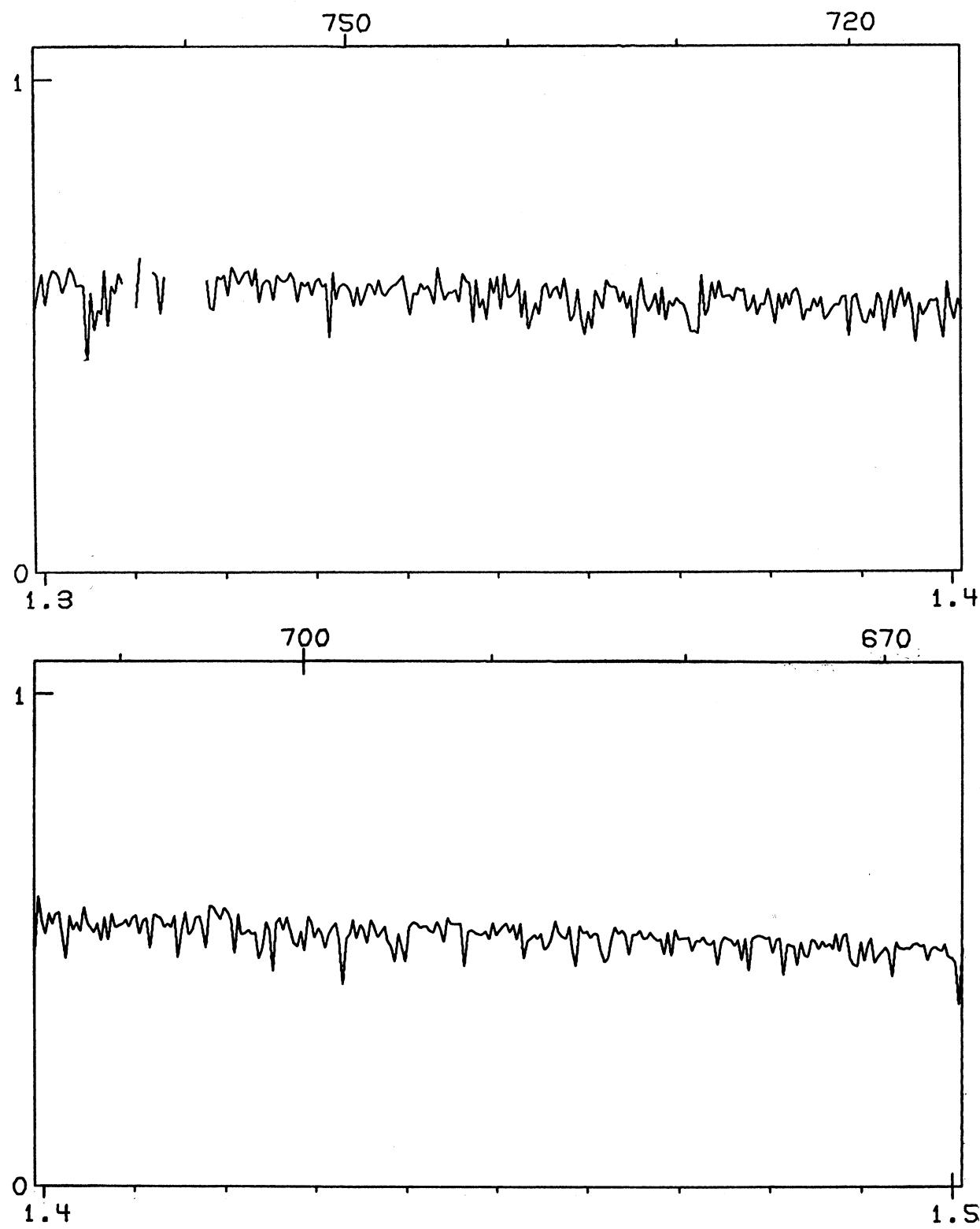
FIG. 16. The spectrum of VV Cep.

FIG. 17. The spectrum of ϵ Cyg.

ATLAS OF STELLAR SPECTRA

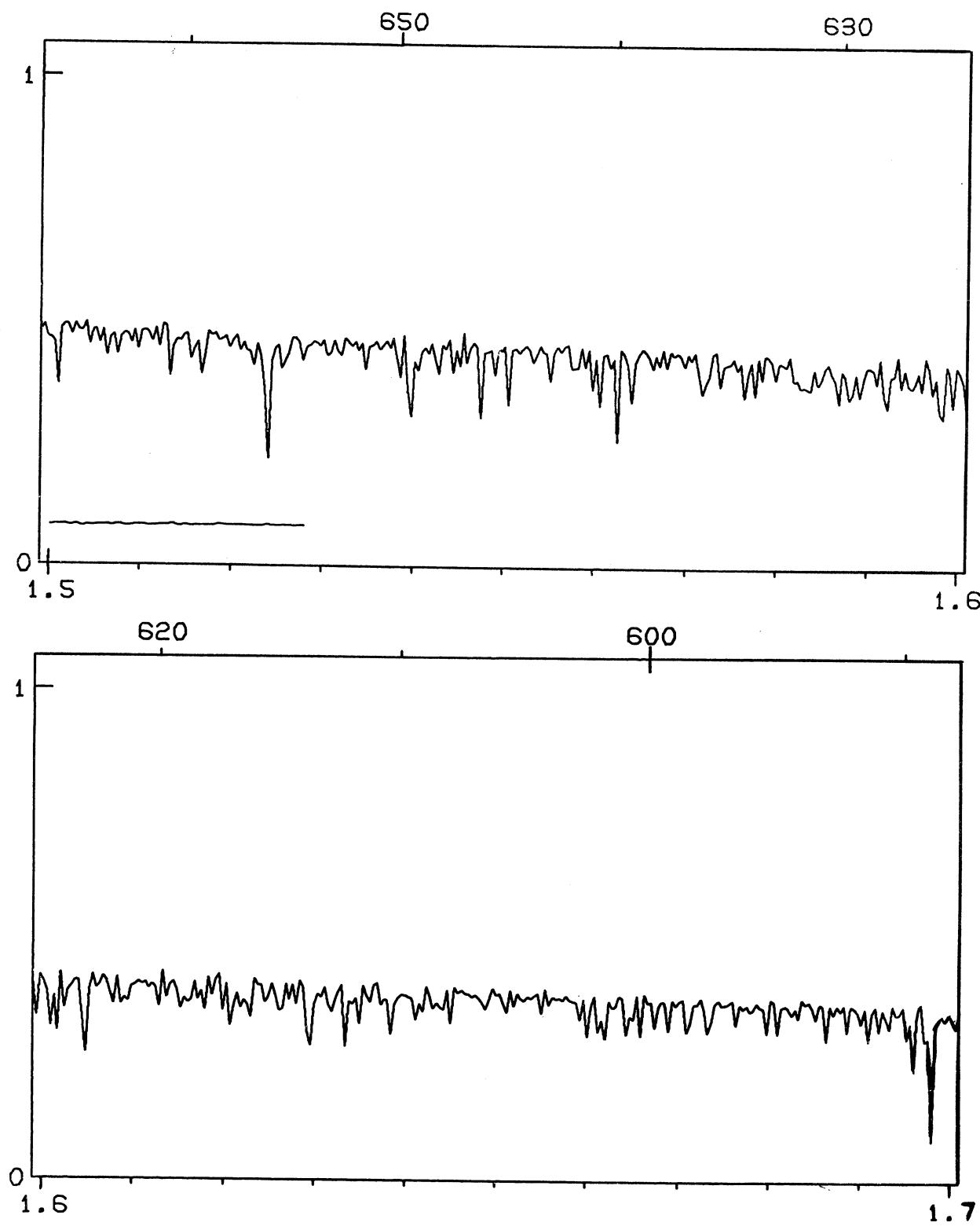
87

FIG. 17. The spectrum of ϵ Cyg.

FIG. 17. The spectrum of ϵ Cyg.

ATLAS OF STELLAR SPECTRA

89

FIG. 17. The spectrum of ϵ Cyg.

90

H. L. JOHNSON

580

560

1

0

1.7

1.8

550

530

1

0

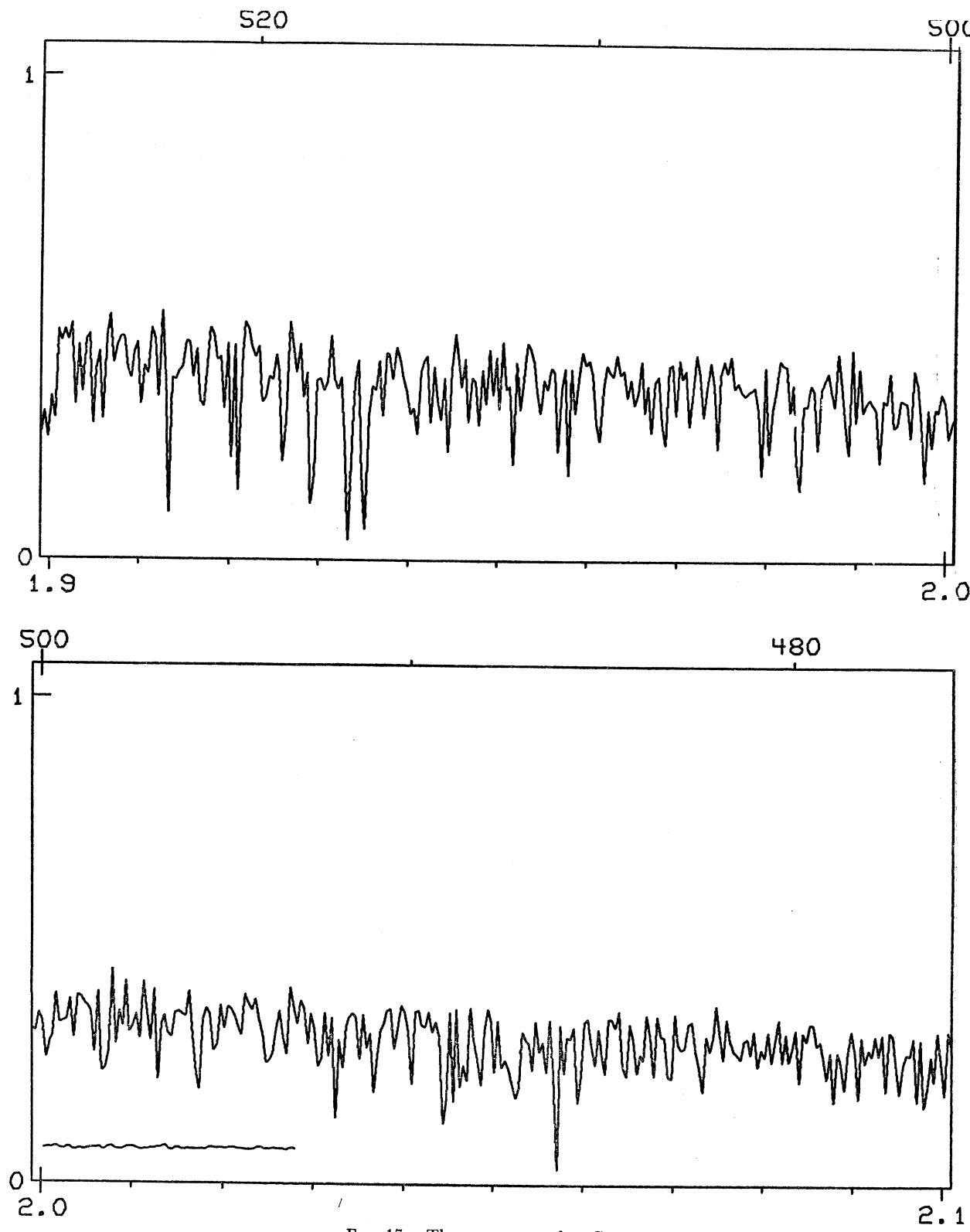
1.8

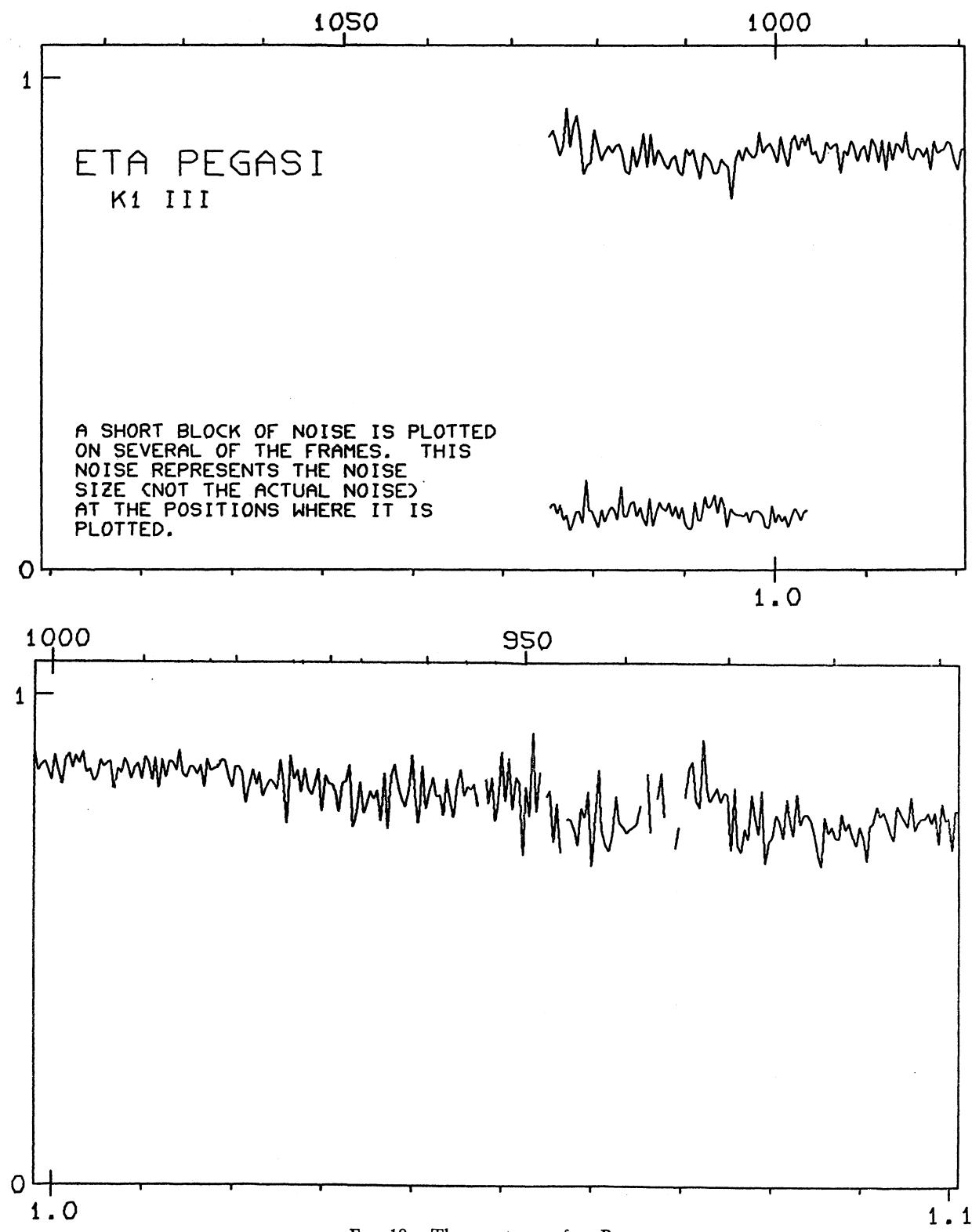
1.9

FIG. 17. The spectrum of ϵ Cyg.

ATLAS OF STELLAR SPECTRA

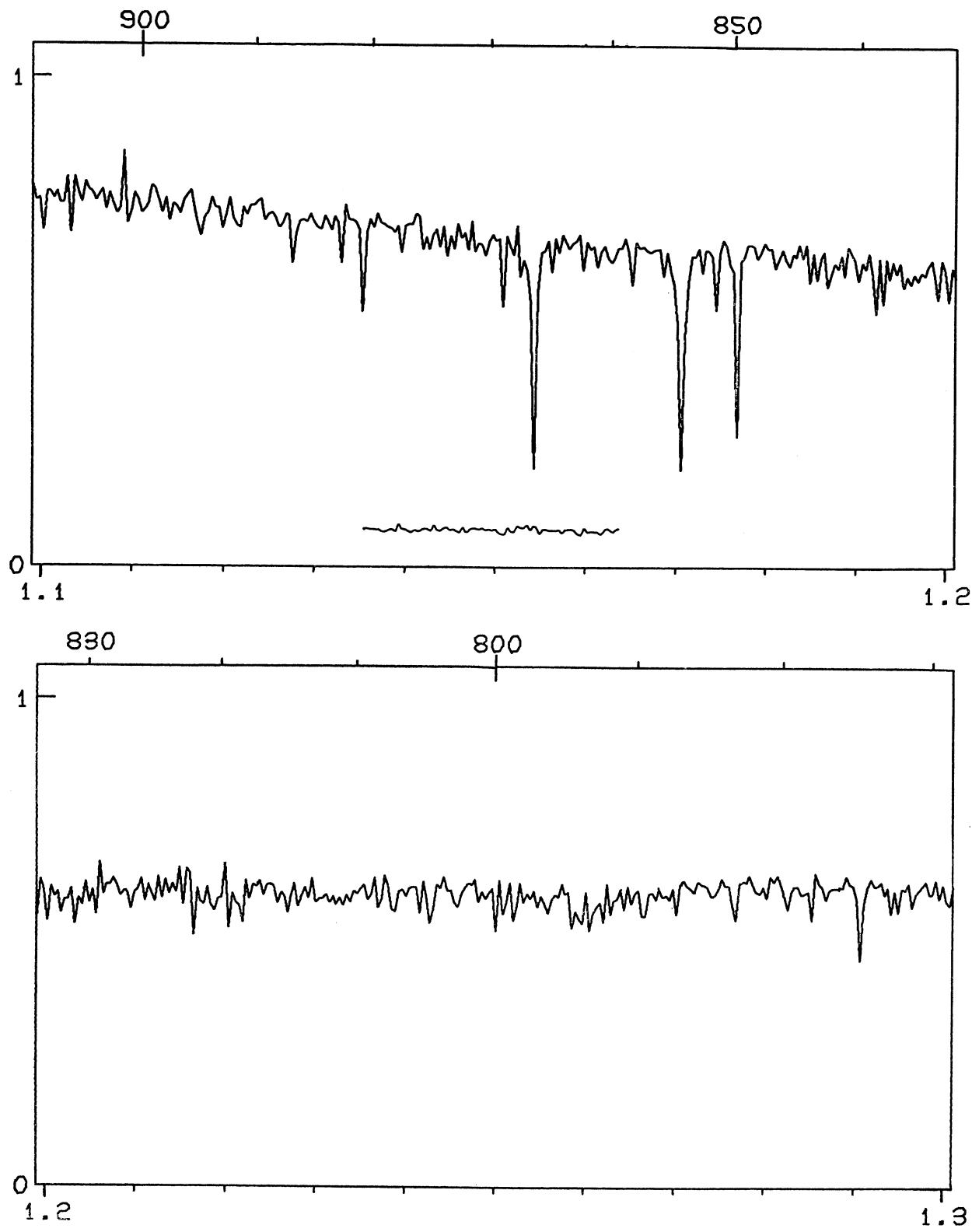
91

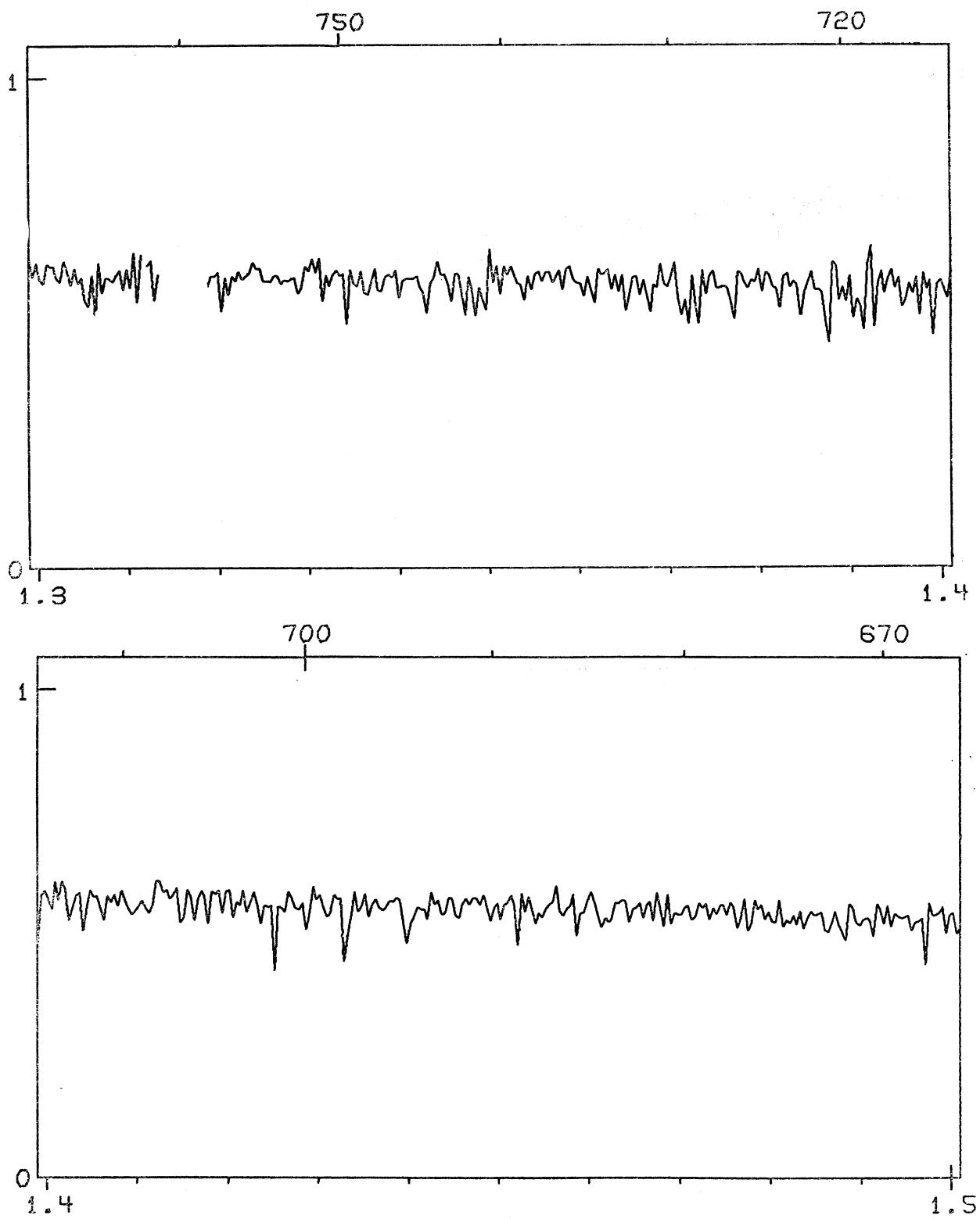
FIG. 17. The spectrum of ϵ Cyg.

FIG. 18. The spectrum of η Peg.

ATLAS OF STELLAR SPECTRA

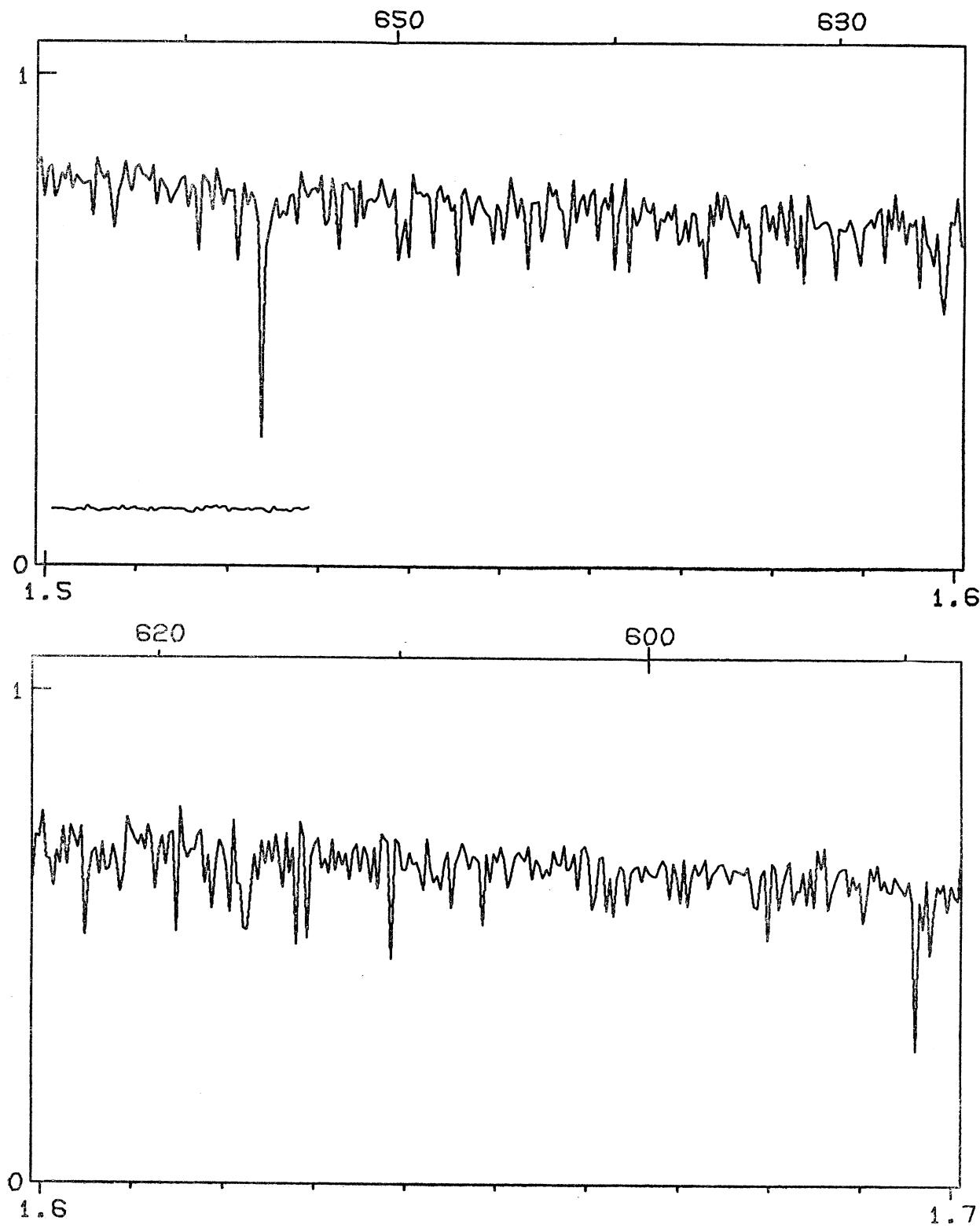
93

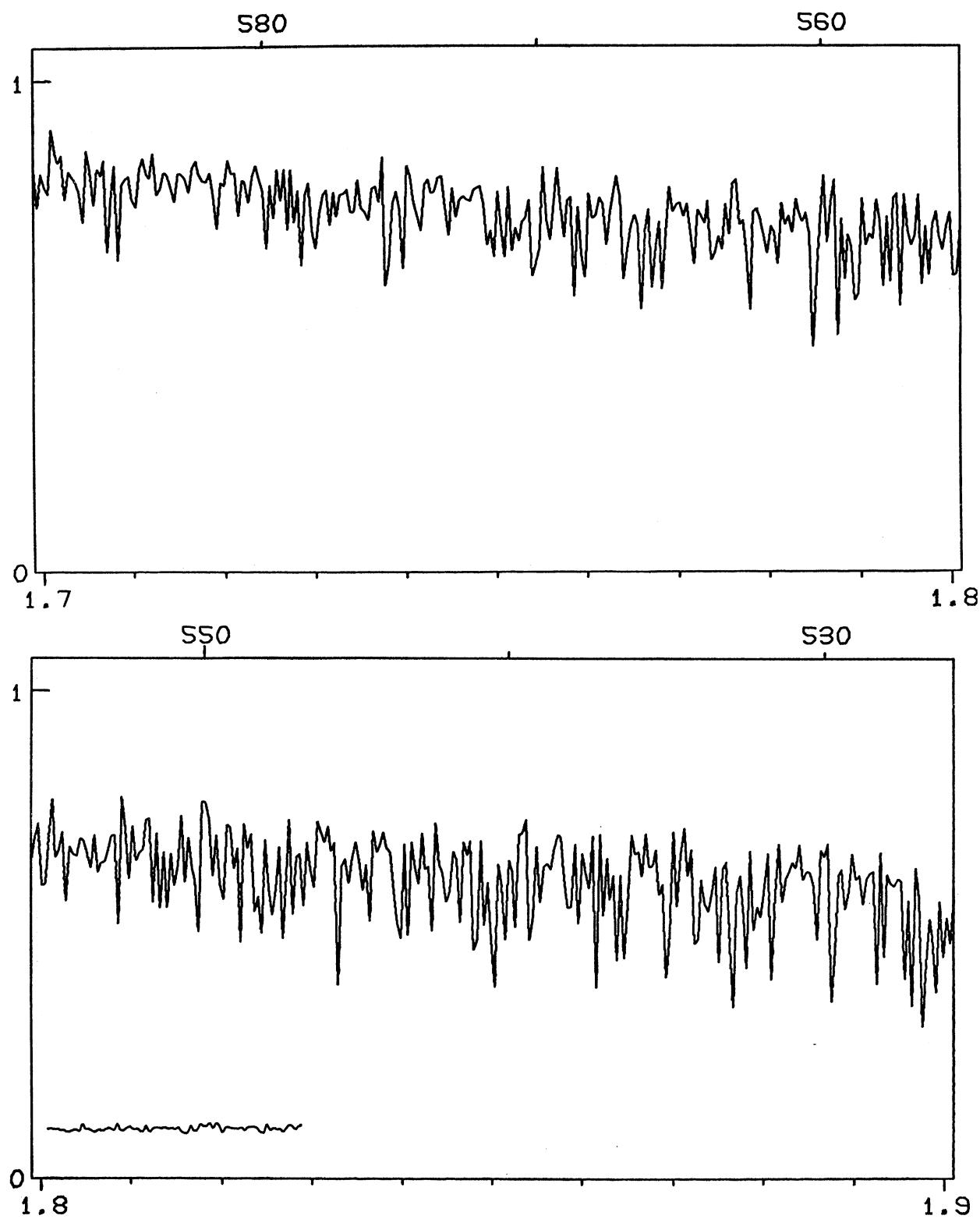
FIG. 18. The spectrum of η Peg.

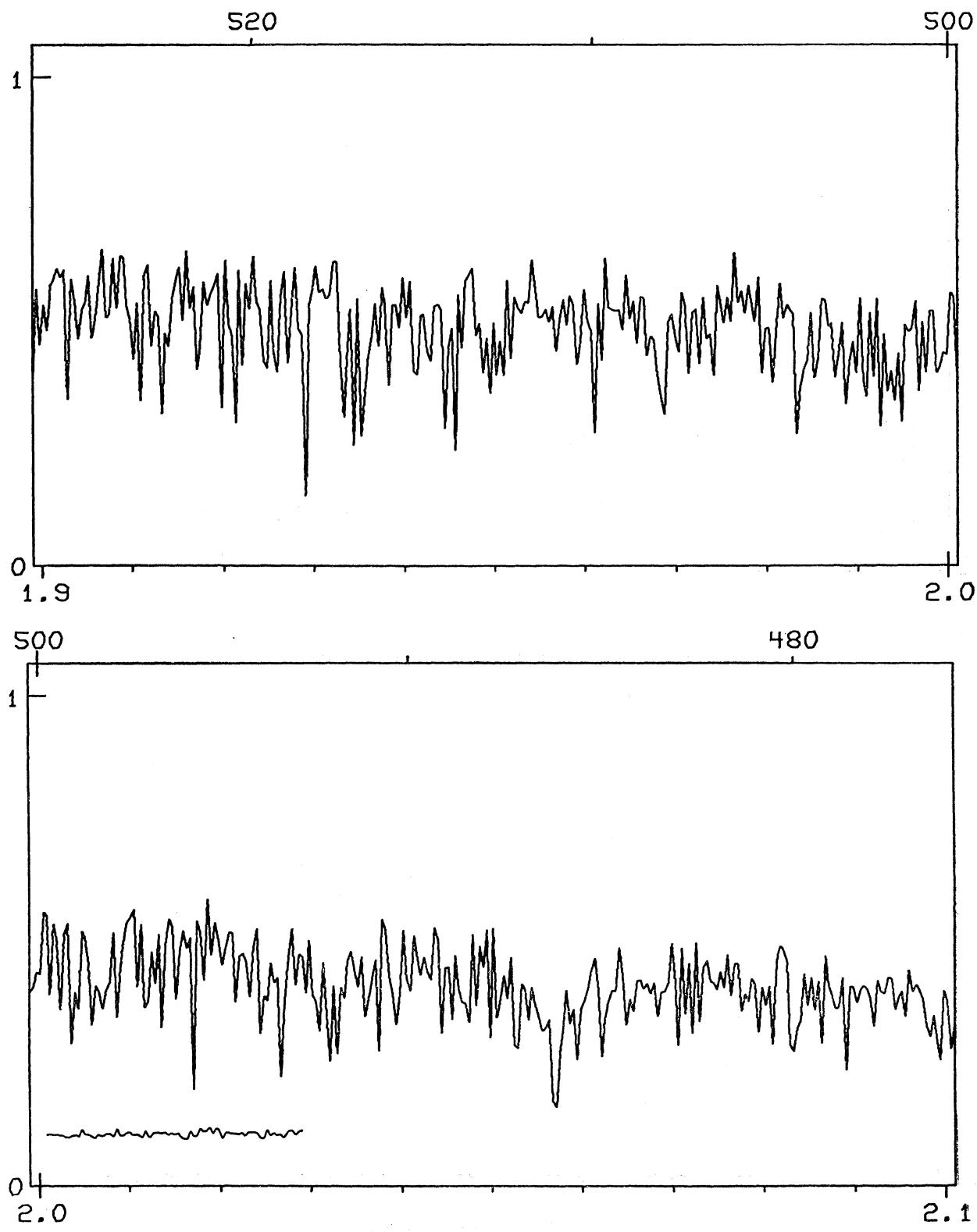
FIG. 18. The spectrum of η Peg.

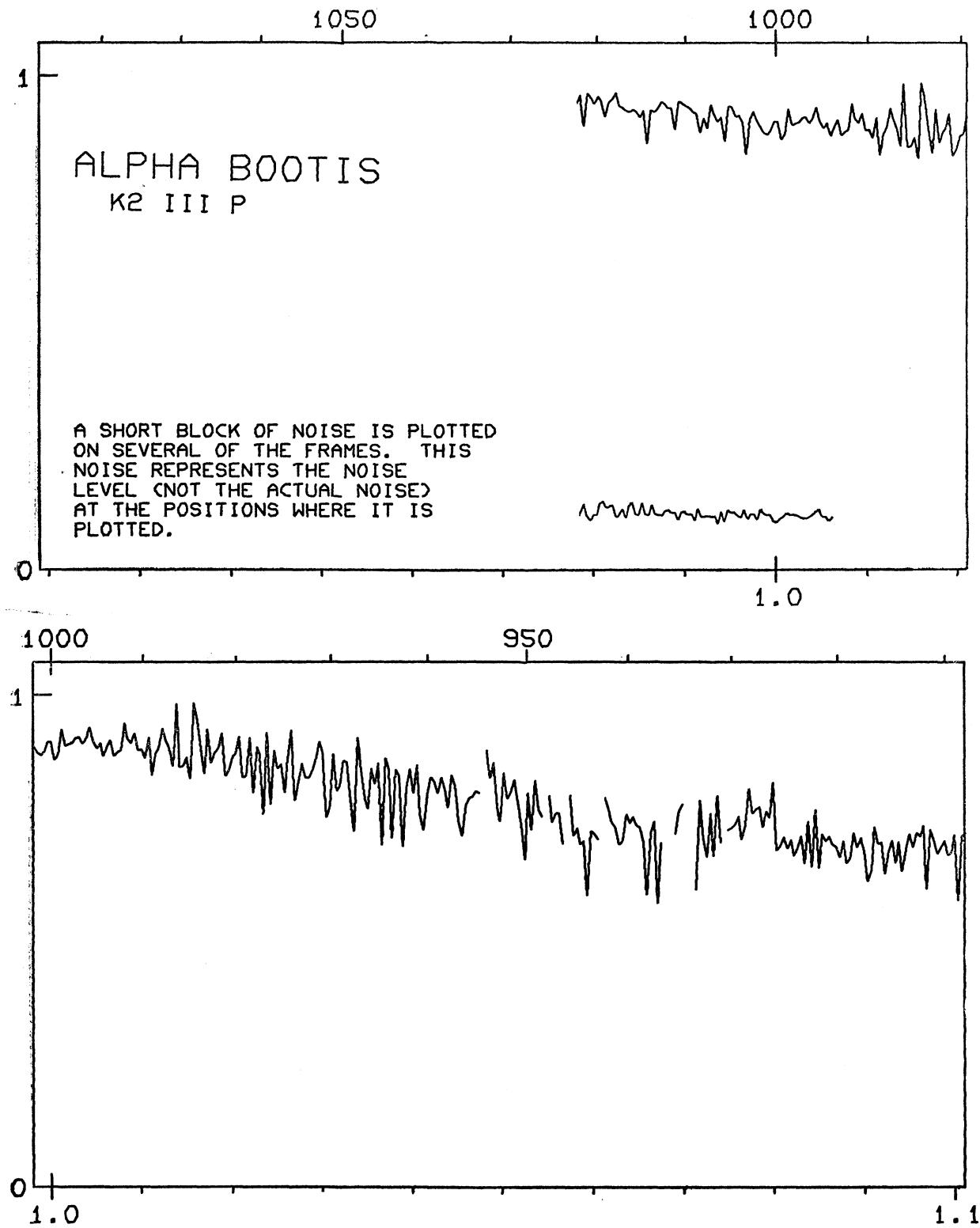
ATLAS OF STELLAR SPECTRA

95

FIG. 18. The spectrum of η Peg.

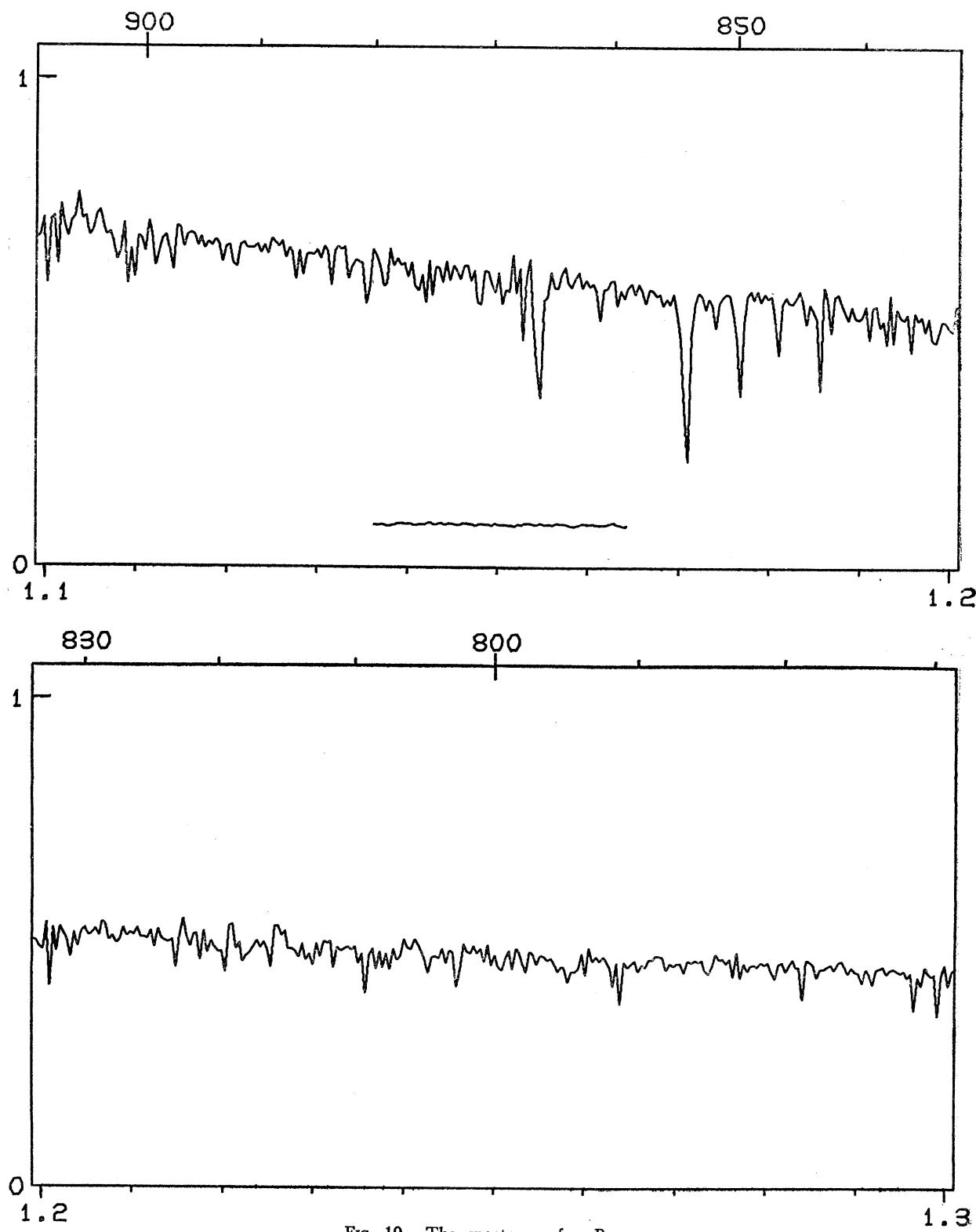
FIG. 18. The spectrum of η Peg.

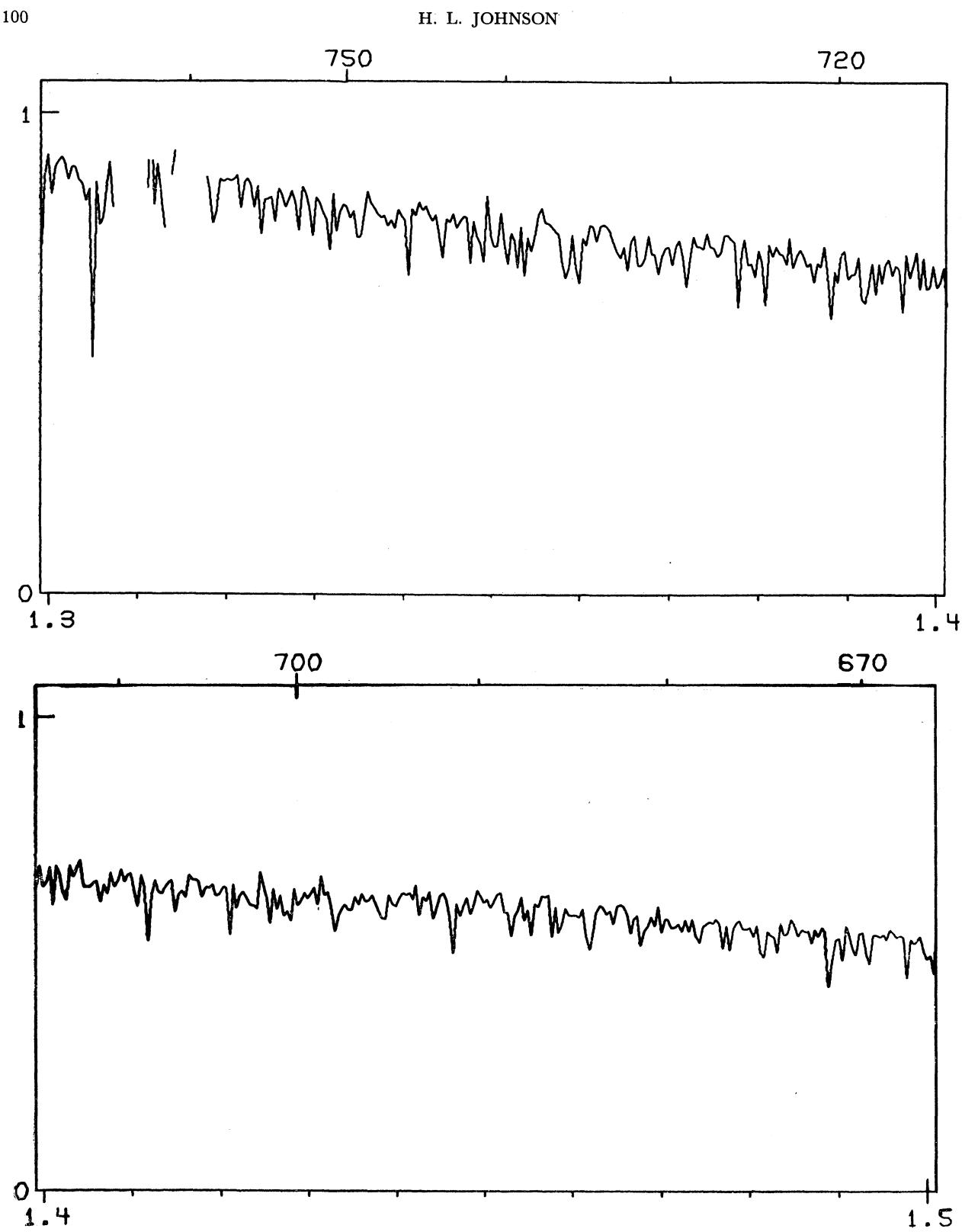
FIG. 18. The spectrum of η Peg.

FIG. 19. The spectrum of α Boo.

ATLAS OF STELLAR SPECTRA

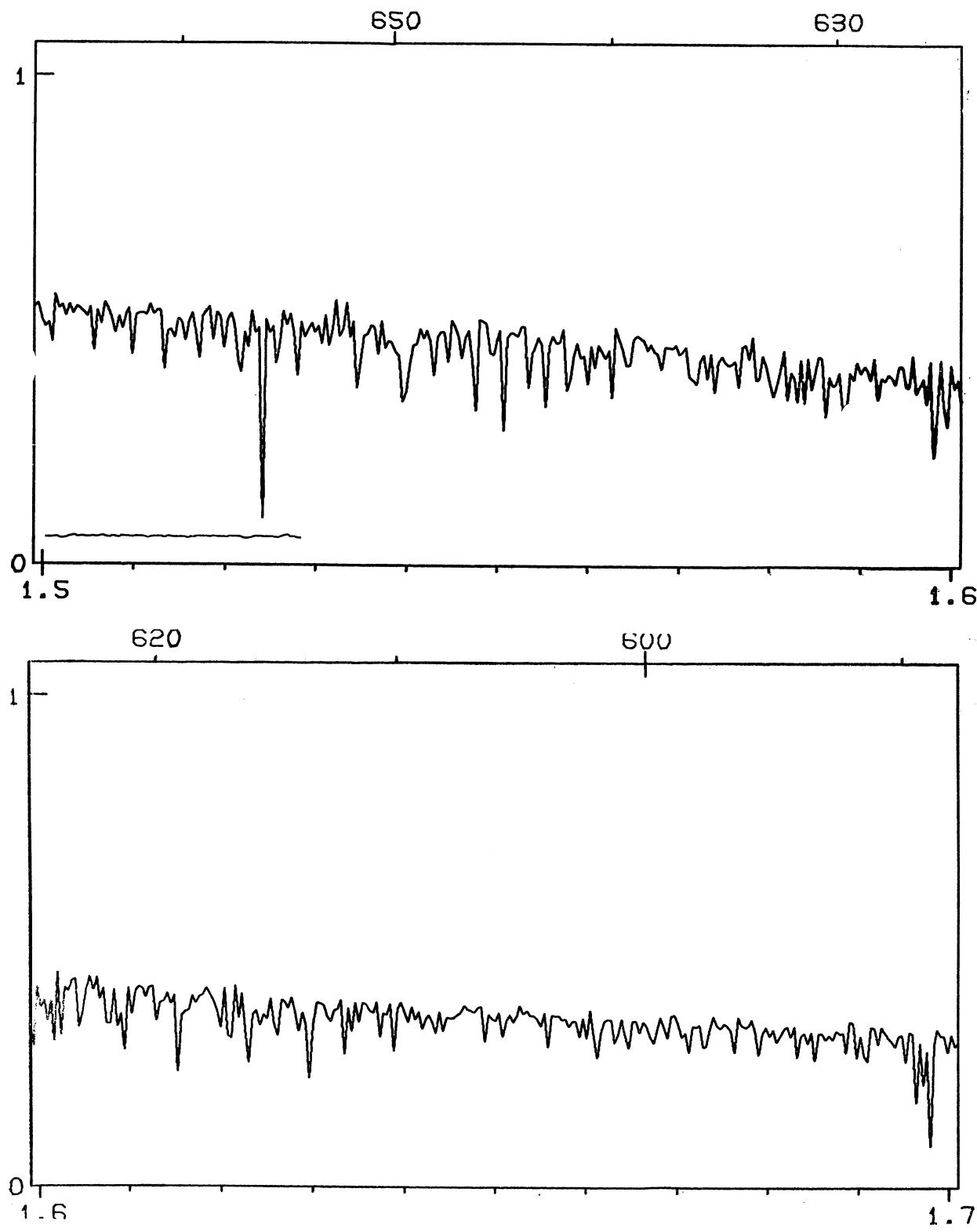
99

FIG. 19. The spectrum of α Boo.

FIG. 19. The spectrum of α Boo.

ATLAS OF STELLAR SPECTRA

101

FIG. 19. The spectrum of α Boo.

102

H. L. JOHNSON

580

560

1

0

1.7

1.8

550

530

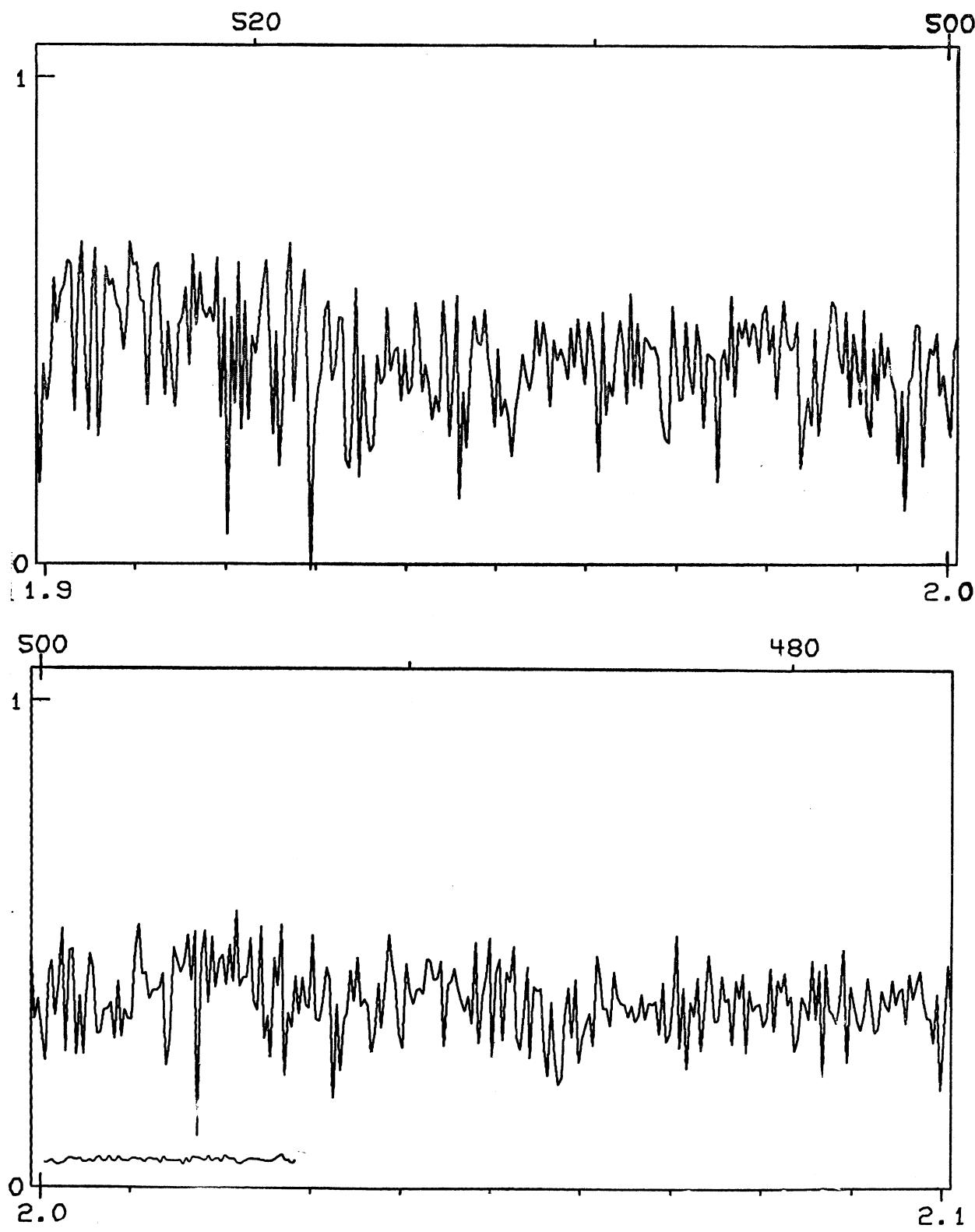
1

0

1.8

1.9

FIG. 19. The spectrum of α Boo.

FIG. 19. The spectrum of α Boo.

104

H. L. JOHNSON

1050

1000

ALPHA SERPENTIS
K2 III

A SHORT BLOCK OF NOISE IS PLOTTED
ON SEVERAL OF THE FRAMES. THIS
NOISE REPRESENTS THE NOISE
SIZE (NOT THE ACTUAL NOISE)
AT THE POSITIONS WHERE IT IS
PLOTTED.

0

1.0

1000

950

1

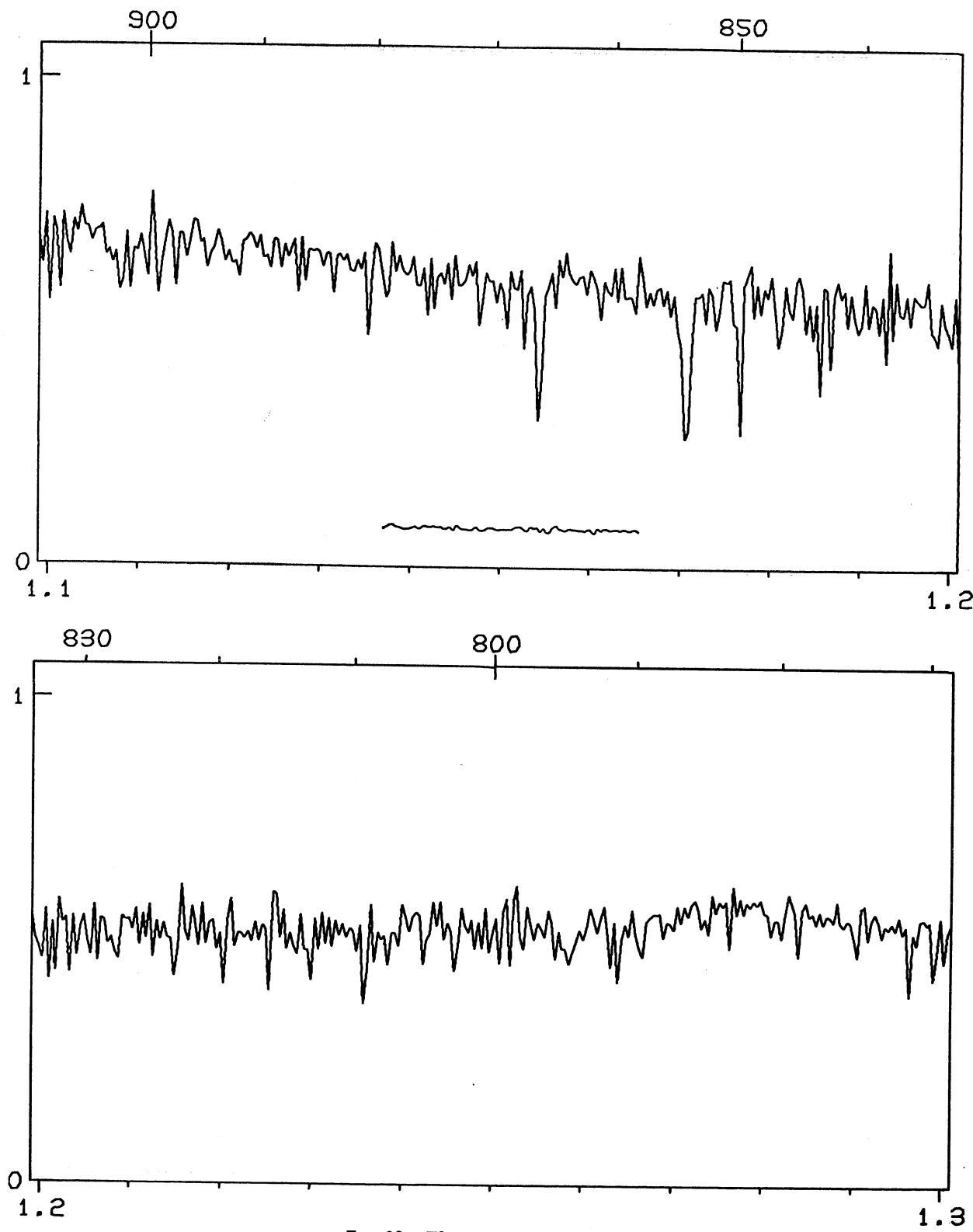
1.0

1.1

FIG. 20. The spectrum of α Ser.

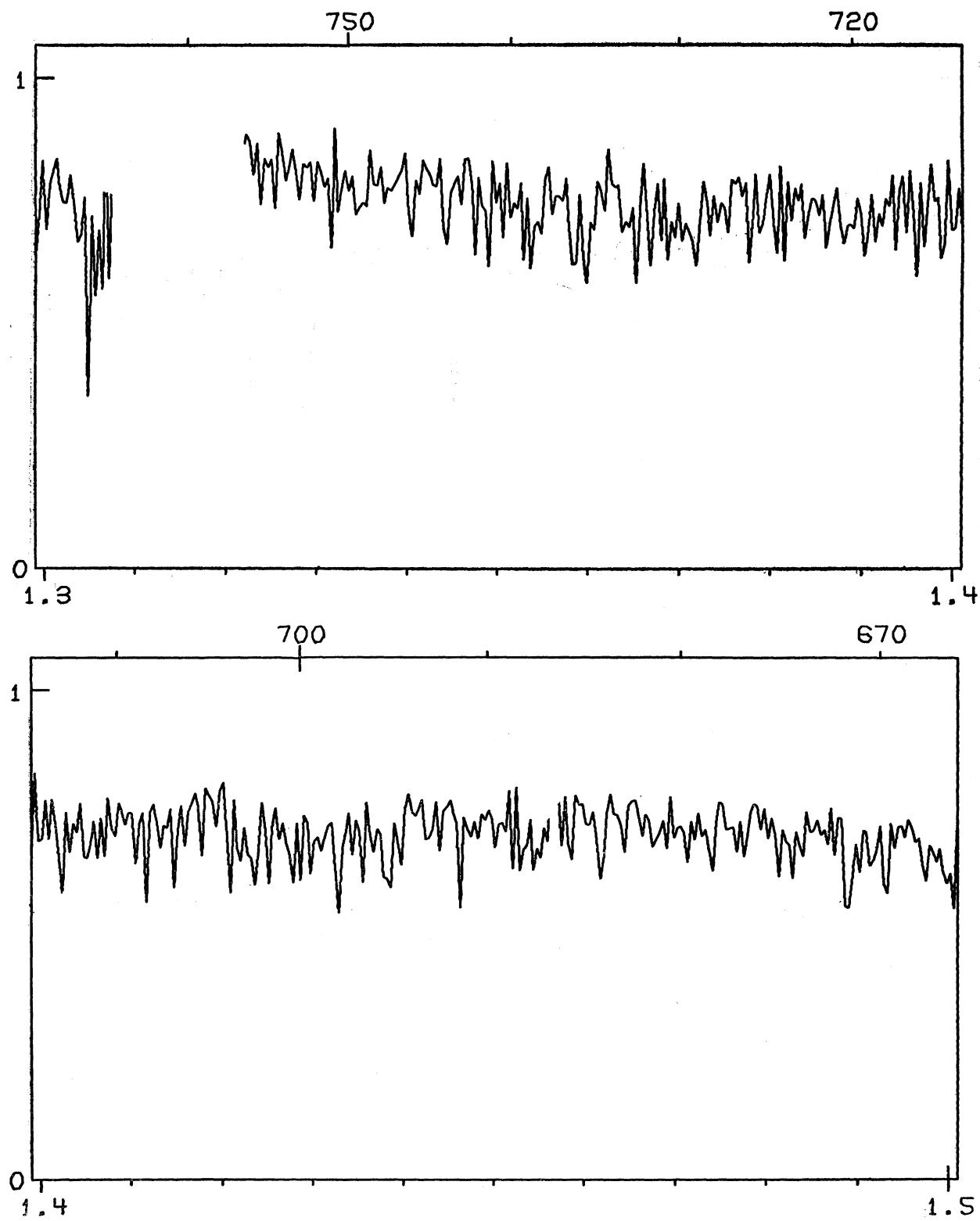
ATLAS OF STELLAR SPECTRA

105

FIG. 20. The spectrum of α Ser.

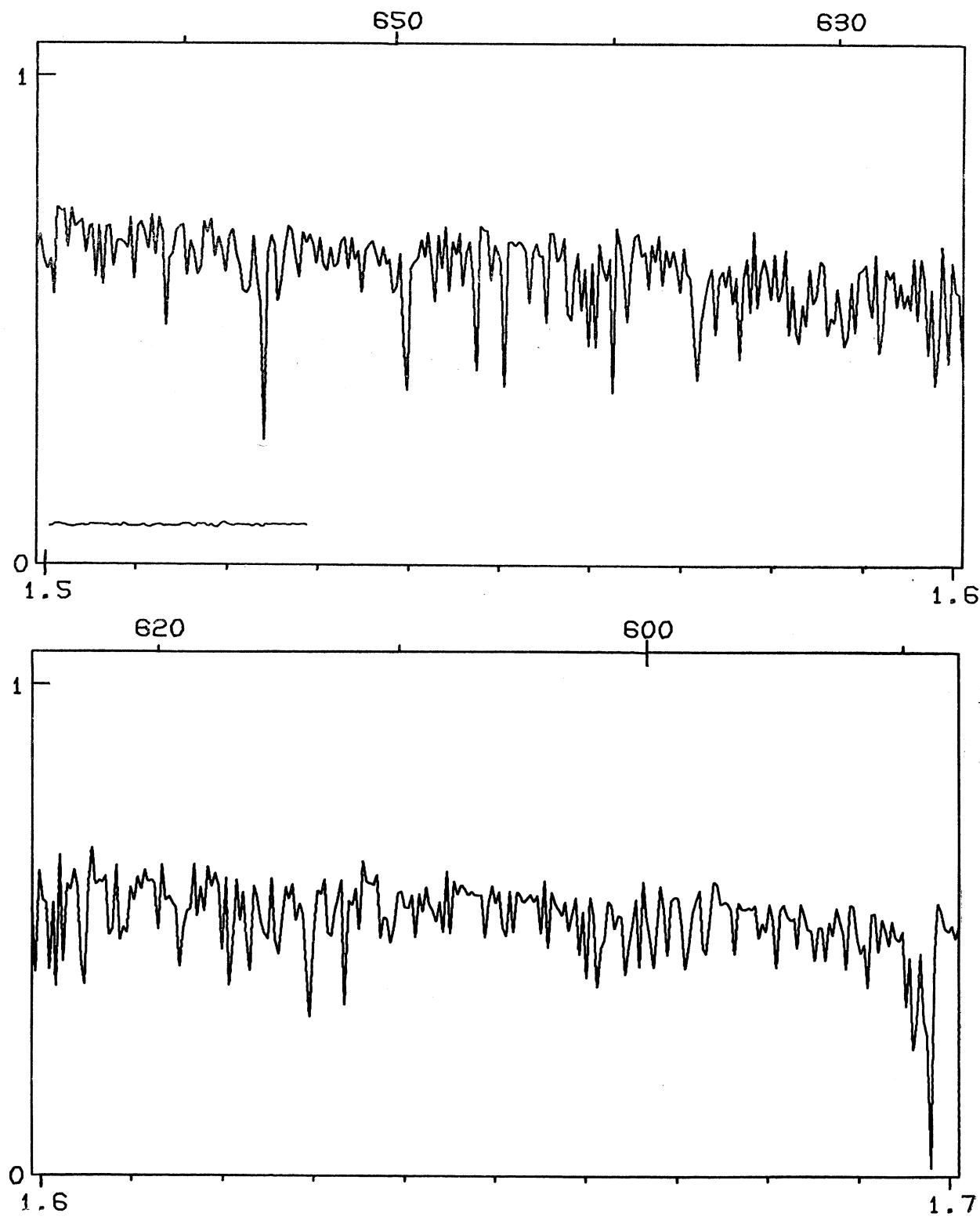
106

H. L. JOHNSON

FIG. 20. The spectrum of α Ser.

ATLAS OF STELLAR SPECTRA

107

FIG. 20. The spectrum of α Ser.

108

H. L. JOHNSON

580

560

1

0

1.7

1.8

550

530

1

0

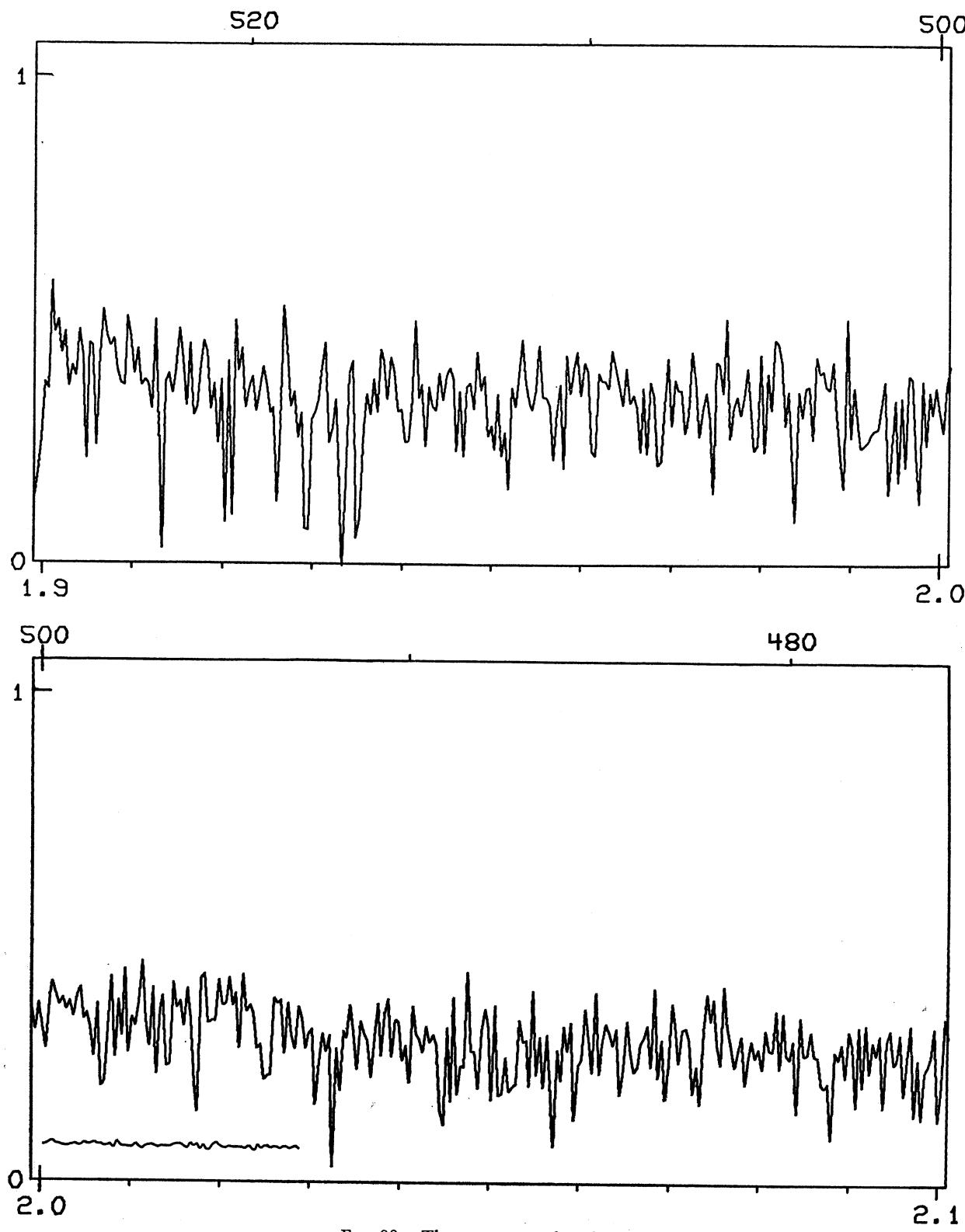
1.8

1.9

FIG. 20. The spectrum of α Ser.

ATLAS OF STELLAR SPECTRA

109

FIG. 20. The spectrum of α Ser.

110

H. L. JOHNSON

1050

1000

GAMMA-1 ANDROMEDAE
K3 II

A SHORT BLOCK OF NOISE IS PLOTTED
ON SEVERAL OF THE FRAMES. THIS
NOISE REPRESENTS THE NOISE
SIZE (NOT THE ACTUAL NOISE)
AT THE POSITIONS WHERE IT IS
PLOTTED.

0

1.0

1000

950

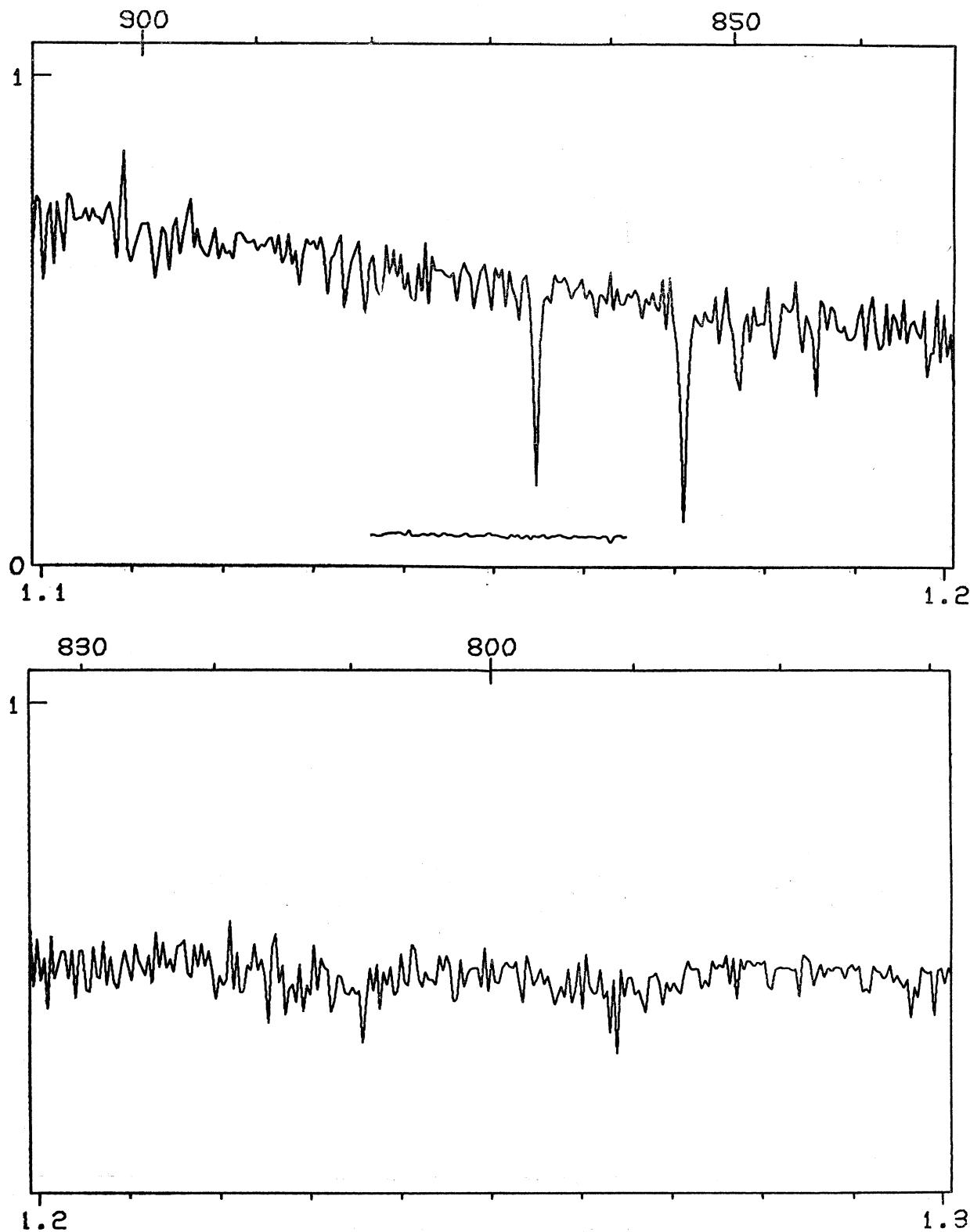
1.0

1.1

FIG. 21. The spectrum of γ^1 And.

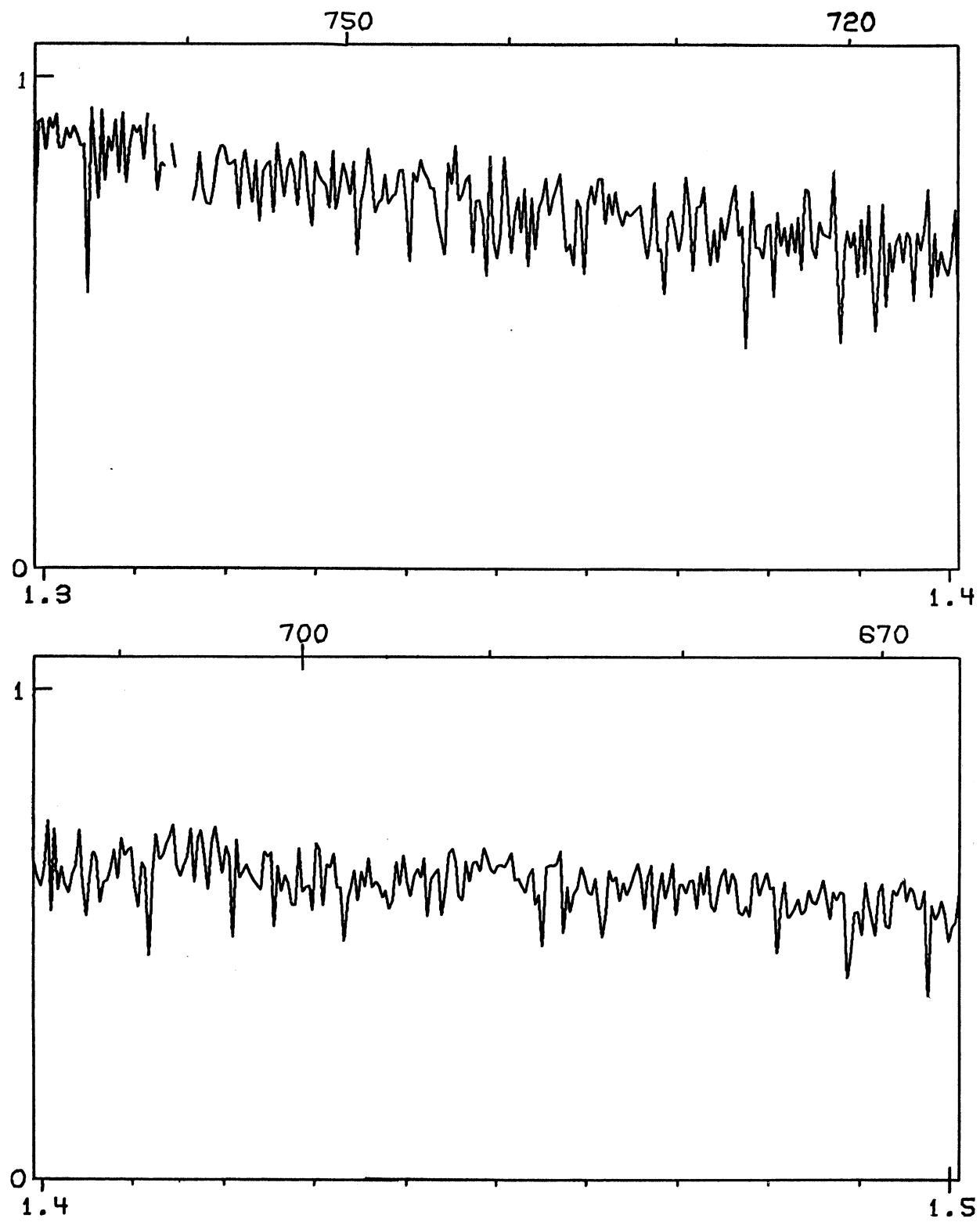
ATLAS OF STELLAR SPECTRA

111

FIG. 21. The spectrum of γ^1 And.

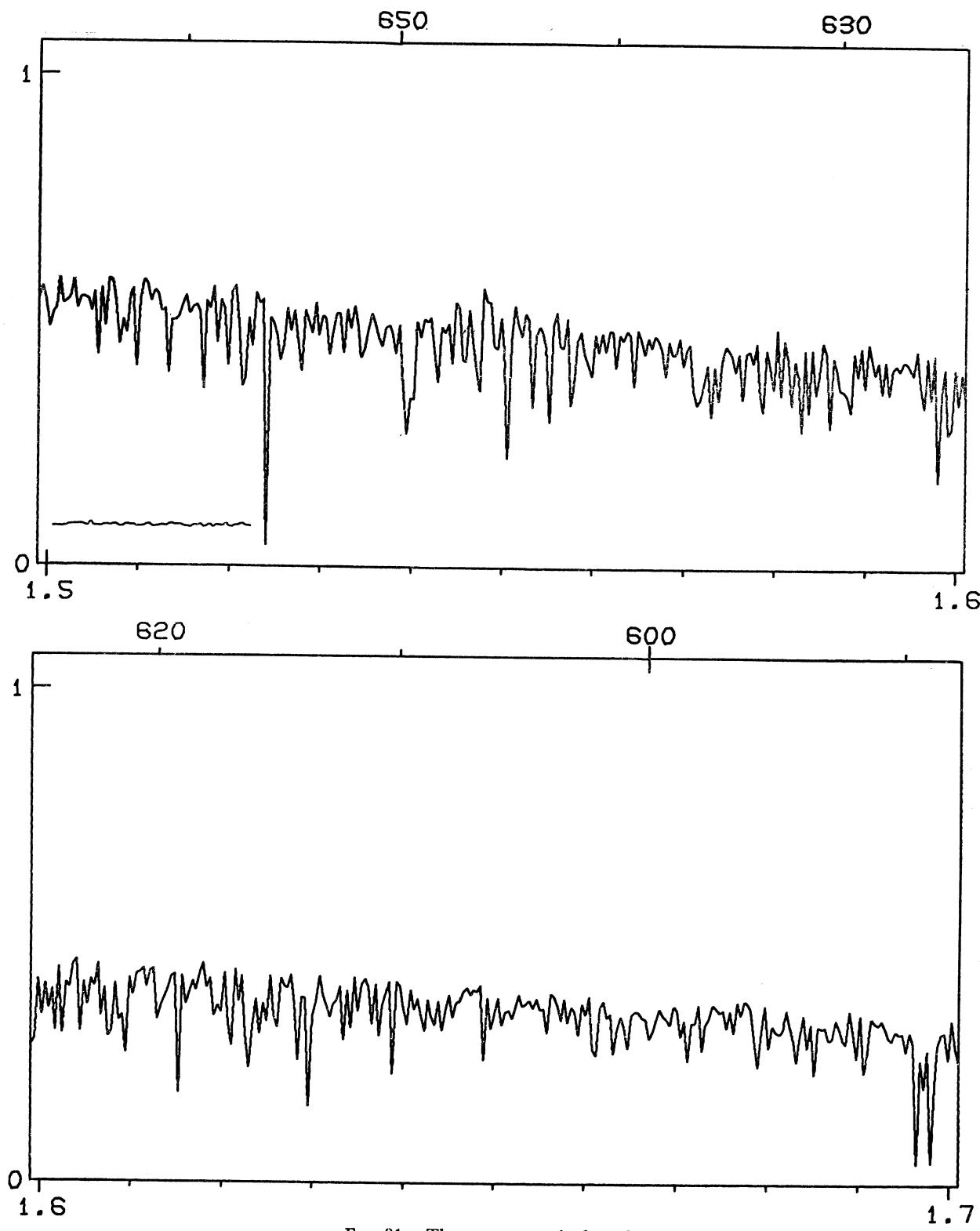
112

H. L. JOHNSON

FIG. 21. The spectrum of γ^1 And.

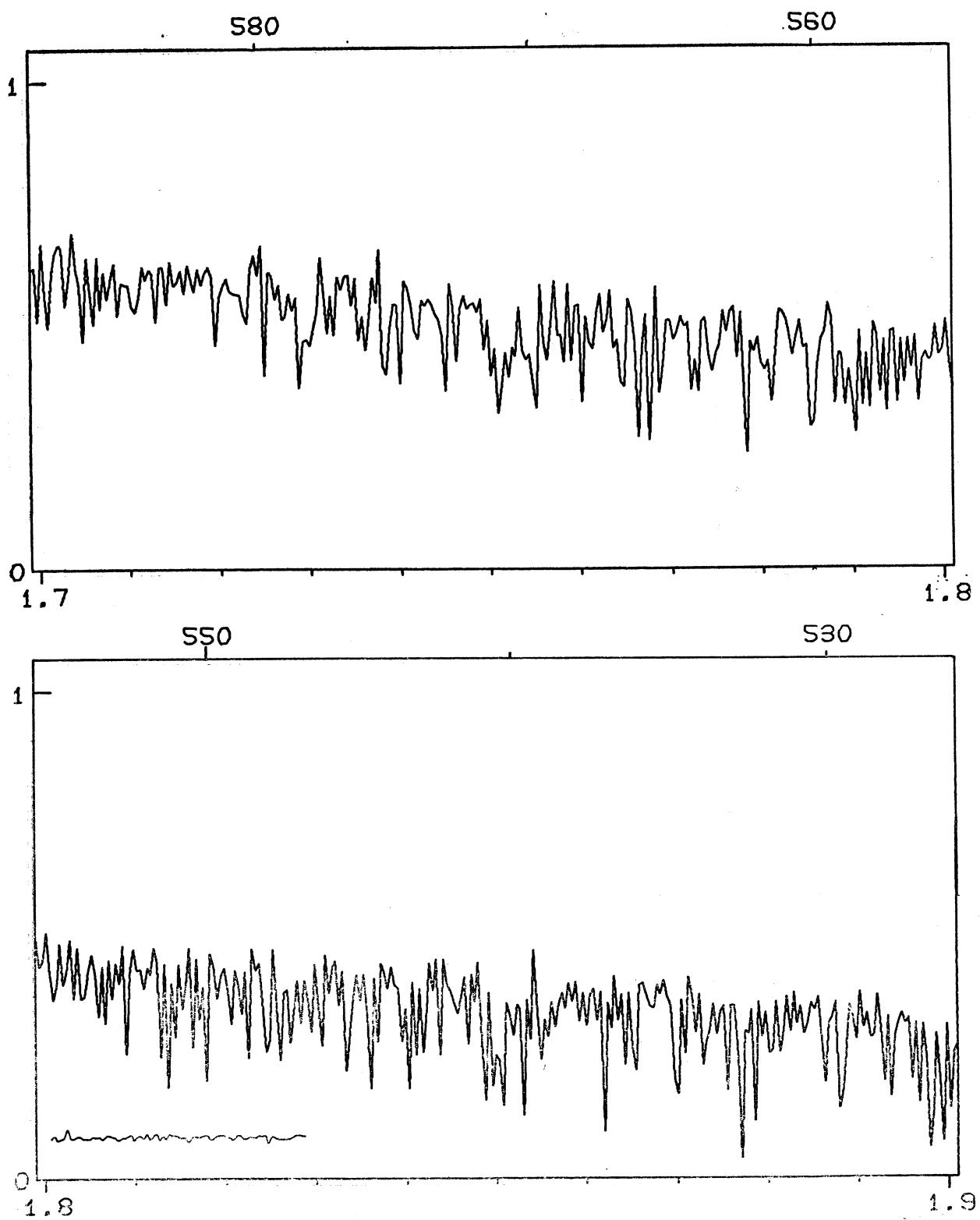
ATLAS OF STELLAR SPECTRA

113

FIG. 21. The spectrum of γ^1 And.

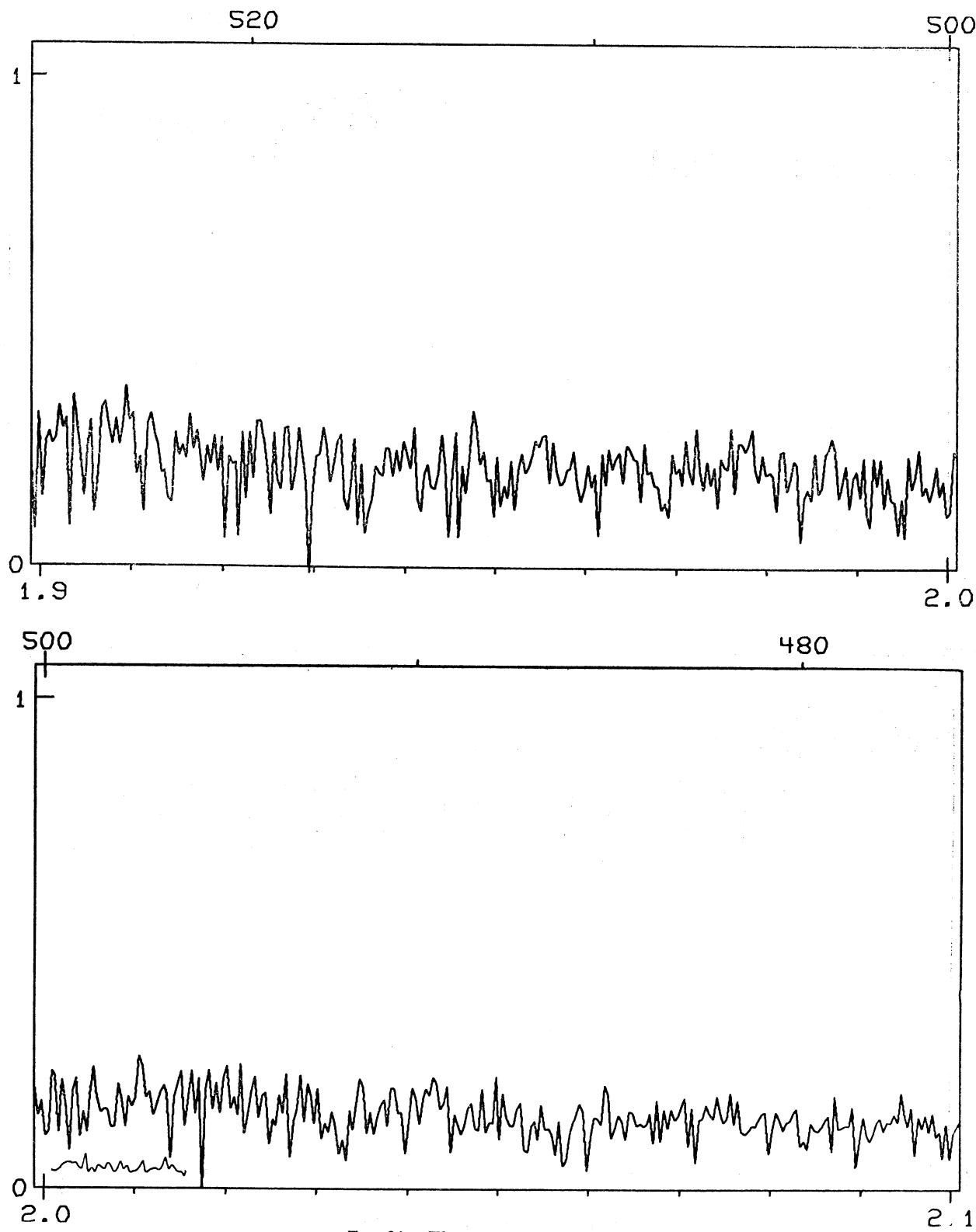
114

H. L. JOHNSON

FIG. 21. The spectrum of γ^1 And.

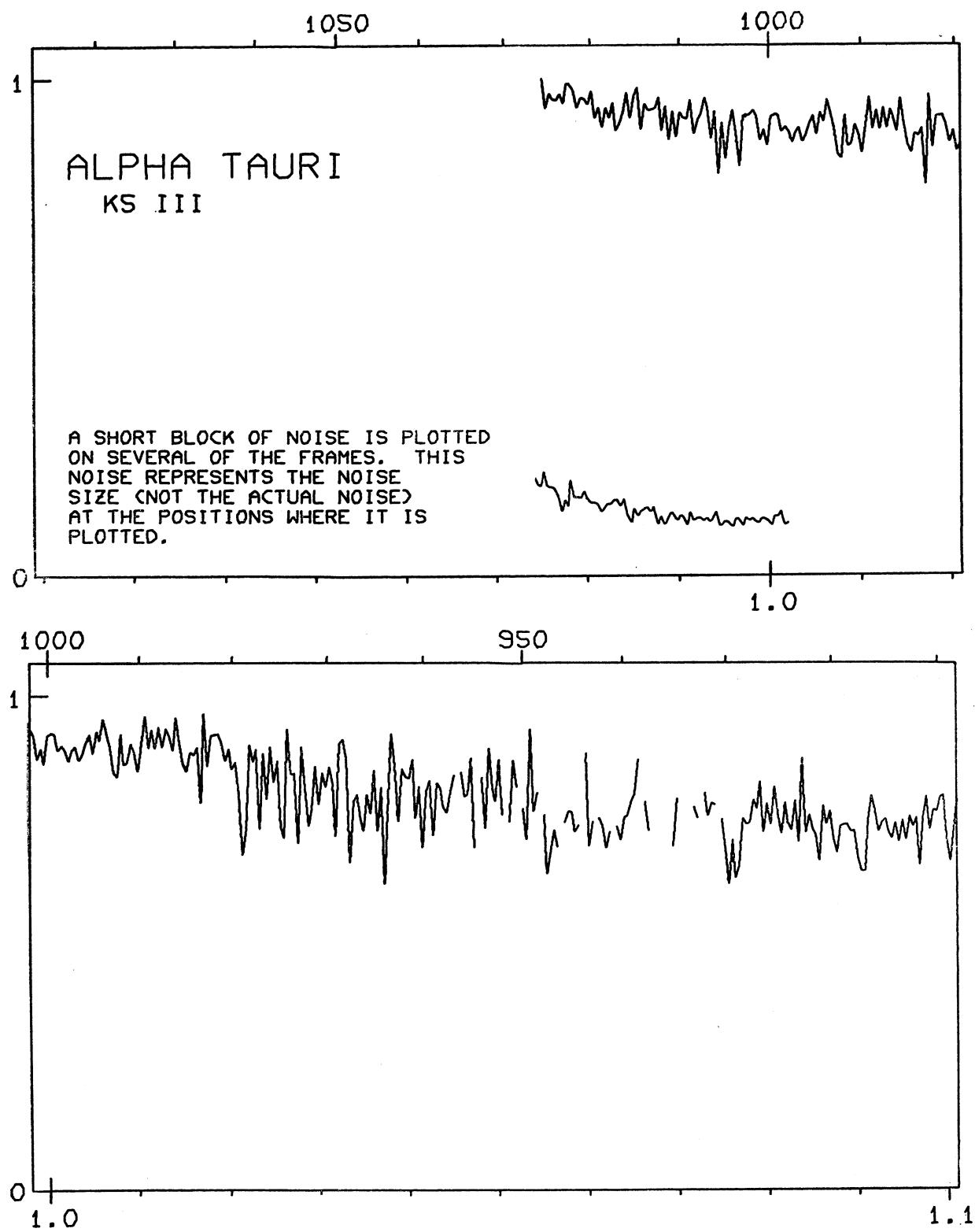
ATLAS OF STELLAR SPECTRA

115

FIG. 21. The spectrum of γ^1 And.

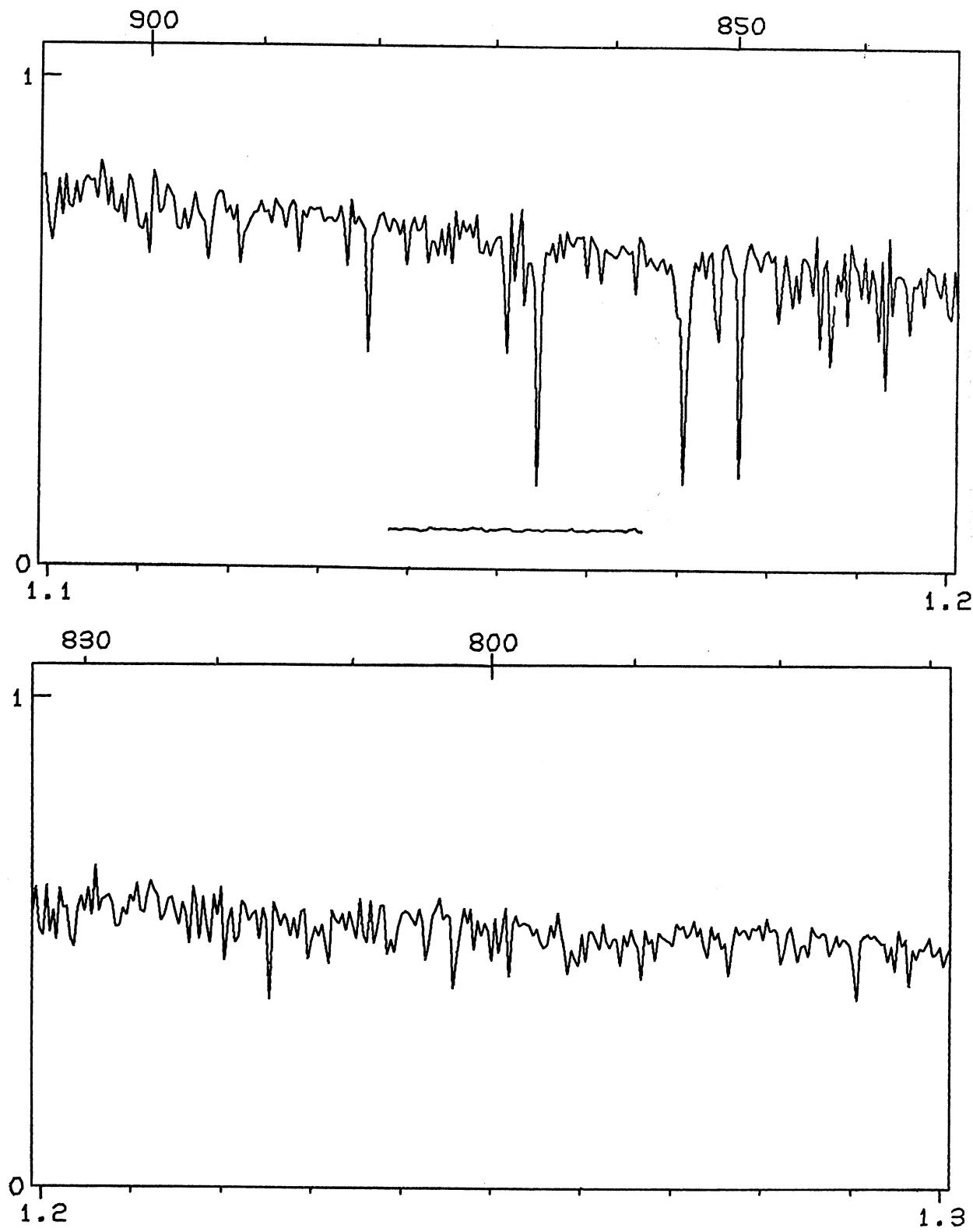
116

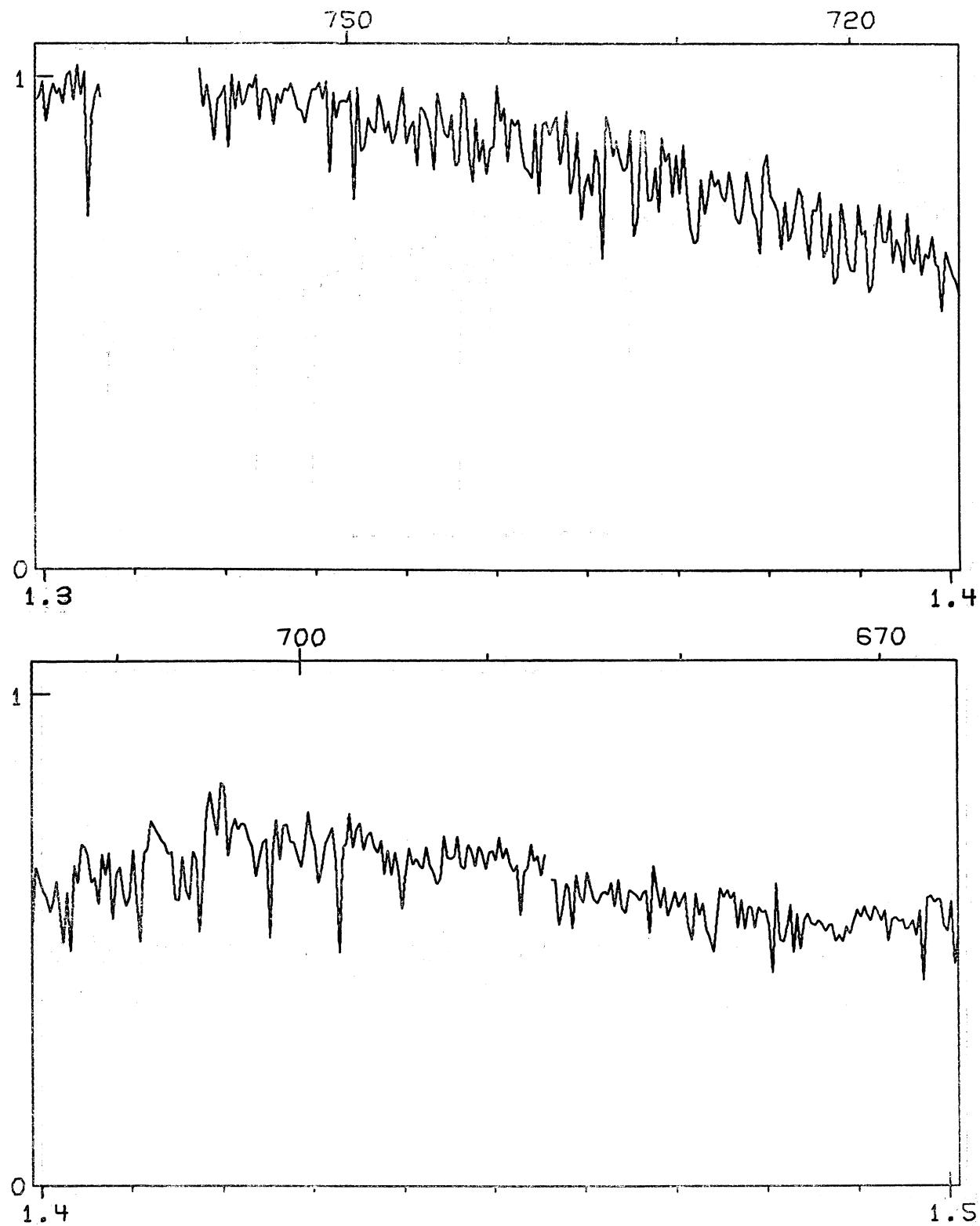
H. L. JOHNSON

FIG. 22. The spectrum of α Tau.

ATLAS OF STELLAR SPECTRA

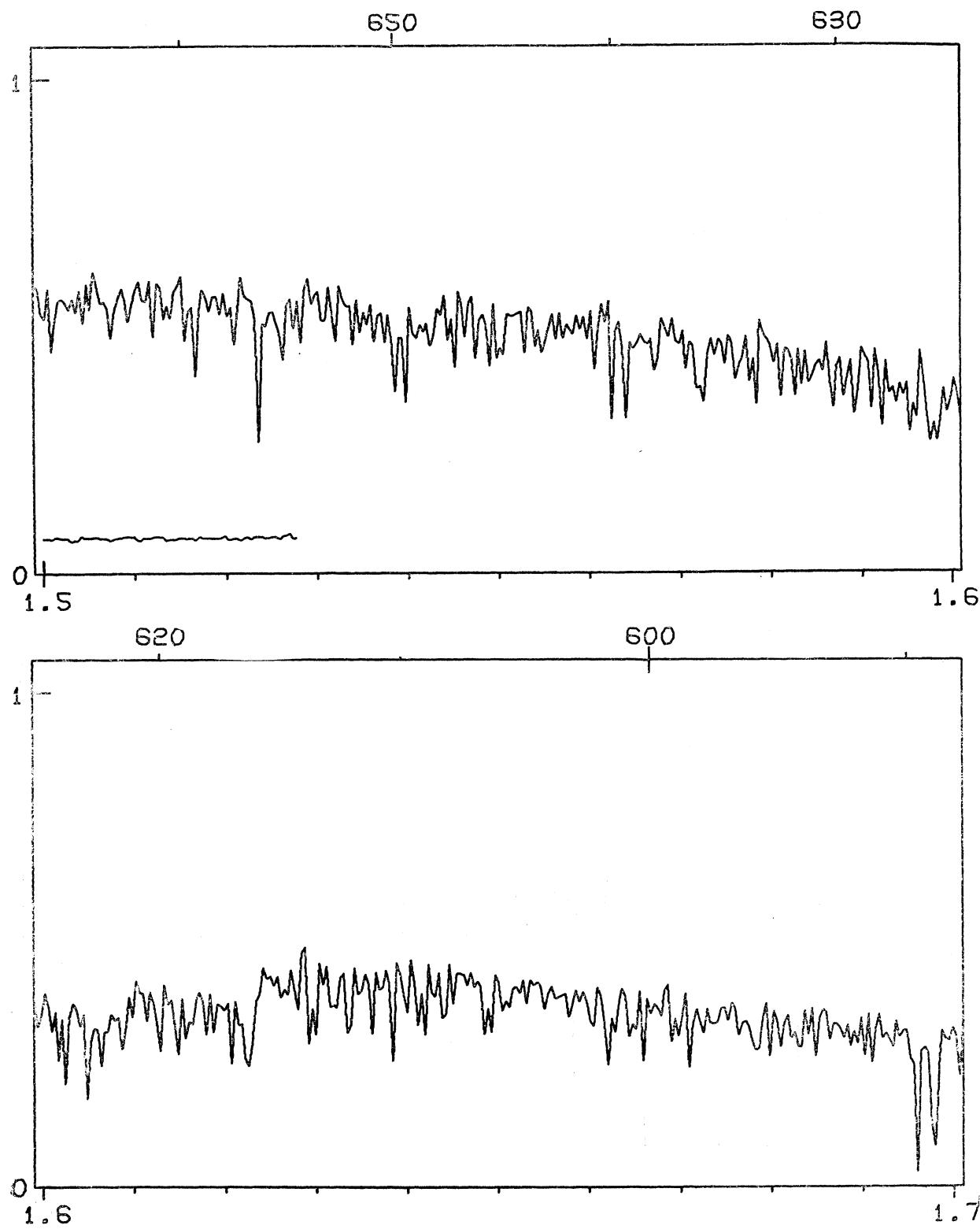
117

FIG. 22. The spectrum of α Tau.

FIG. 22. The spectrum of α Tau.

ATLAS OF STELLAR SPECTRA

119

FIG. 22. The spectrum of α Tau.

120

H. L. JOHNSON

580

560

1

0

1.7

1.8

550

530

1

0

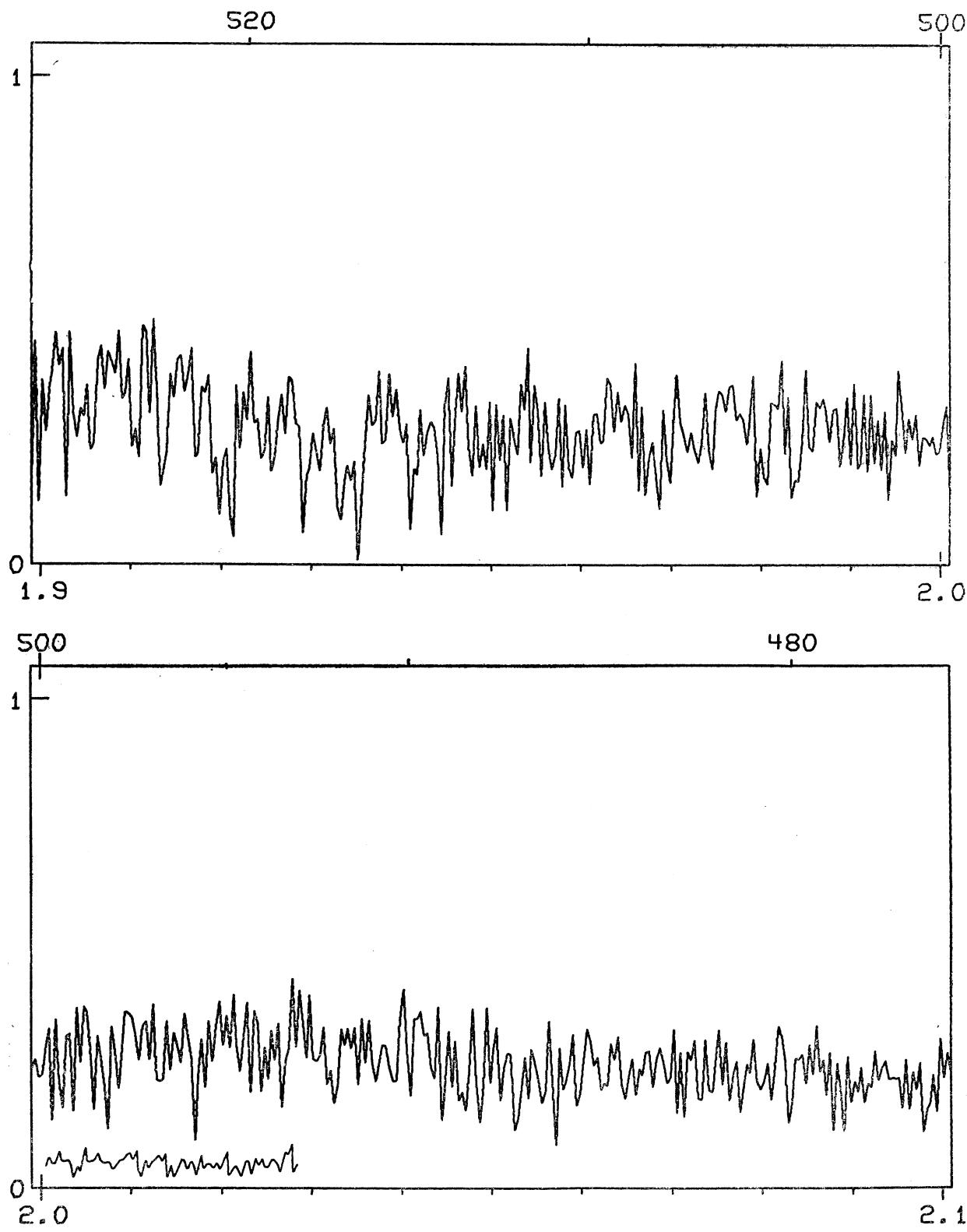
1.8

1.9

FIG. 22. The spectrum of α Tau.

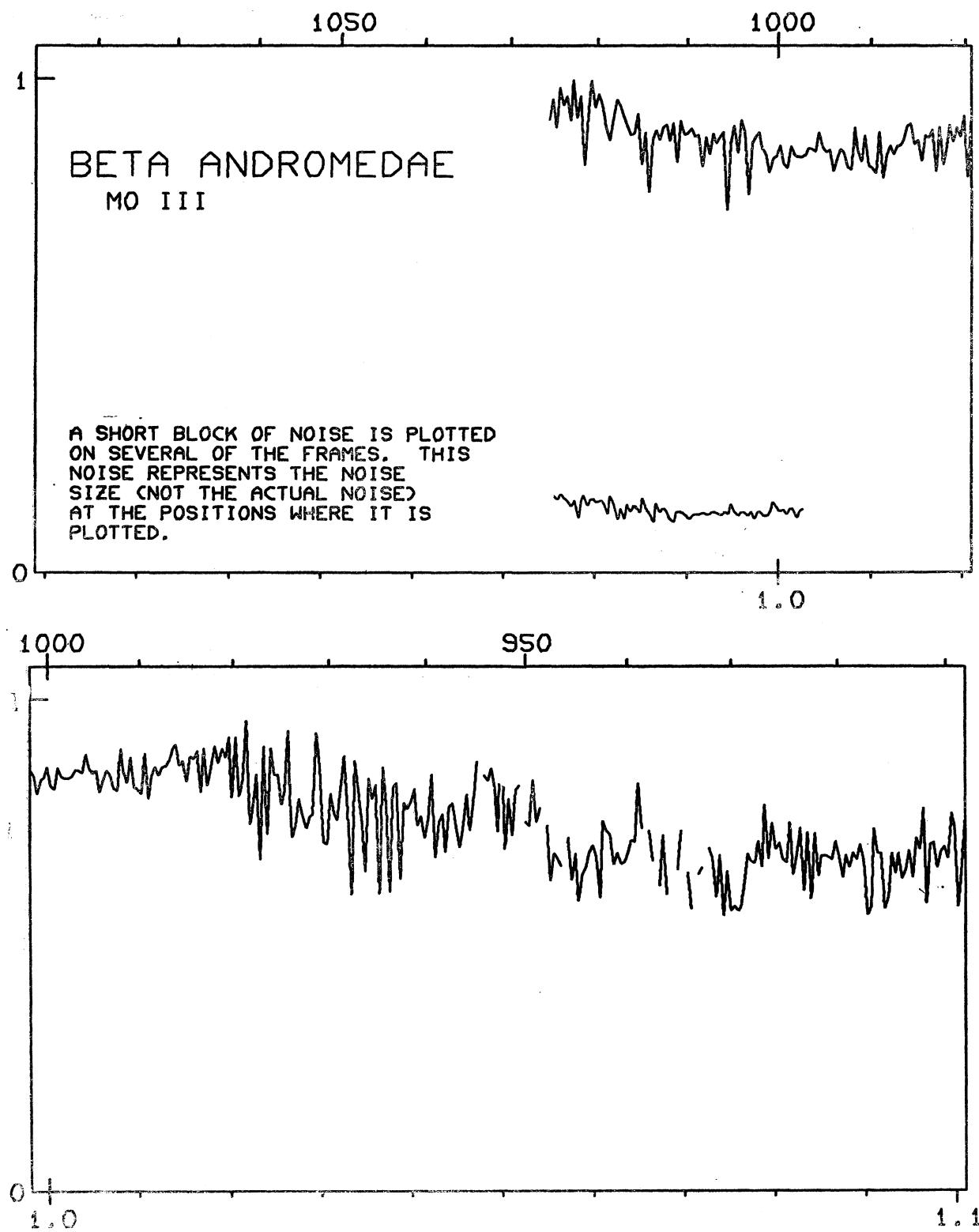
ATLAS OF STELLAR SPECTRA

121

FIG. 22. The spectrum of α Tau.

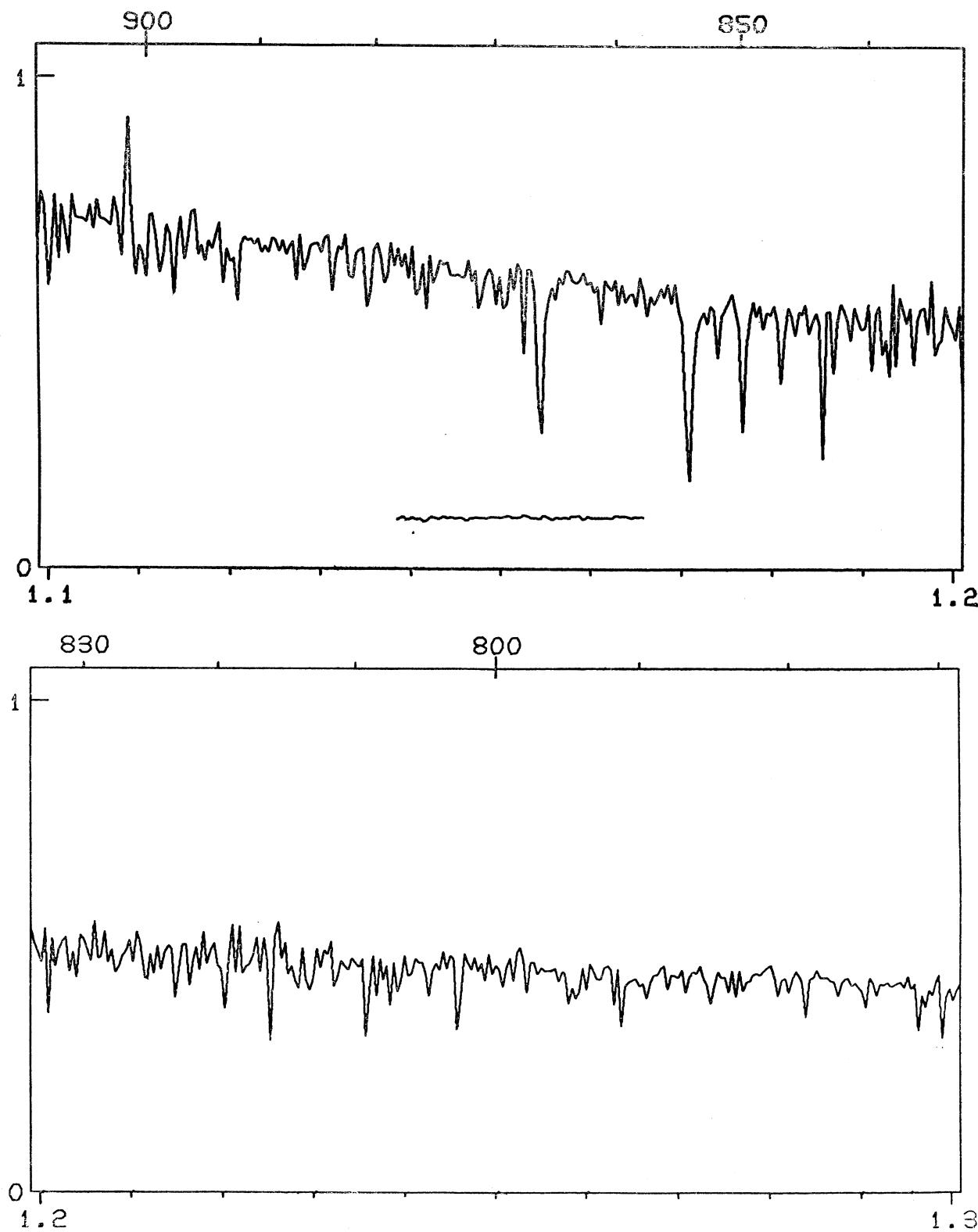
122

H. L. JOHNSON

FIG. 23. The spectrum of β And.

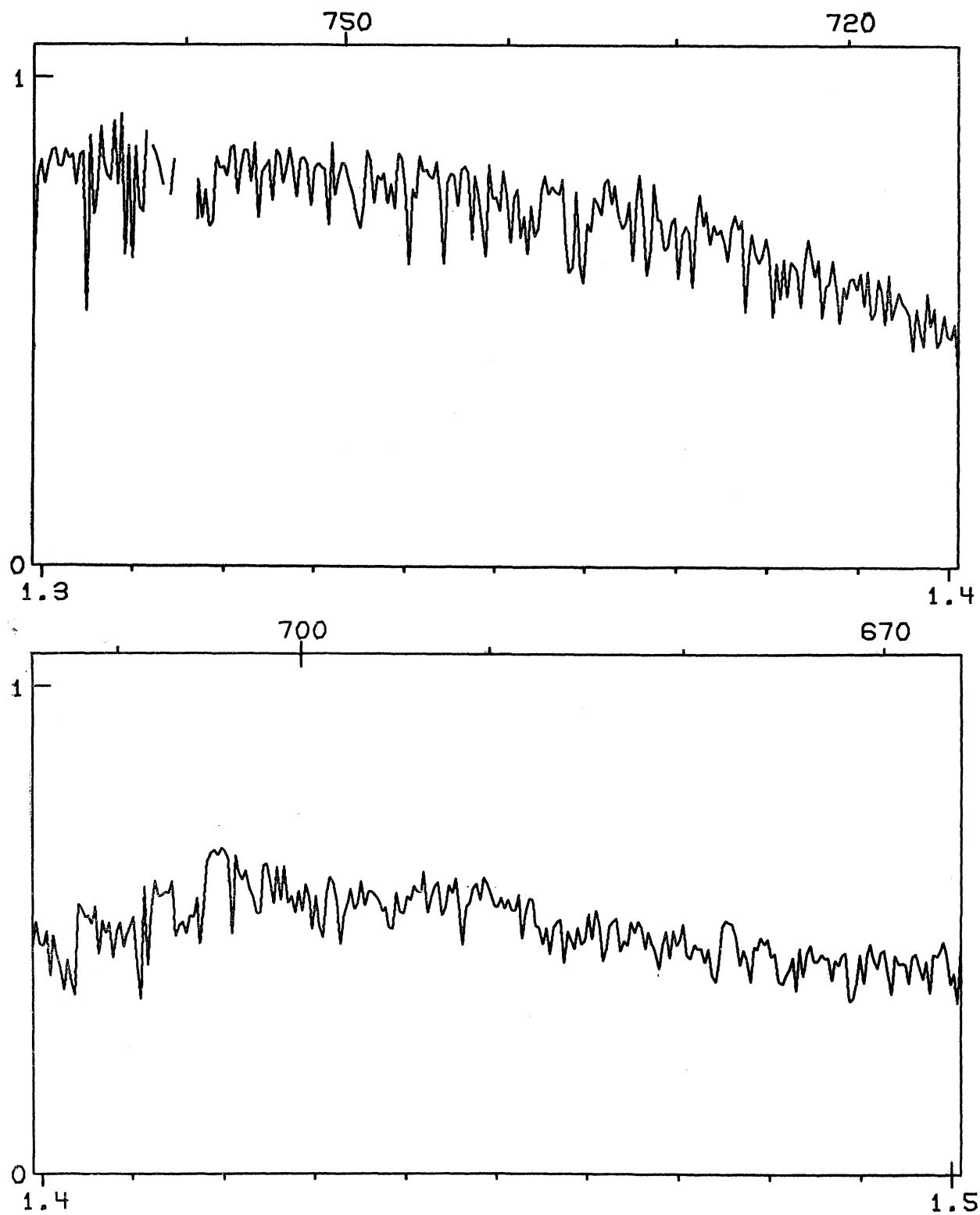
ATLAS OF STELLAR SPECTRA

123

FIG. 23. The spectrum of β And.

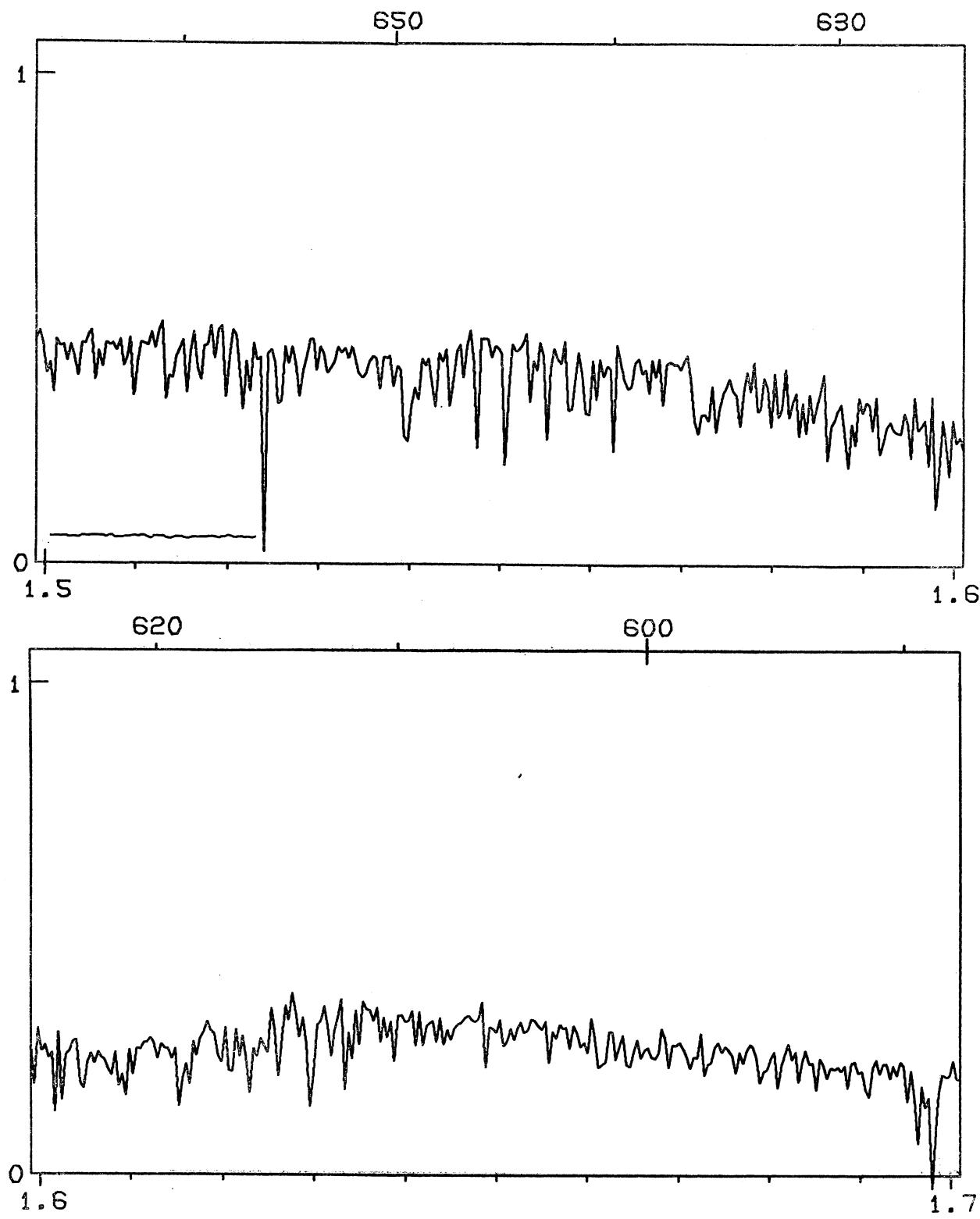
124

H. L. JOHNSON

FIG. 23. The spectrum of β And.

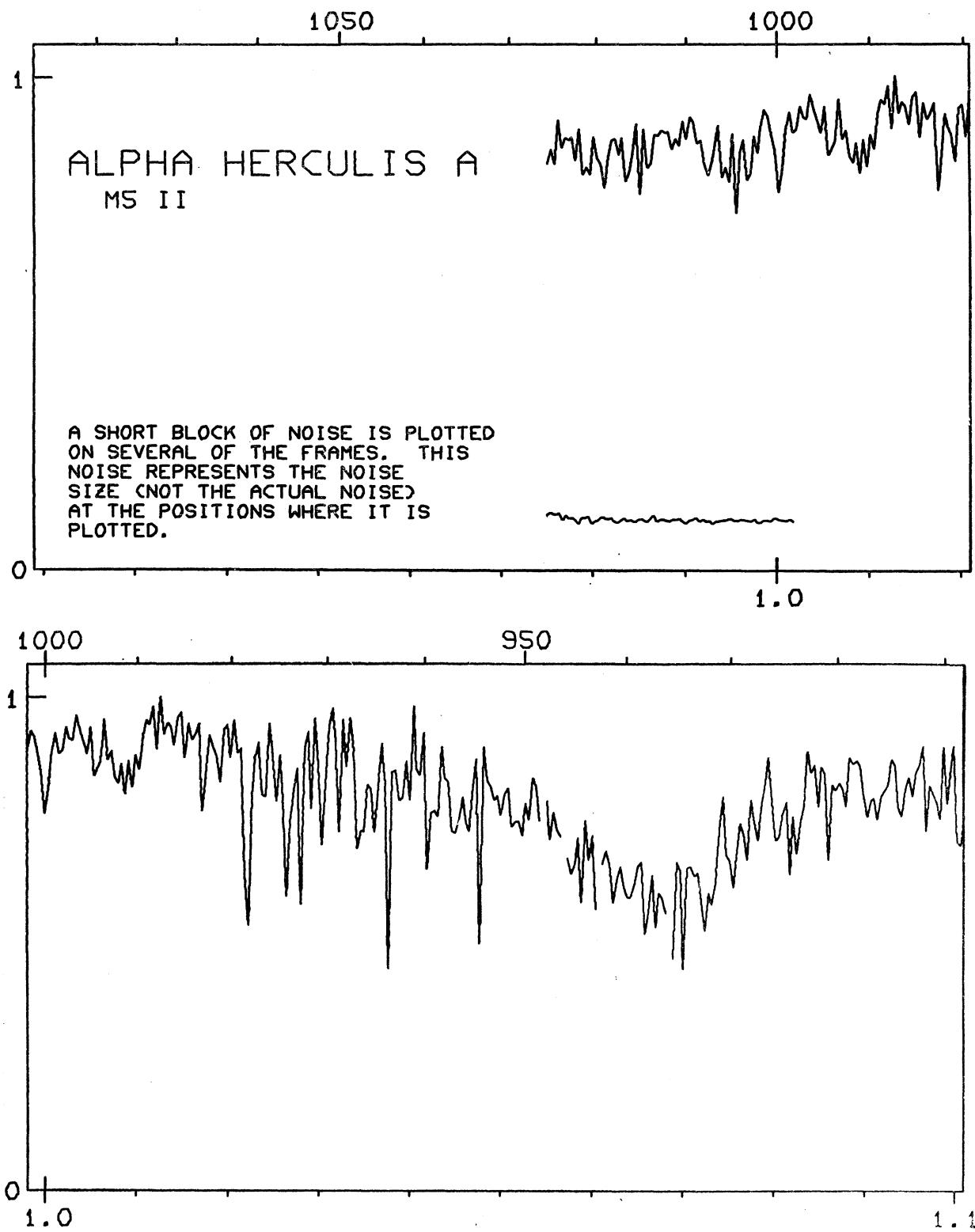
ATLAS OF STELLAR SPECTRA

125

FIG. 23. The spectrum of β And.

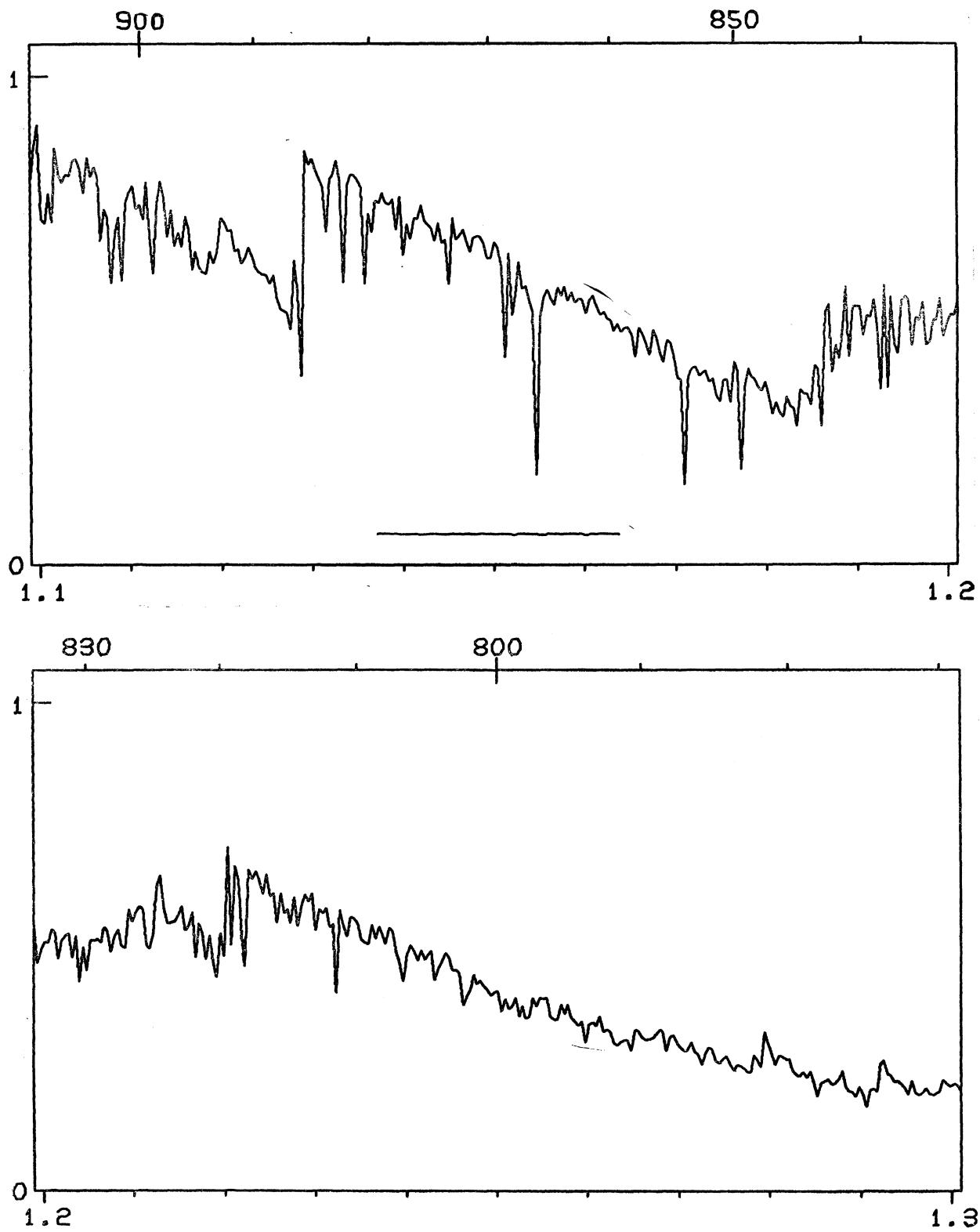
126

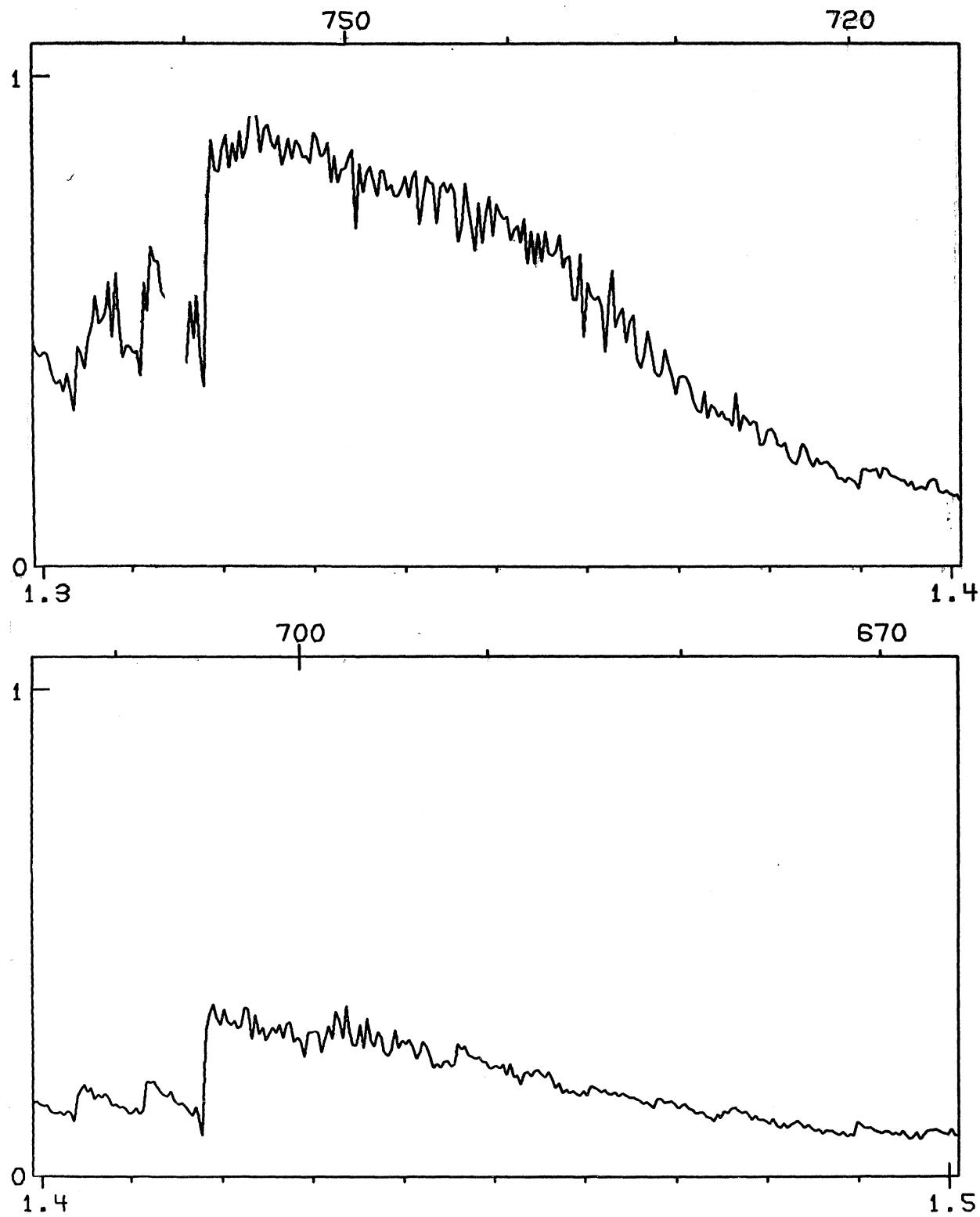
H. L. JOHNSON

FIG. 24. The spectrum of α Her A.

ATLAS OF STELLAR SPECTRA

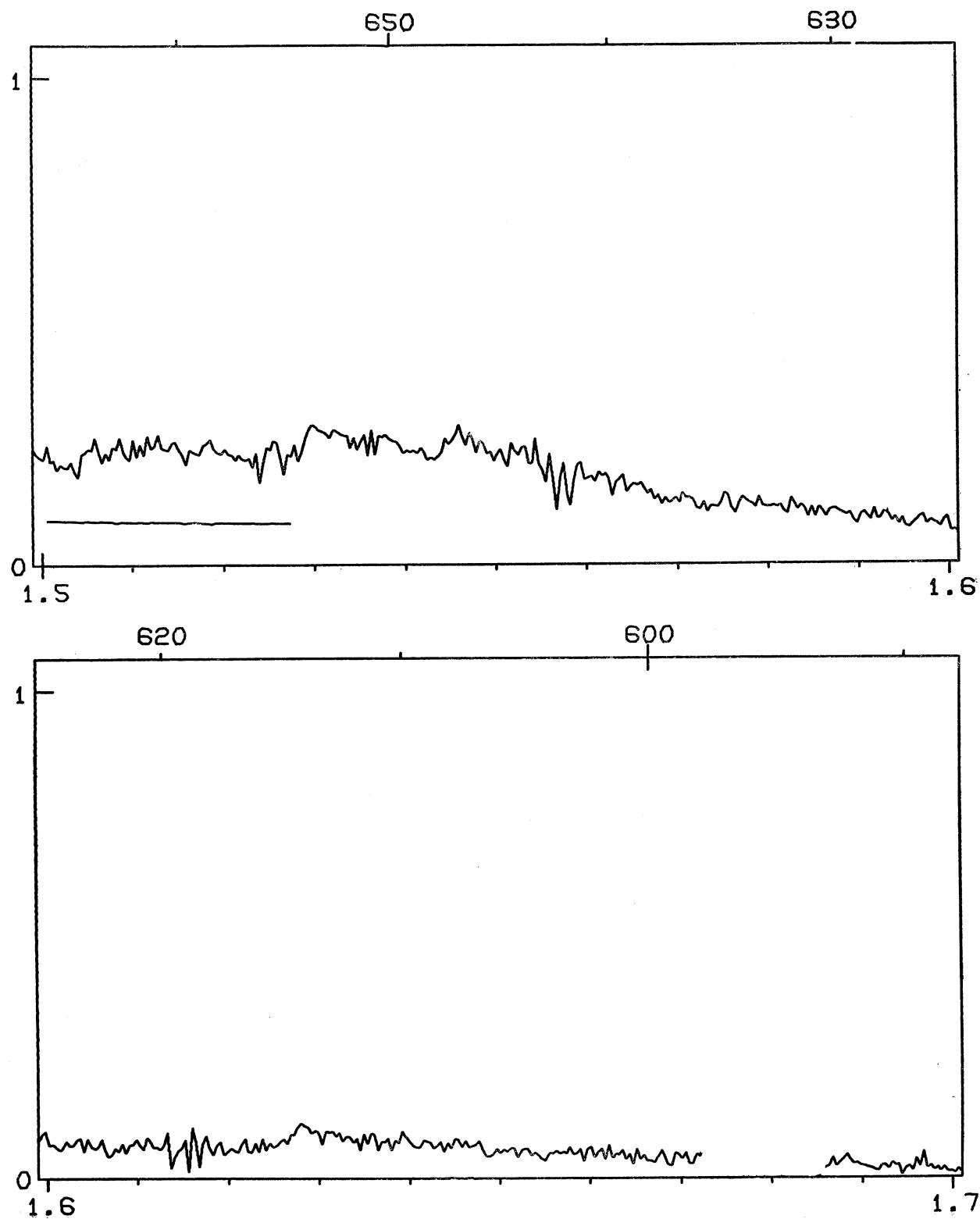
127

FIG. 24. The spectrum of α Her A.

FIG. 24. The spectrum of α Her A.

ATLAS OF STELLAR SPECTRA

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FIG. 24. The spectrum of α Her A.

130

H. L. JOHNSON

1050

1000

G HERCULIS
M6- III

A SHORT BLOCK OF NOISE IS PLOTTED
ON SEVERAL OF THE FRAMES. THIS
NOISE REPRESENTS THE NOISE
SIZE (NOT THE ACTUAL NOISE)
AT THE POSITIONS WHERE IT IS
PLOTTED.

0

1.0

1000

950

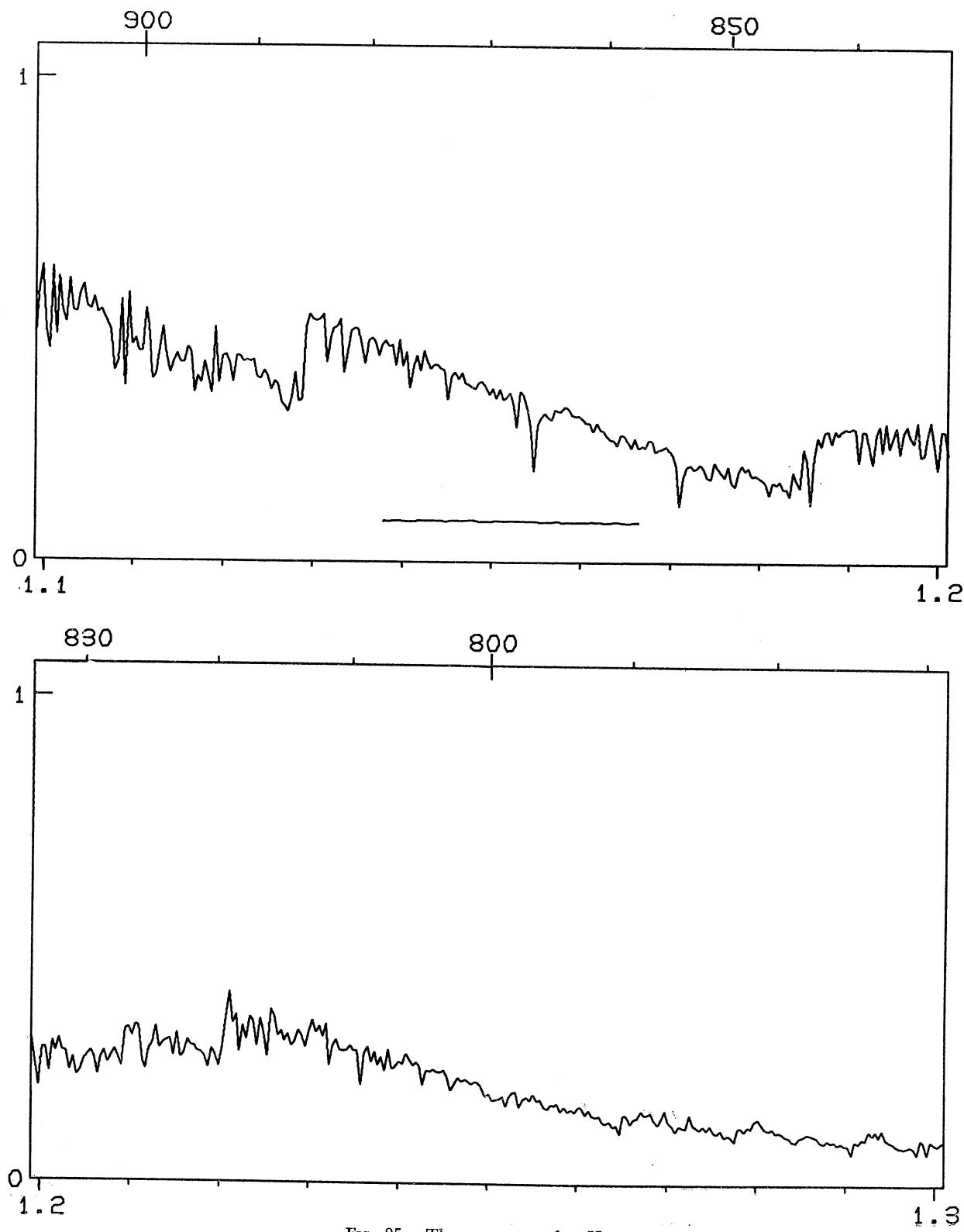
1.1

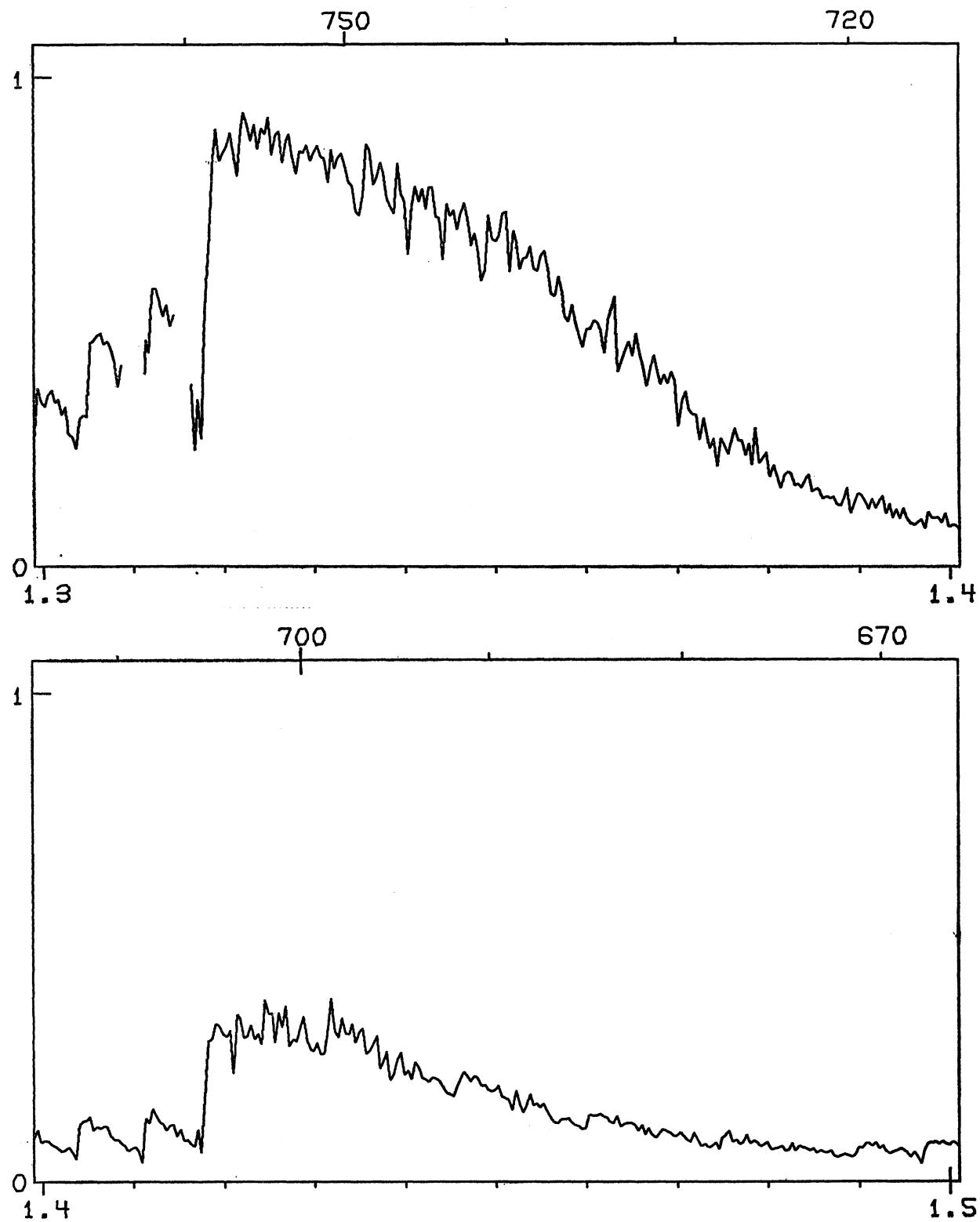
1.0

FIG. 25. The spectrum of g Her.

ATLAS OF STELLAR SPECTRA

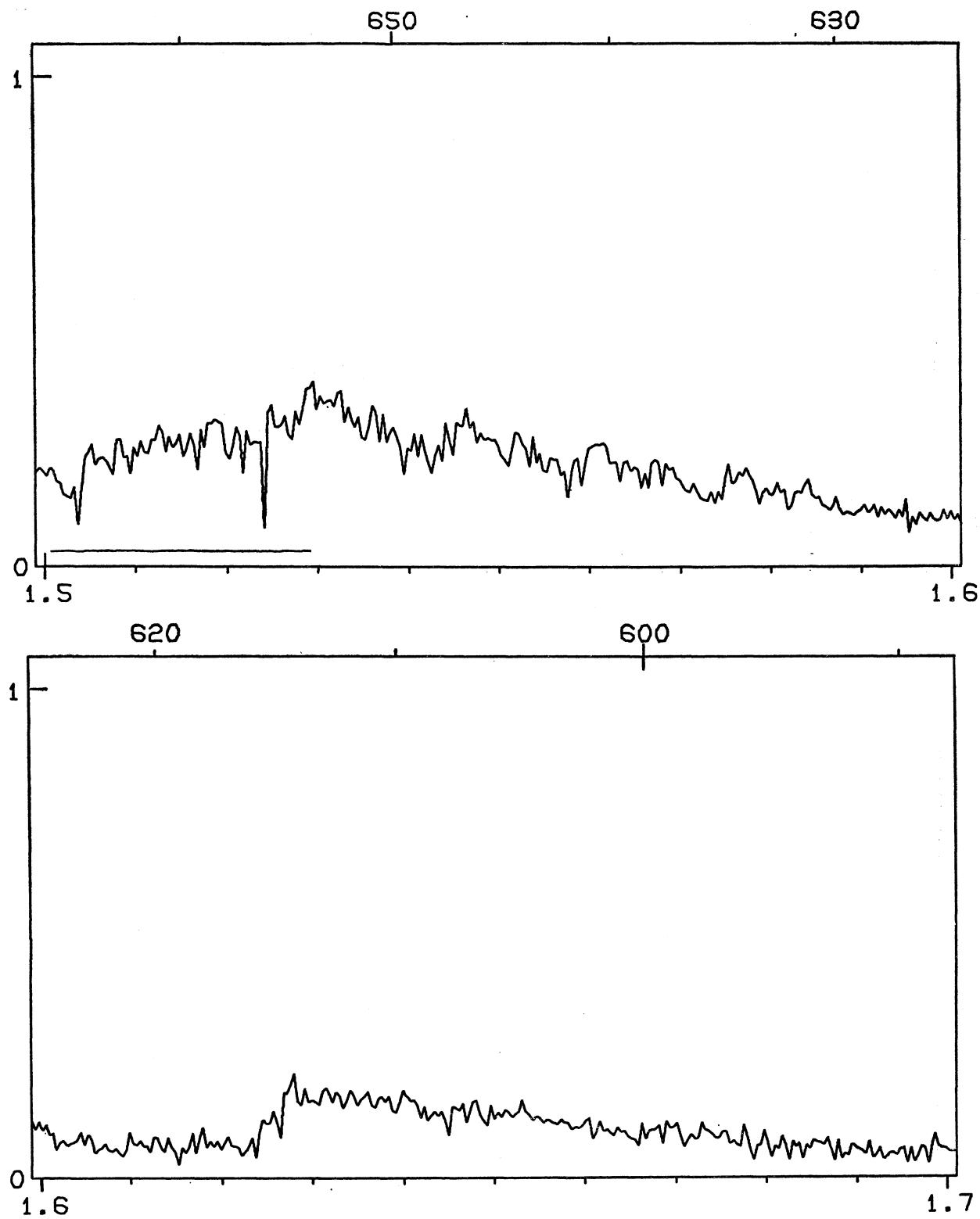
131

FIG. 25. The spectrum of g Her.

FIG. 25. The spectrum of *g* Her.

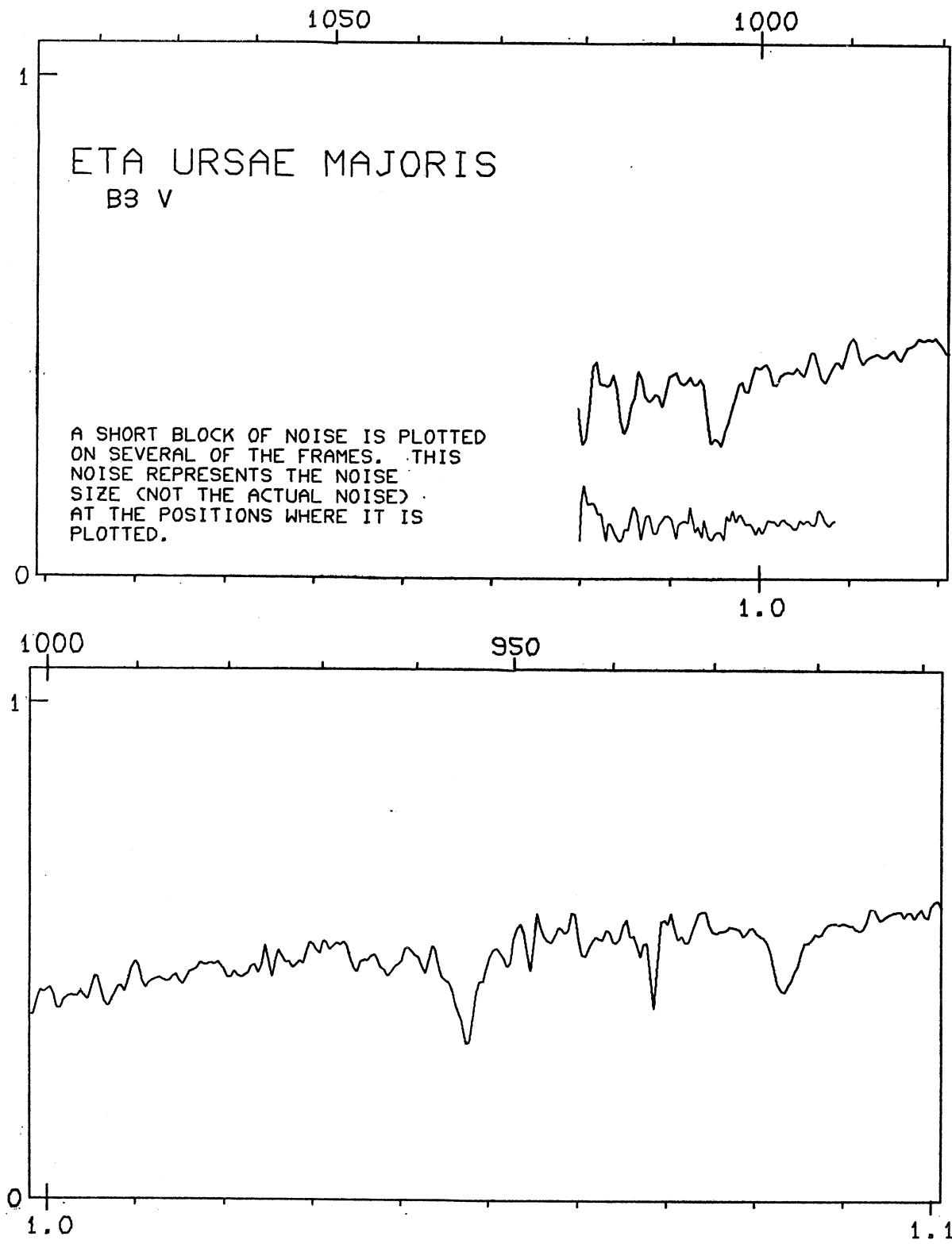
ATLAS OF STELLAR SPECTRA

133

FIG. 25. The spectrum of *g* Her.

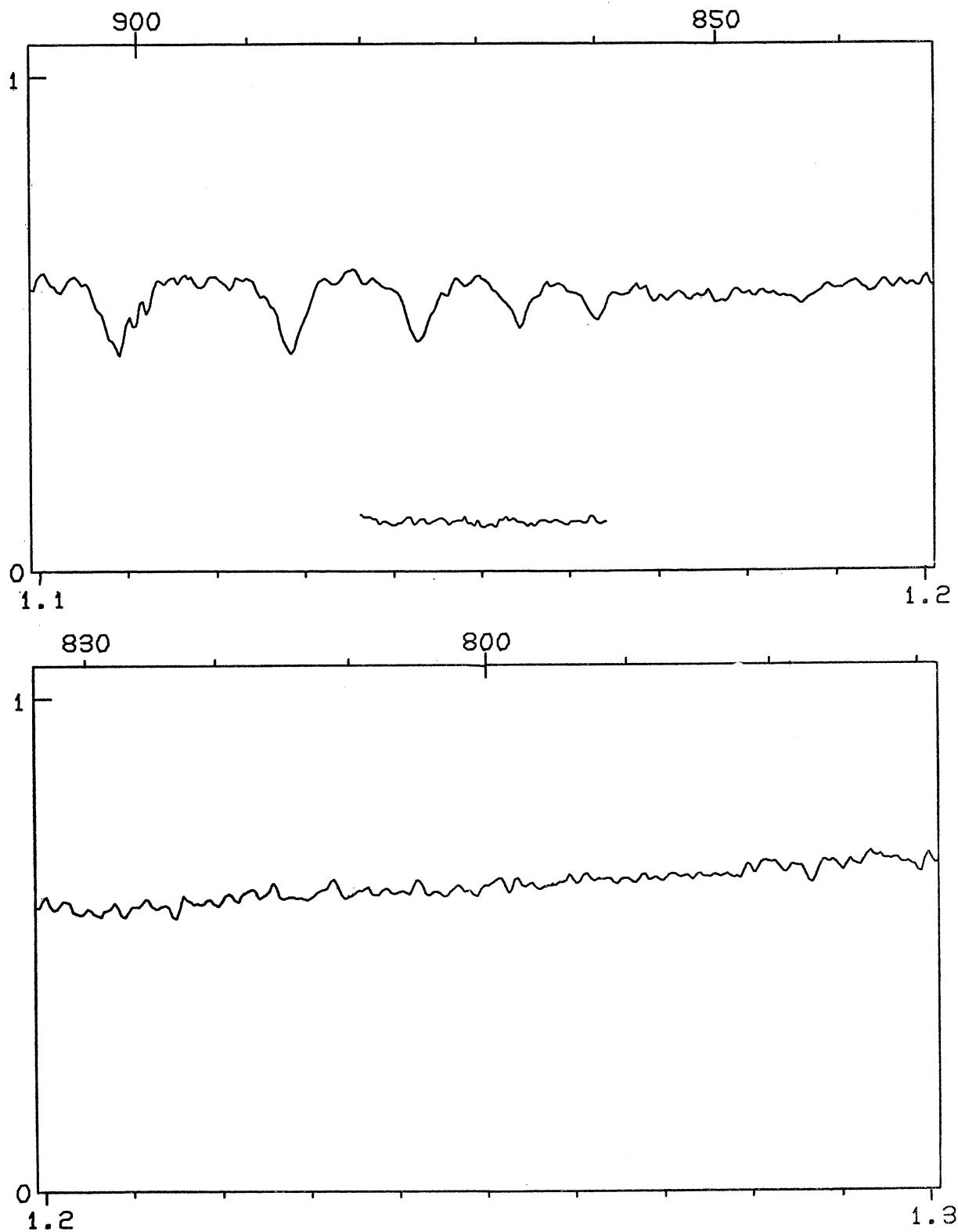
134

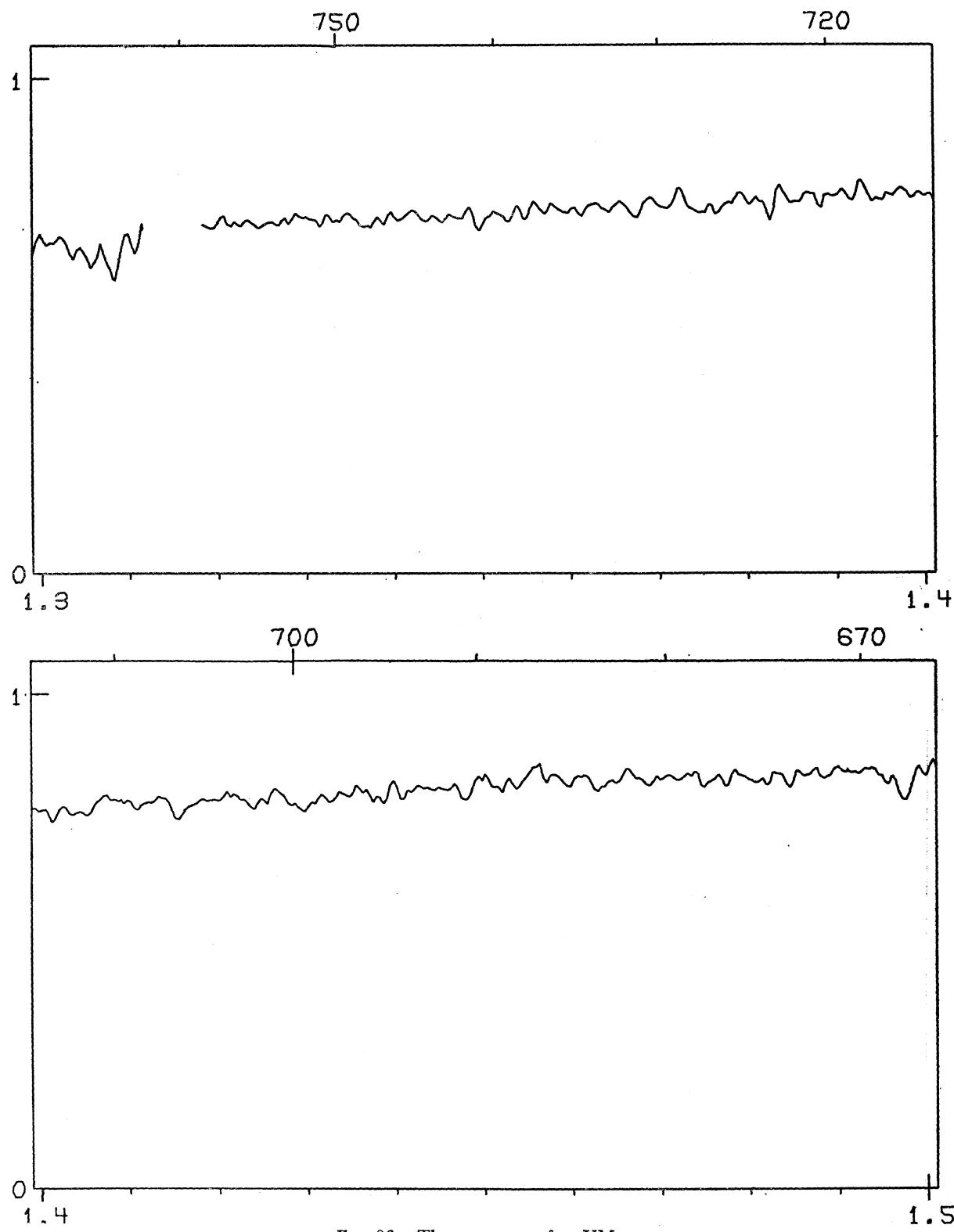
H. L. JOHNSON

FIG. 26. The spectrum of η UMa.

ATLAS OF STELLAR SPECTRA

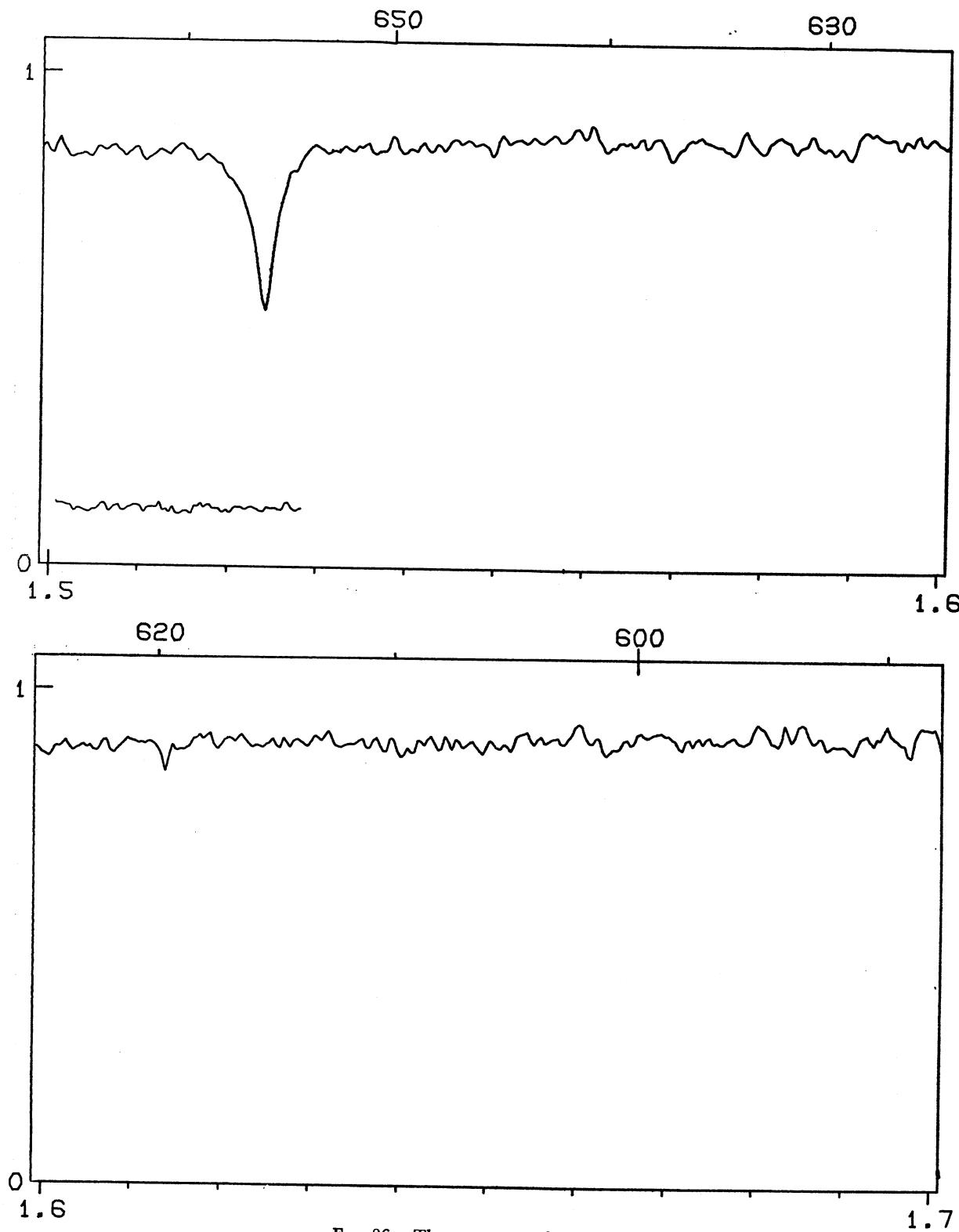
135

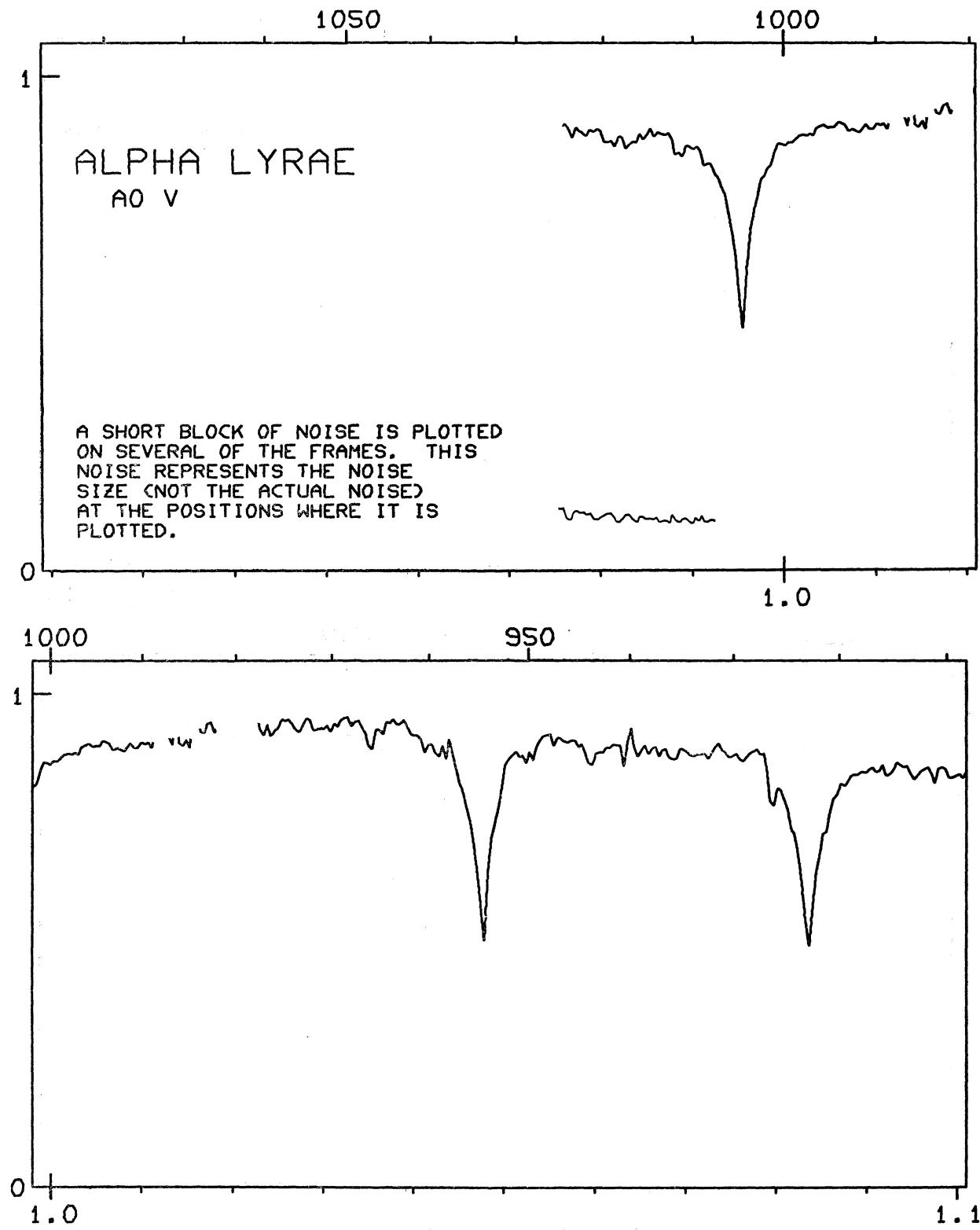
FIG. 26. The spectrum of η UMa.

FIG. 26. The spectrum of η UMa.

ATLAS OF STELLAR SPECTRA

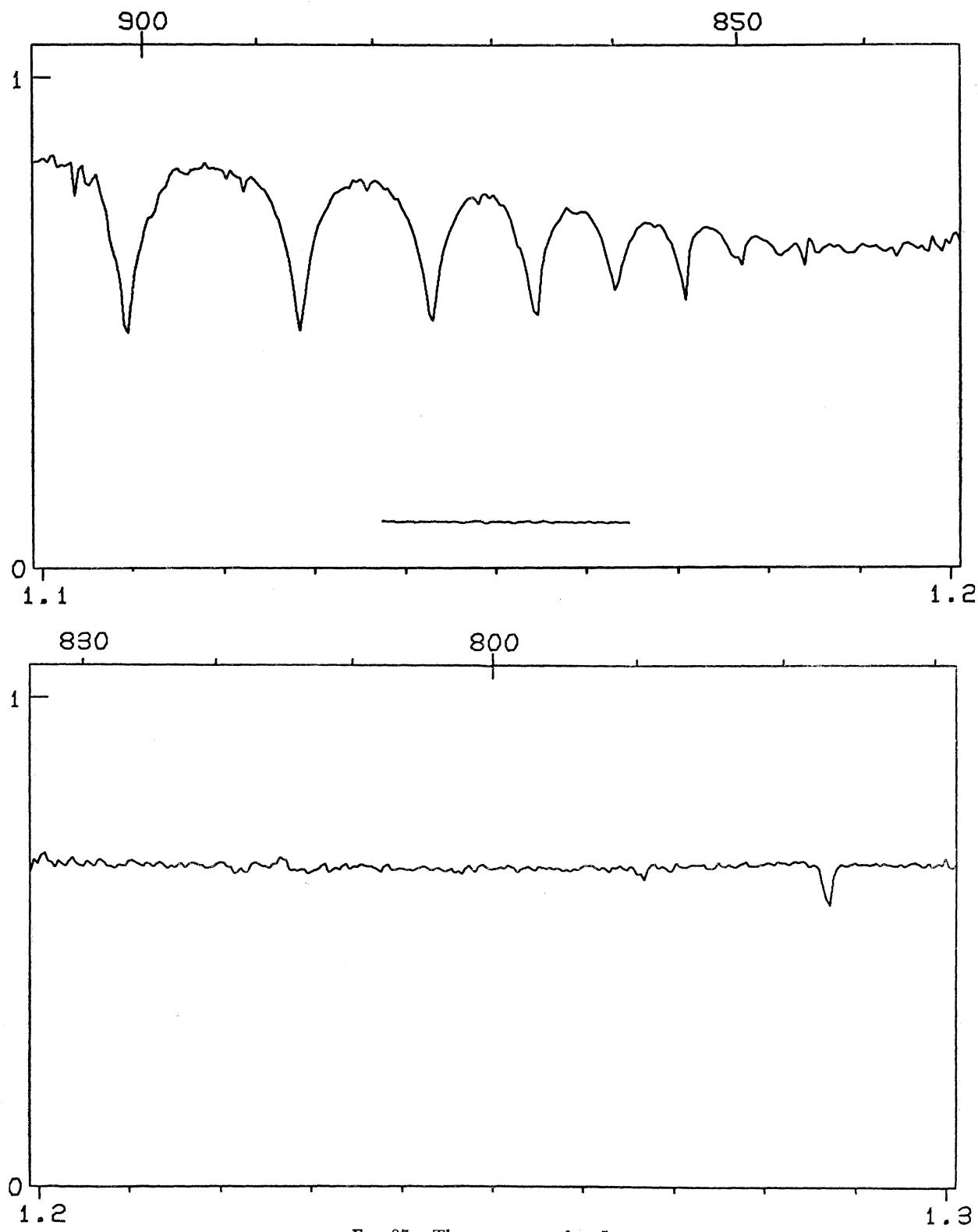
137

FIG. 26. The spectrum of η UMa.

FIG. 27. The spectrum of α Lyr.

ATLAS OF STELLAR SPECTRA

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FIG. 27. The spectrum of α Lyr.

140

H. L. JOHNSON

750

720

1

0

1.3

1.4

700

670

1

0

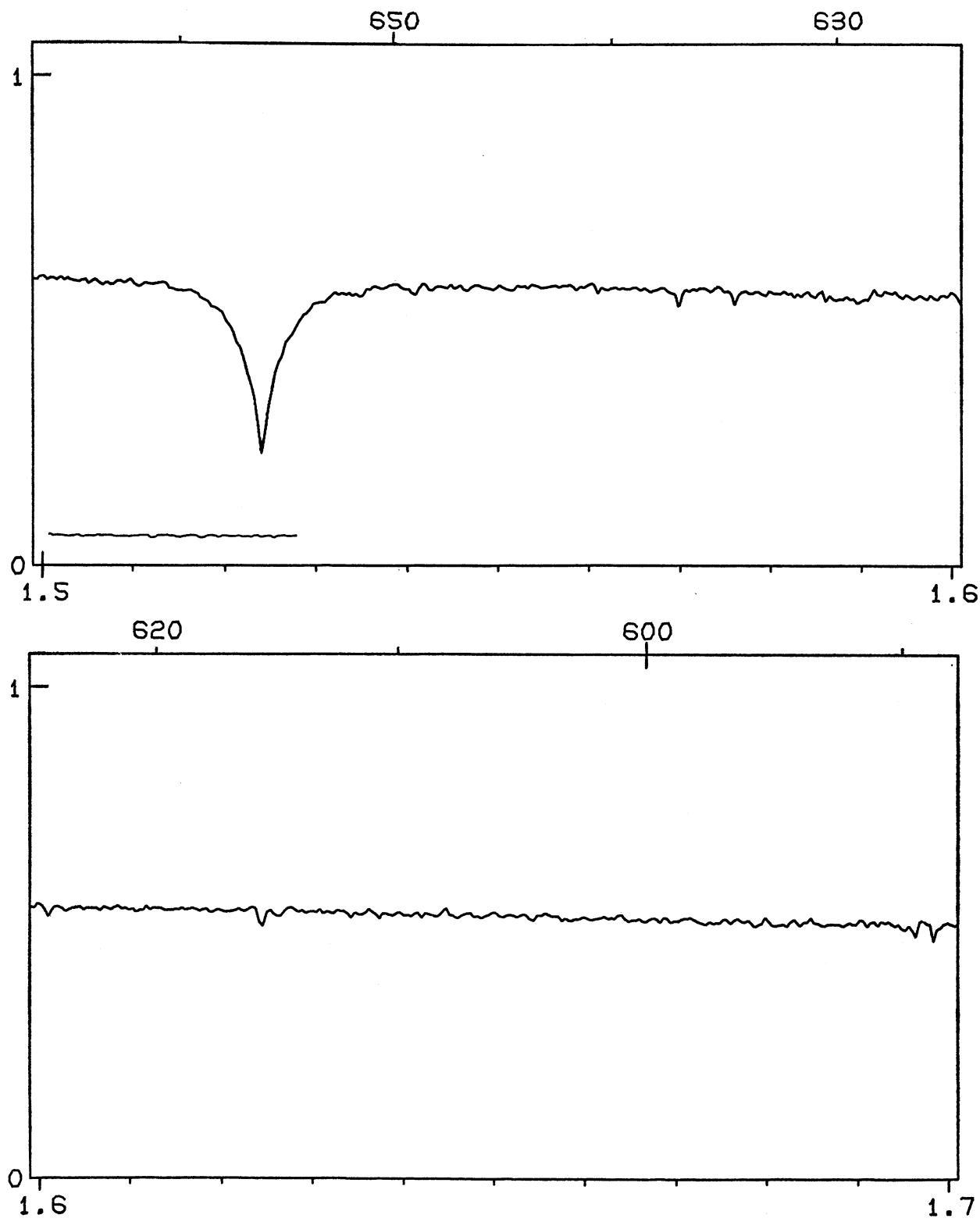
1.4

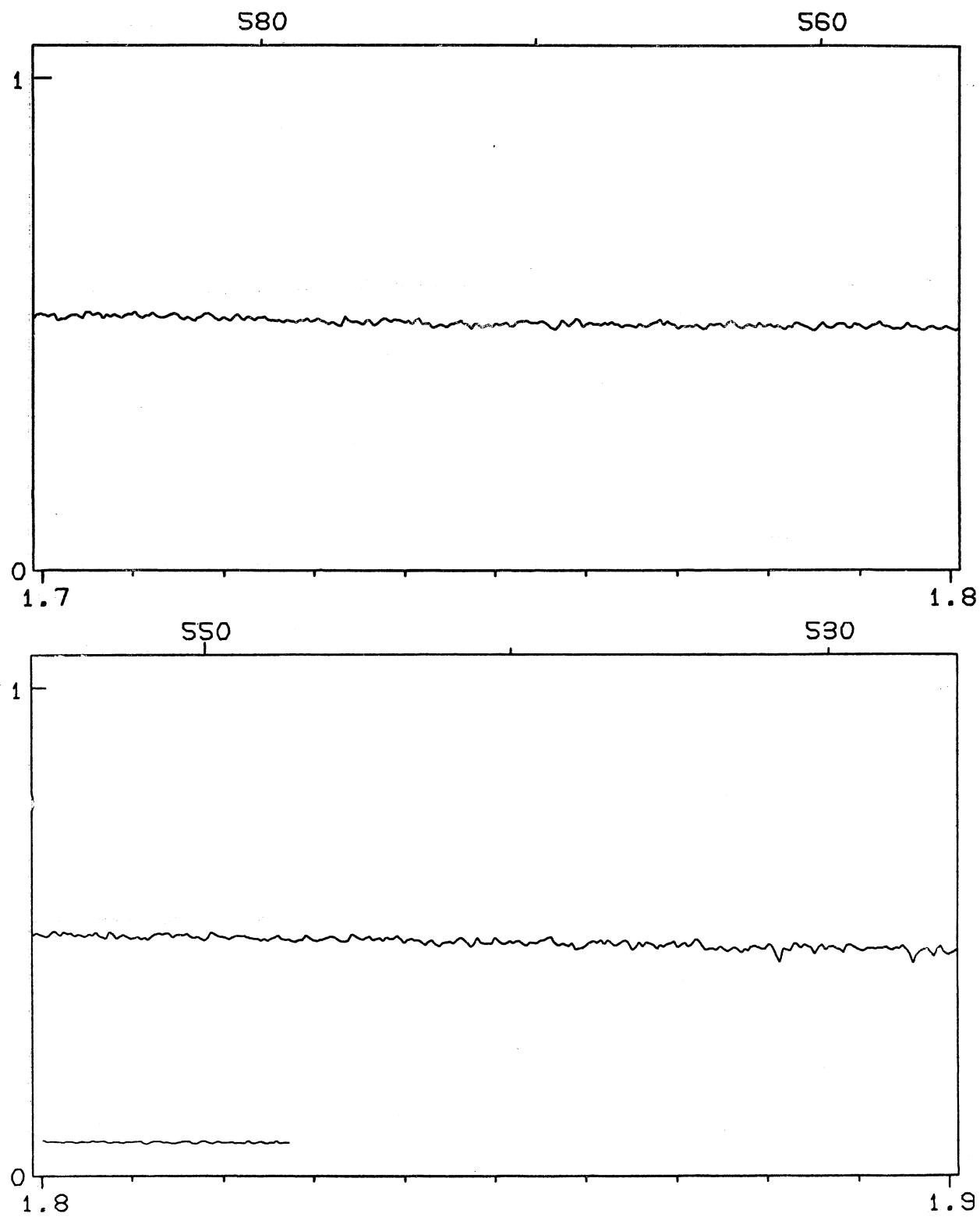
1.5

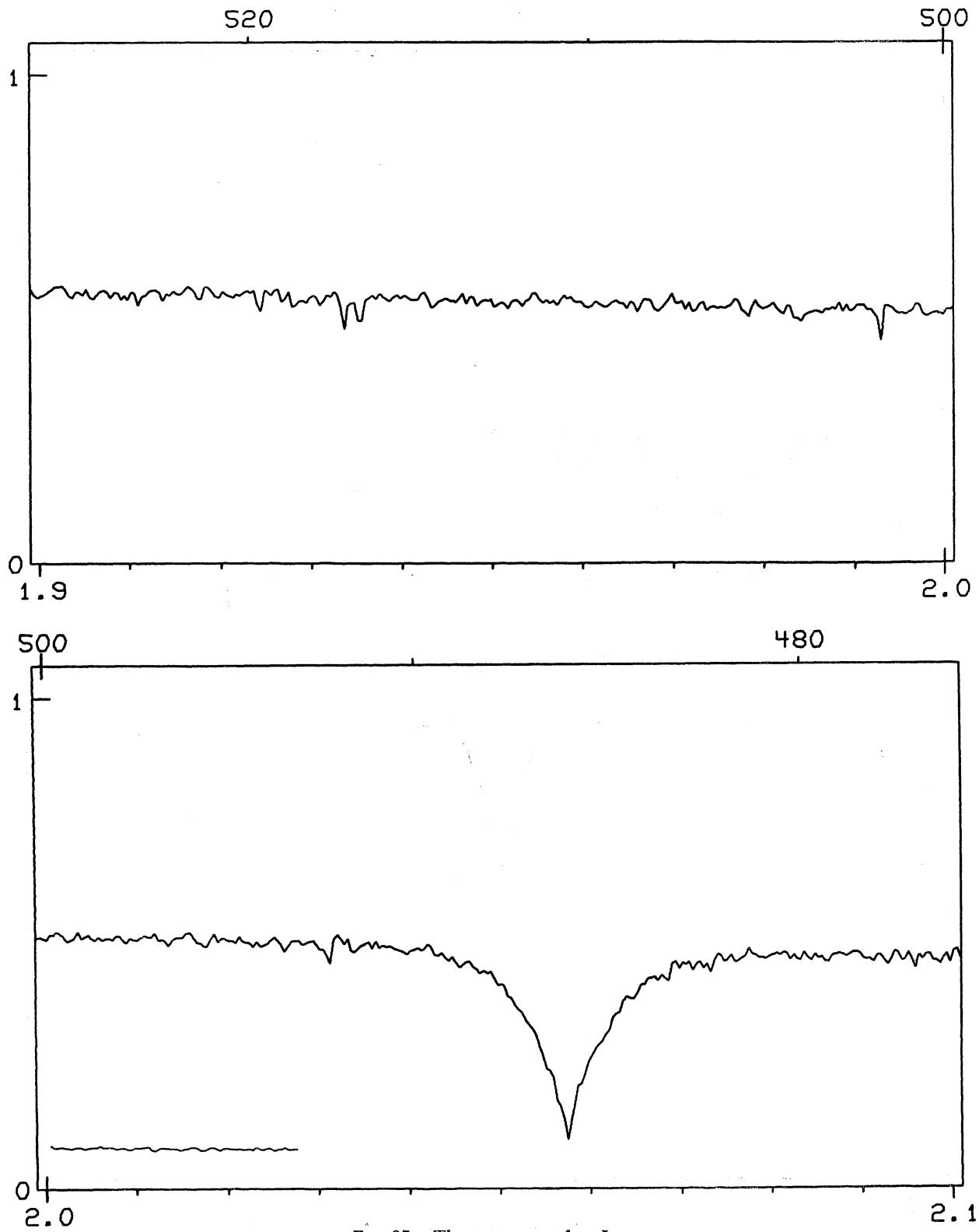
FIG. 27. The spectrum of α Lyr.

ATLAS OF STELLAR SPECTRA

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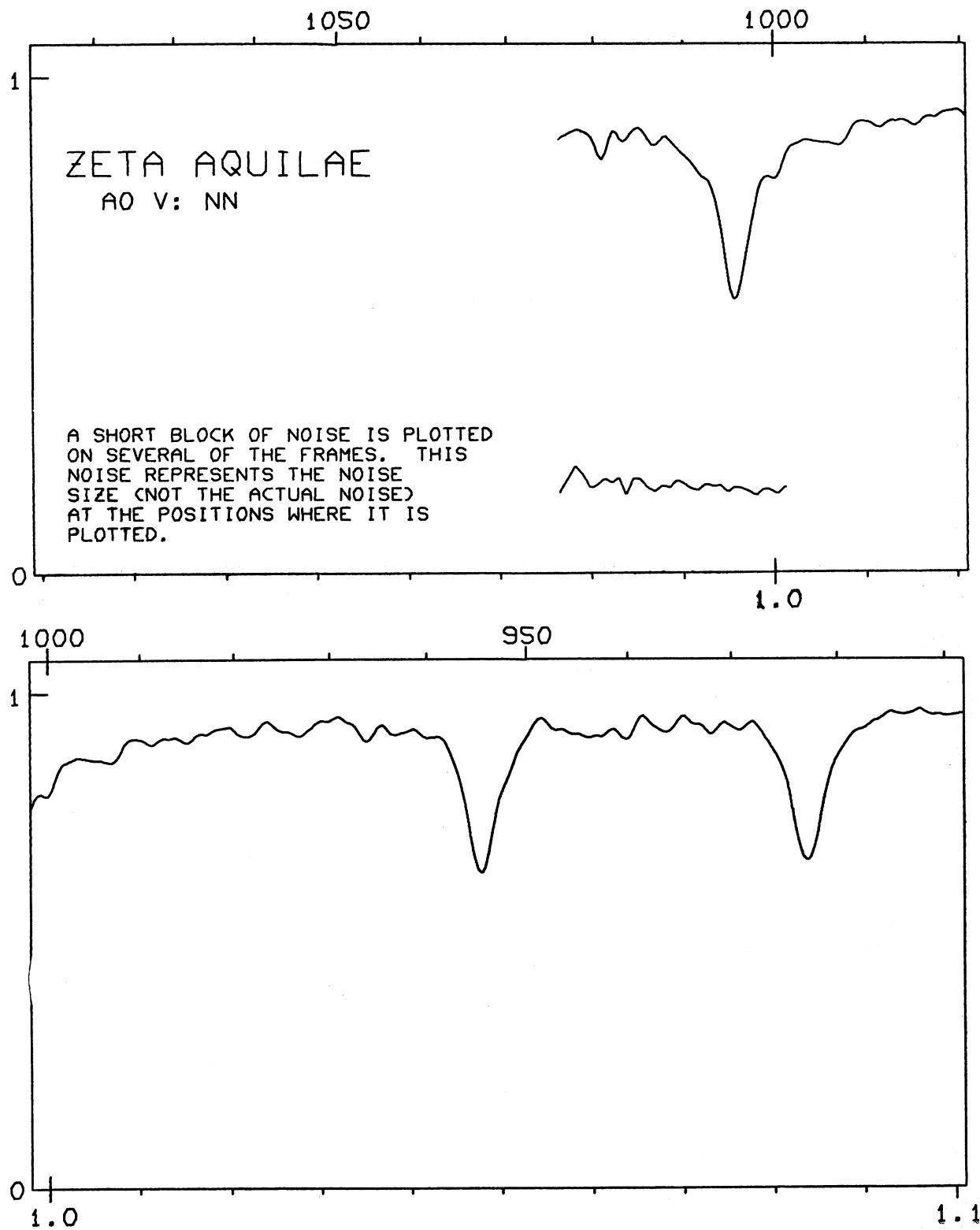
FIG. 27. The spectrum of α Lyr.

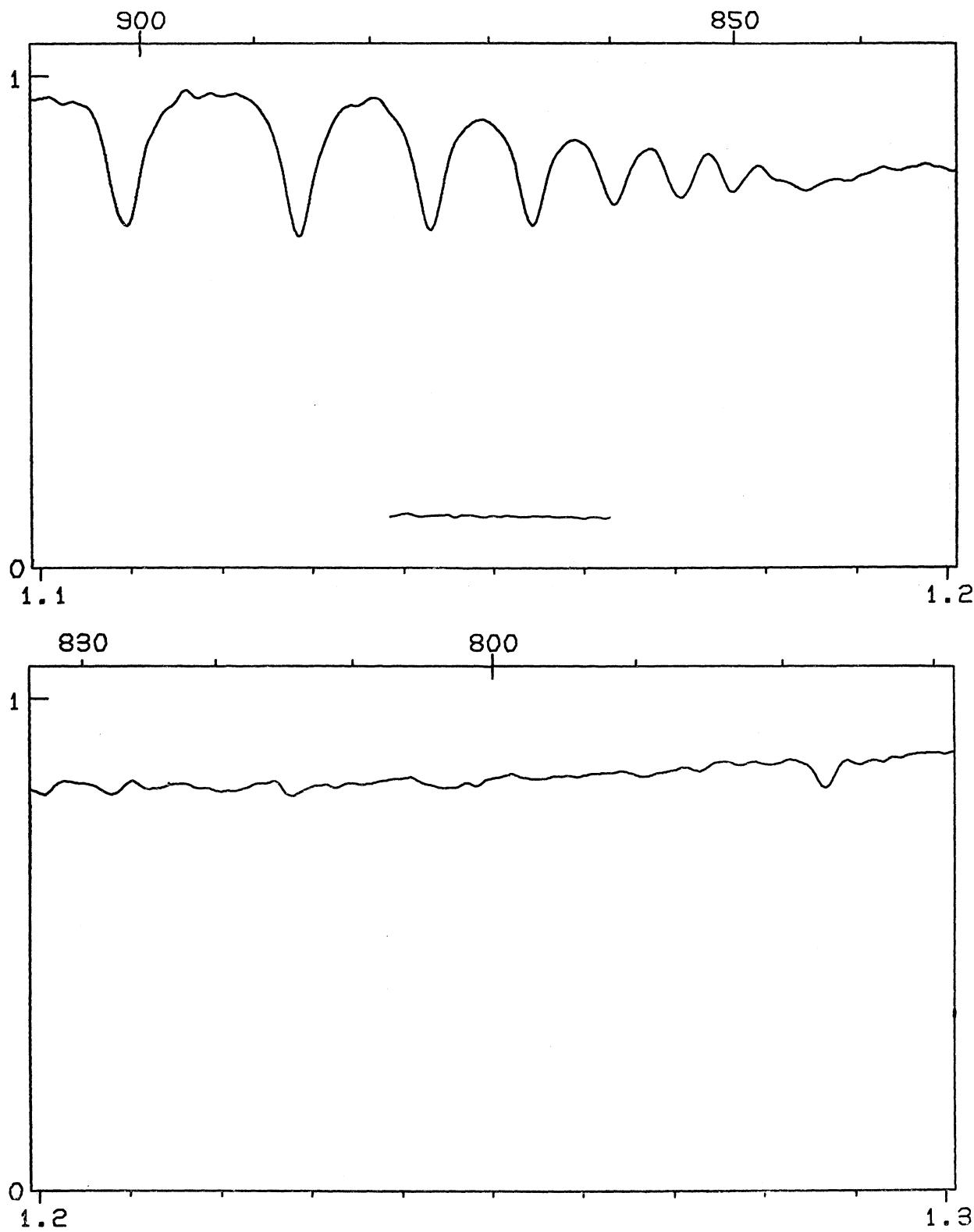
FIG. 27. The spectrum of α Lyr.

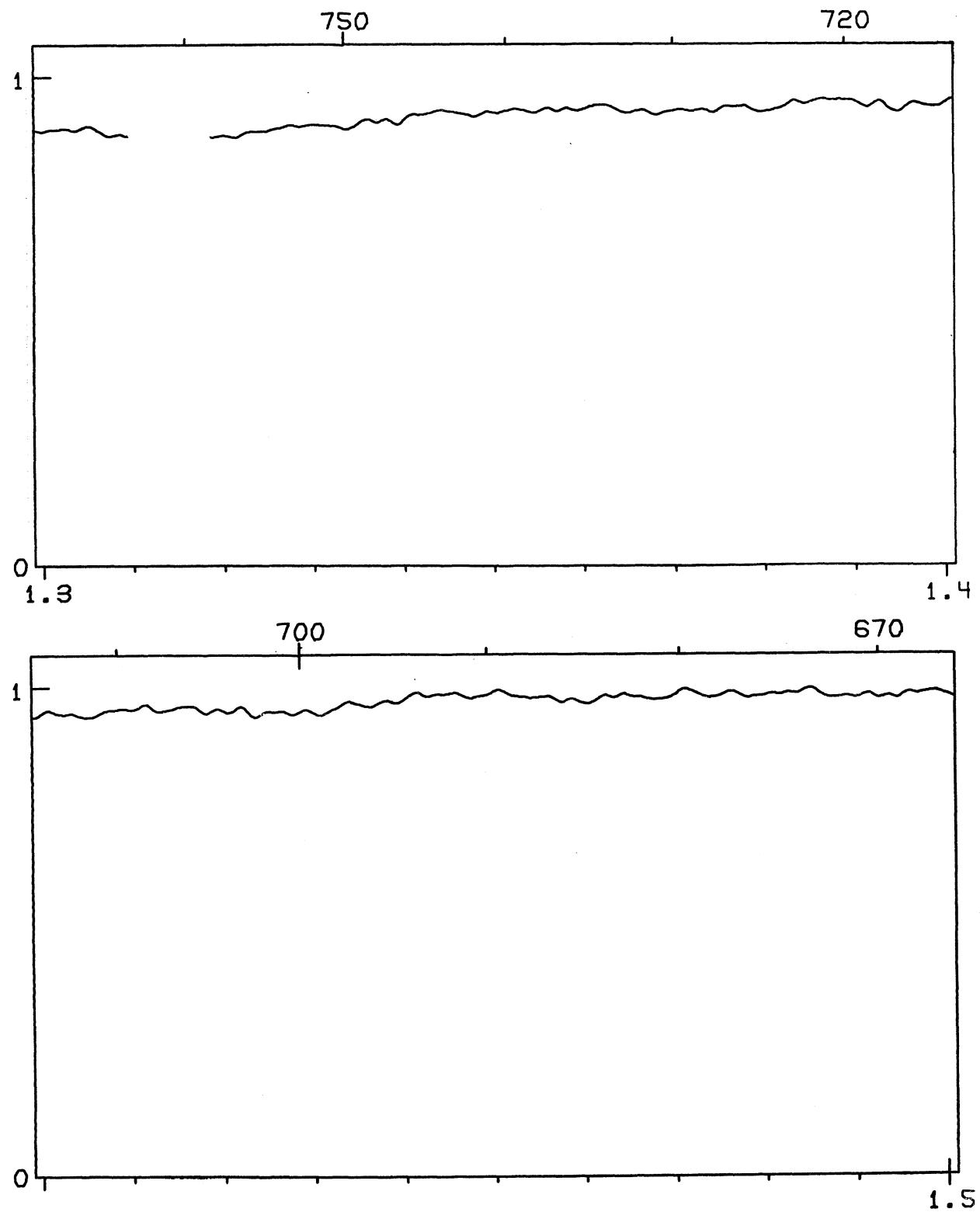
FIG. 27. The spectrum of α Lyr.

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H. L. JOHNSON

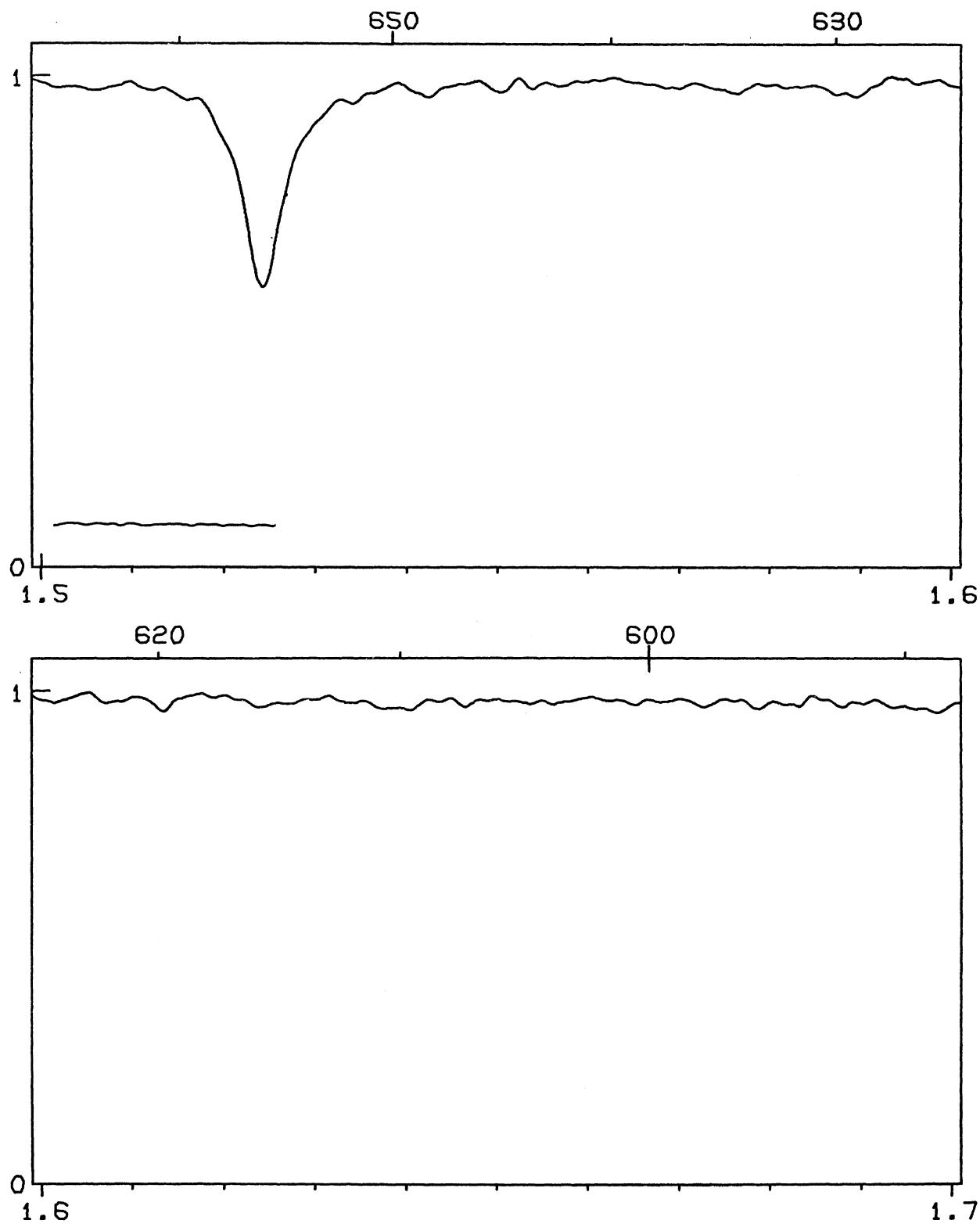
FIG. 28. The spectrum of ξ Aql.

FIG. 28. The spectrum of ξ Aql.

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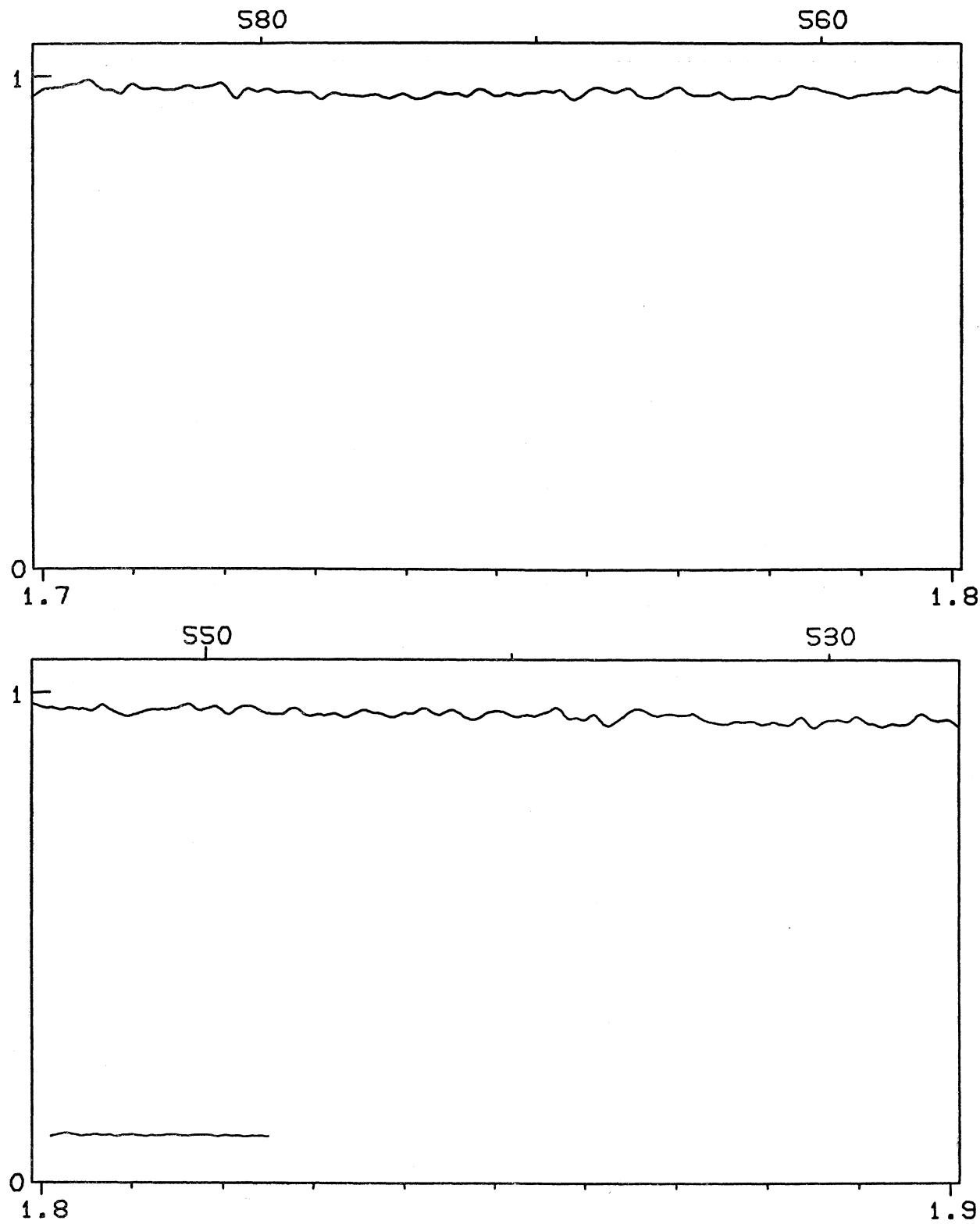
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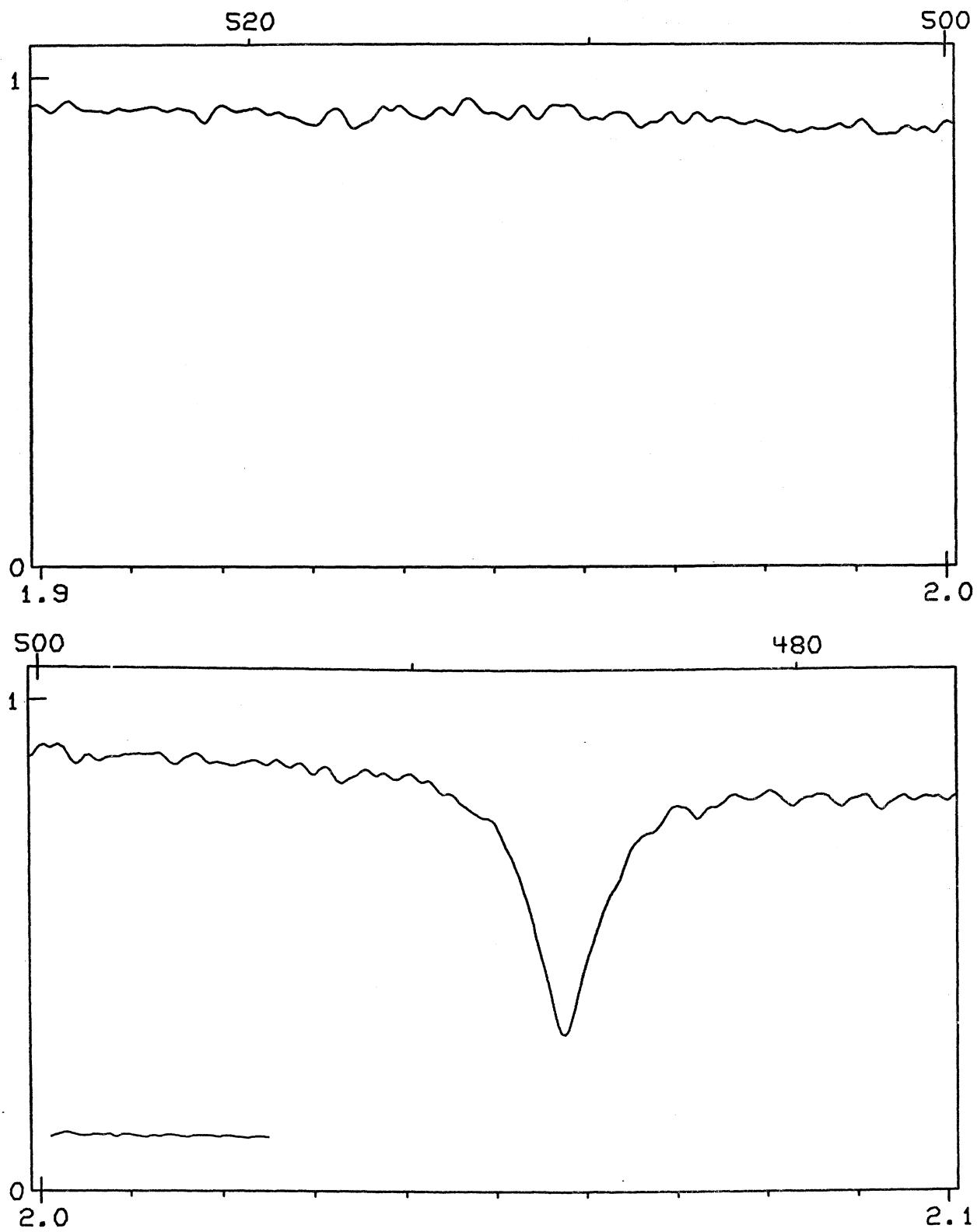
147

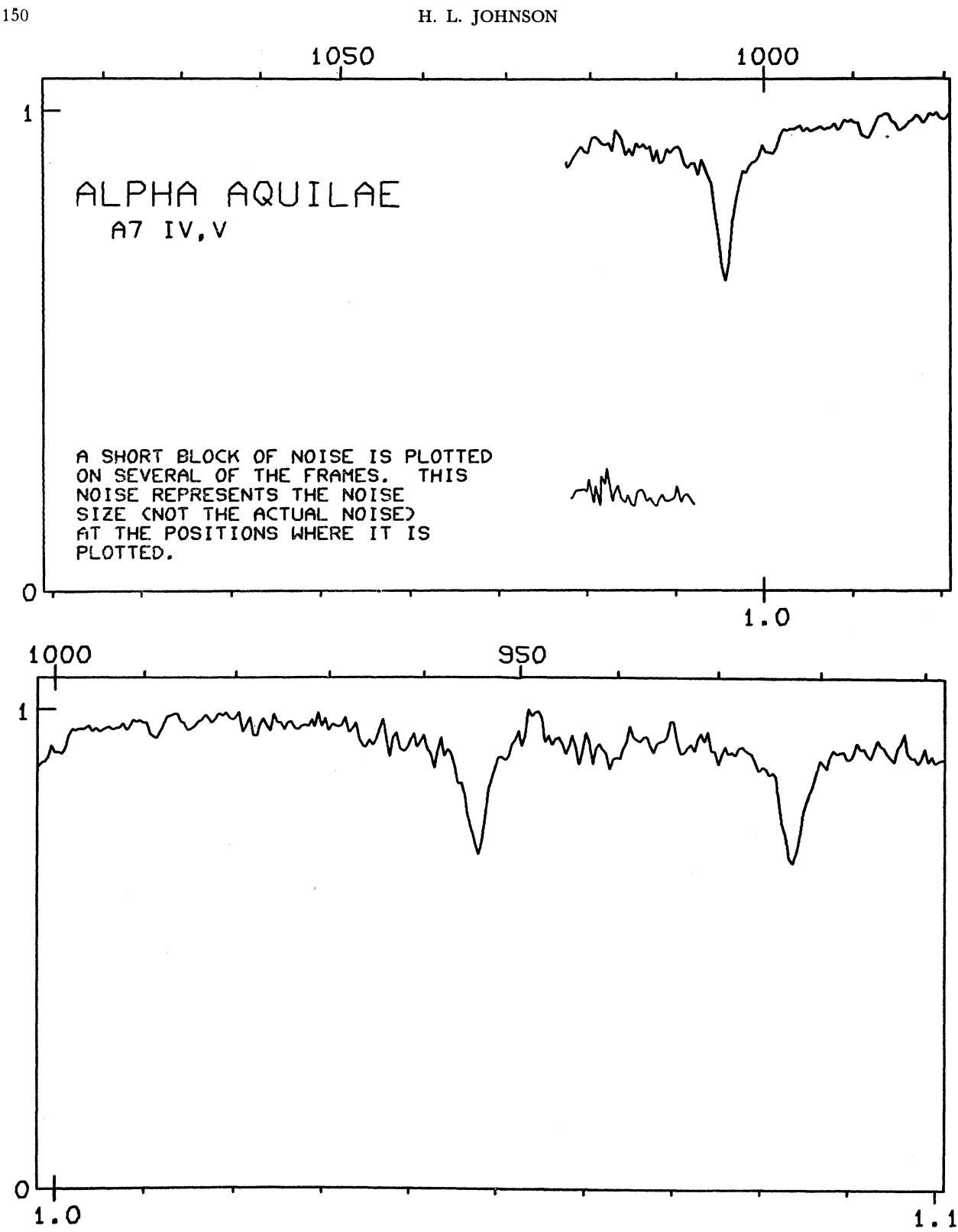
FIG. 28. The spectrum of ξ Aql.

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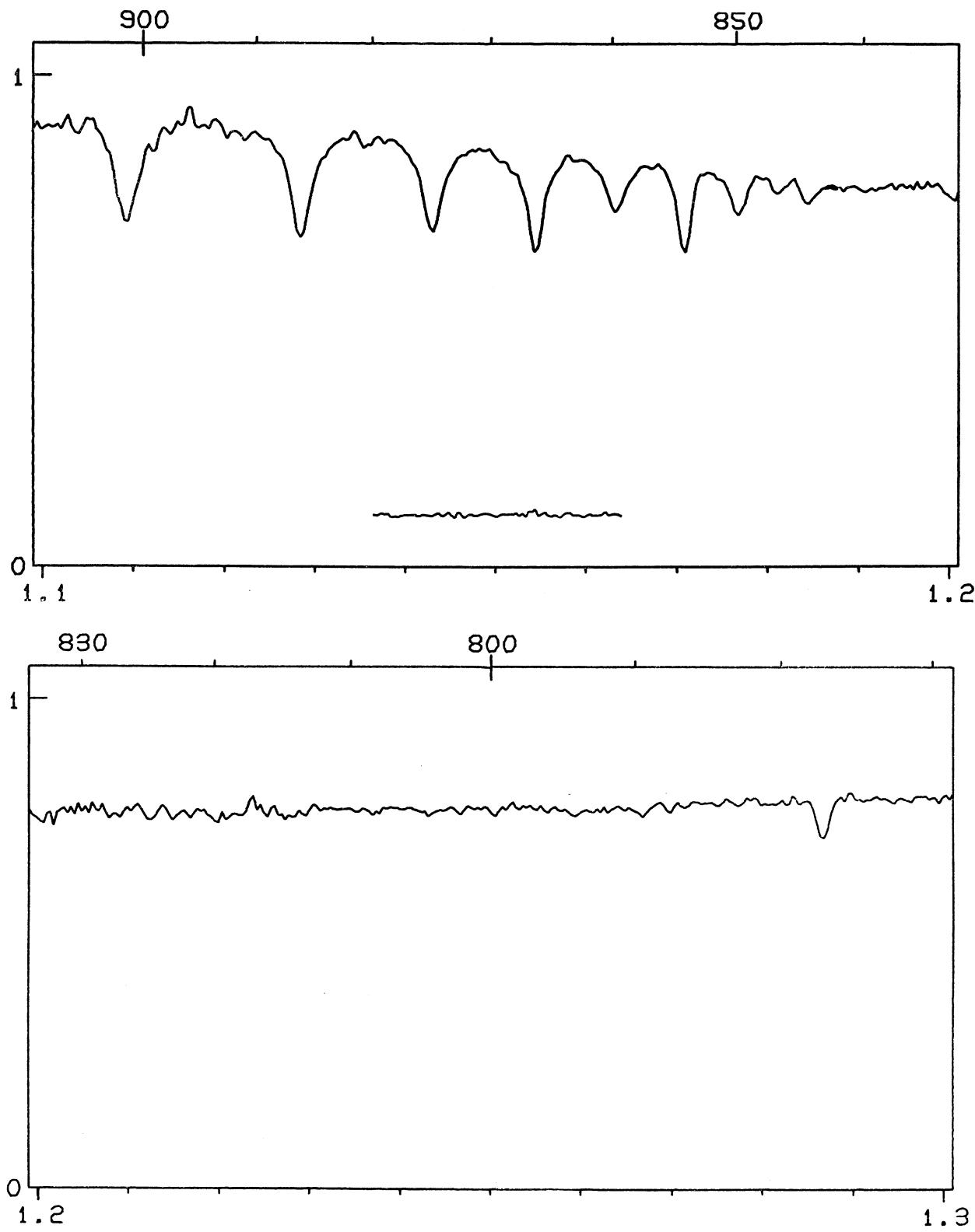
FIG. 28. The spectrum of ξ Aql.

FIG. 28. The spectrum of ξ Aql.

FIG. 29. The spectrum of α Aql.

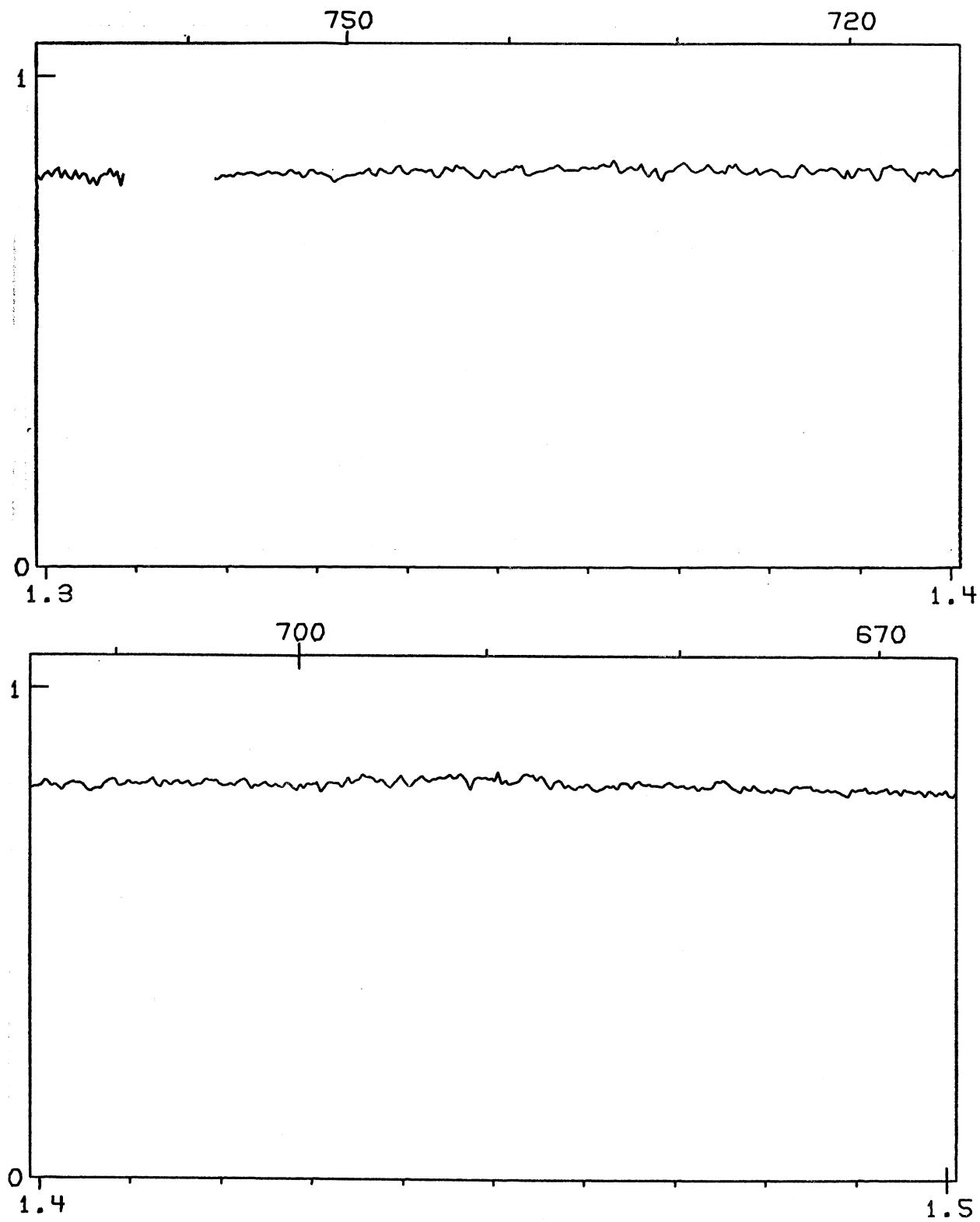
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FIG. 29. The spectrum of α Aql.

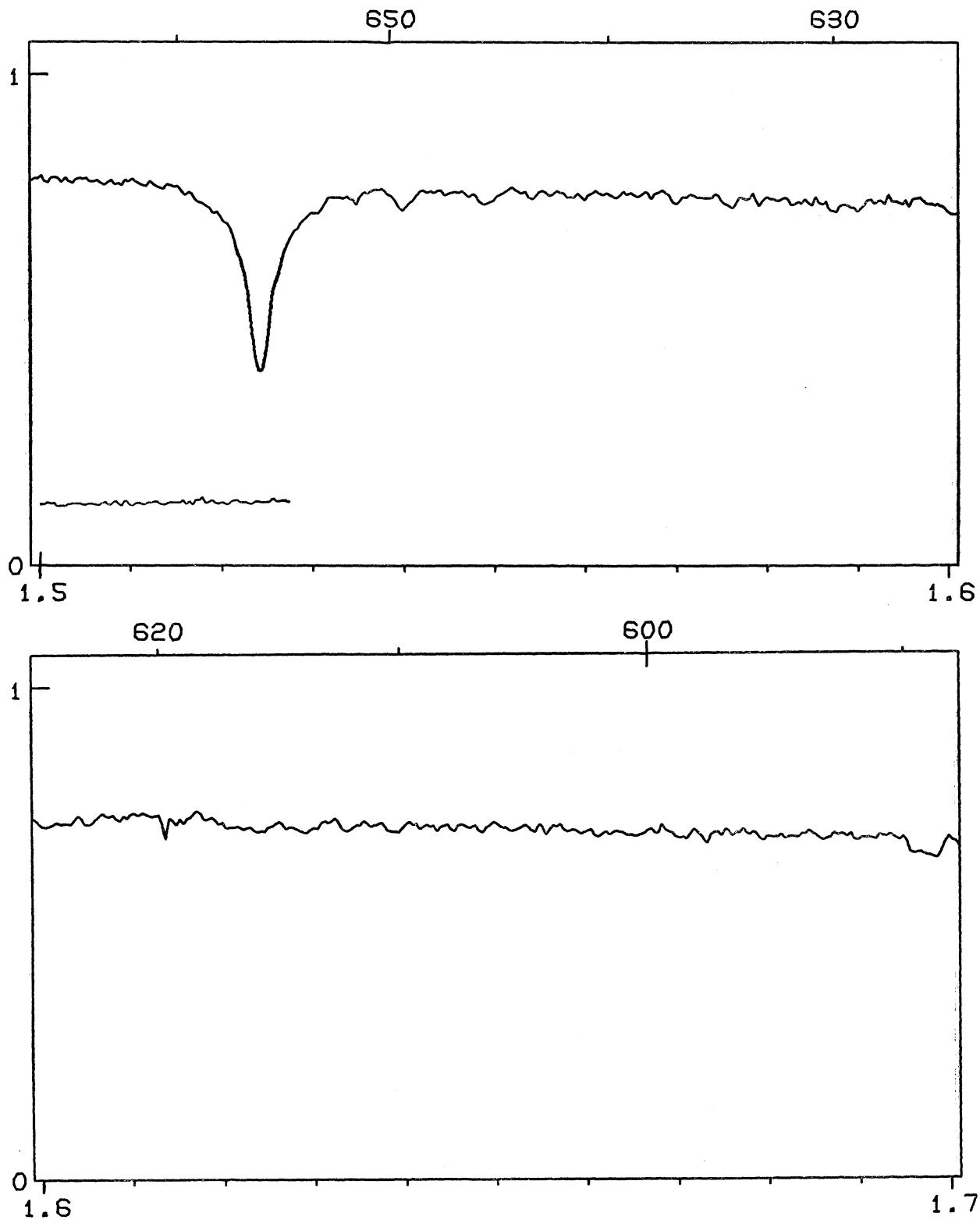
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FIG. 29. The spectrum of α Aql.

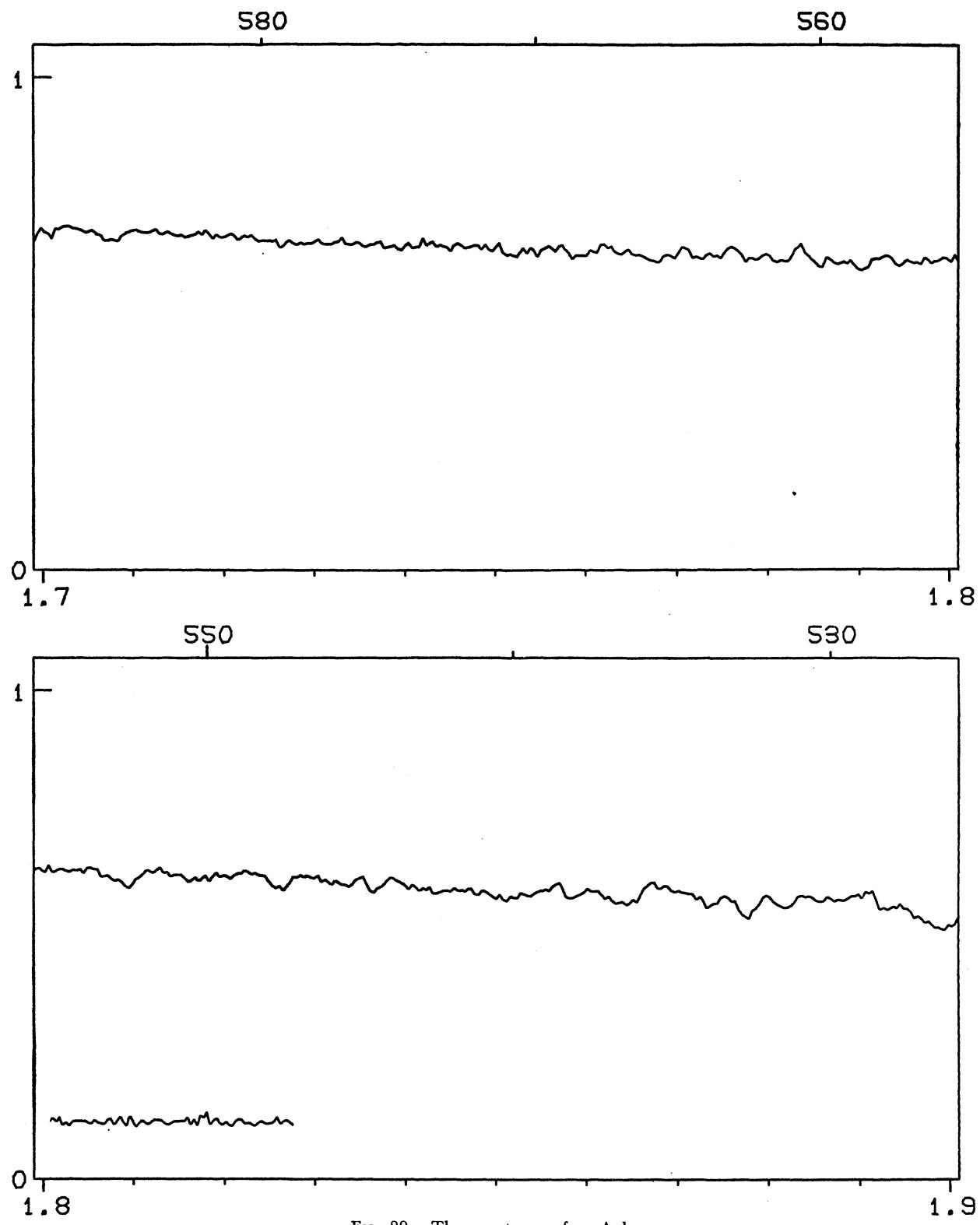
ATLAS OF STELLAR SPECTRA

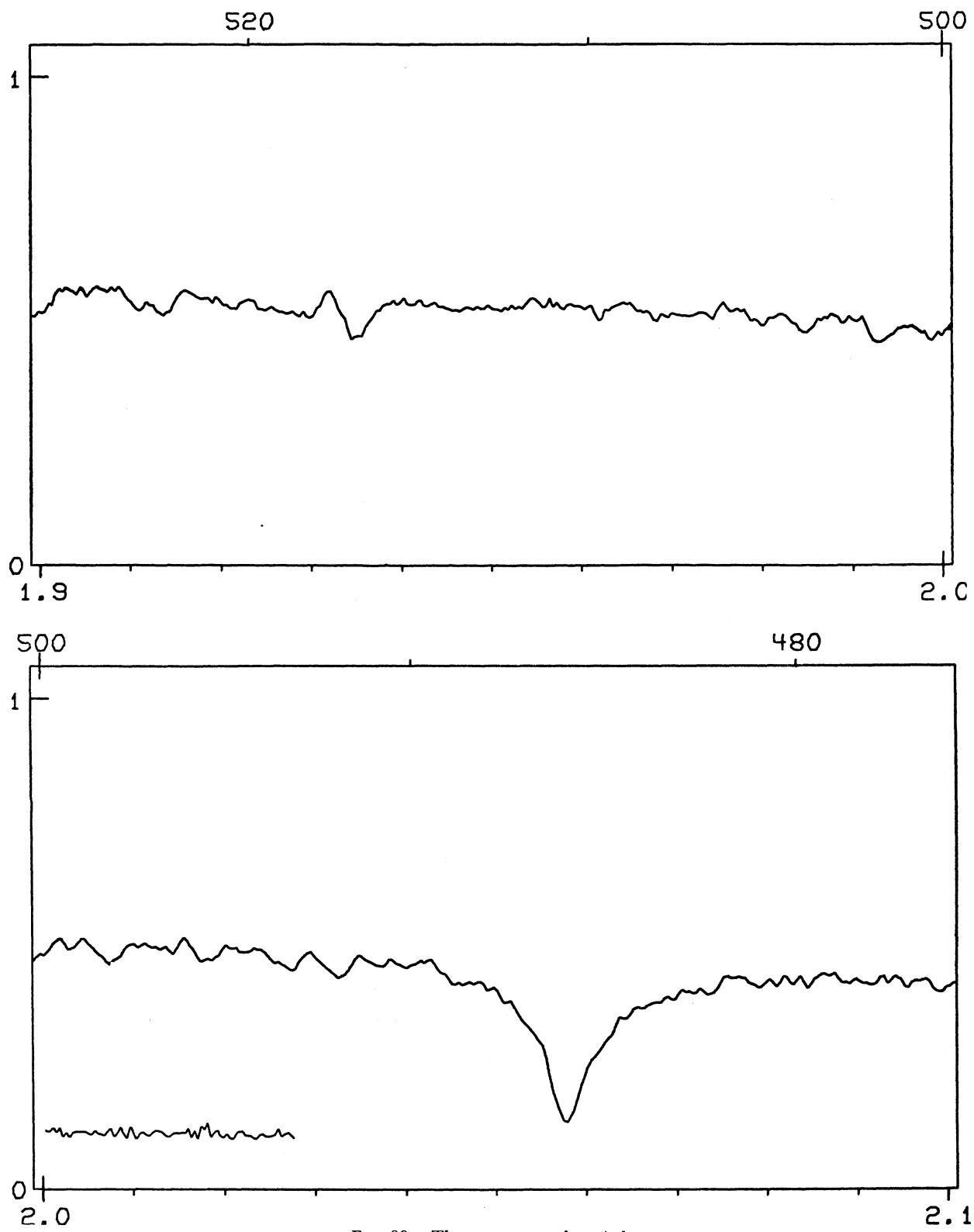
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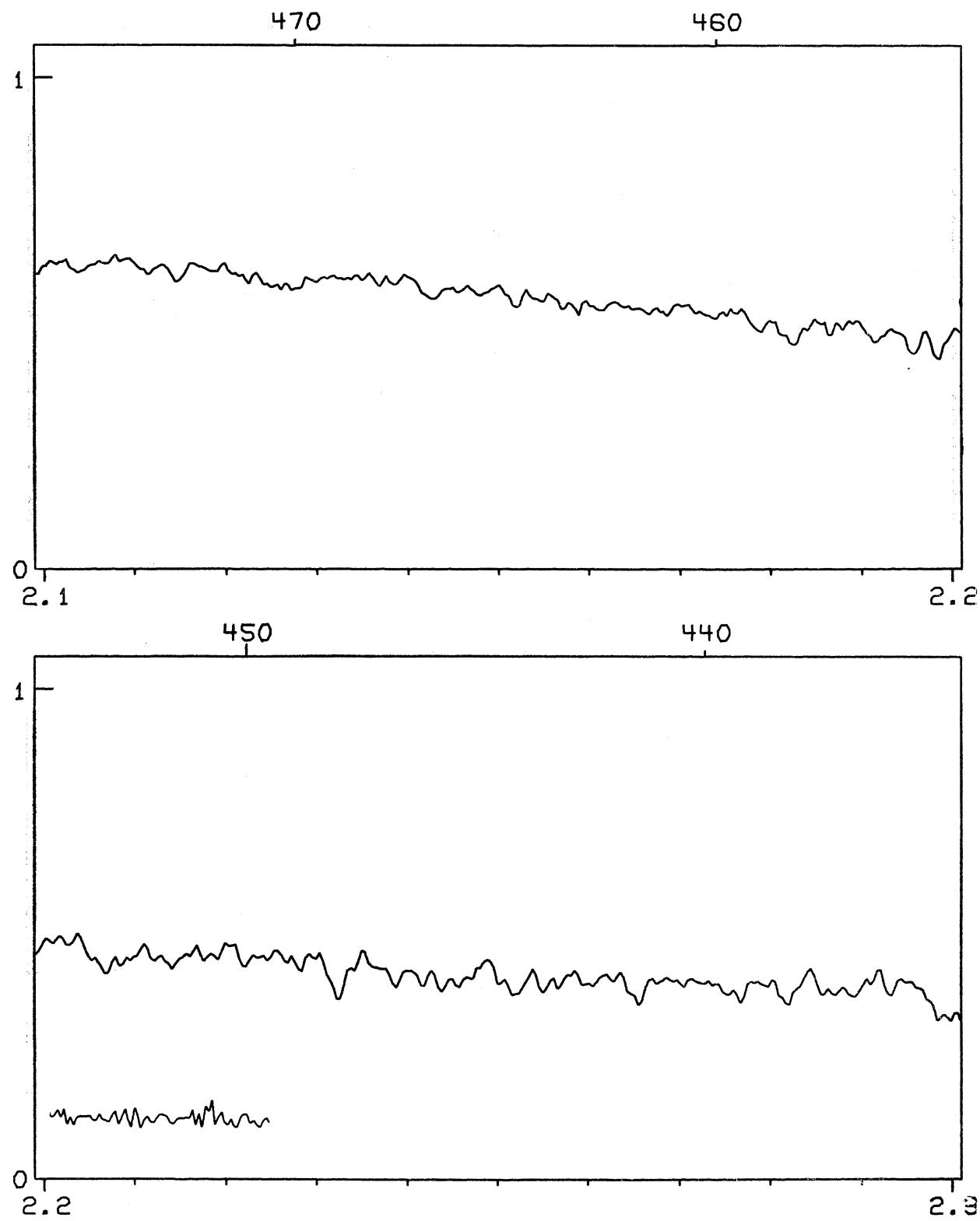
FIG. 29. The spectrum of α Aql.

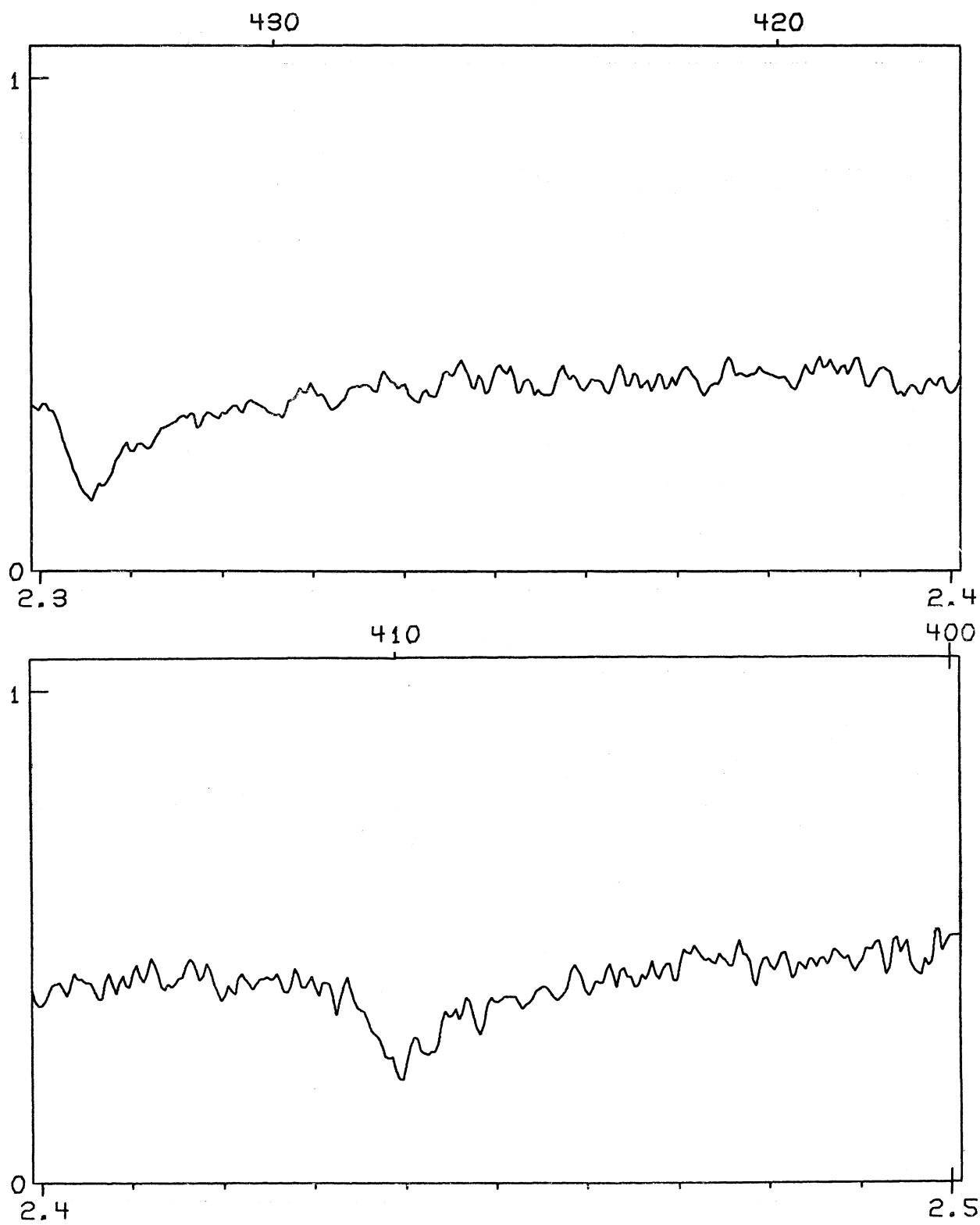
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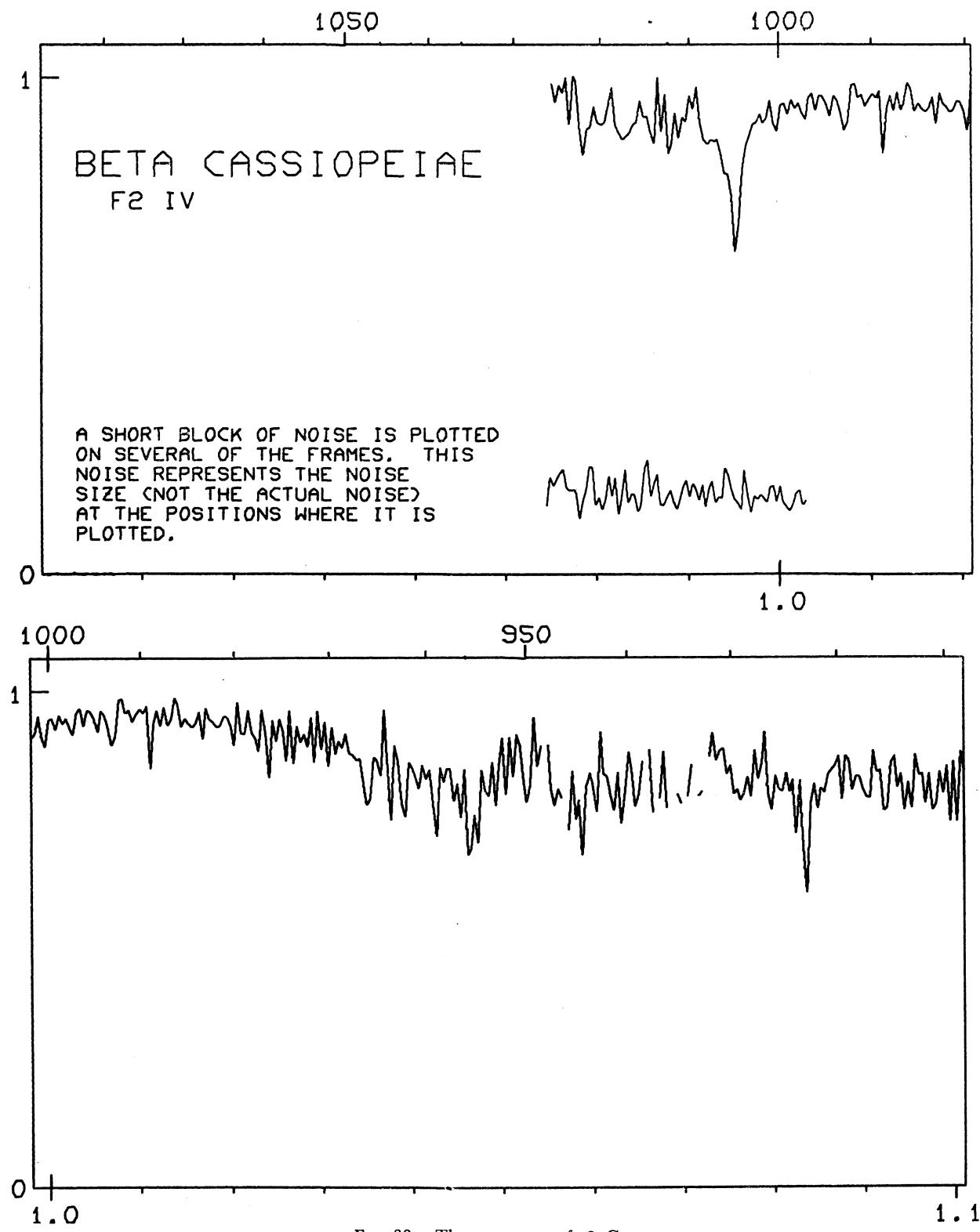
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FIG. 29. The spectrum of α Aql.

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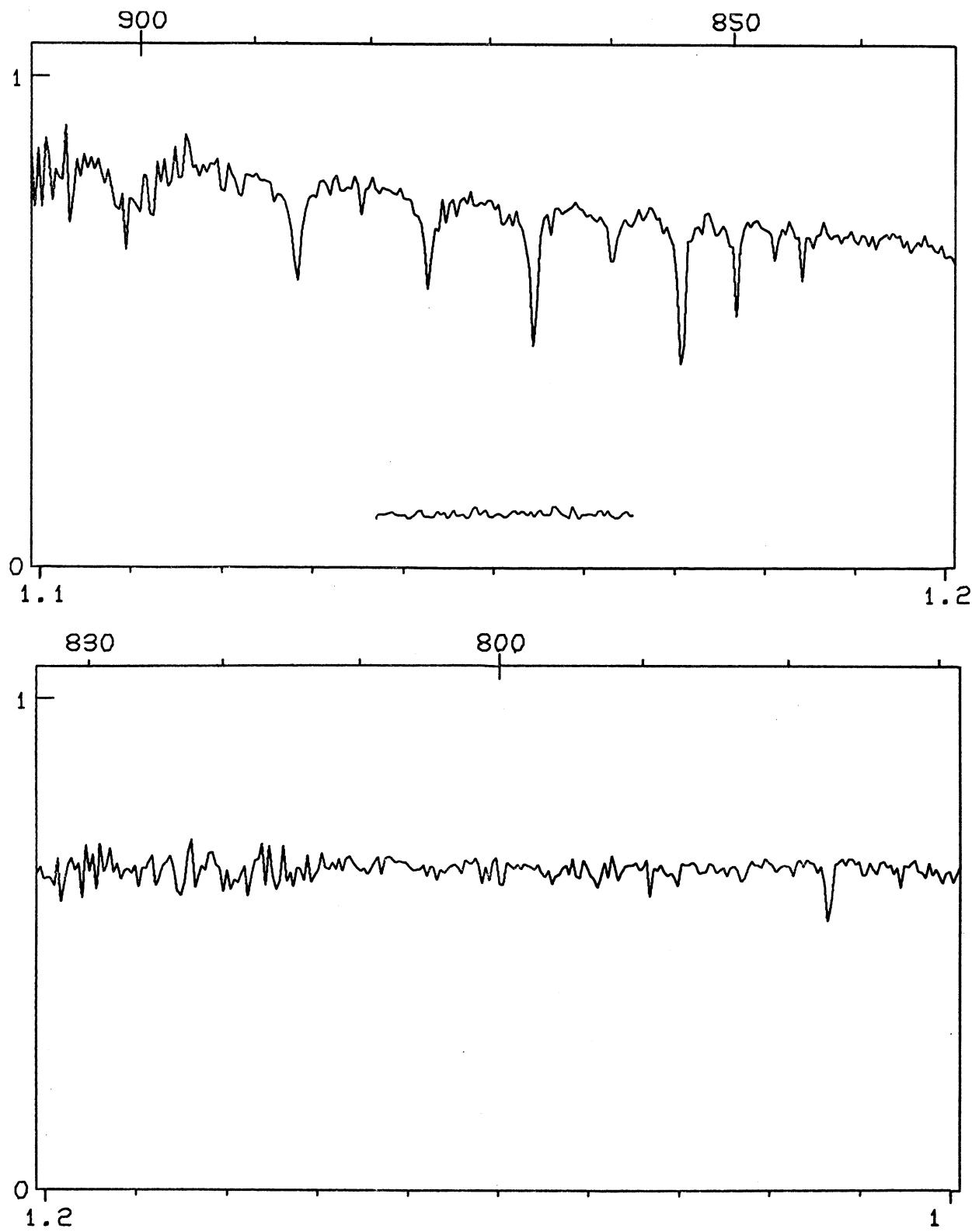
FIG. 29. The spectrum of α Aql.

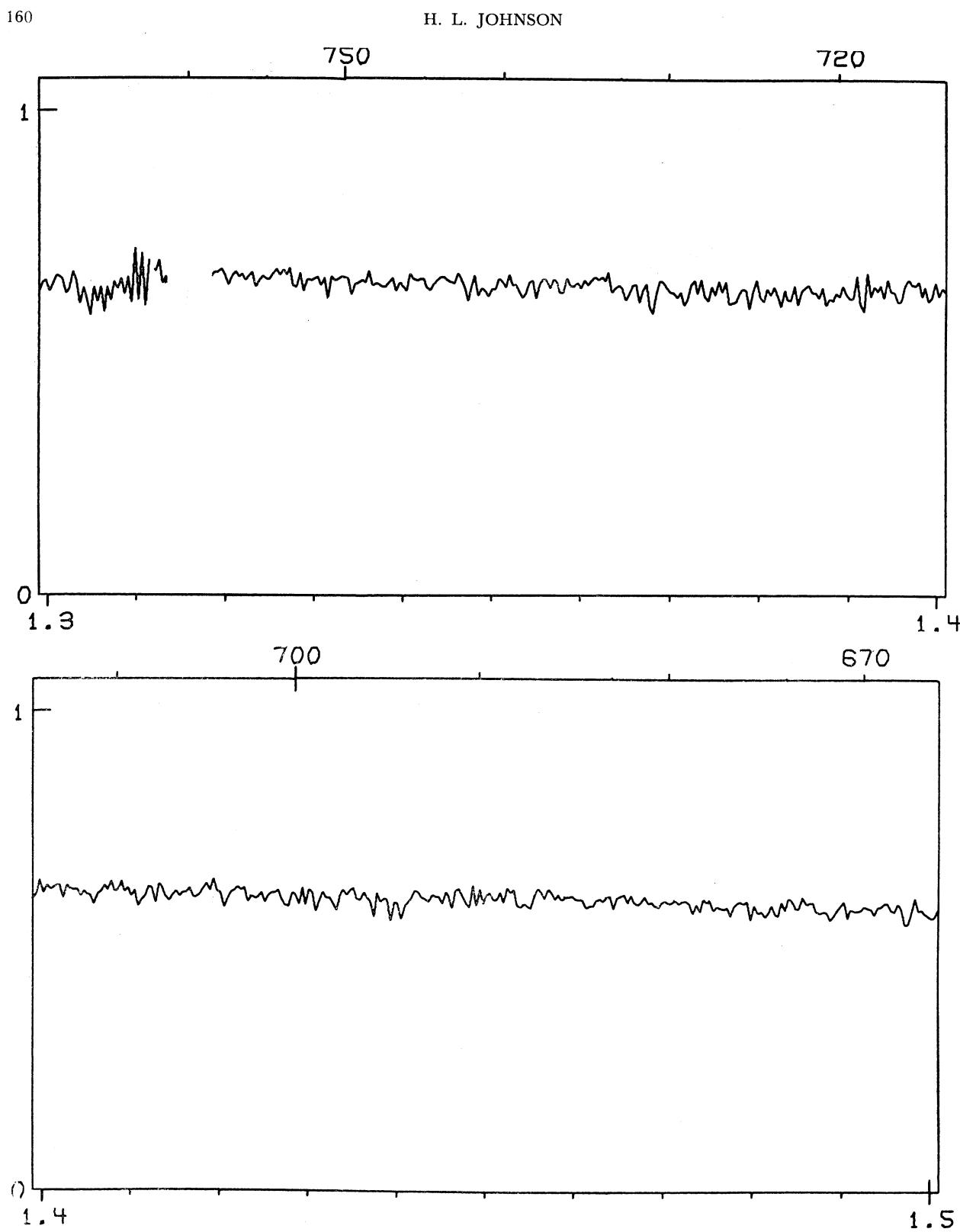
FIG. 29. The spectrum of α Aql.

FIG. 30. The spectrum of β Cas.

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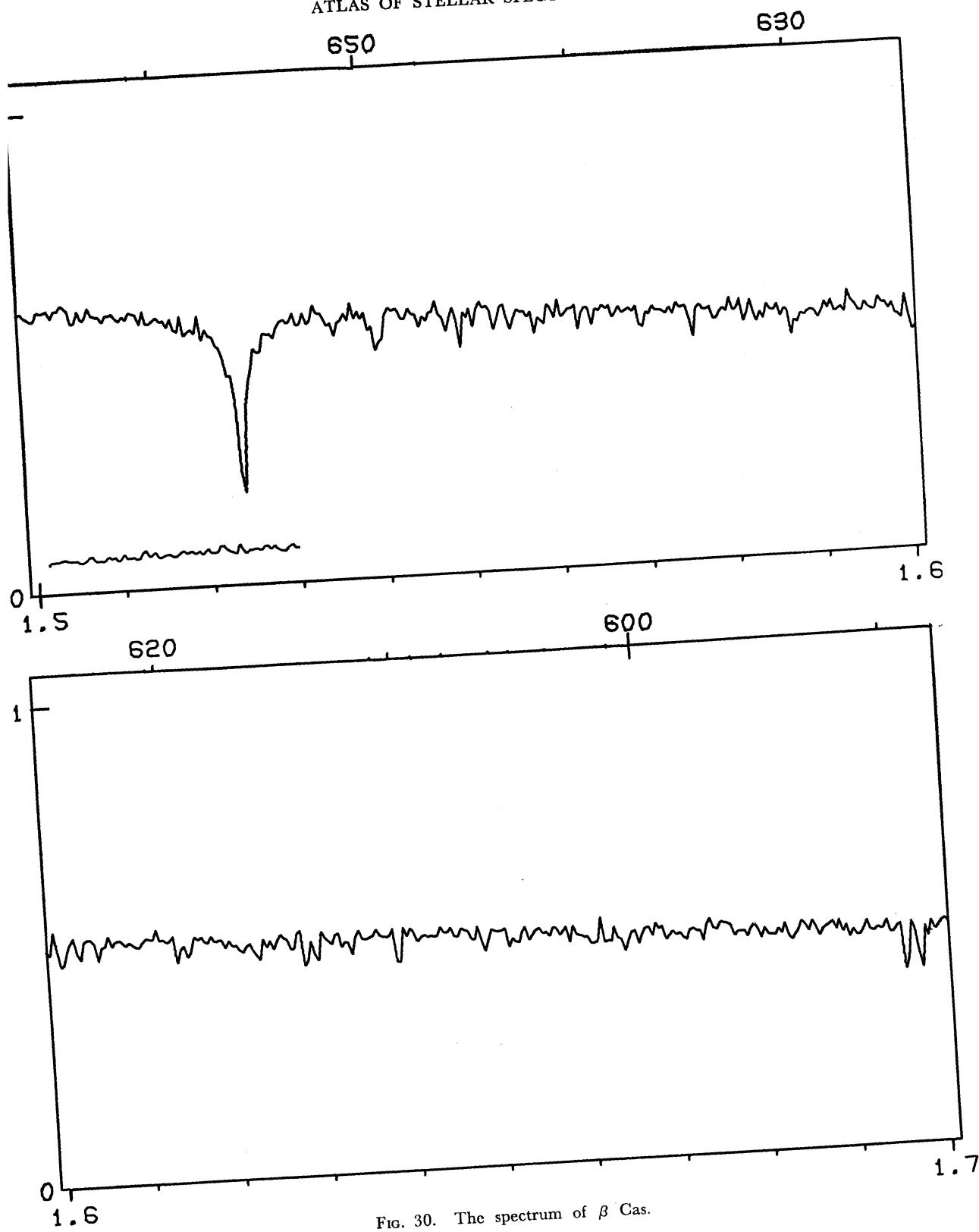
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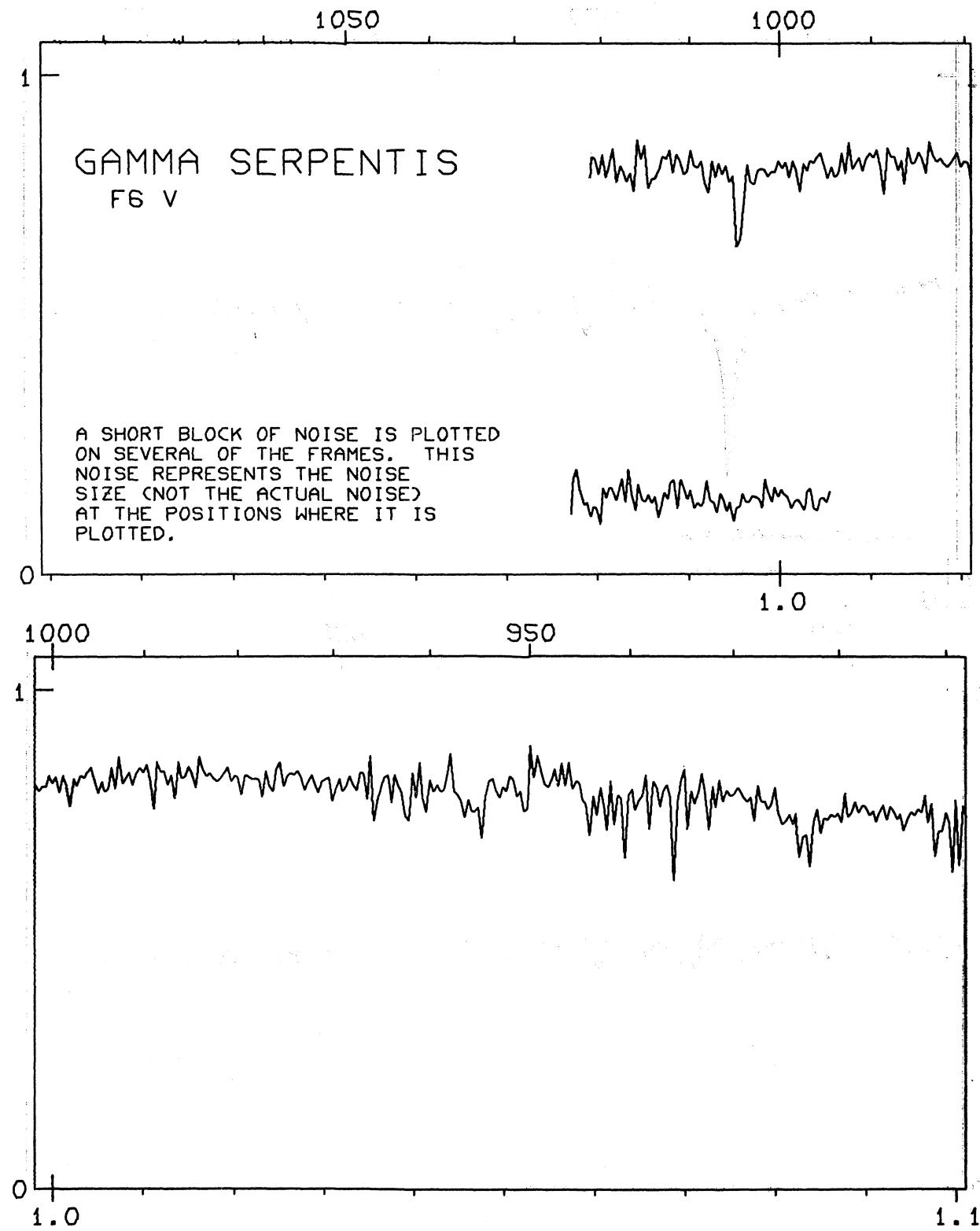
FIG. 30. The spectrum of β Cas.

FIG. 30. The spectrum of β Cas.

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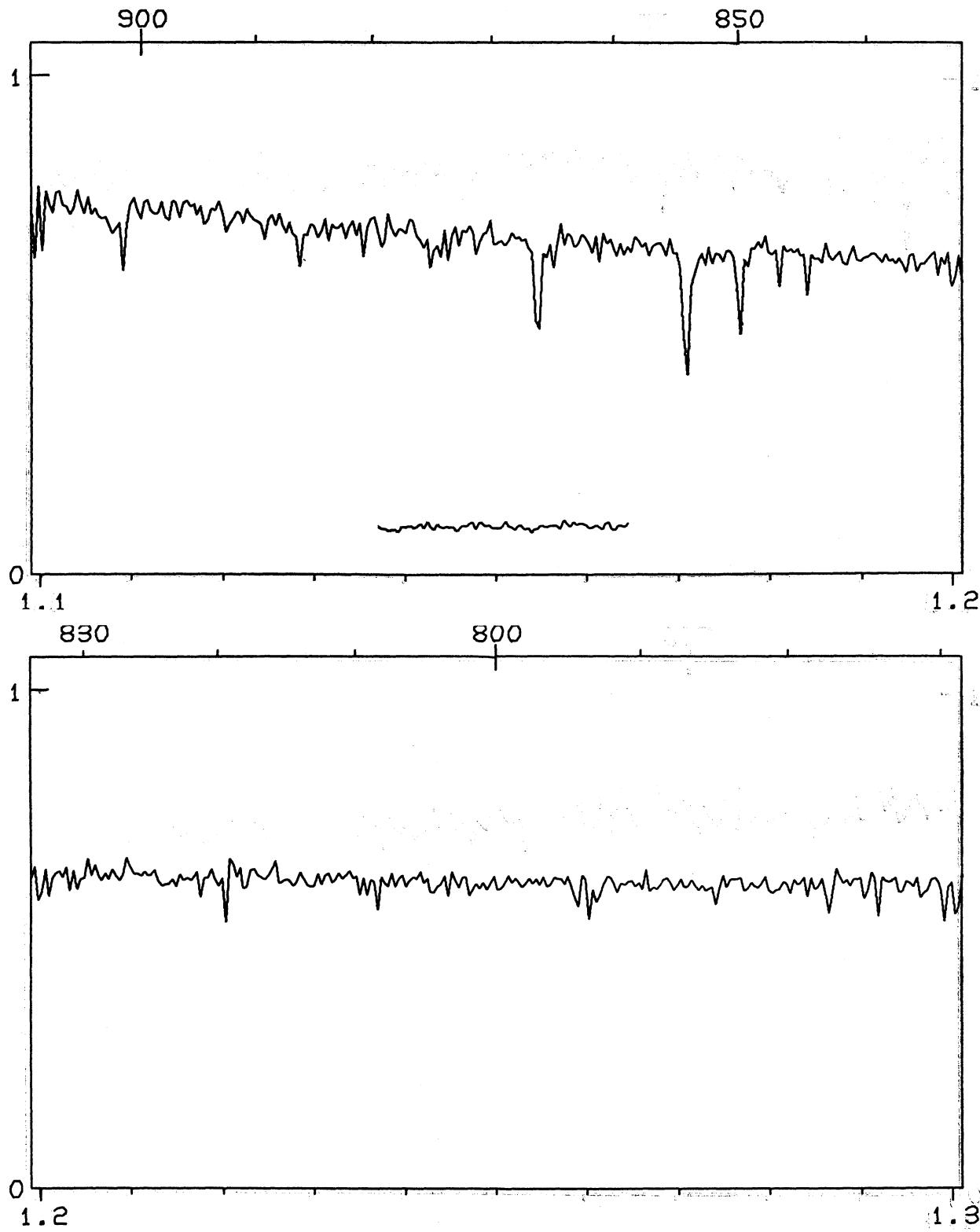
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FIG. 30. The spectrum of β Cas.

FIG. 31. The spectrum of γ Ser.

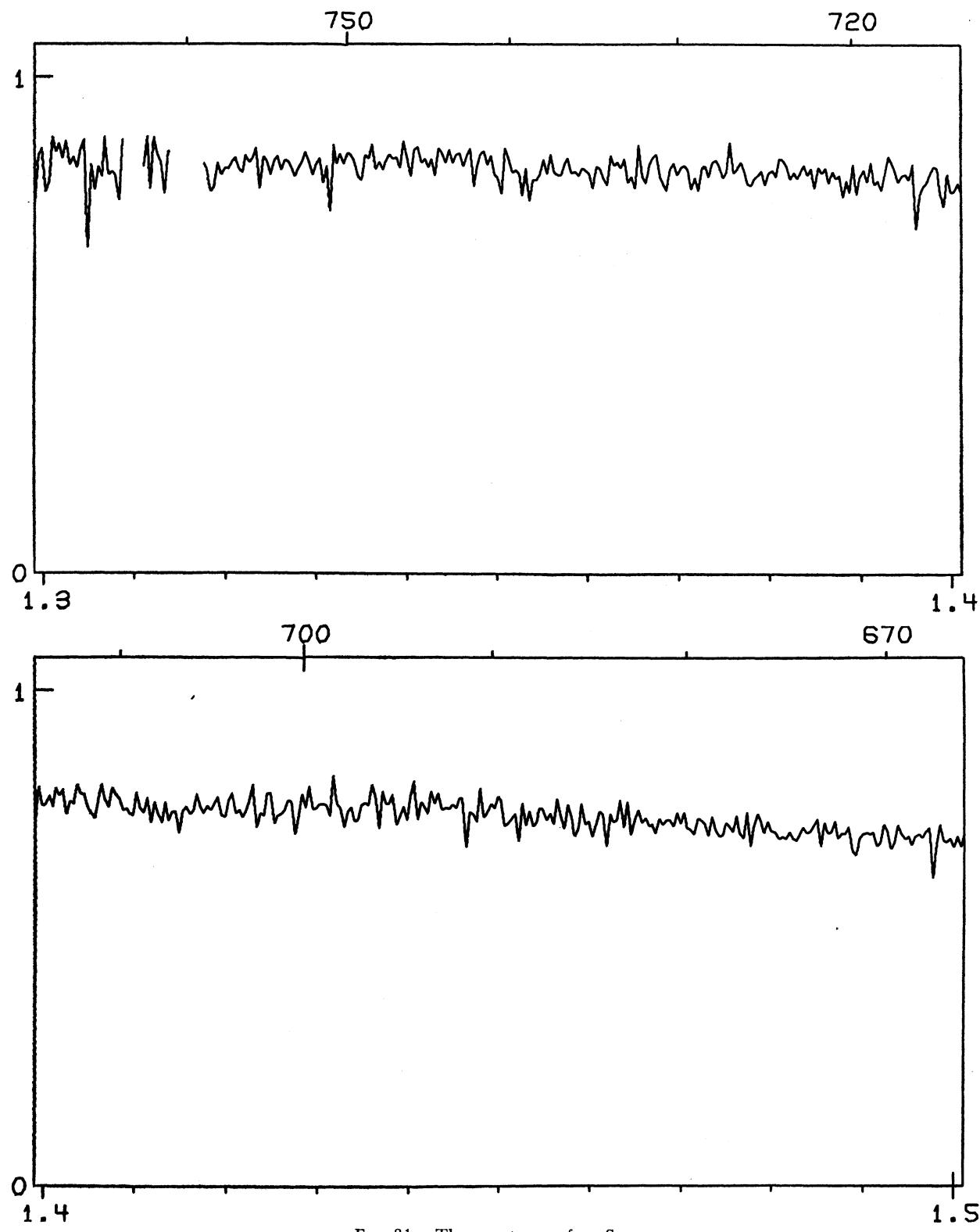
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FIG. 31. The spectrum of γ Ser.

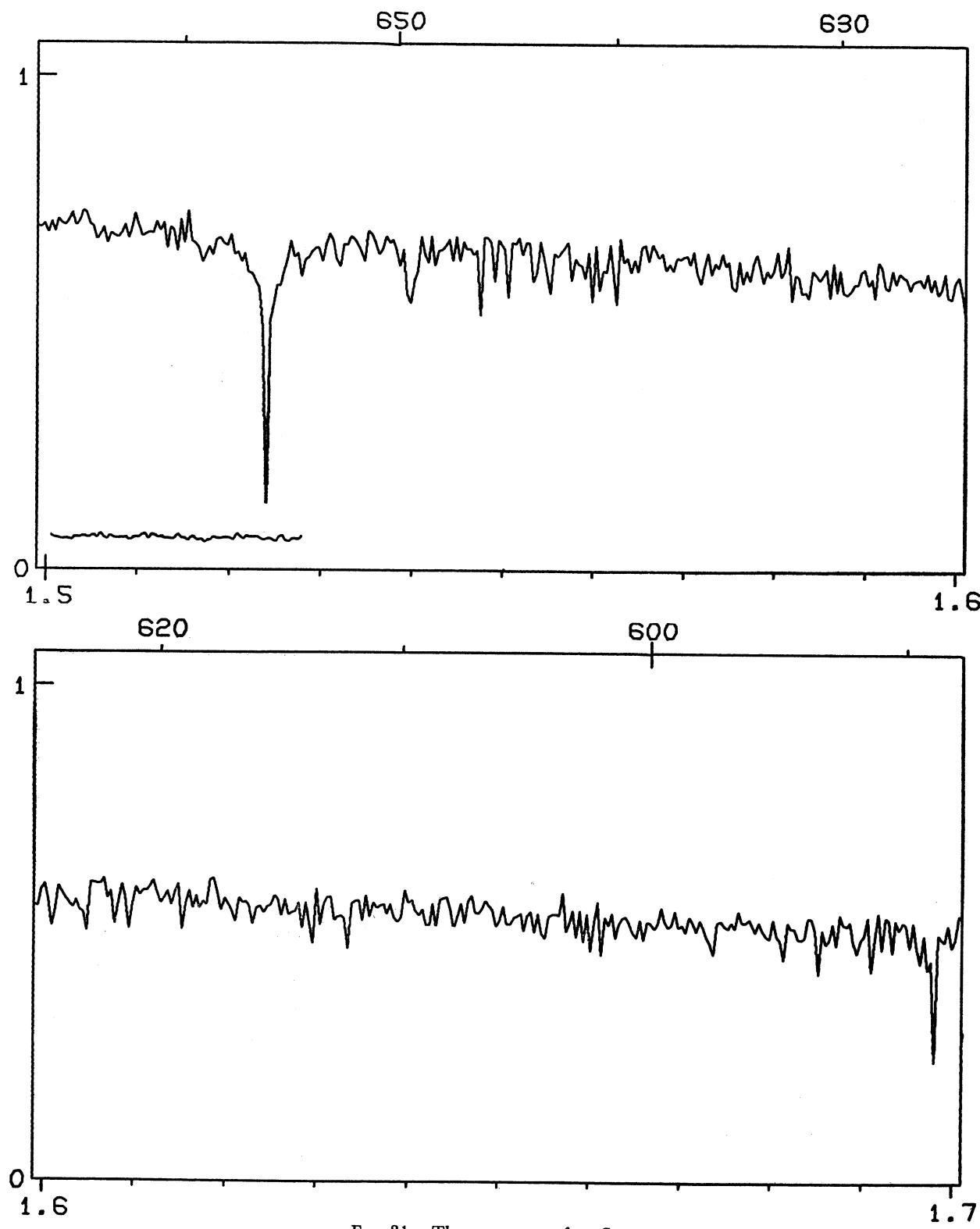
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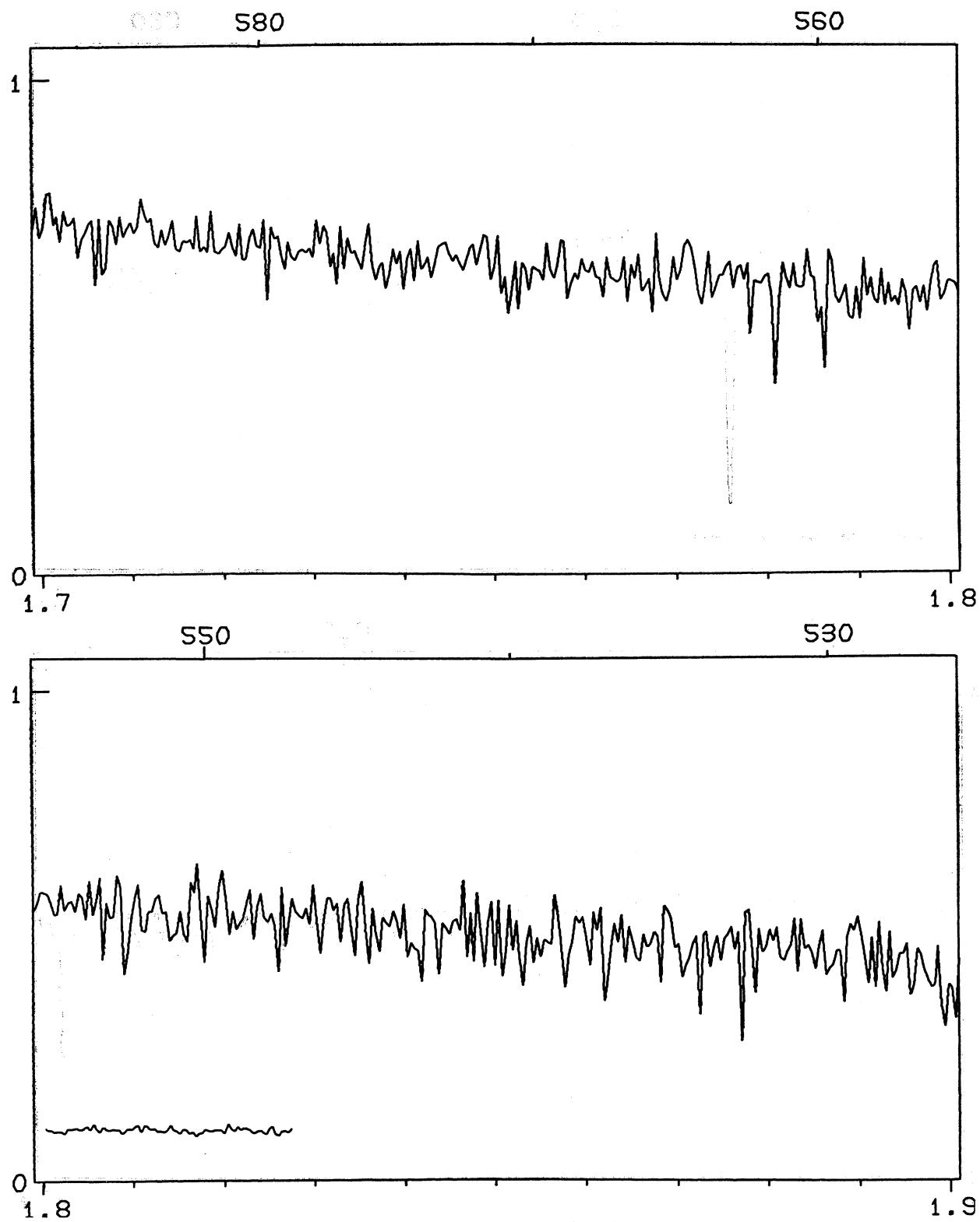
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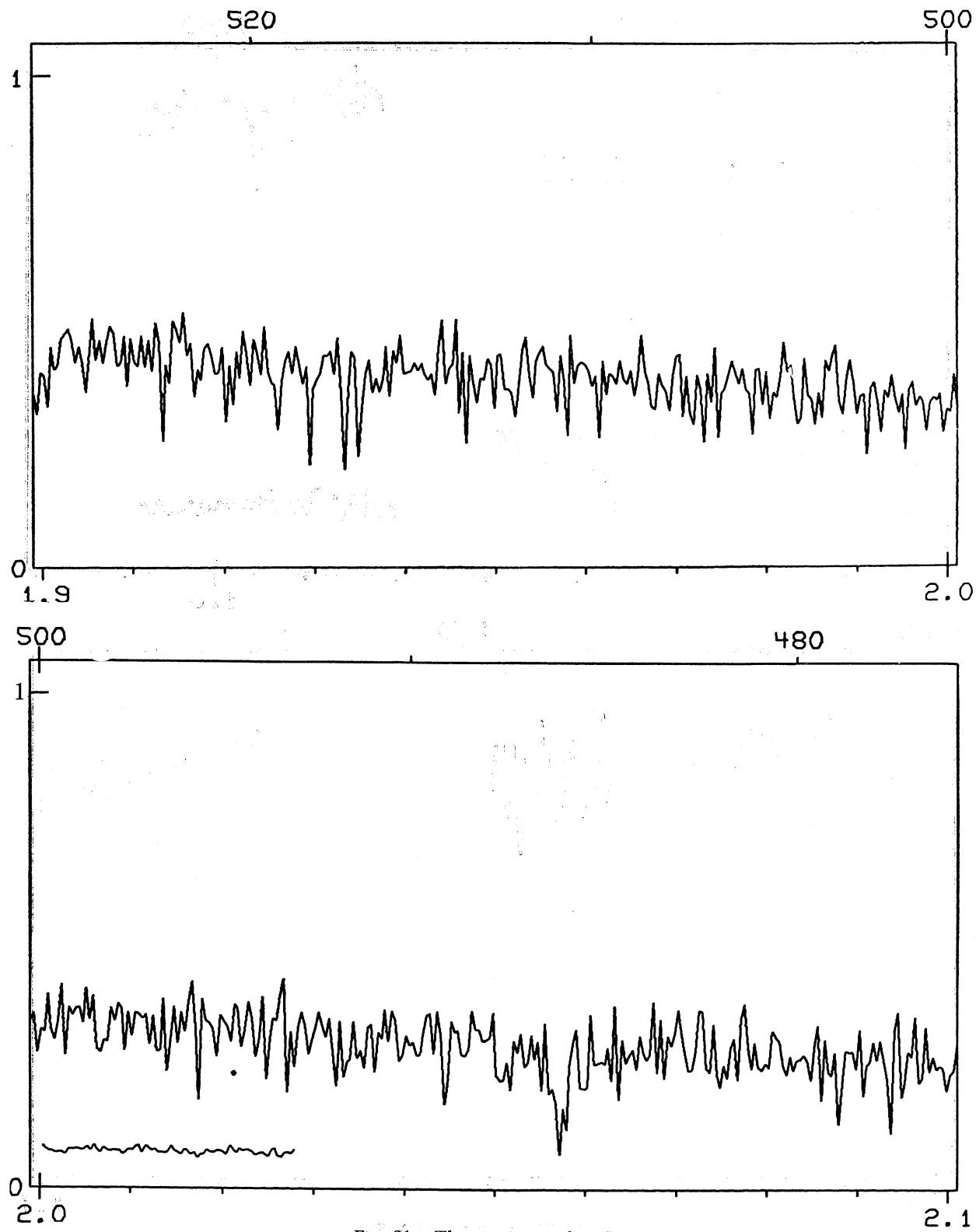
FIG. 31. The spectrum of γ Ser.

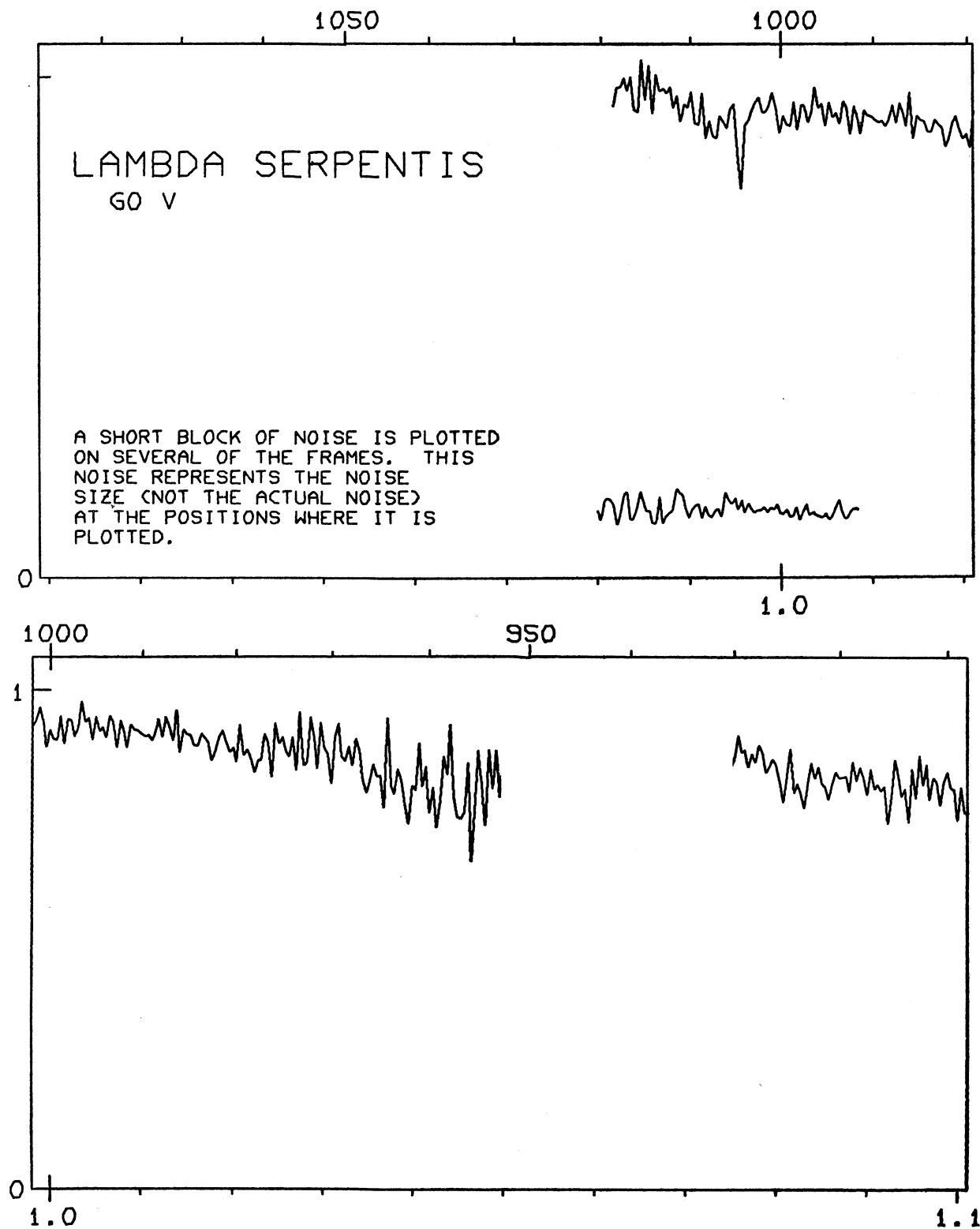
ATLAS OF STELLAR SPECTRA

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FIG. 31. The spectrum of γ Ser.

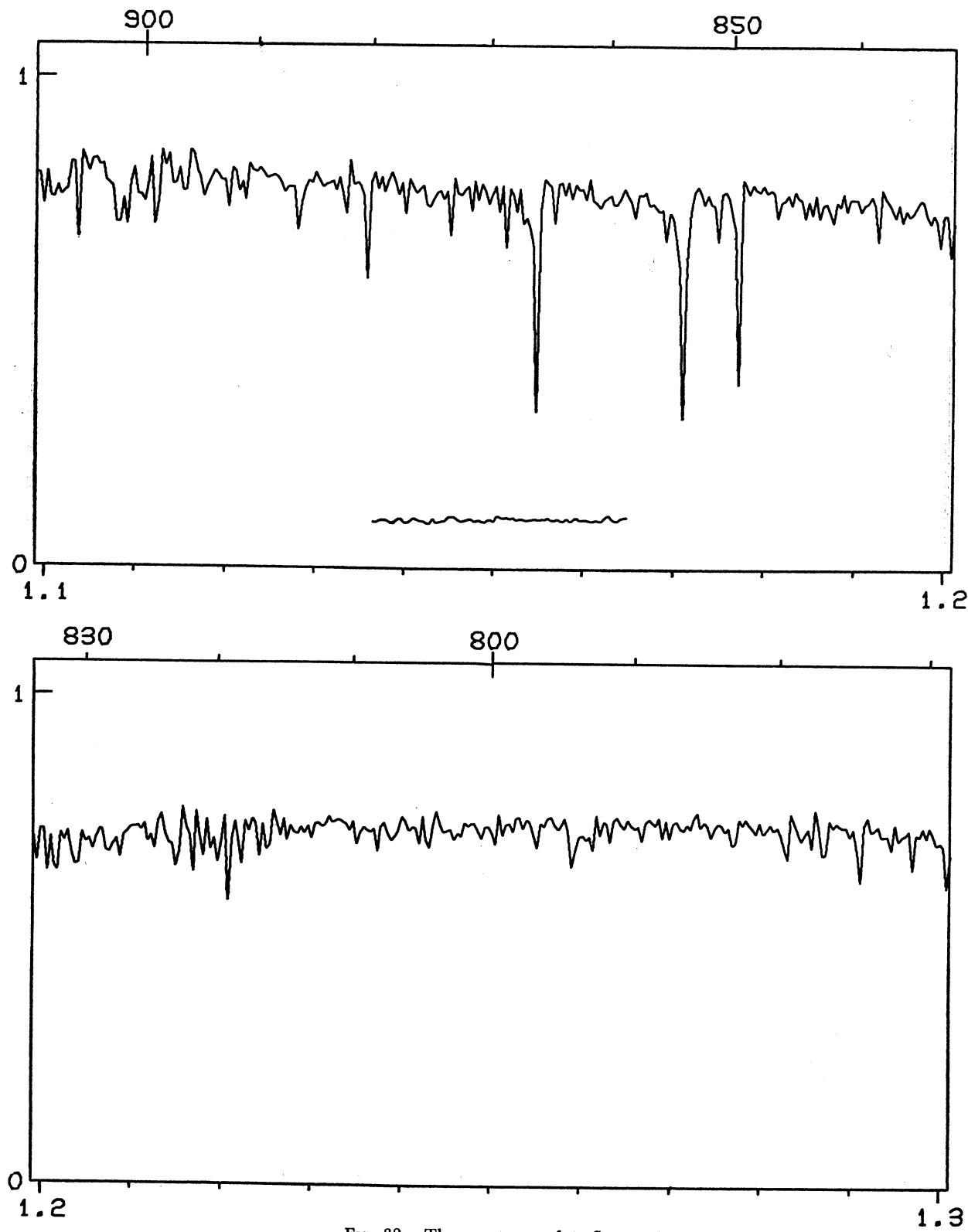
FIG. 31. The spectrum of γ Ser.

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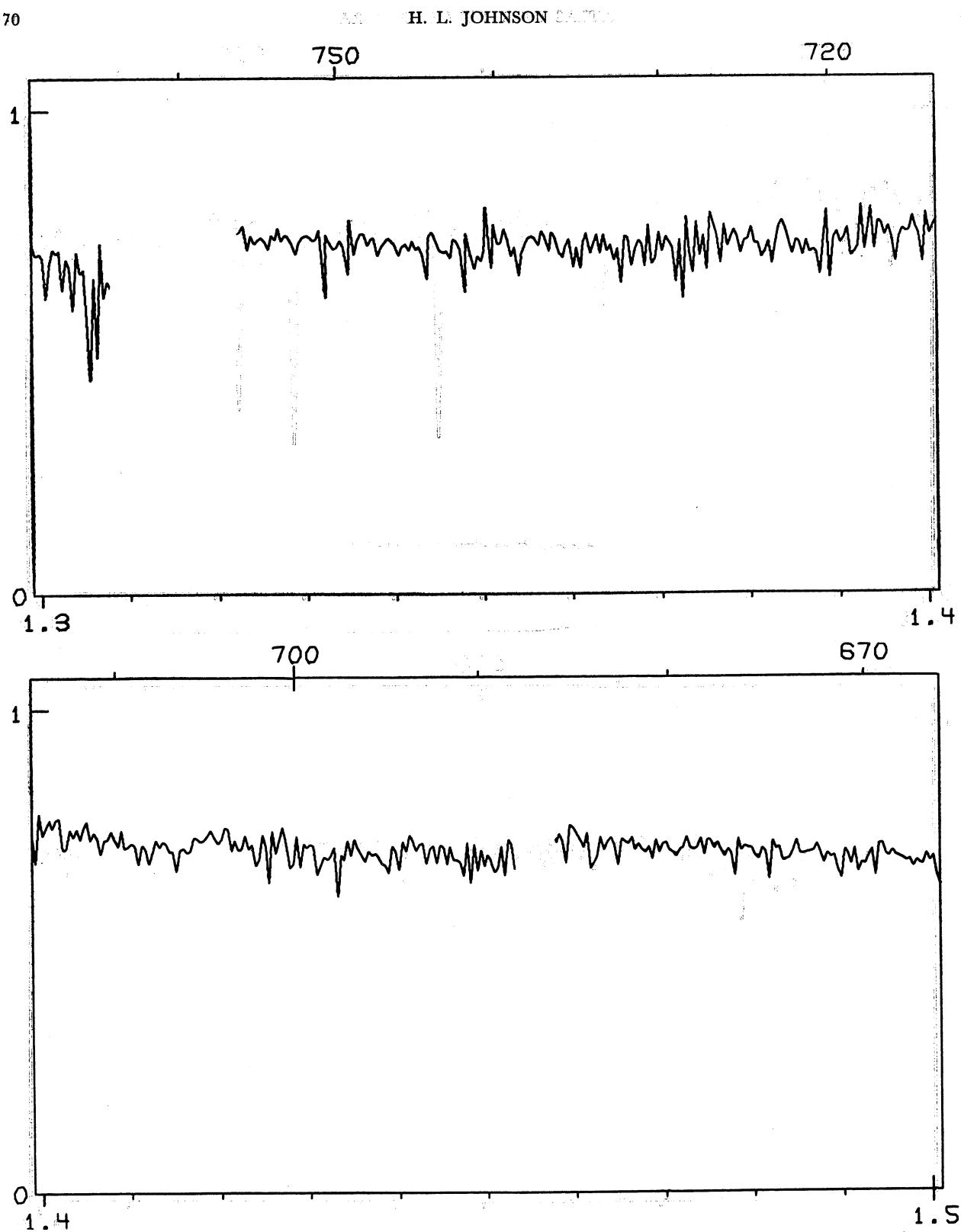
FIG. 32. The spectrum of λ Ser.

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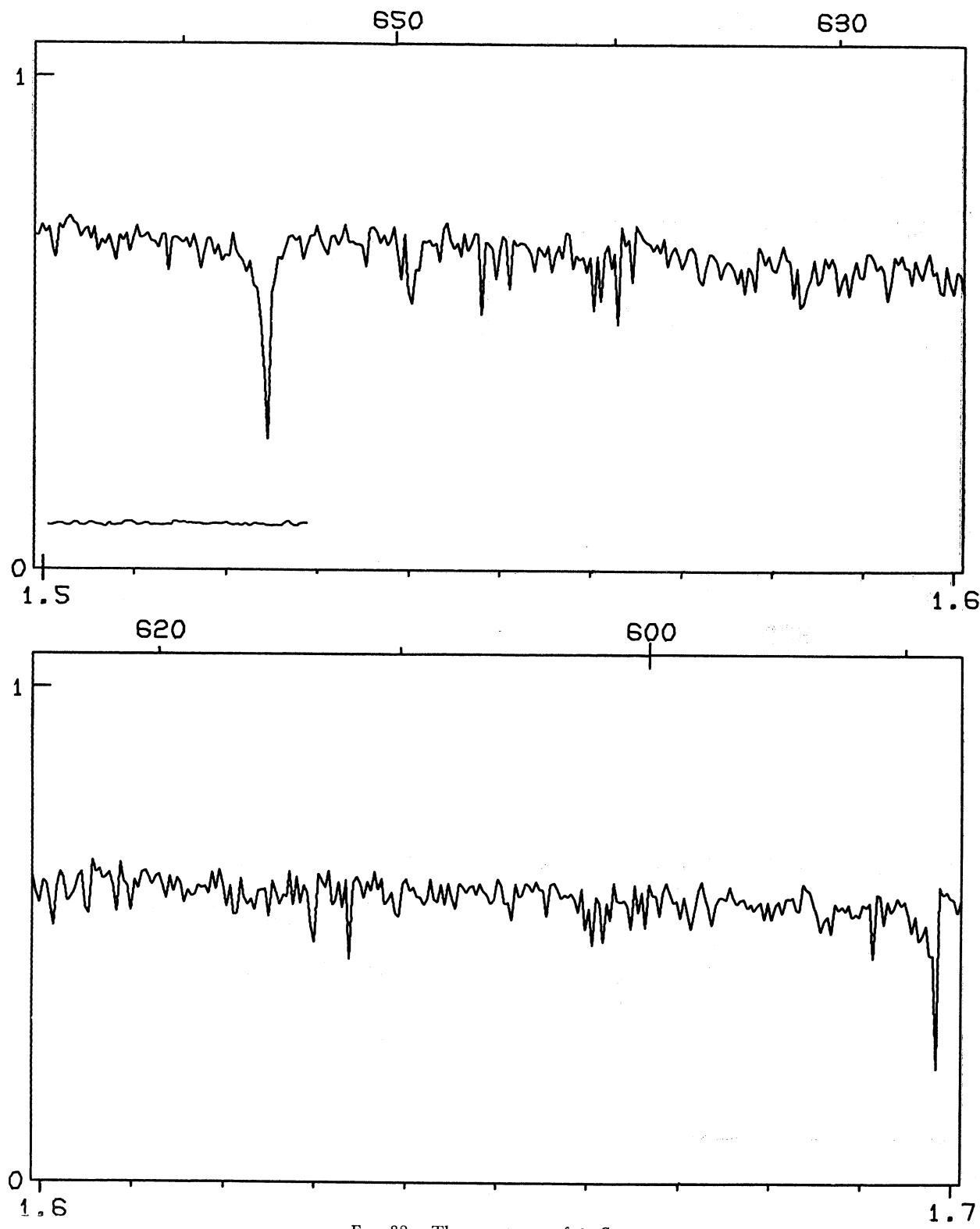
FIG. 32. The spectrum of λ Ser.

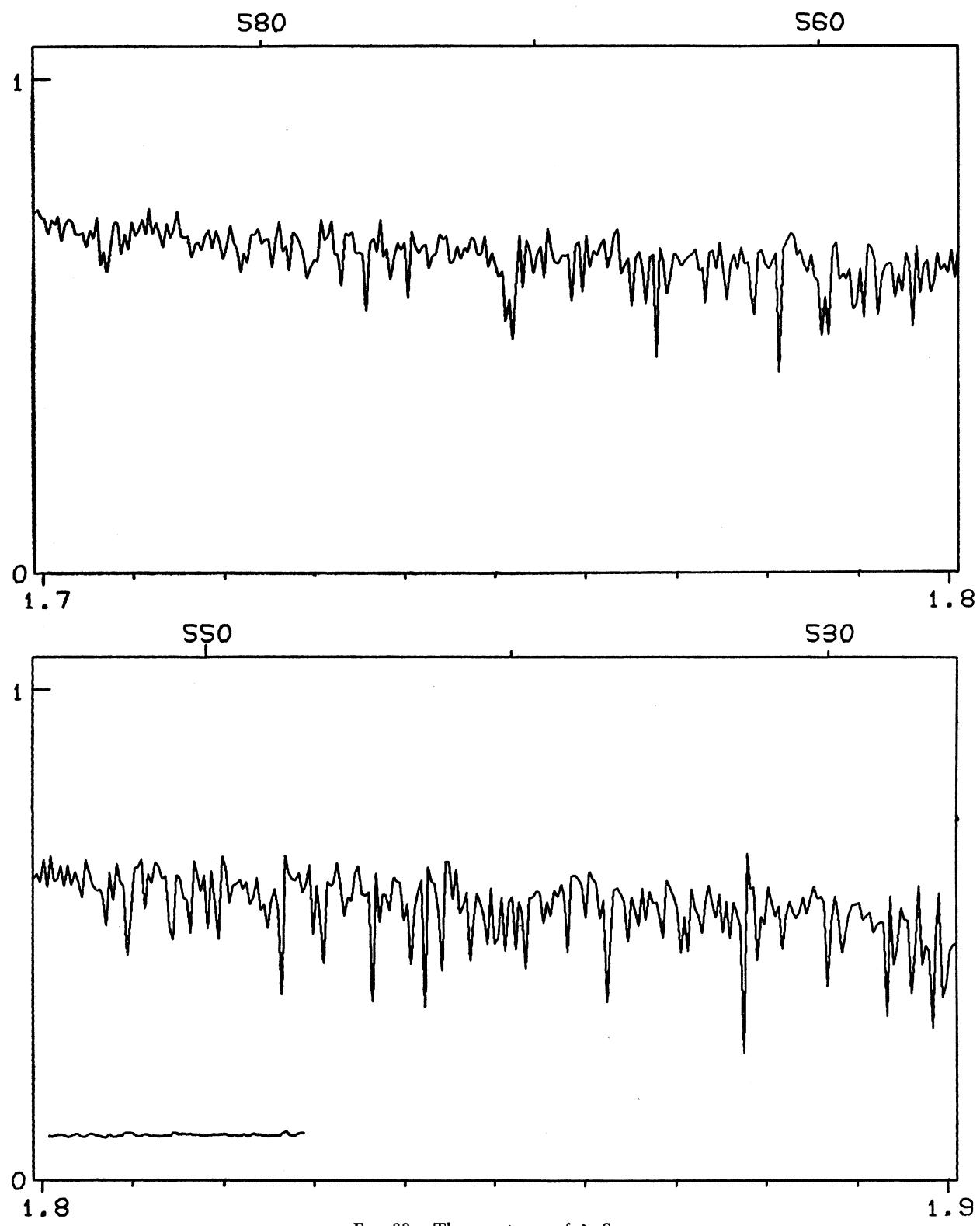
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FIG. 32. The spectrum of λ Ser.

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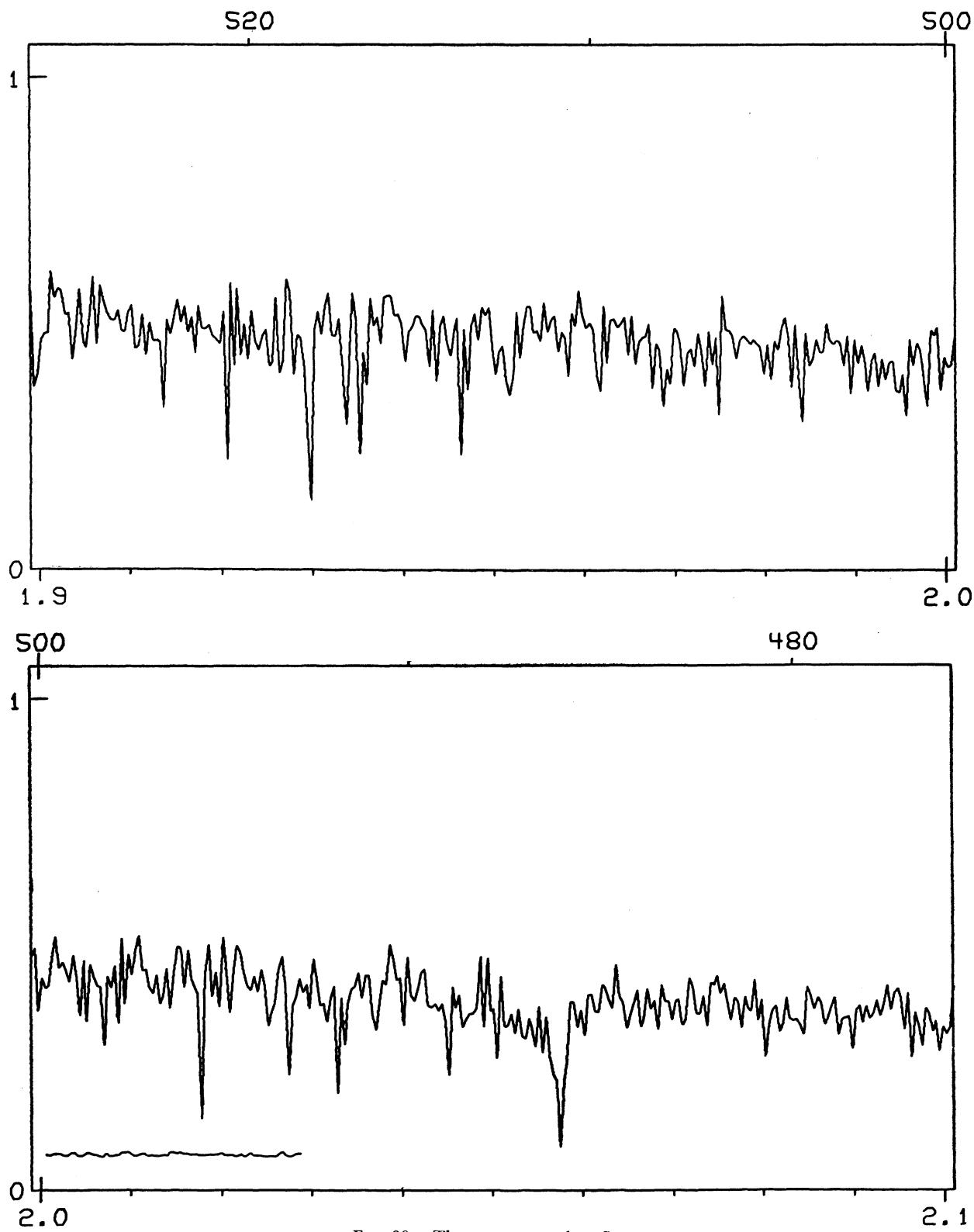
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FIG. 32. The spectrum of λ Ser.

FIG. 32. The spectrum of λ Ser.

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FIG. 32. The spectrum of λ Ser.

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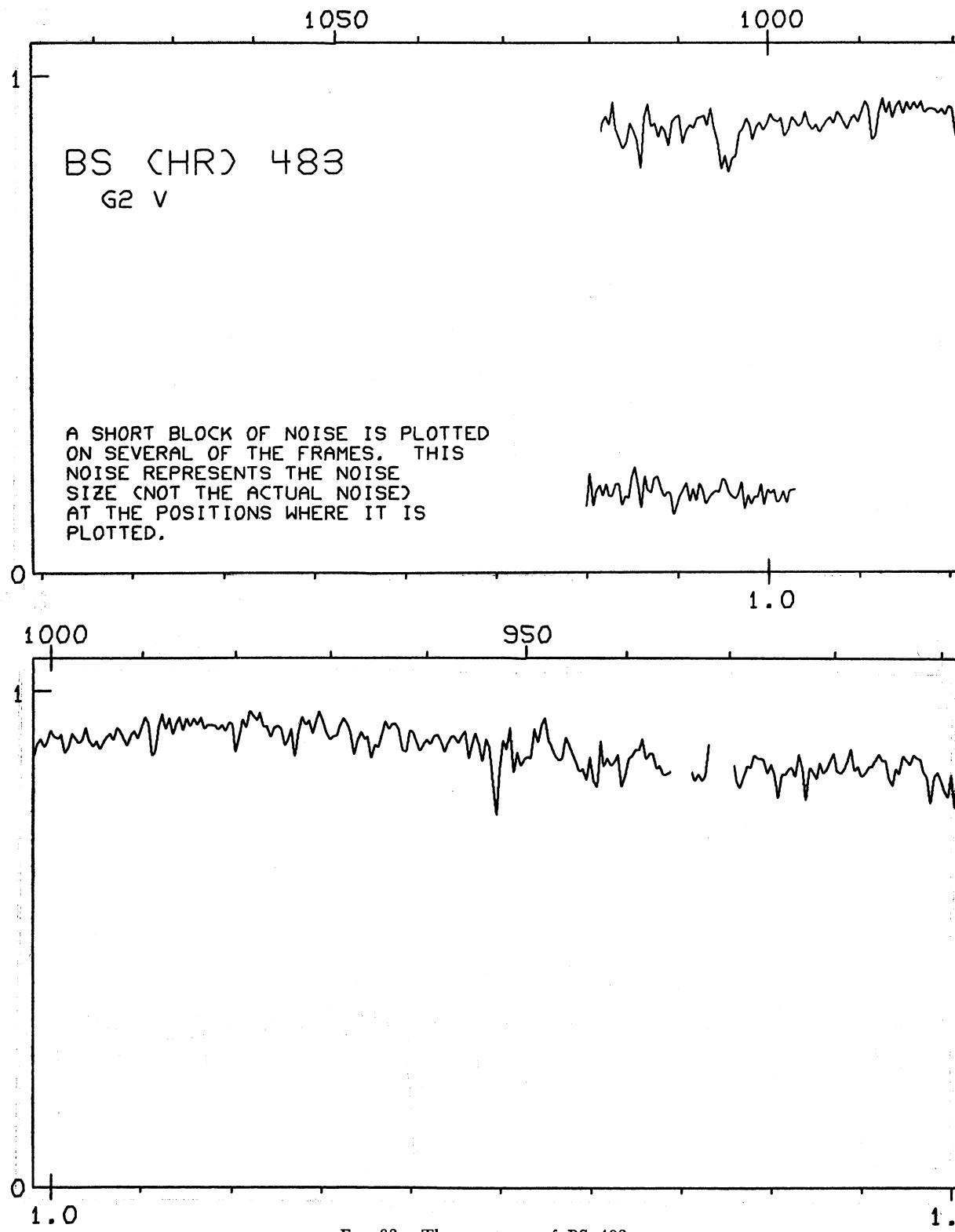


FIG. 33. The spectrum of BS 483.

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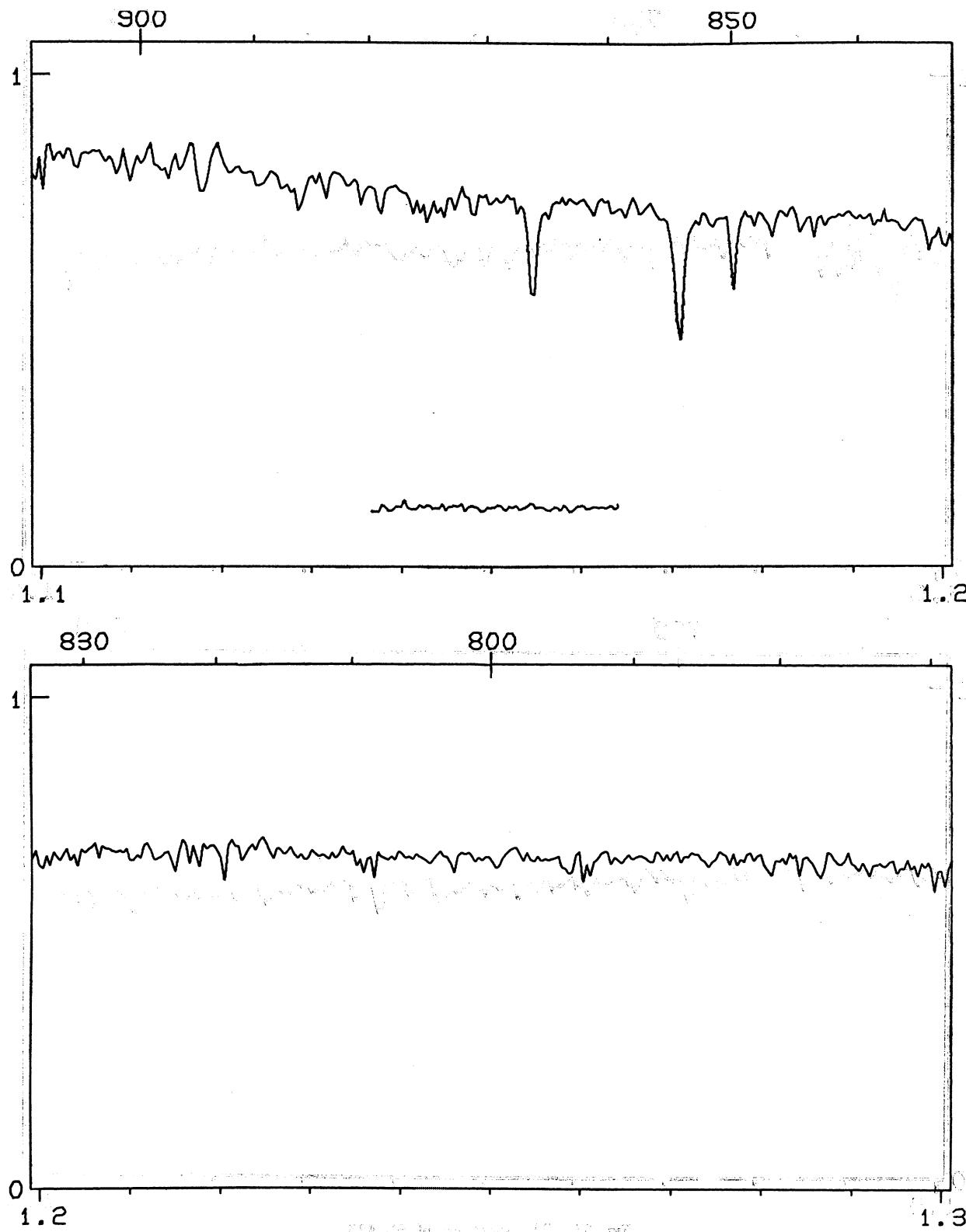


FIG. 33. The spectrum of BS 483.

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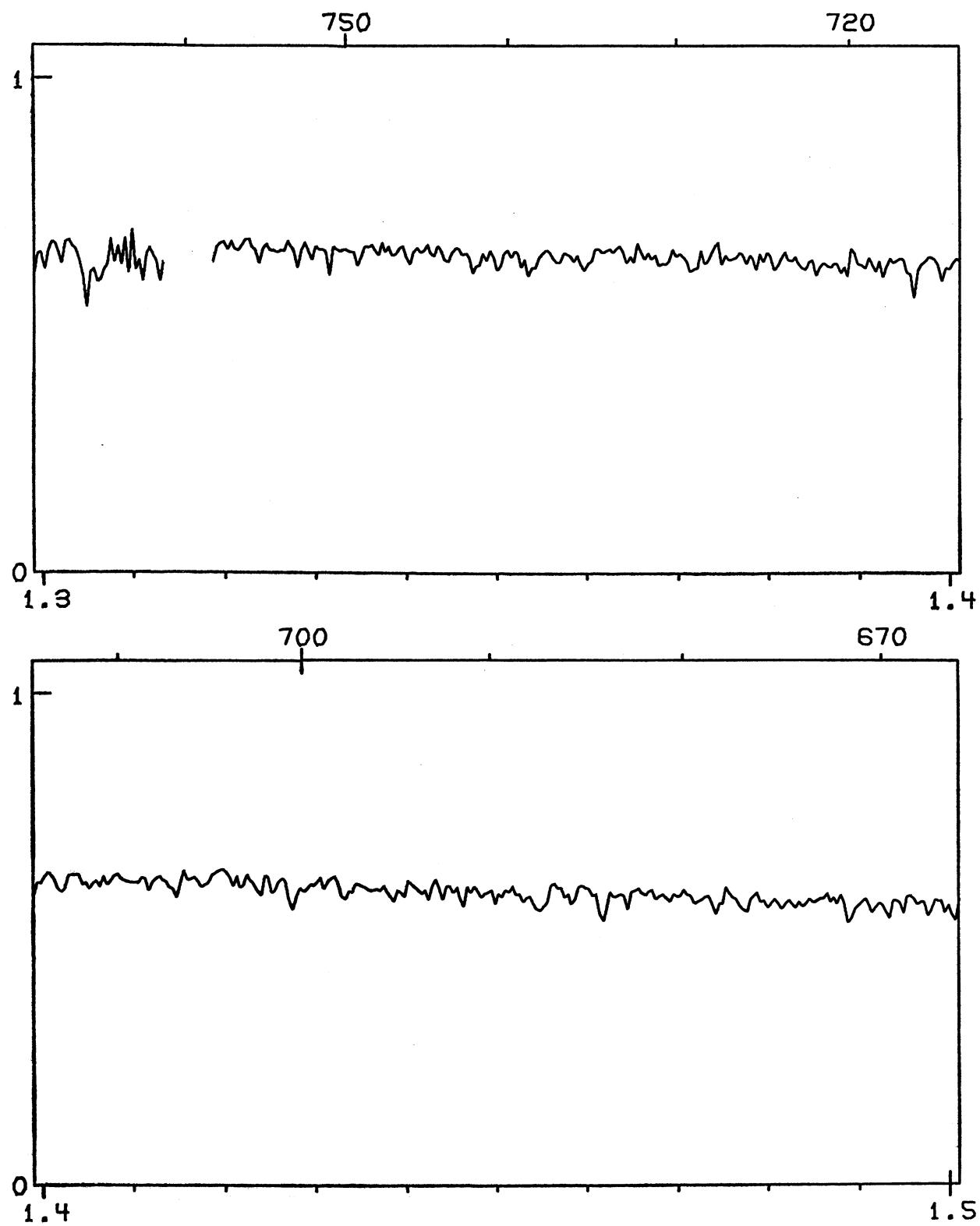


FIG. 33. The spectrum of BS 483.

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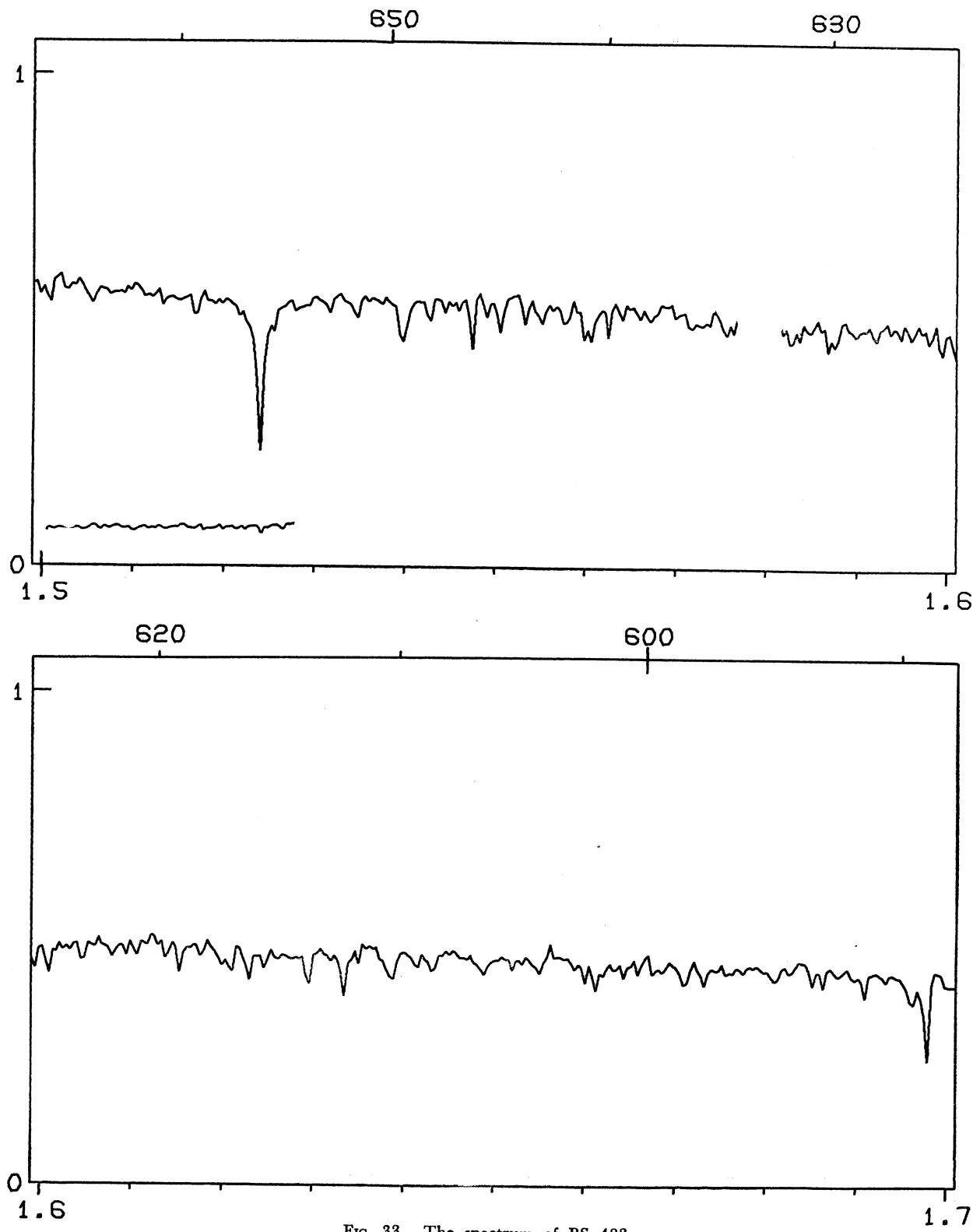


FIG. 33. The spectrum of BS 483.

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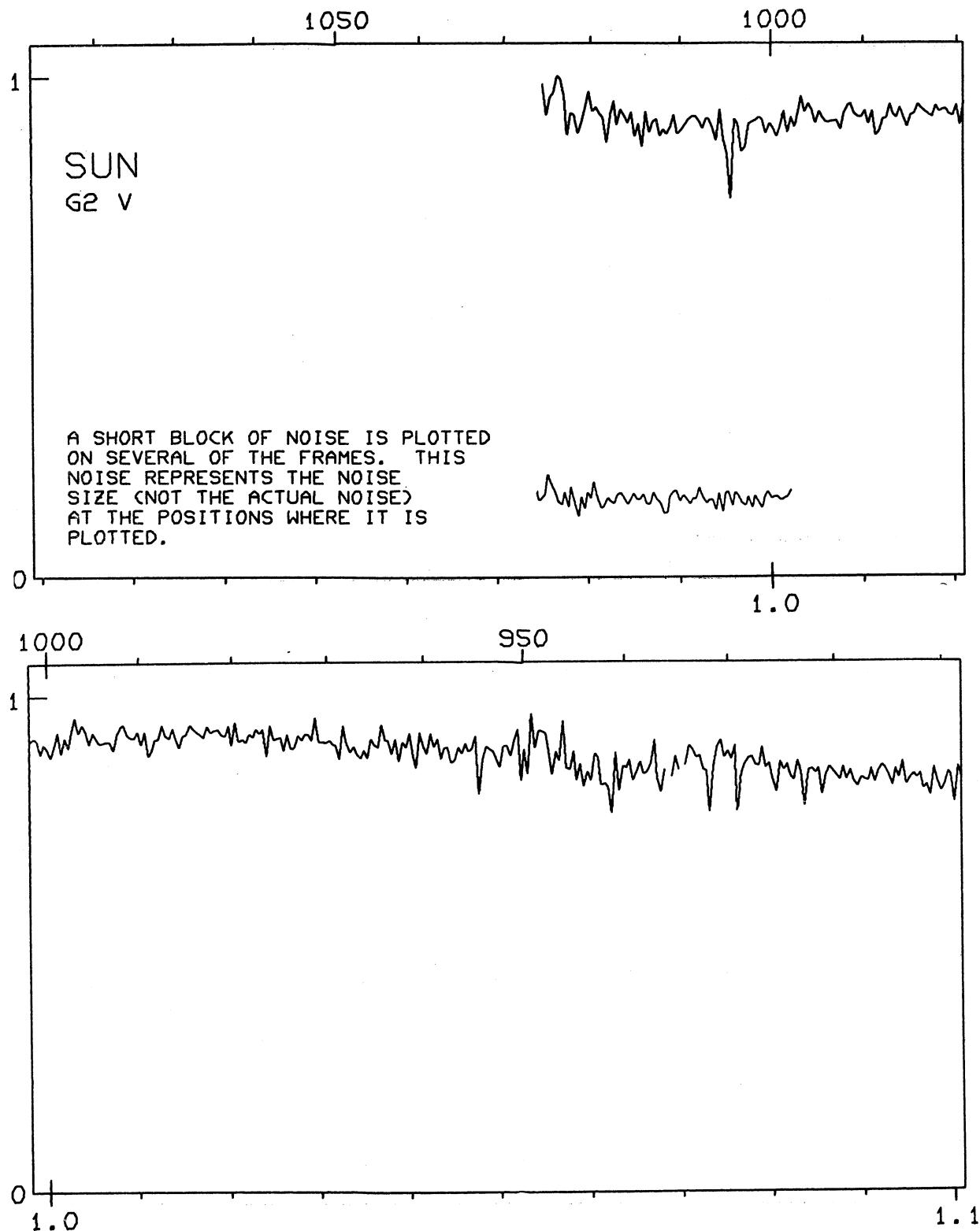


FIG. 34. The spectrum of the Sun, as reflected by the Moon and a satellite of Jupiter.

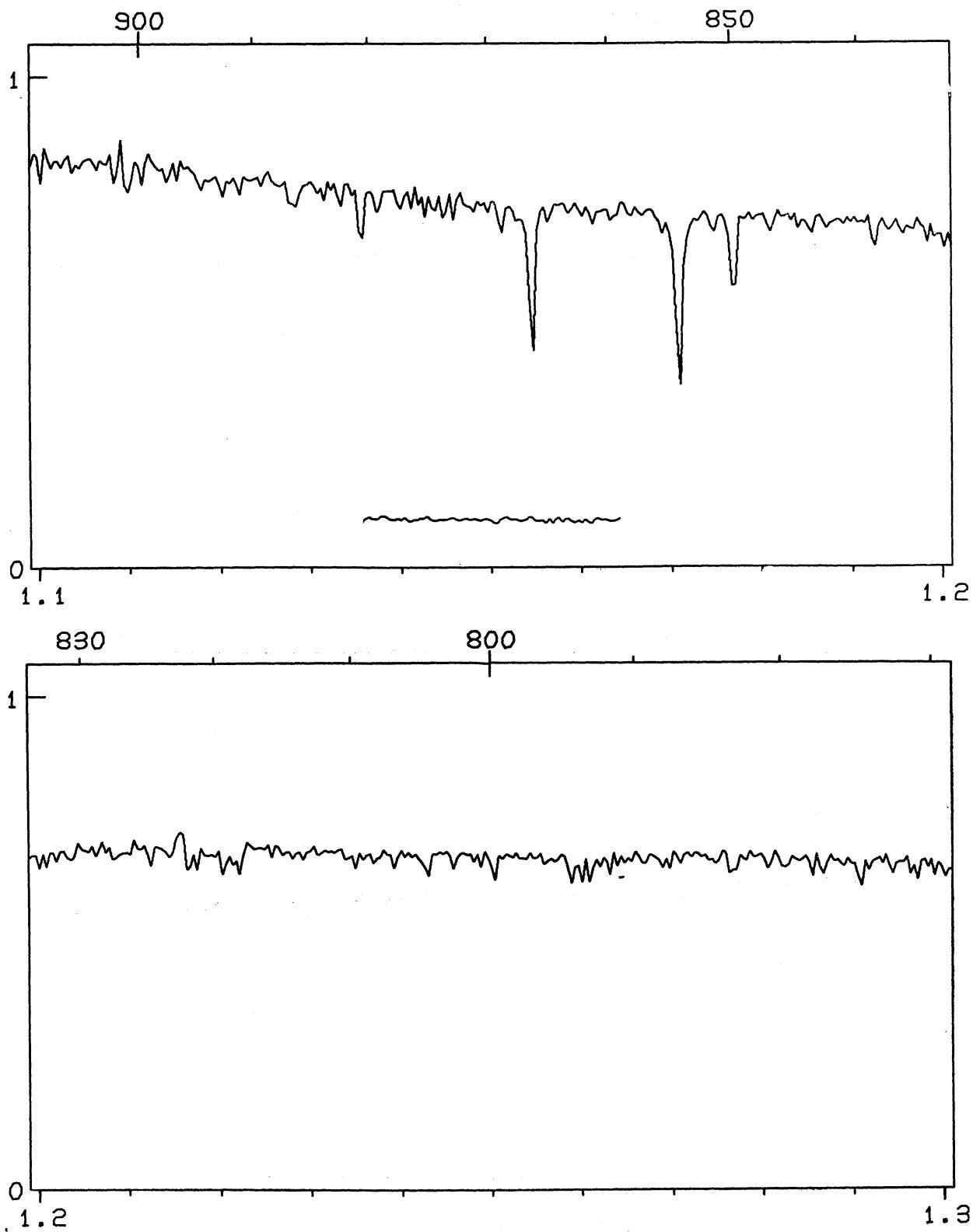


FIG. 34. The spectrum of the Sun.

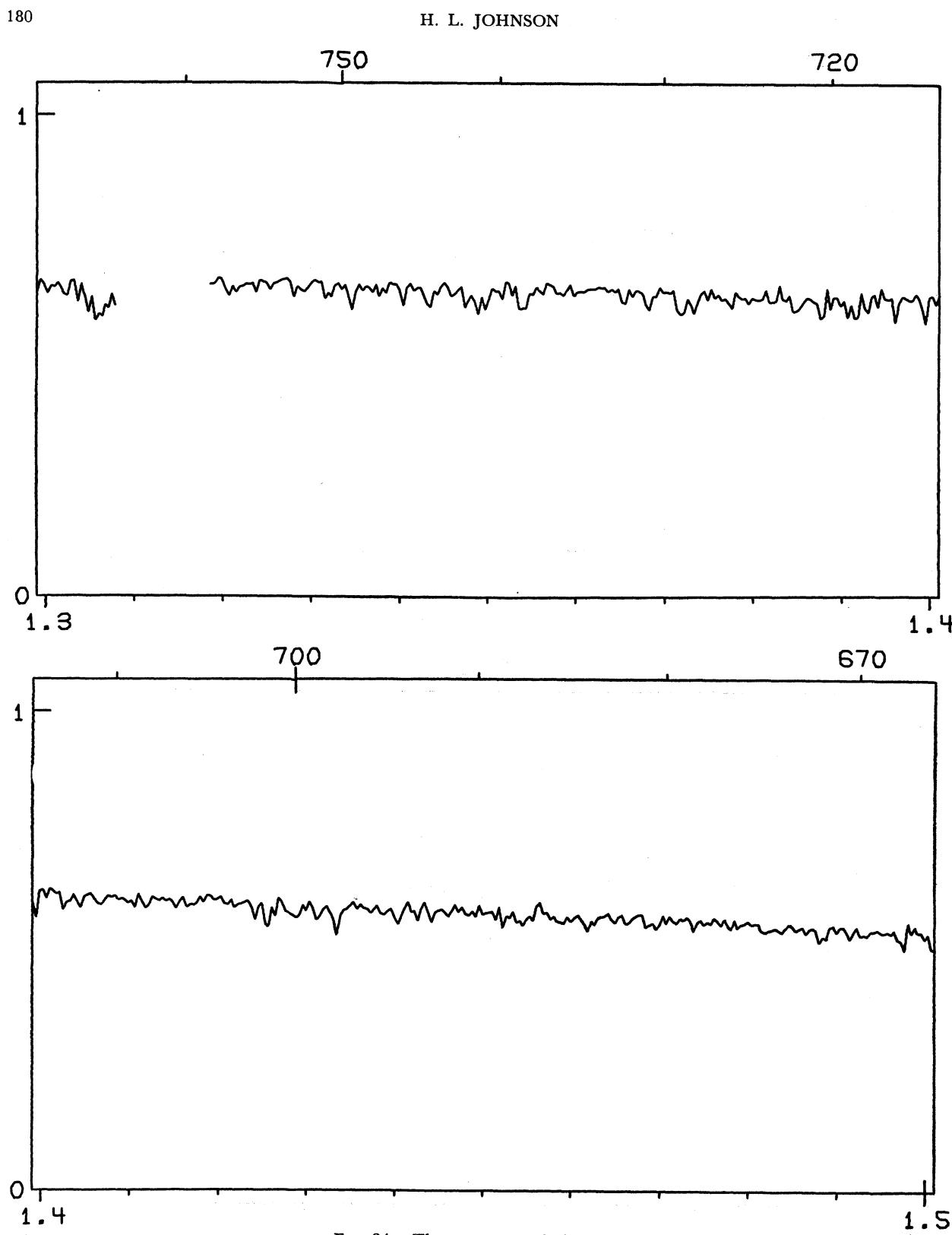


FIG. 34. The spectrum of the Sun.

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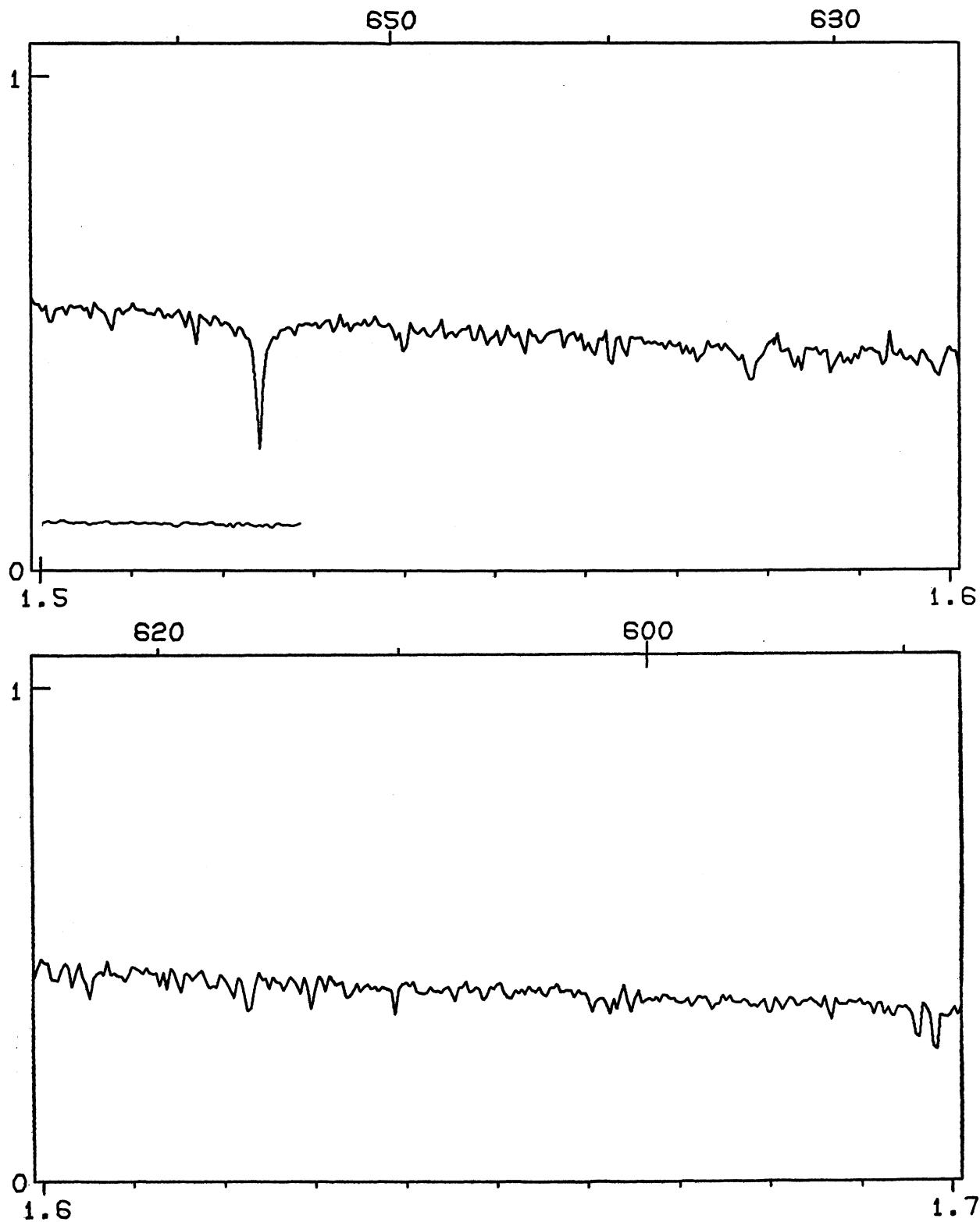


FIG. 34. The spectrum of the Sun.

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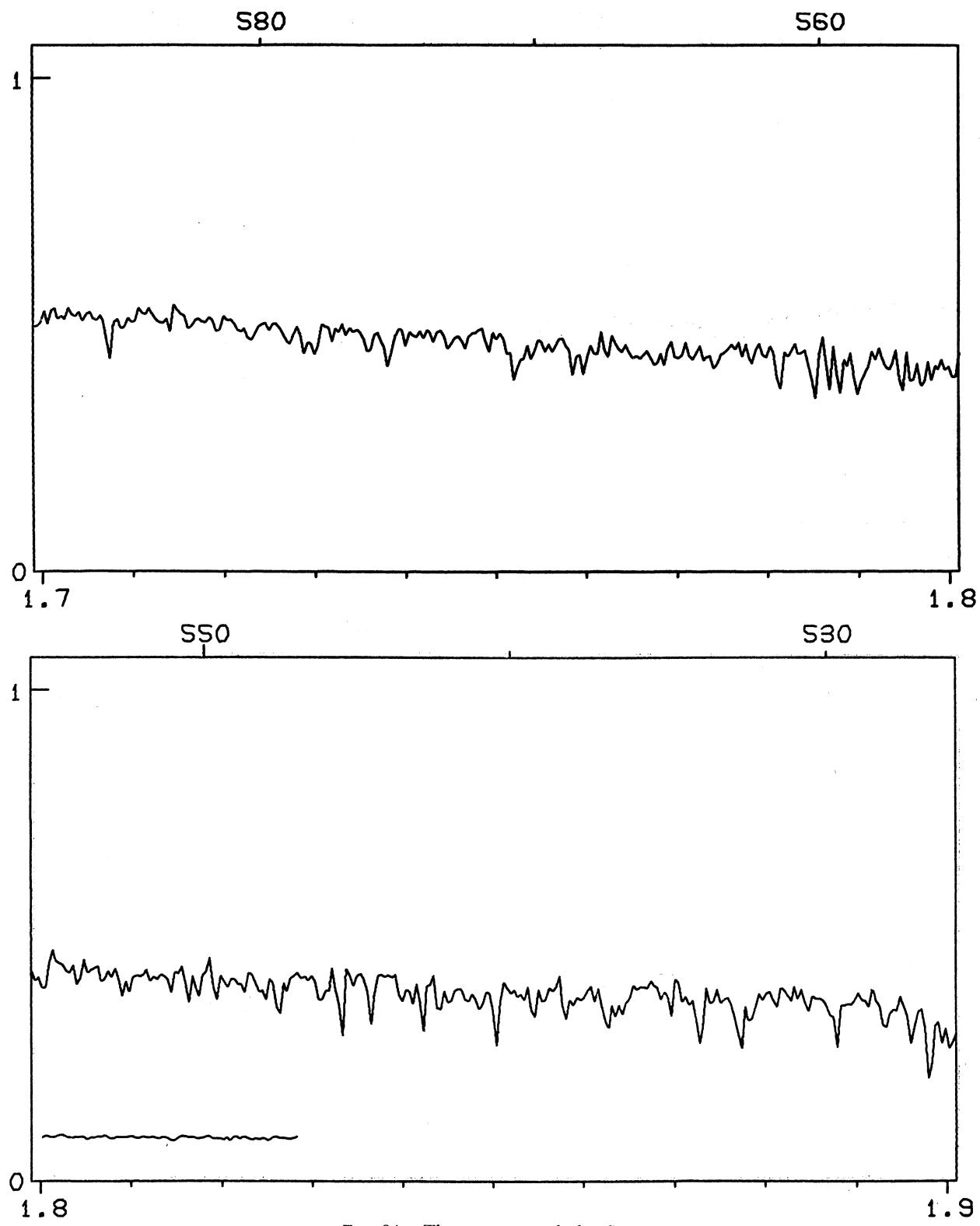


FIG. 34. The spectrum of the Sun.

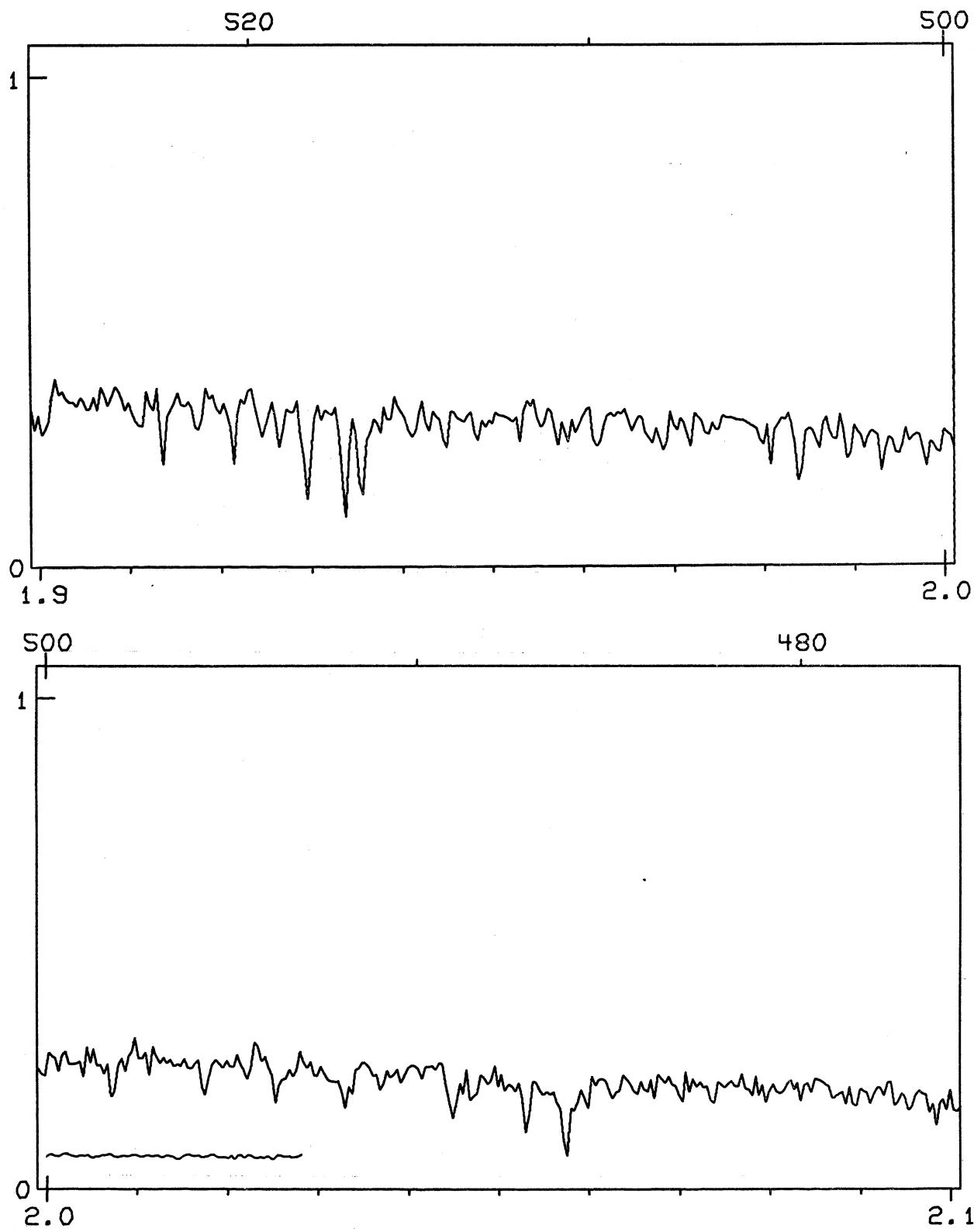


FIG. 34. The spectrum of the Sun.

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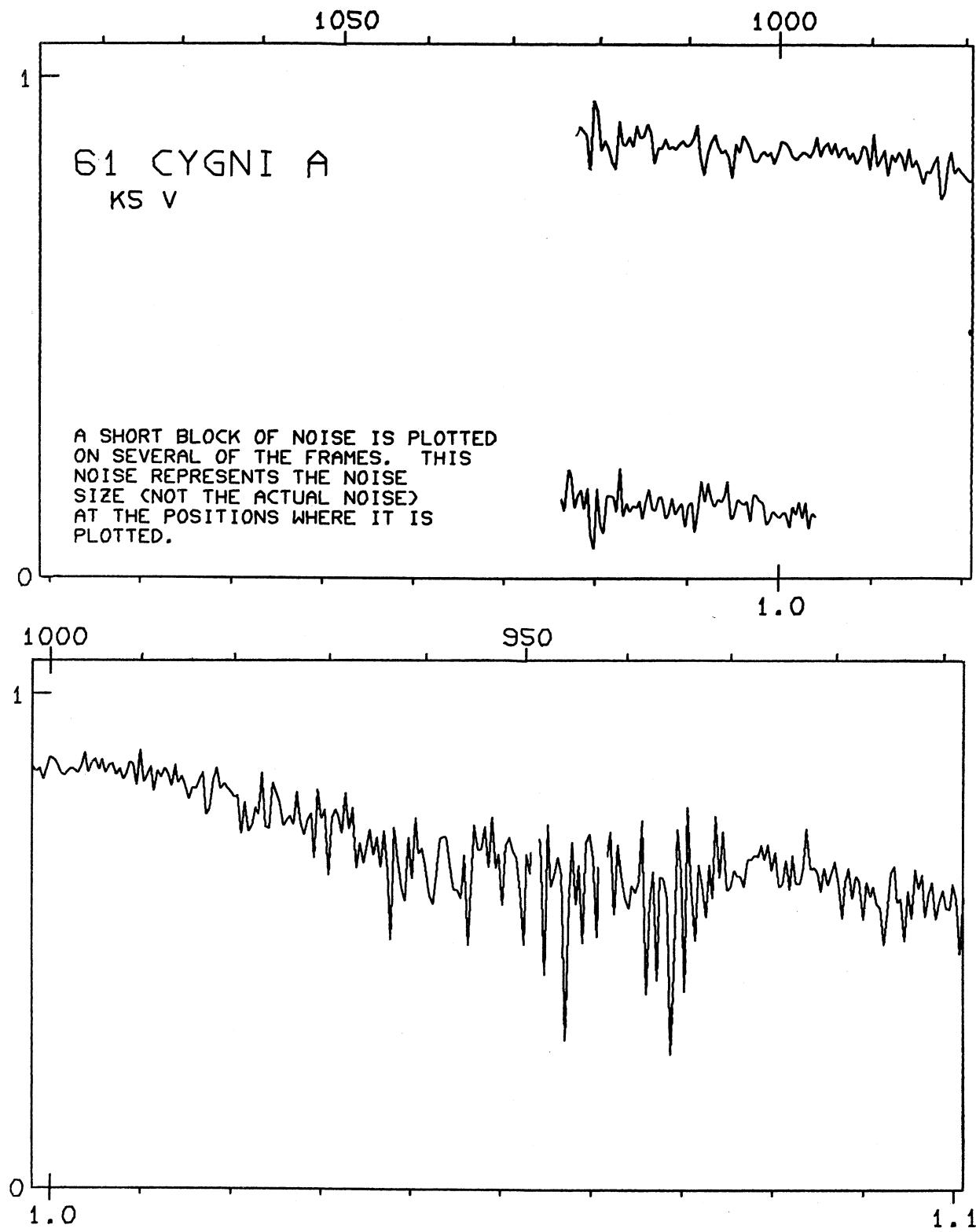


FIG. 35. The spectrum of 61 Cyg A.

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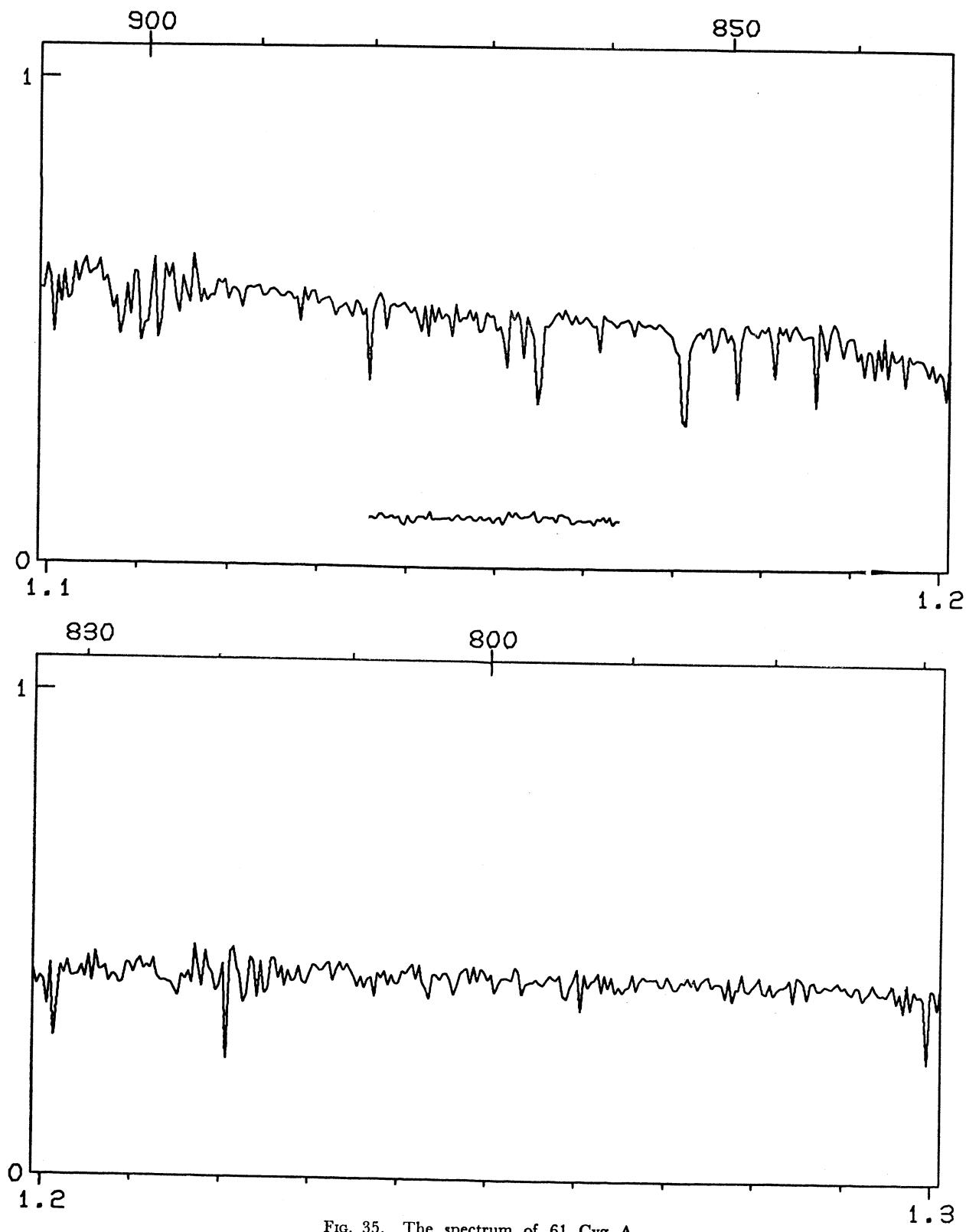


FIG. 35. The spectrum of 61 Cyg A.

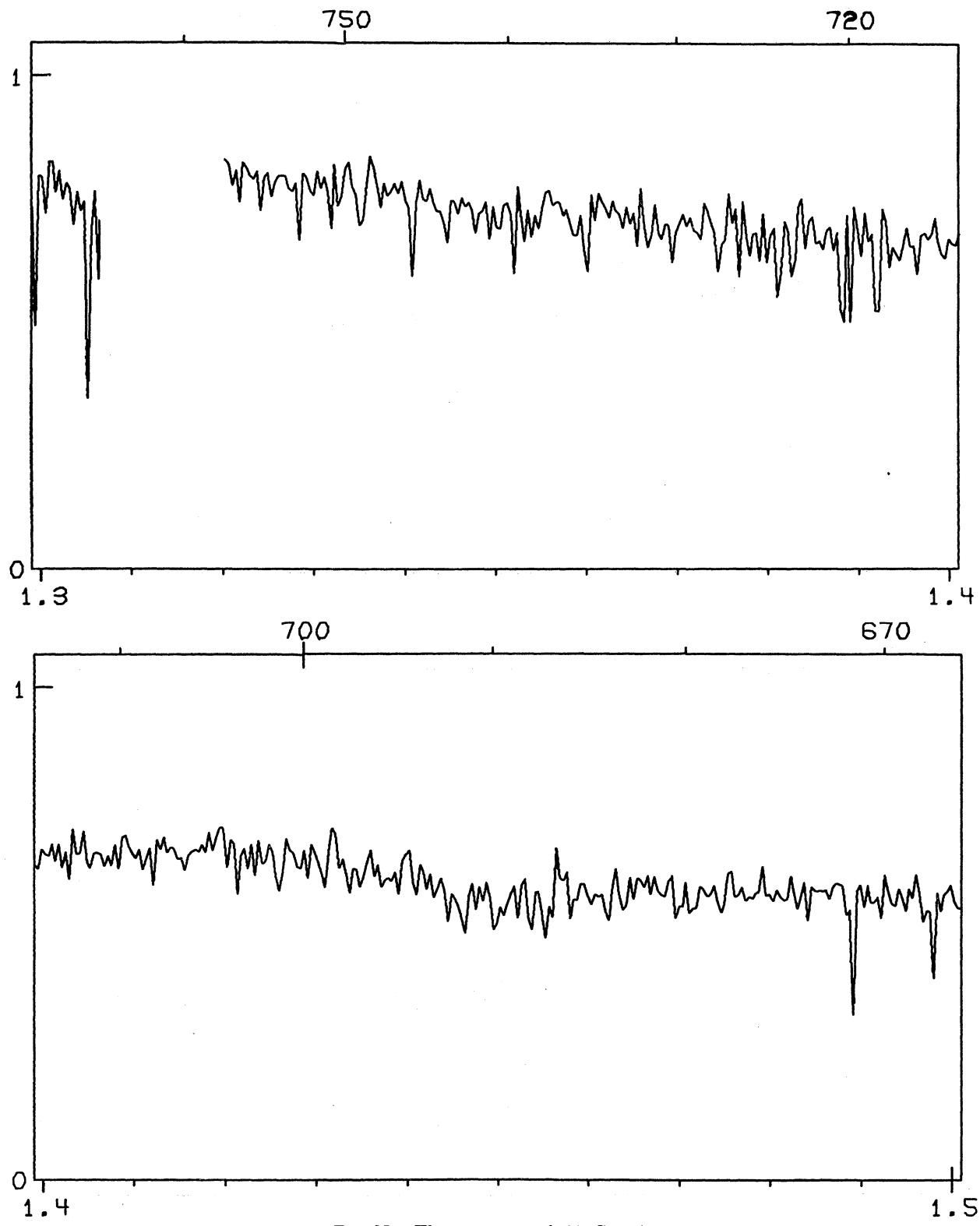


FIG. 35. The spectrum of 61 Cyg A.

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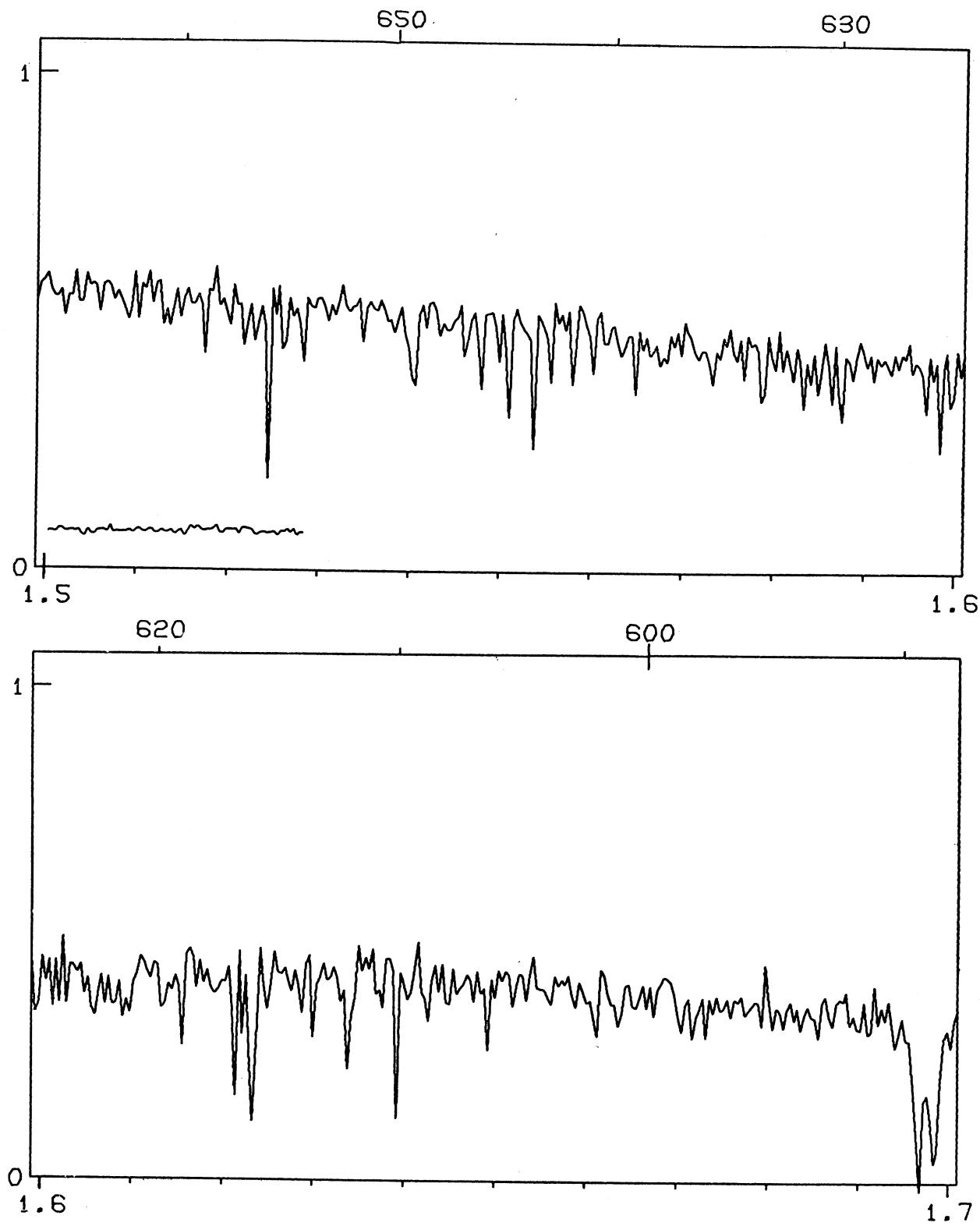
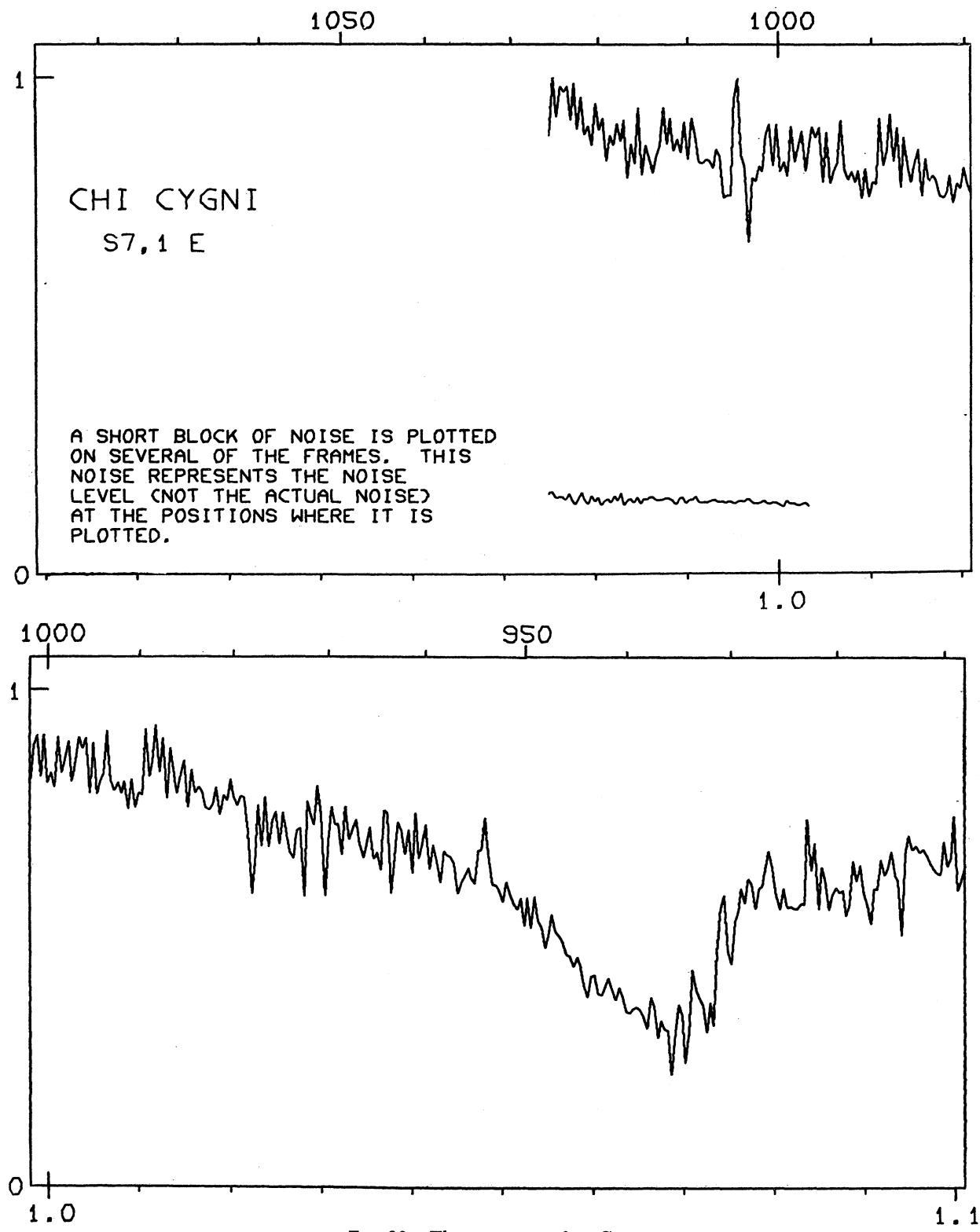
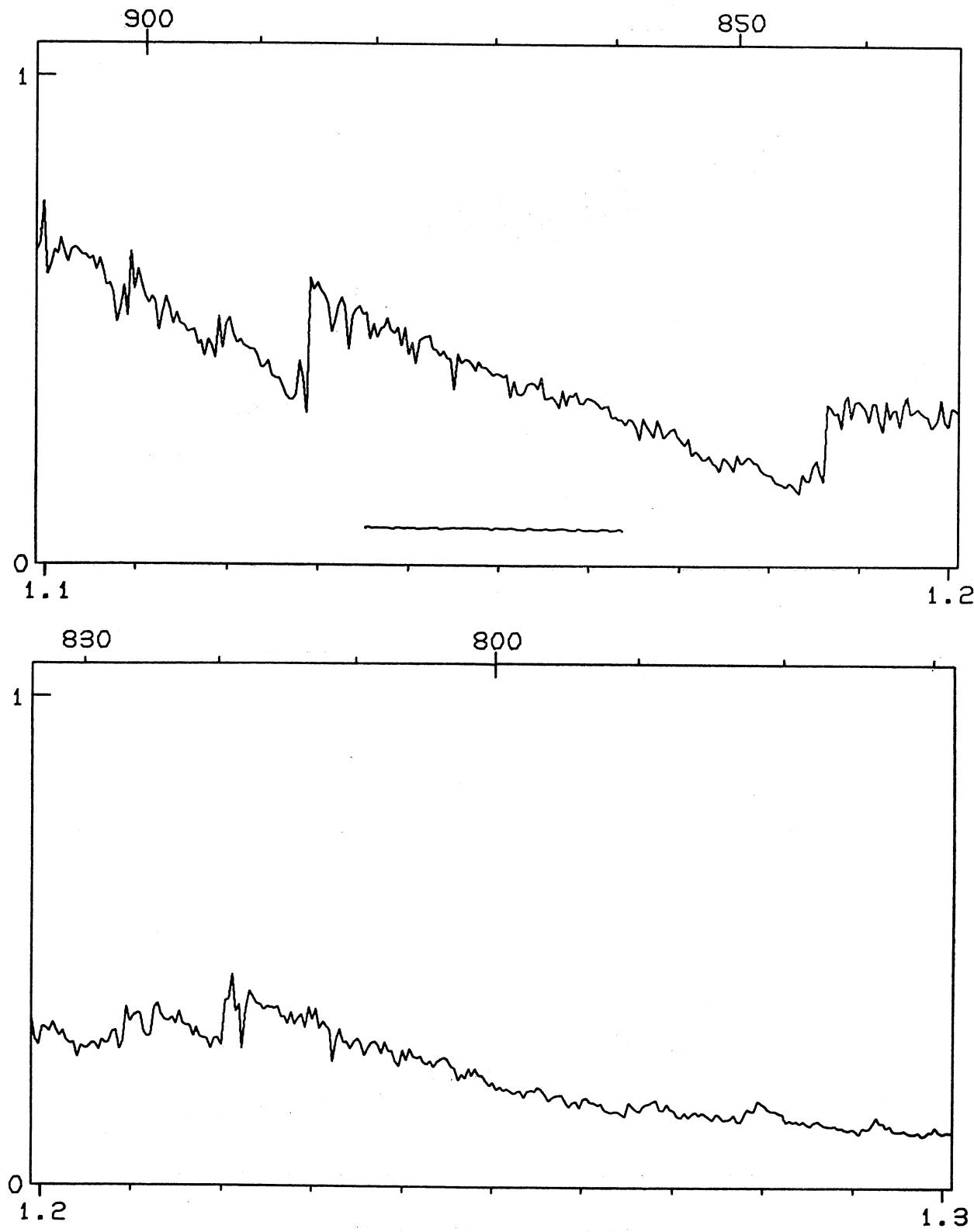


FIG. 35. The spectrum of 61 Cyg A.

FIG. 36. The spectrum of χ Cyg.

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FIG. 36. The spectrum of χ Cyg.

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750

720

1

1.3

1.4

700

670

1

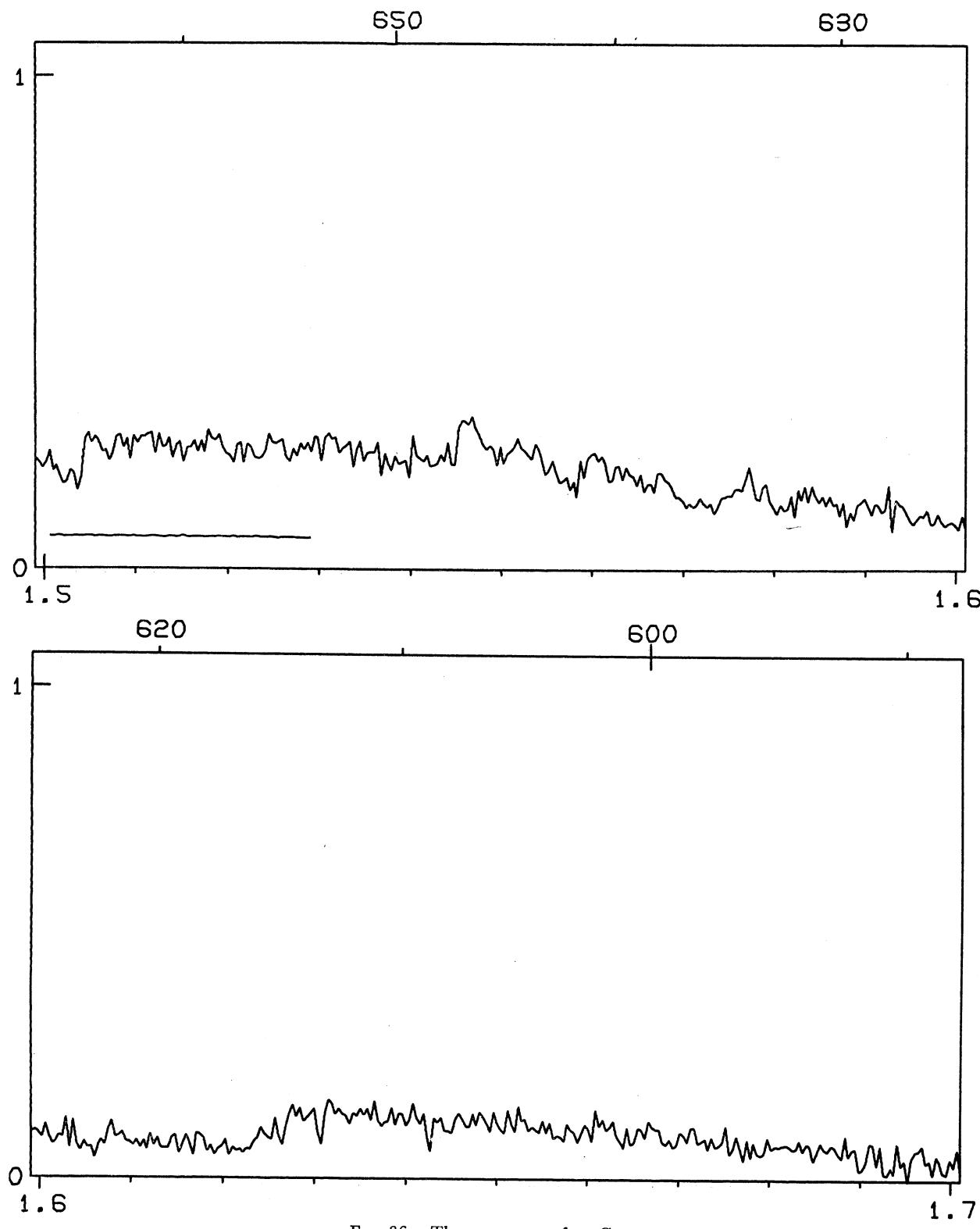
1.4

1.5

FIG. 36. The spectrum of χ Cyg.

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FIG. 36. The spectrum of χ Cyg.

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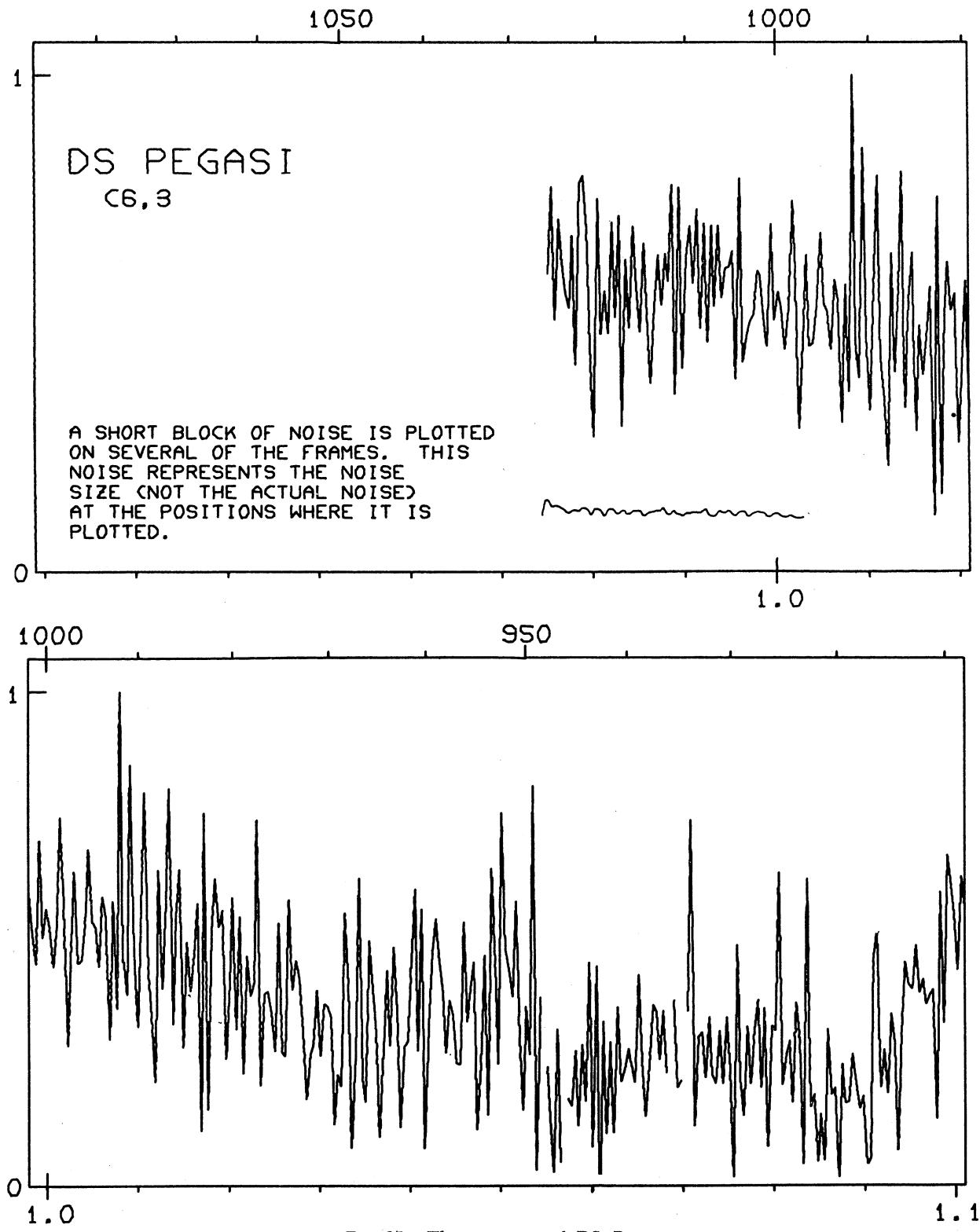


FIG. 37. The spectrum of DS Peg.

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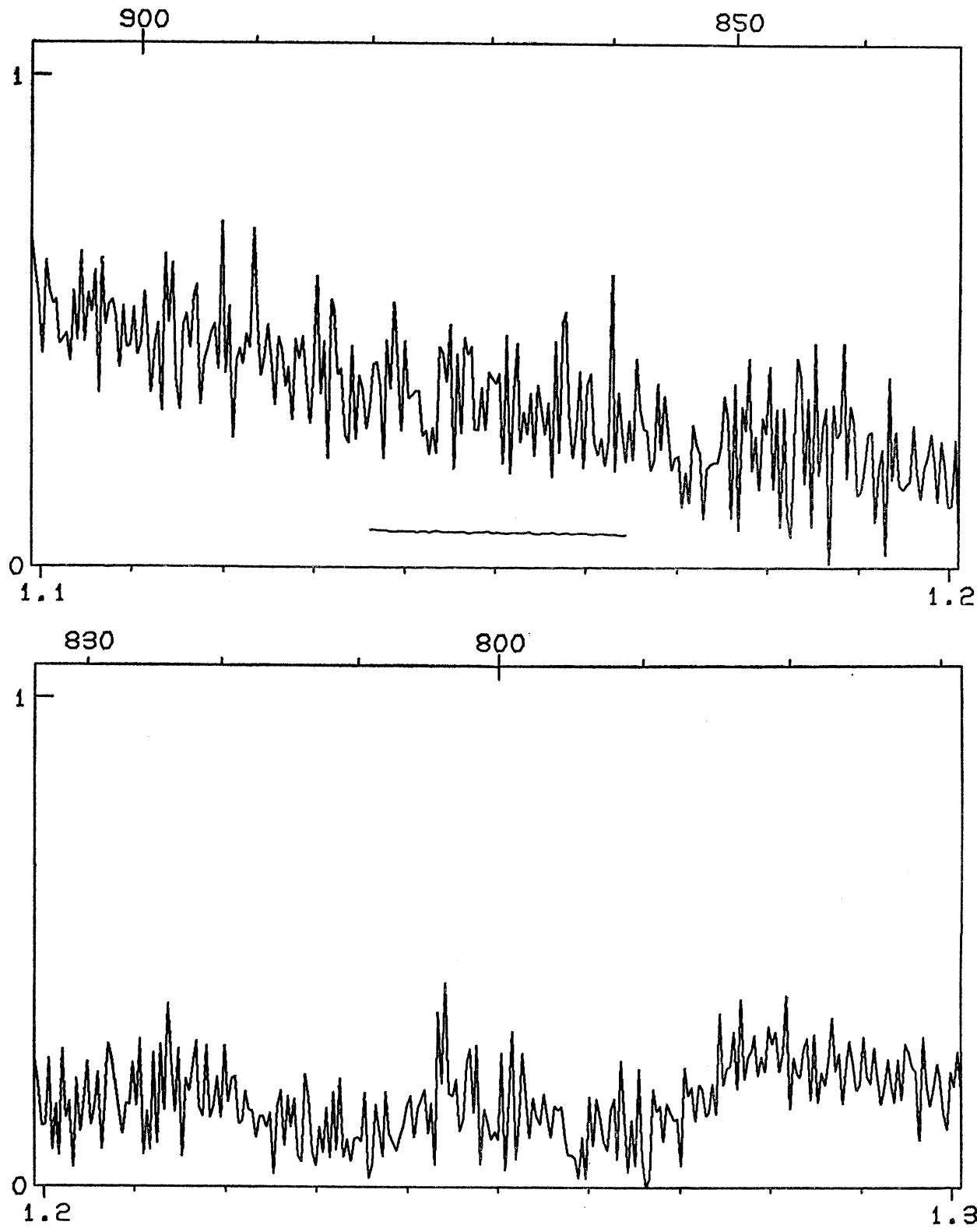


FIG. 37. The spectrum of DS Peg.

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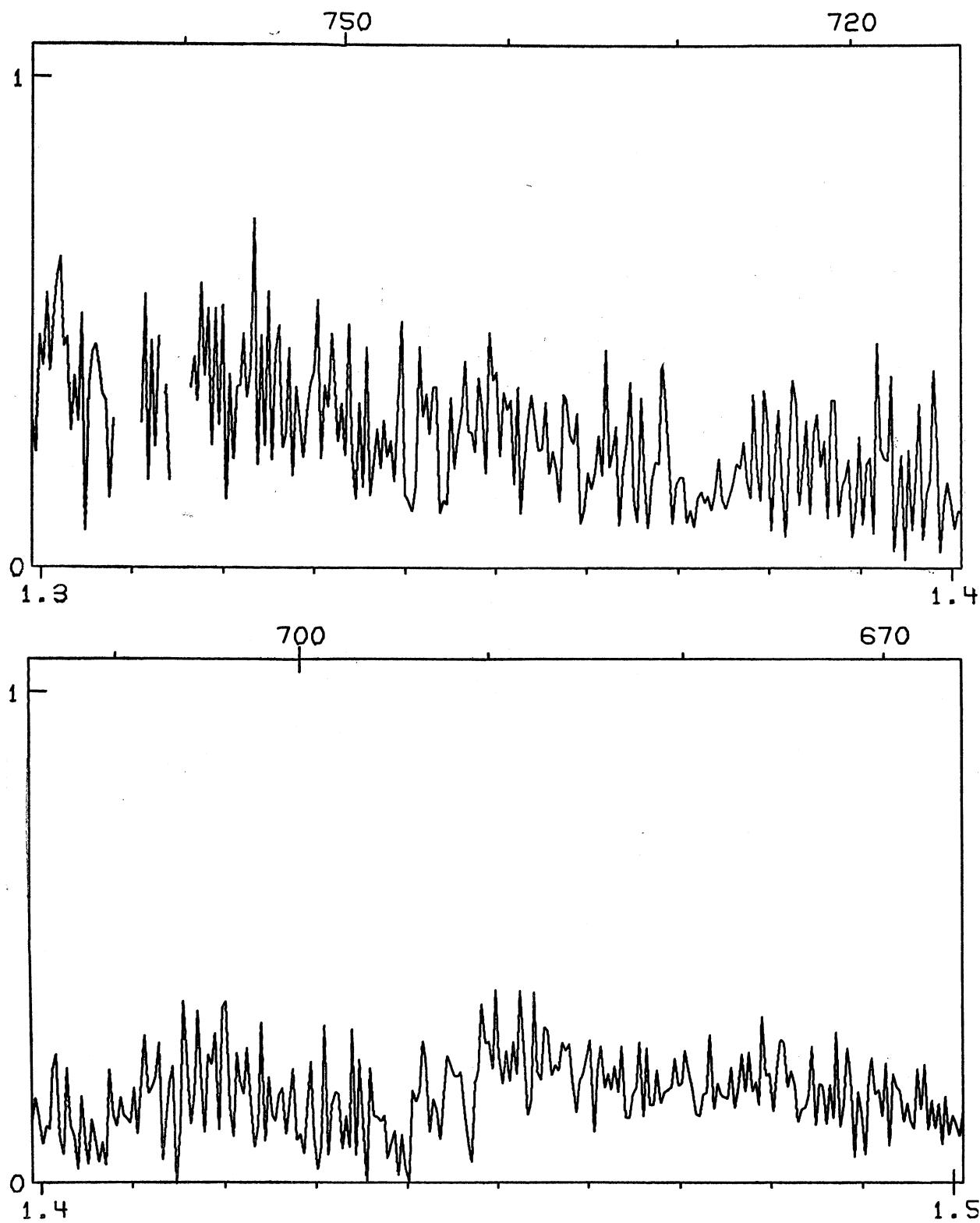


FIG. 37. The spectrum of DS Peg.

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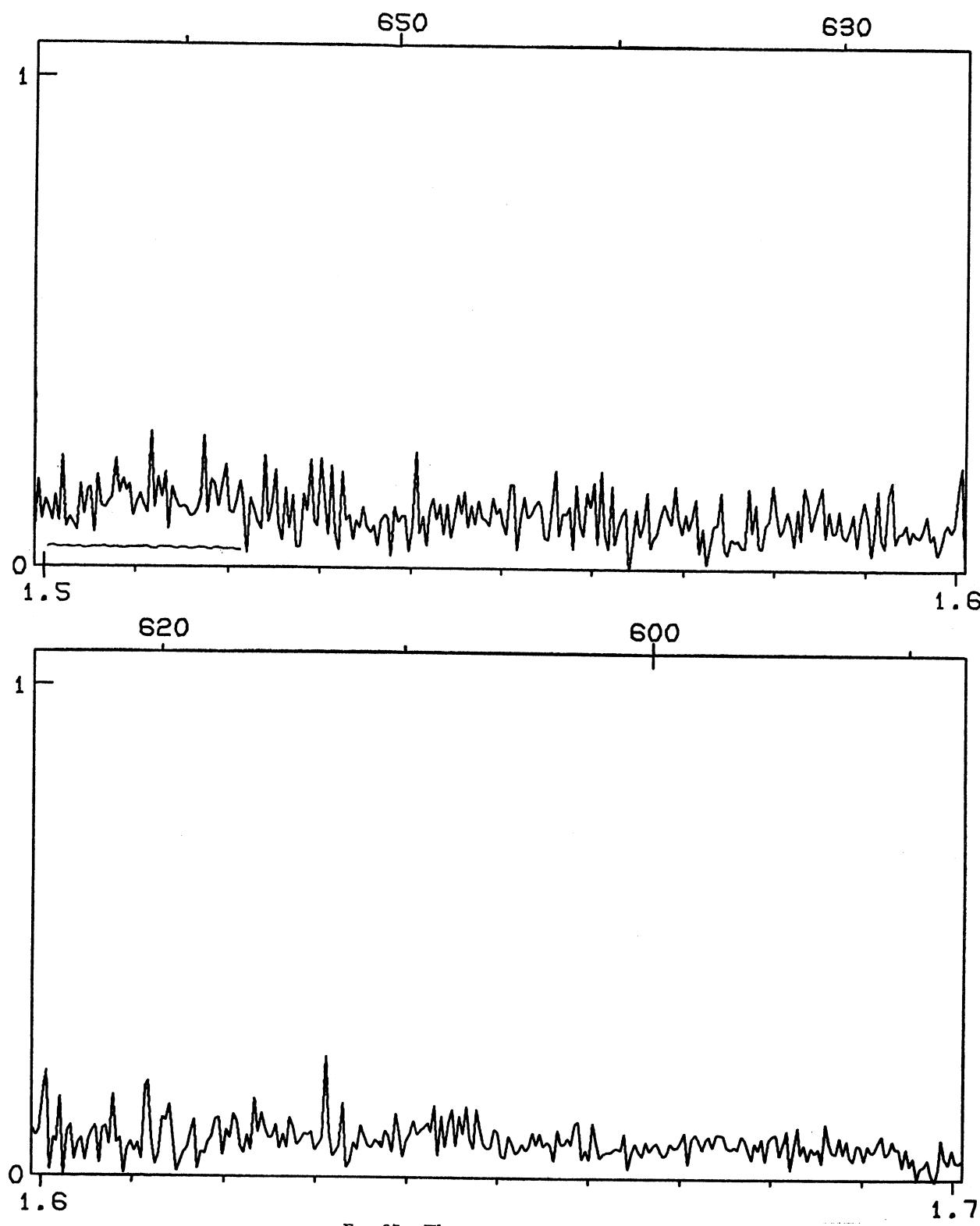
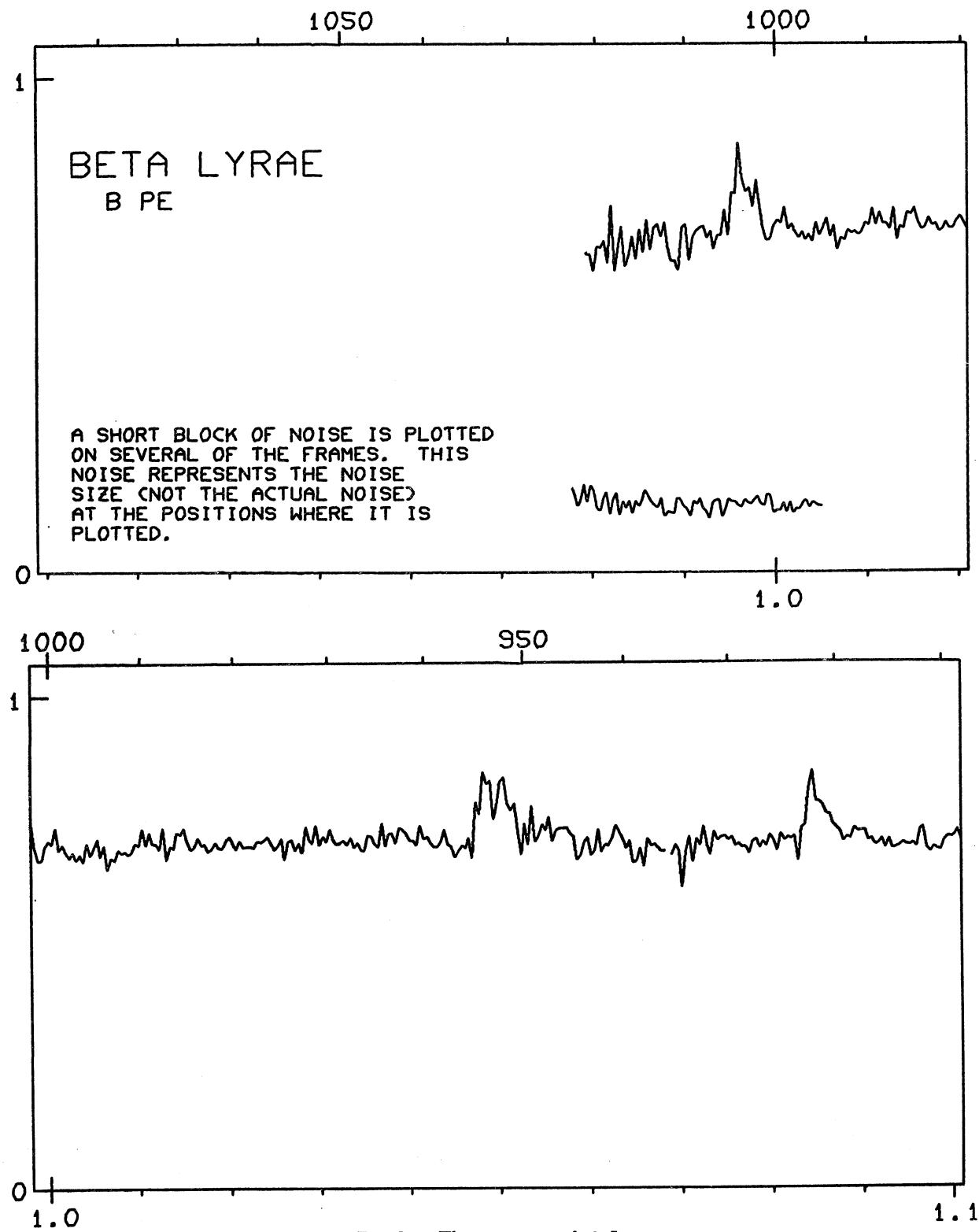


FIG. 37. The spectrum of DS Peg.

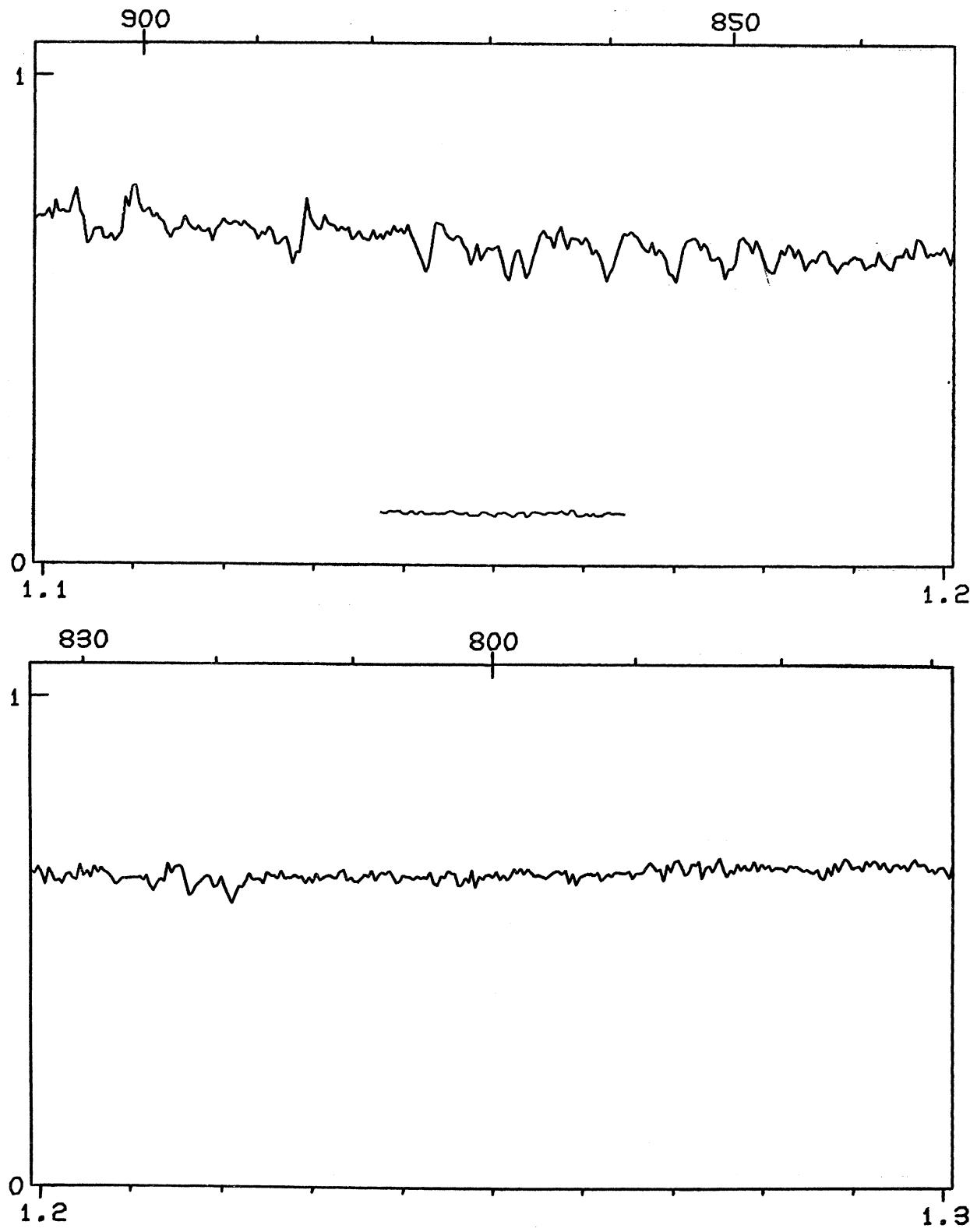
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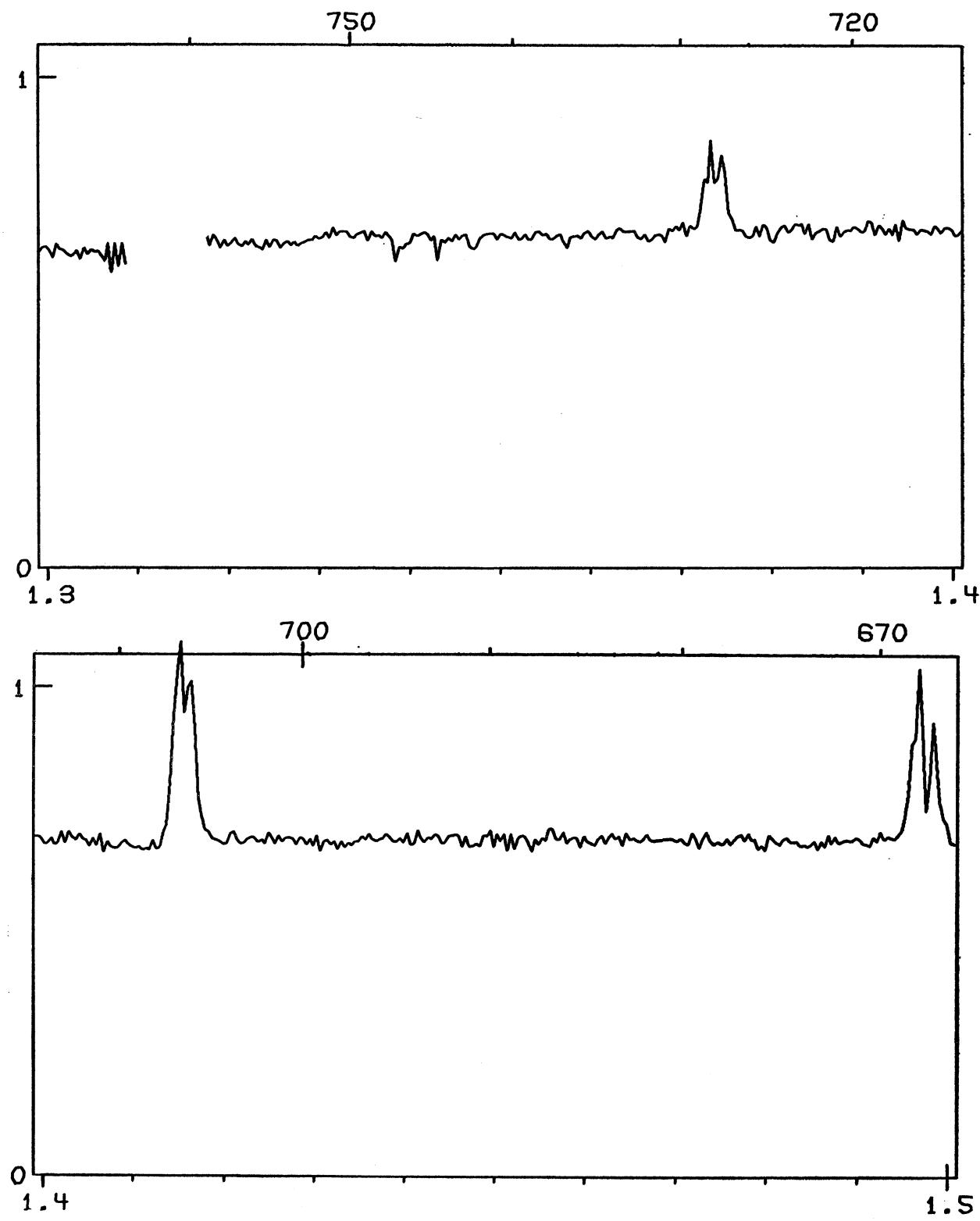
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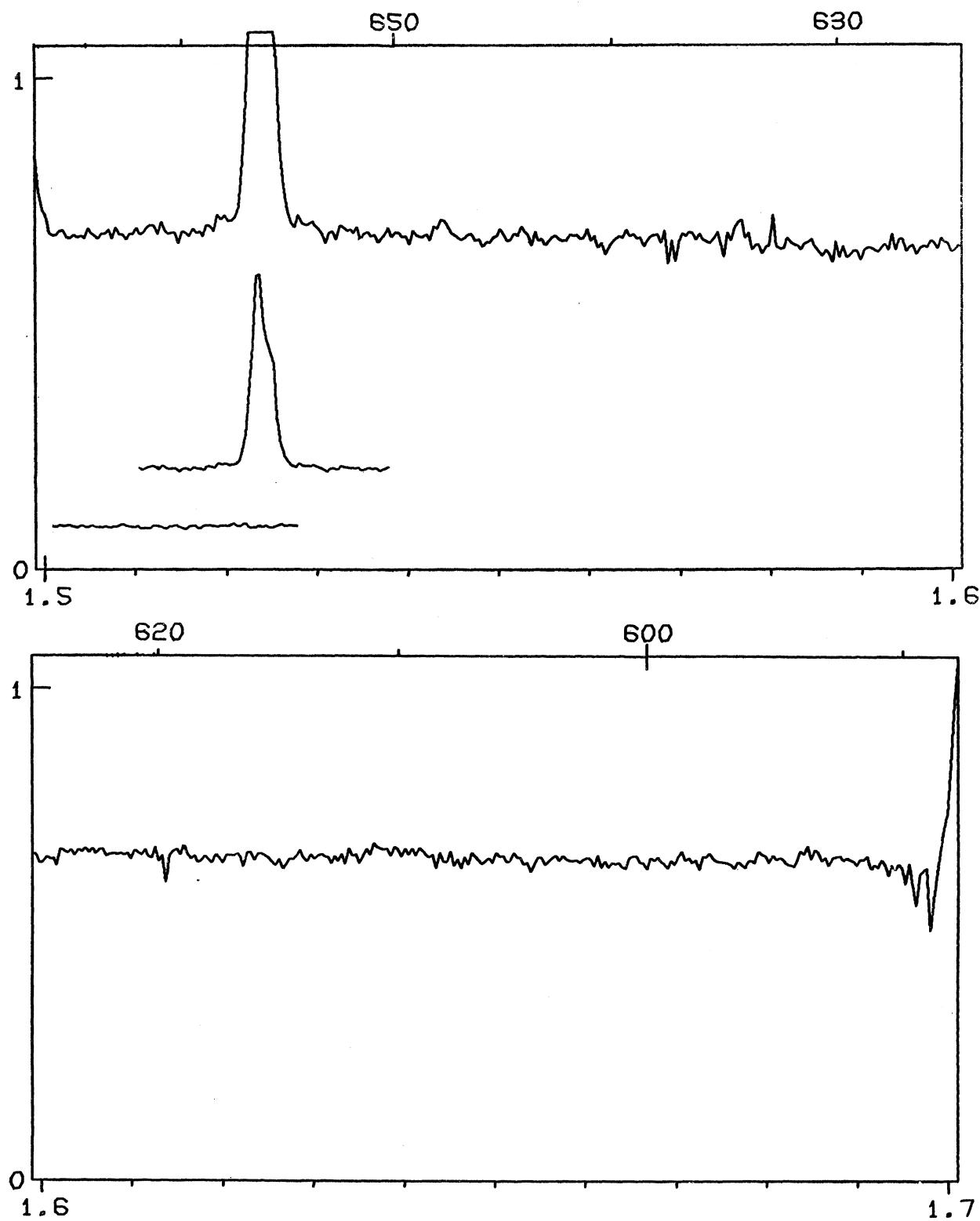
FIG. 38. The spectrum of β Lyr.

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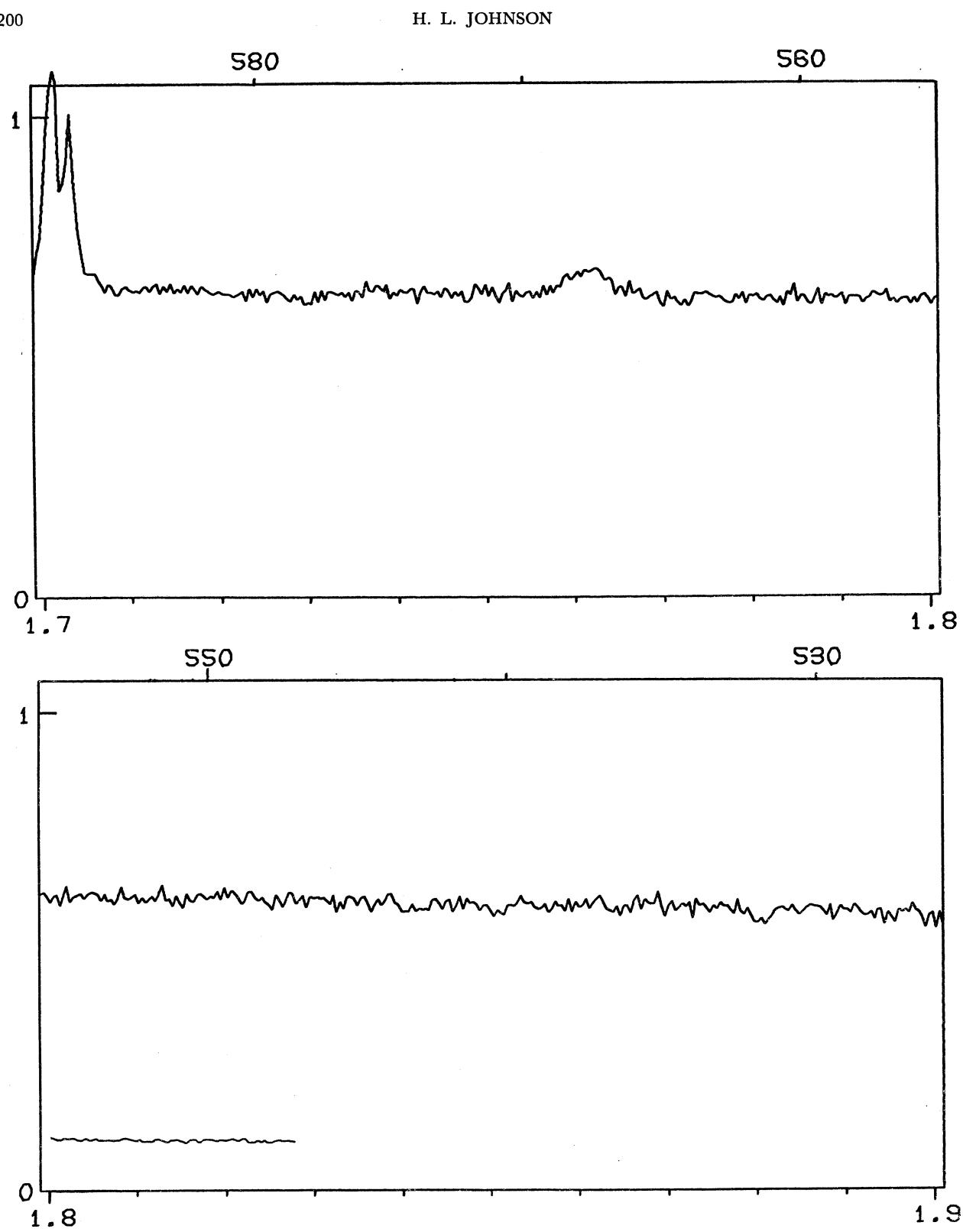
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FIG. 38. The spectrum of β Lyr.

FIG. 38. The spectrum of β Lyr.

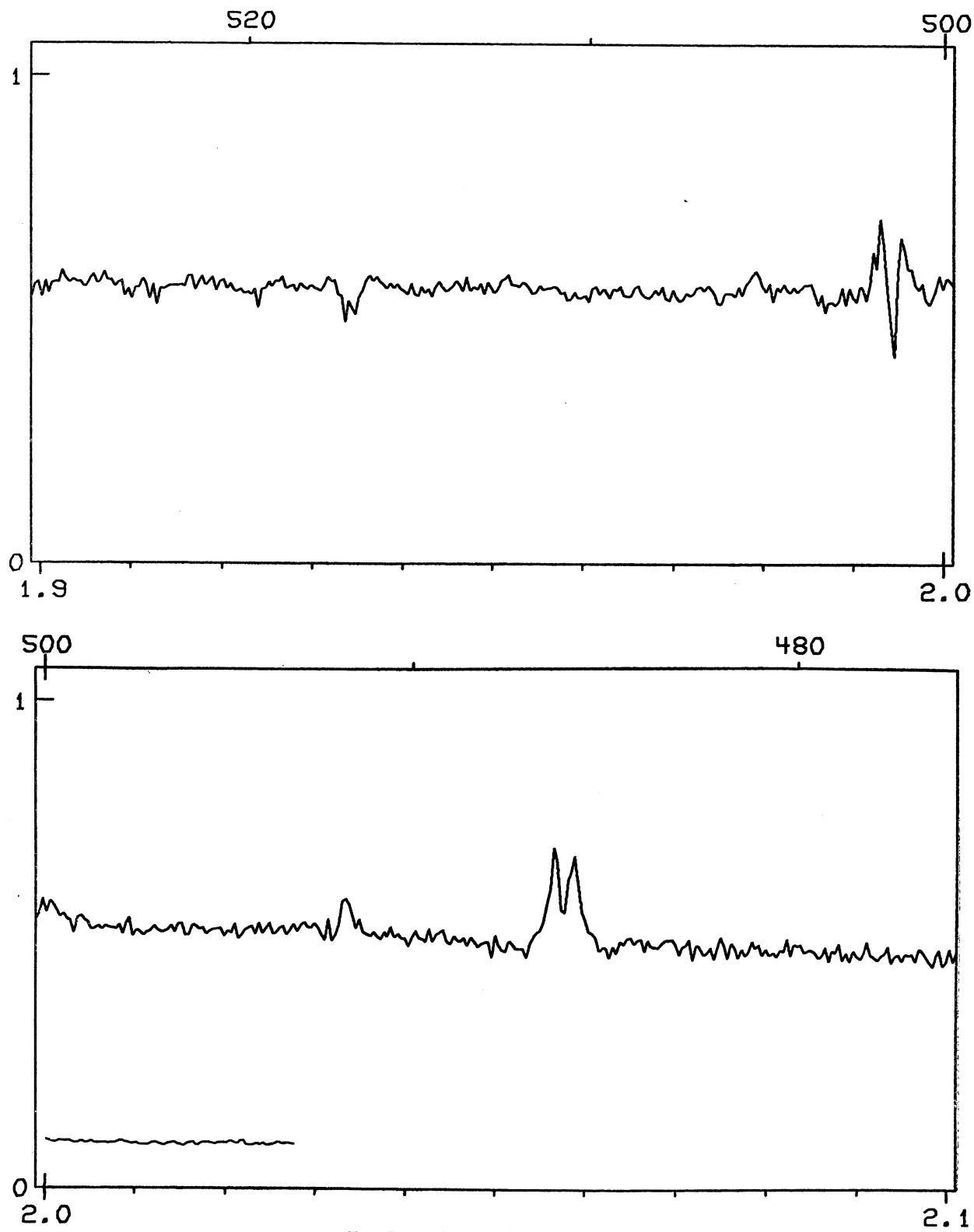
FIG. 38. The spectrum of β Lyr.

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FIG. 38. The spectrum of β Lyr.

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FIG. 38. The spectrum of β Lyr.