

# Spatial variation in the fine-structure constant – new results from VLT/UVES

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## ABSTRACT

(no abstract)

## Key words:

This document gives all of the Voigt profile fits for the VLT many-multiplet systems analysed in the paper. Each absorber is plotted on a velocity scale, such that corresponding components align vertically. Velocities are given as differences from an arbitrary redshift, which is chosen to be close to the maximum optical depth of the absorber. The positions of fitted components are indicated by blue tick marks. Plotted above each fit are the residuals of the fit, that is [fit-data]/error, where the error is the  $1\sigma$  uncertainty associated with each flux pixel. The two red lines indicate  $\pm 1\sigma$ , within which the residuals are expected to occur about 68% of the time if the errors are Gaussian, the error array is correct and the fitted model is a good representation of the data.

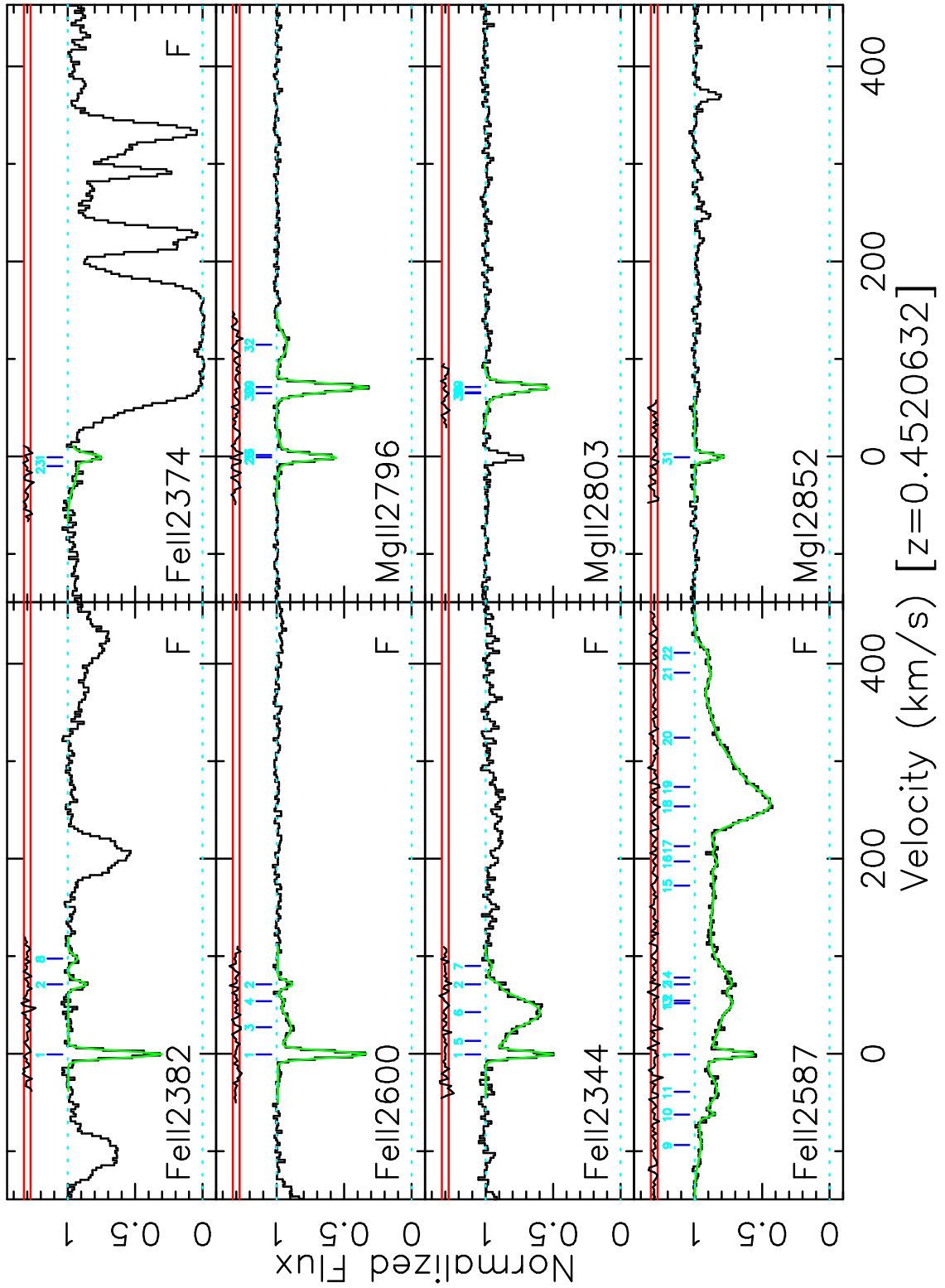
Each plot contains a maximum of 16 regions. In the event that there are more fitting regions than this, the fit is split into several parts. Each part may contain common transitions so as to provide a common reference, and to illustrate the velocity structure more clearly.

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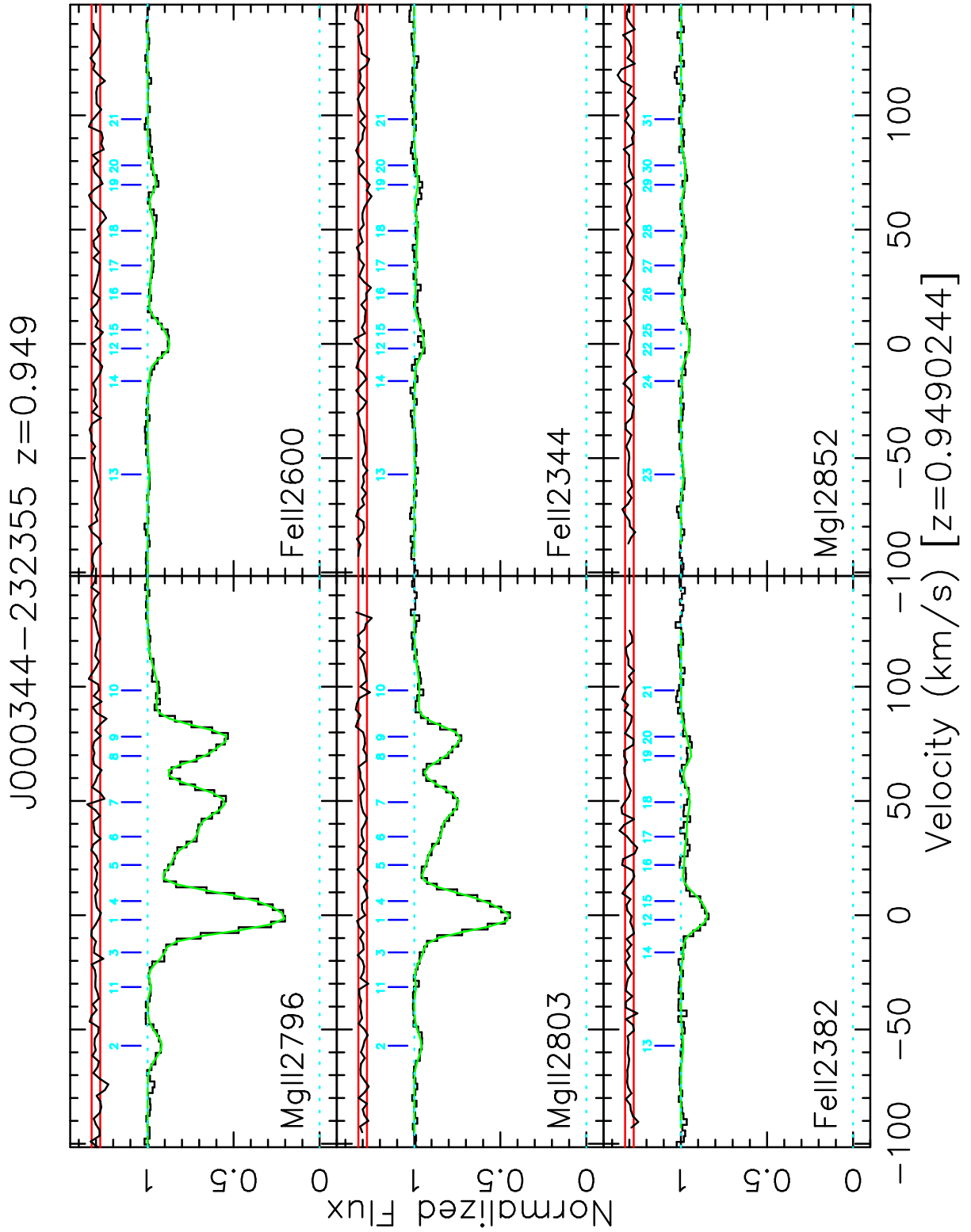
† E-mail: jkw@phys.unsw.edu.au

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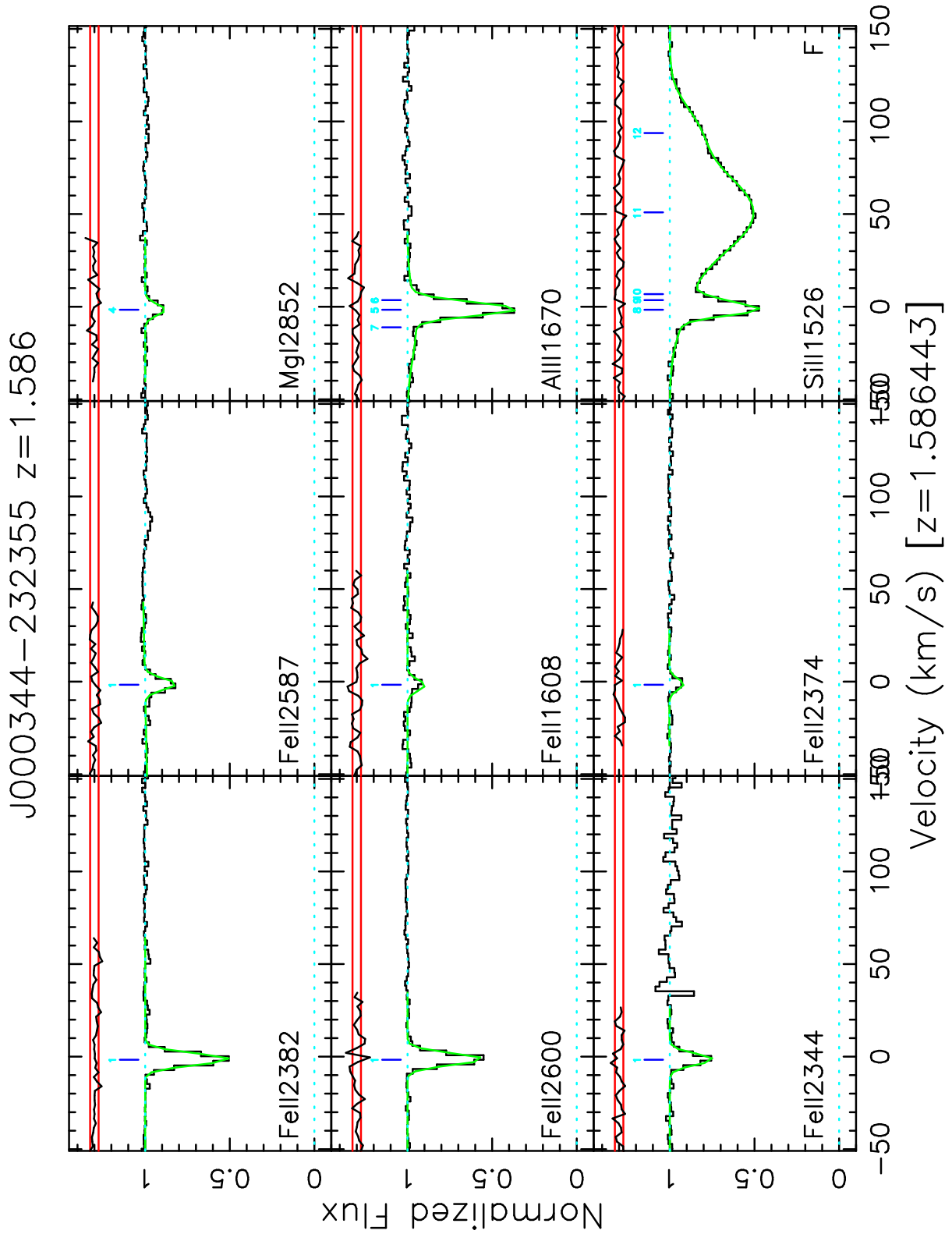
J000344–232355  $z=0.452$



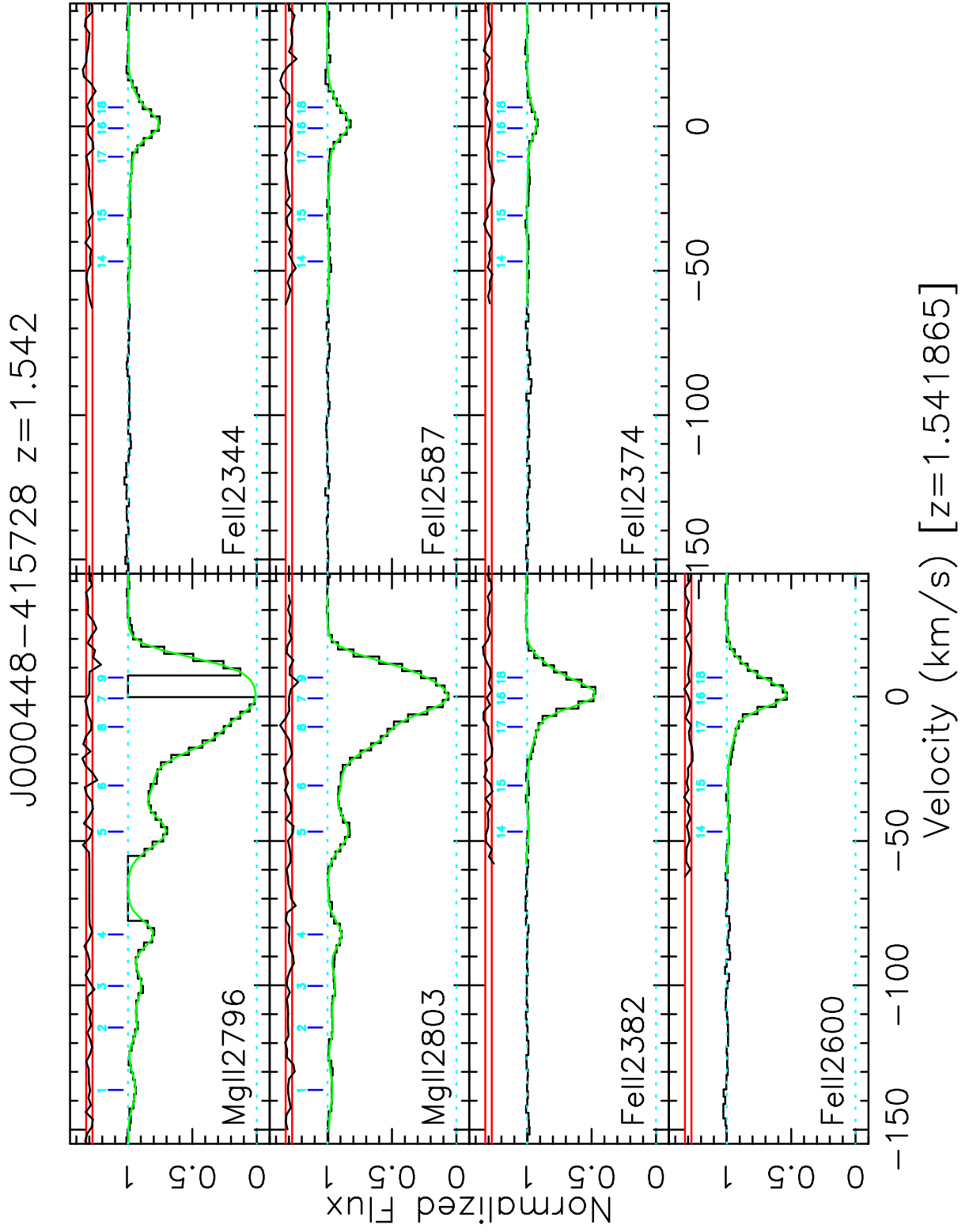
**Figure 1.** Many-multiplet fit for the  $z = 0.452$  absorber toward J000344–232355.



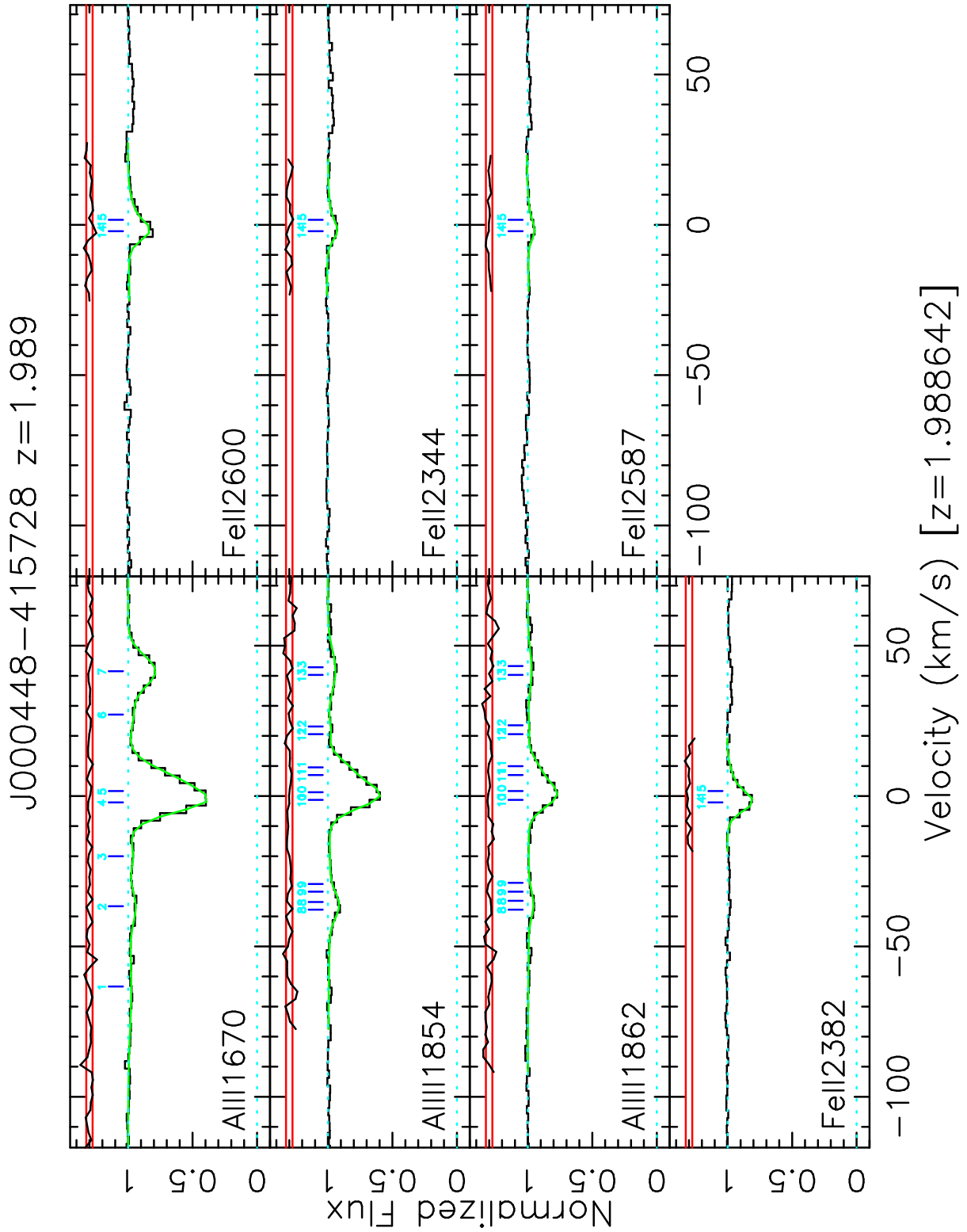
**Figure 2.** Many-multiplet fit for the  $z = 0.949$  absorber toward J000344–232355.



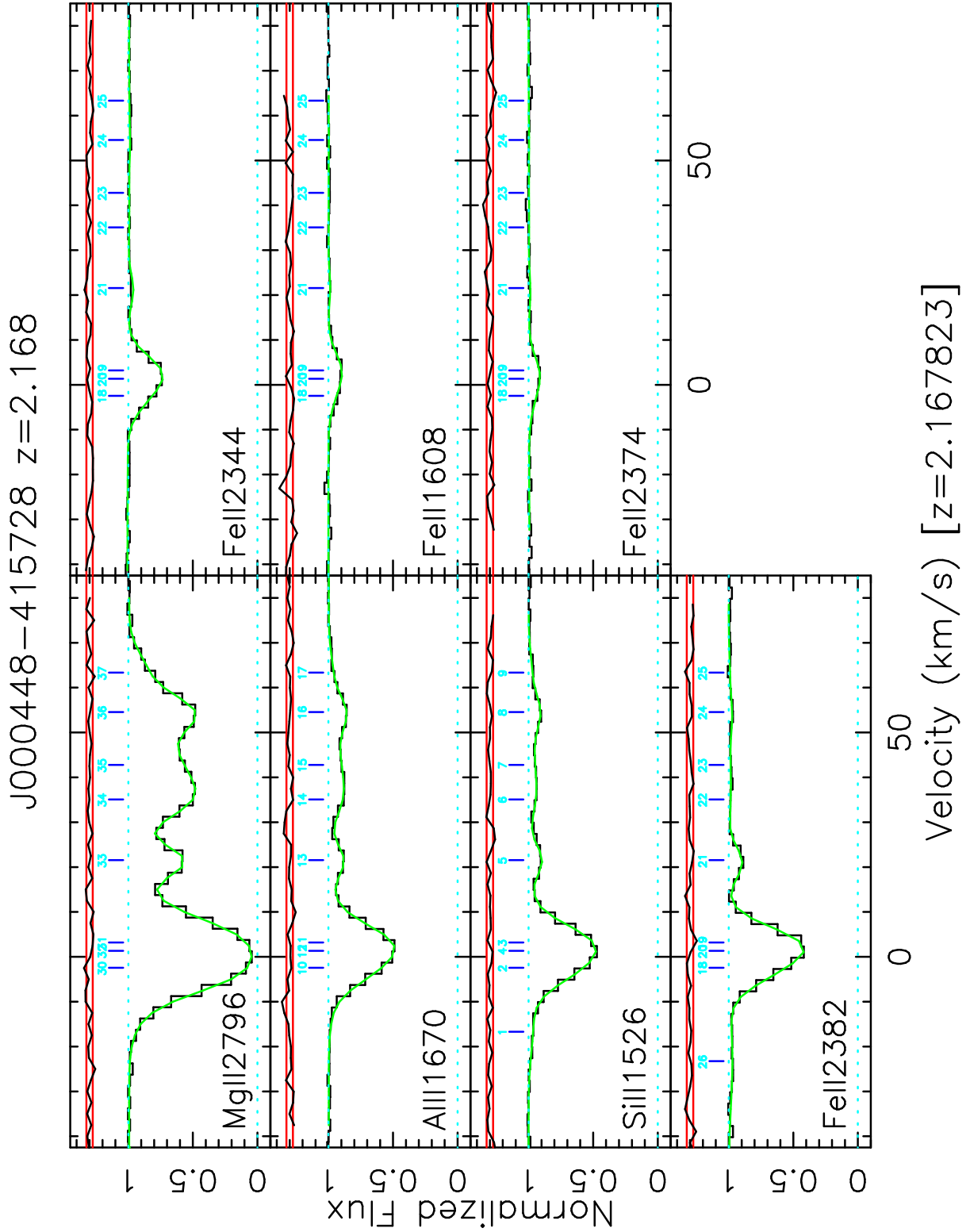
**Figure 3.** Many-multiplet fit for the  $z = 1.586$  absorber toward J000344–232355.



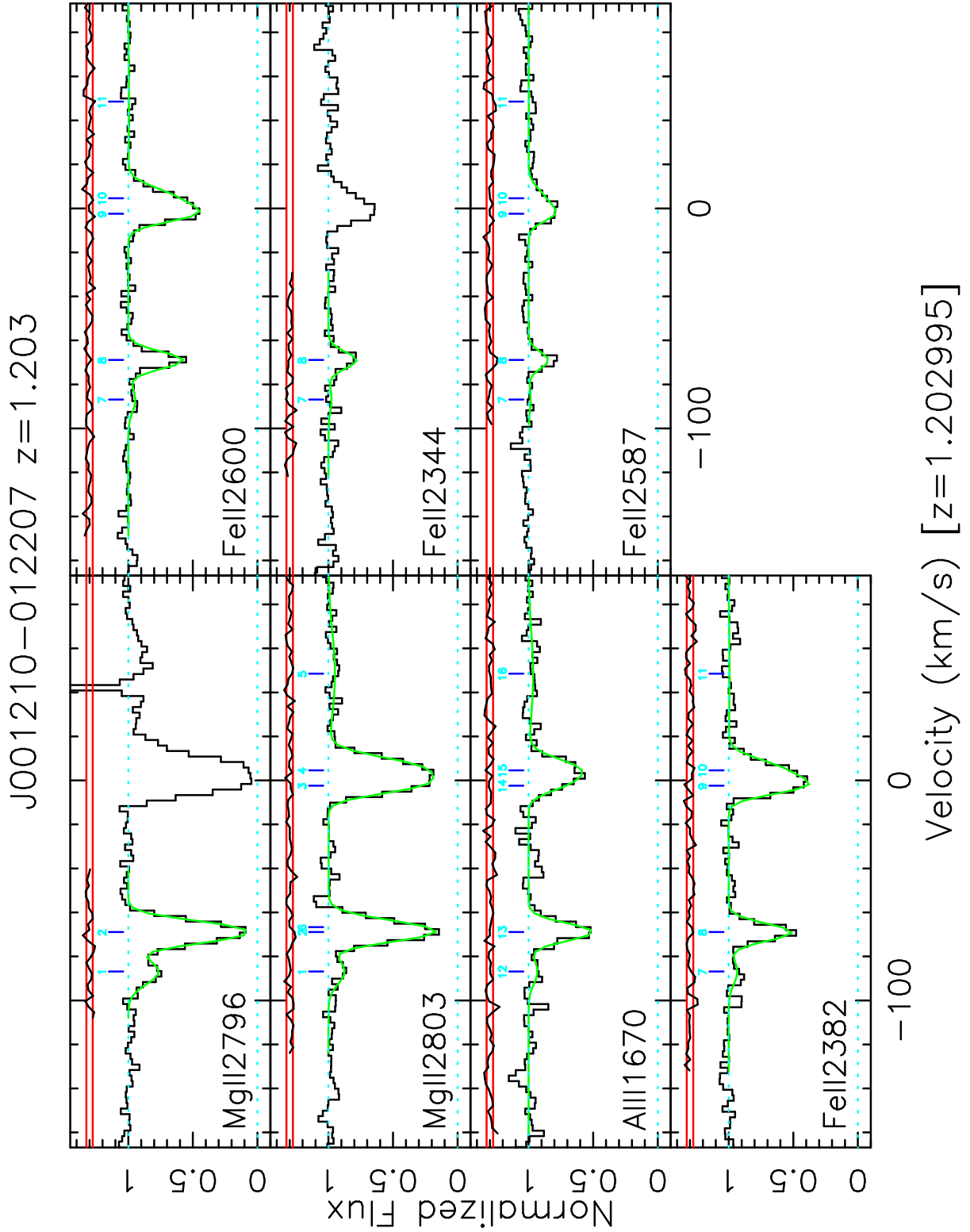
**Figure 4.** Many-multiplet fit for the  $z = 1.542$  absorber toward J000448-415728.



**Figure 5.** Many-multiplet fit for the  $z = 1.989$  absorber toward J000448-415728.

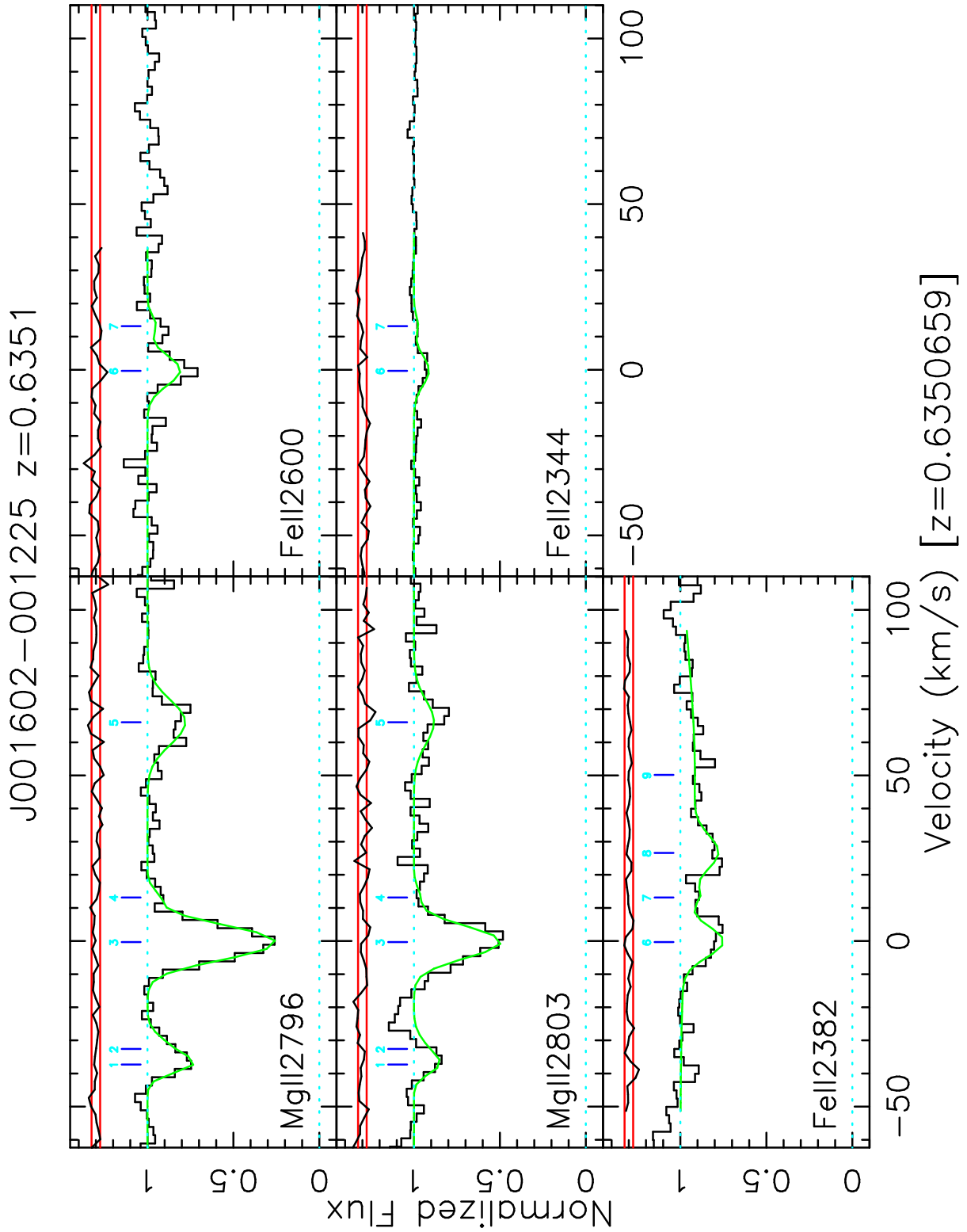


**Figure 6.** Many-multiplet fit for the  $z = 2.168$  absorber toward J000448-415728.

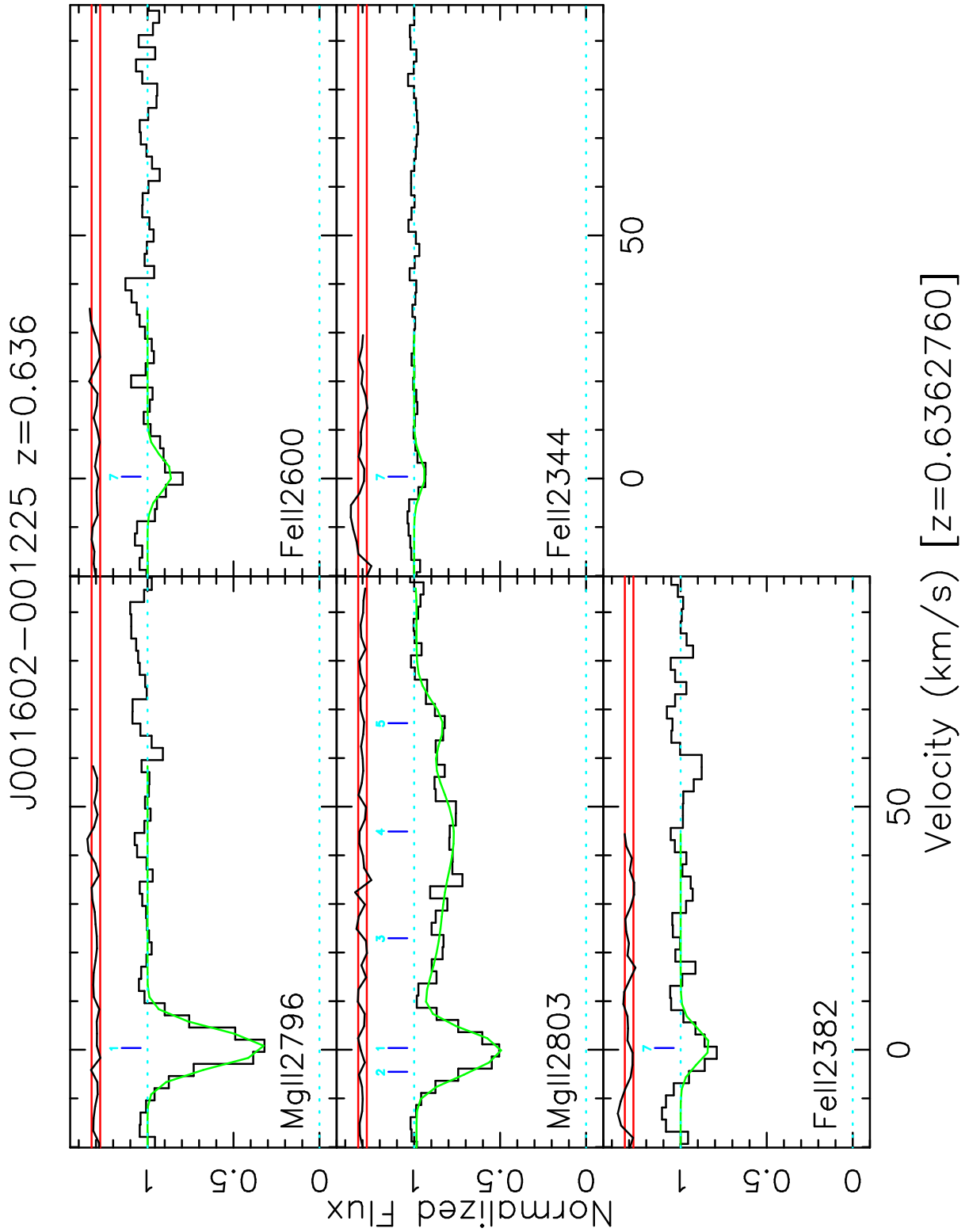


**Figure 7.** Many-multiplet fit for the  $z = 1.203$  absorber toward J001210-012207.





**Figure 8.** Many-multiplet fit for the  $z = 0.635$  absorber toward J001602-001225.



**Figure 9.** Many-multiplet fit for the  $z = 0.636$  absorber toward J001602–001225.

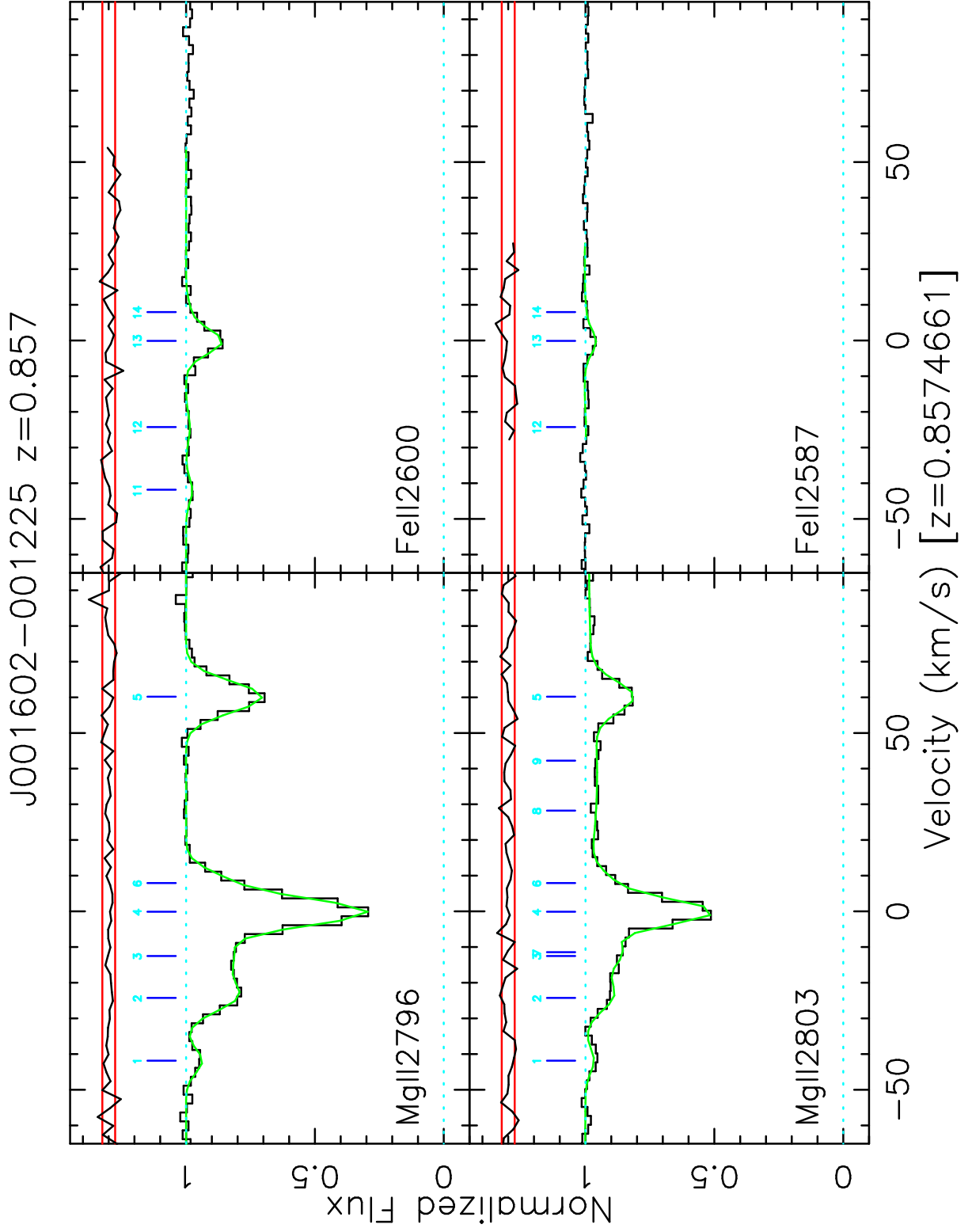
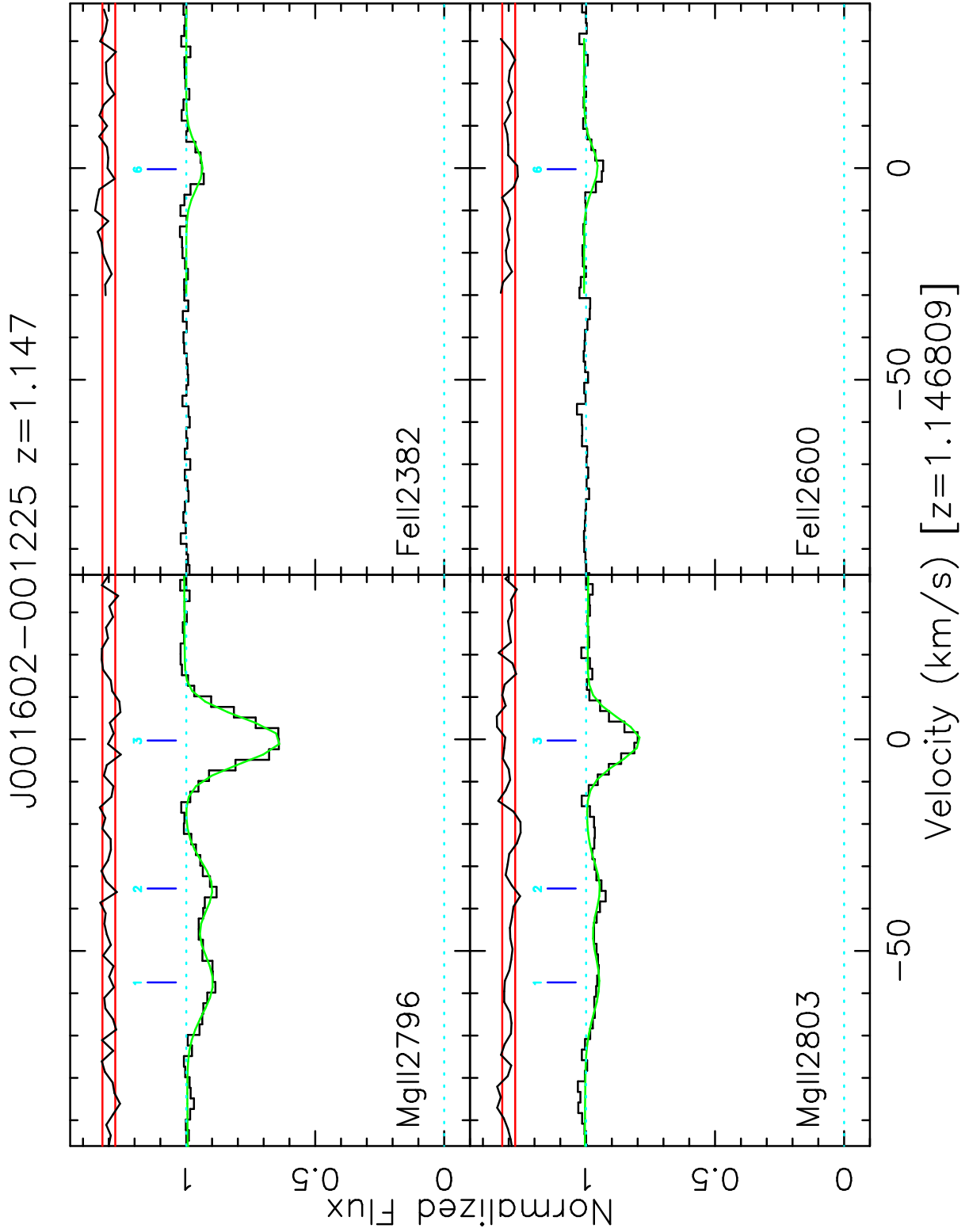


Figure 10. Many-multiplet fit for the  $z = 0.857$  absorber toward J001602-001225.



**Figure 11.** Many-multiplet fit for the  $z = 1.147$  absorber toward J001602-001225.

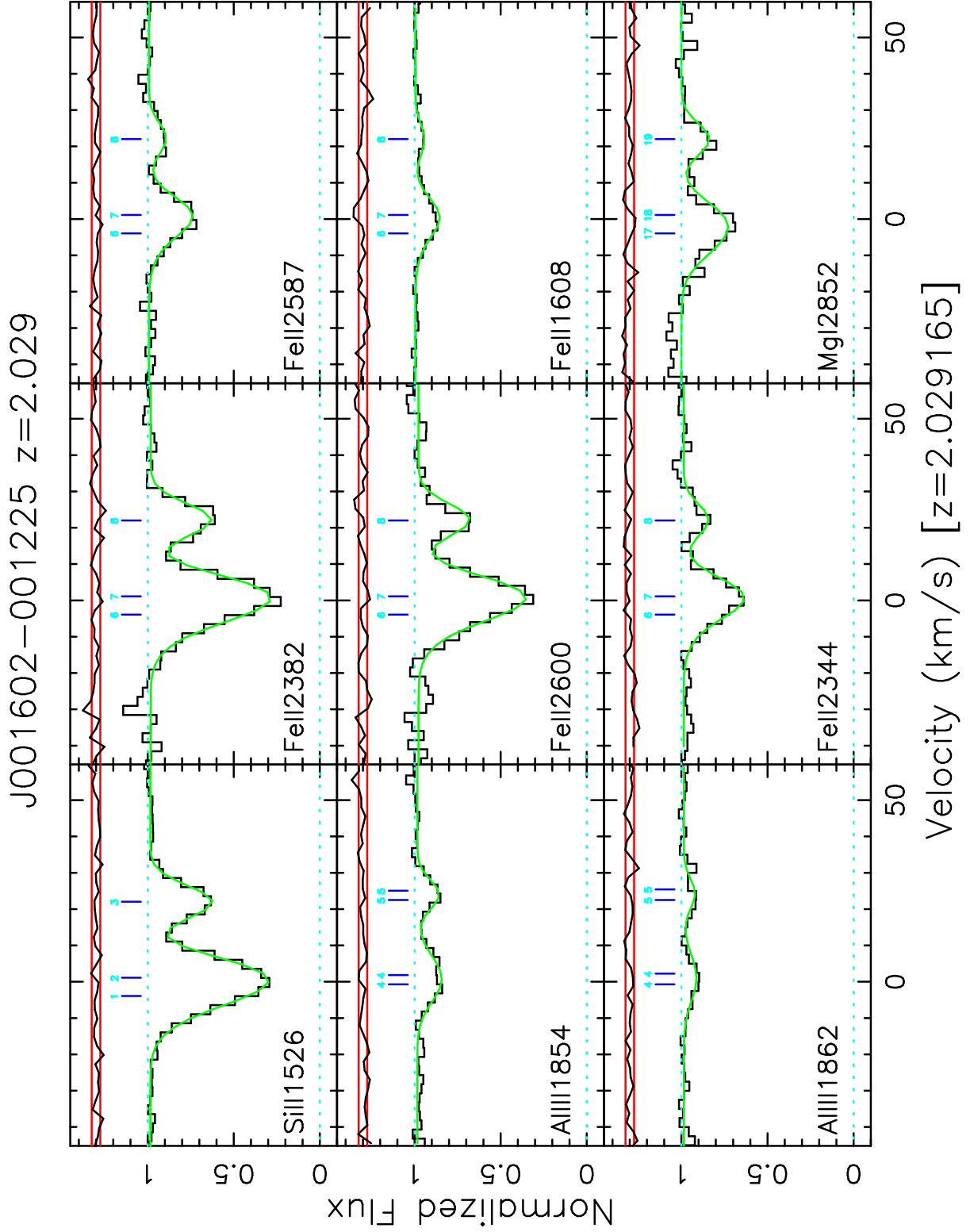
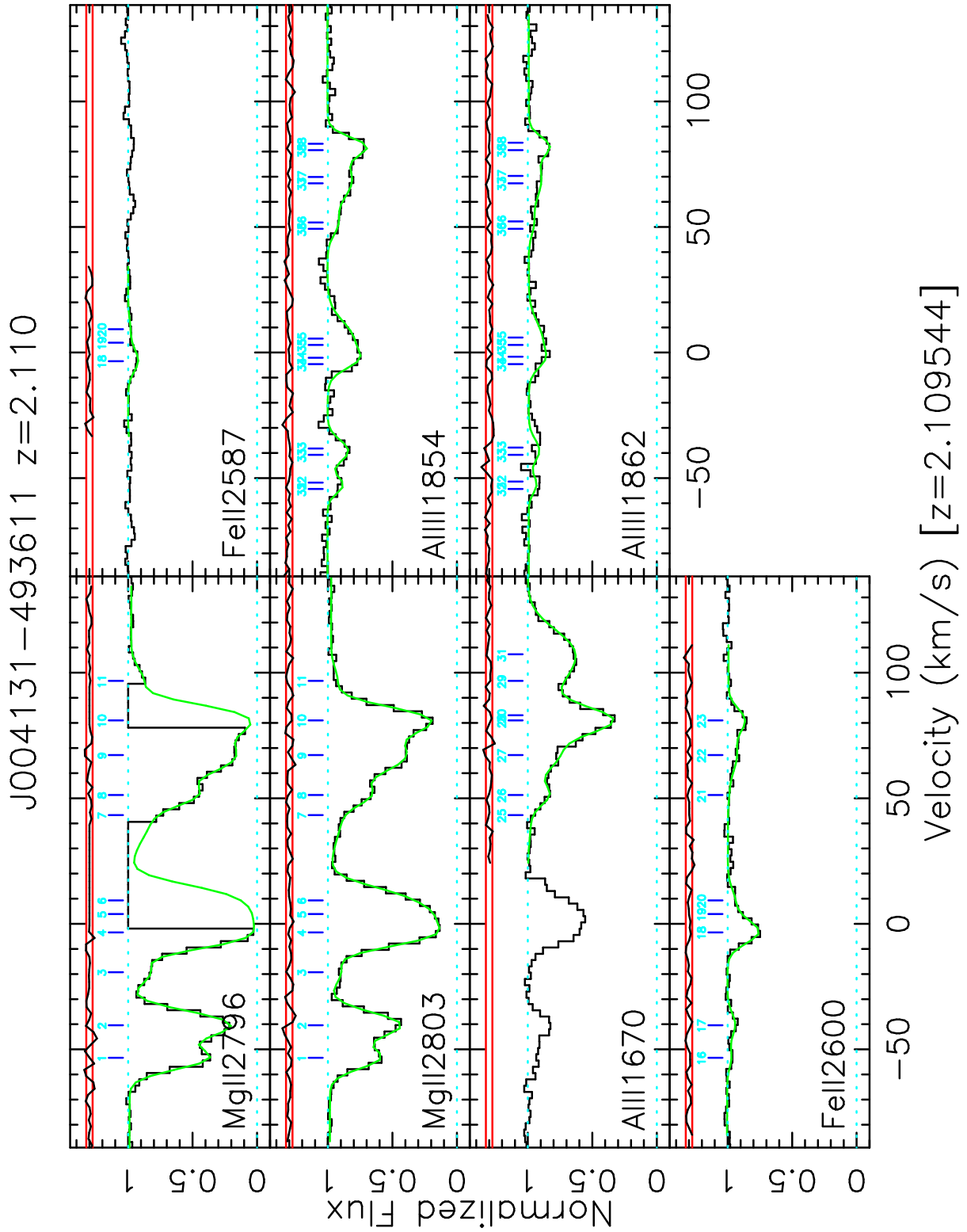


Figure 12. Many-multiplet fit for the  $z = 2.029$  absorber toward J001602-001225.



**Figure 13.** Many-multiplet fit for the  $z = 2.110$  absorber toward J004131–493611.

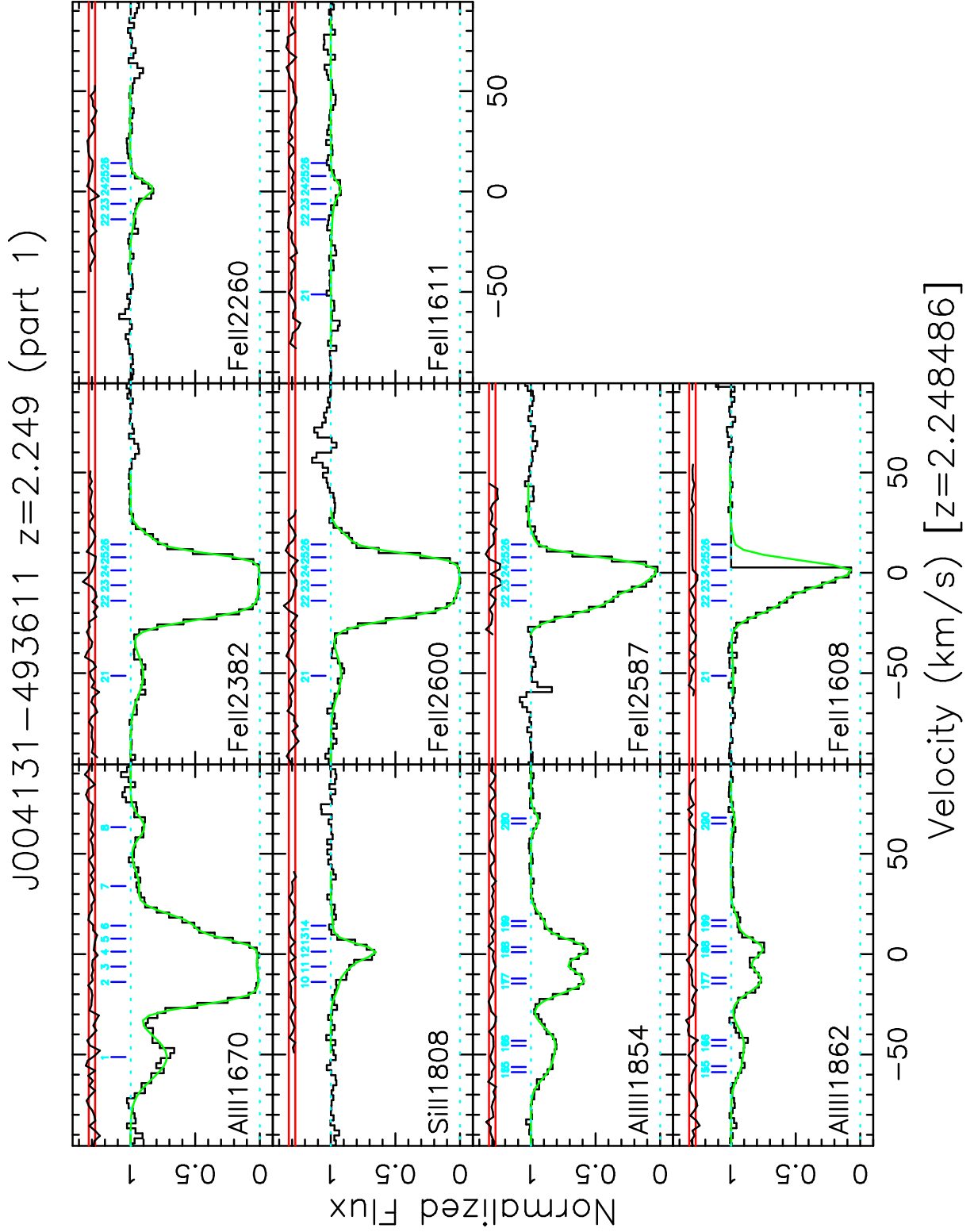
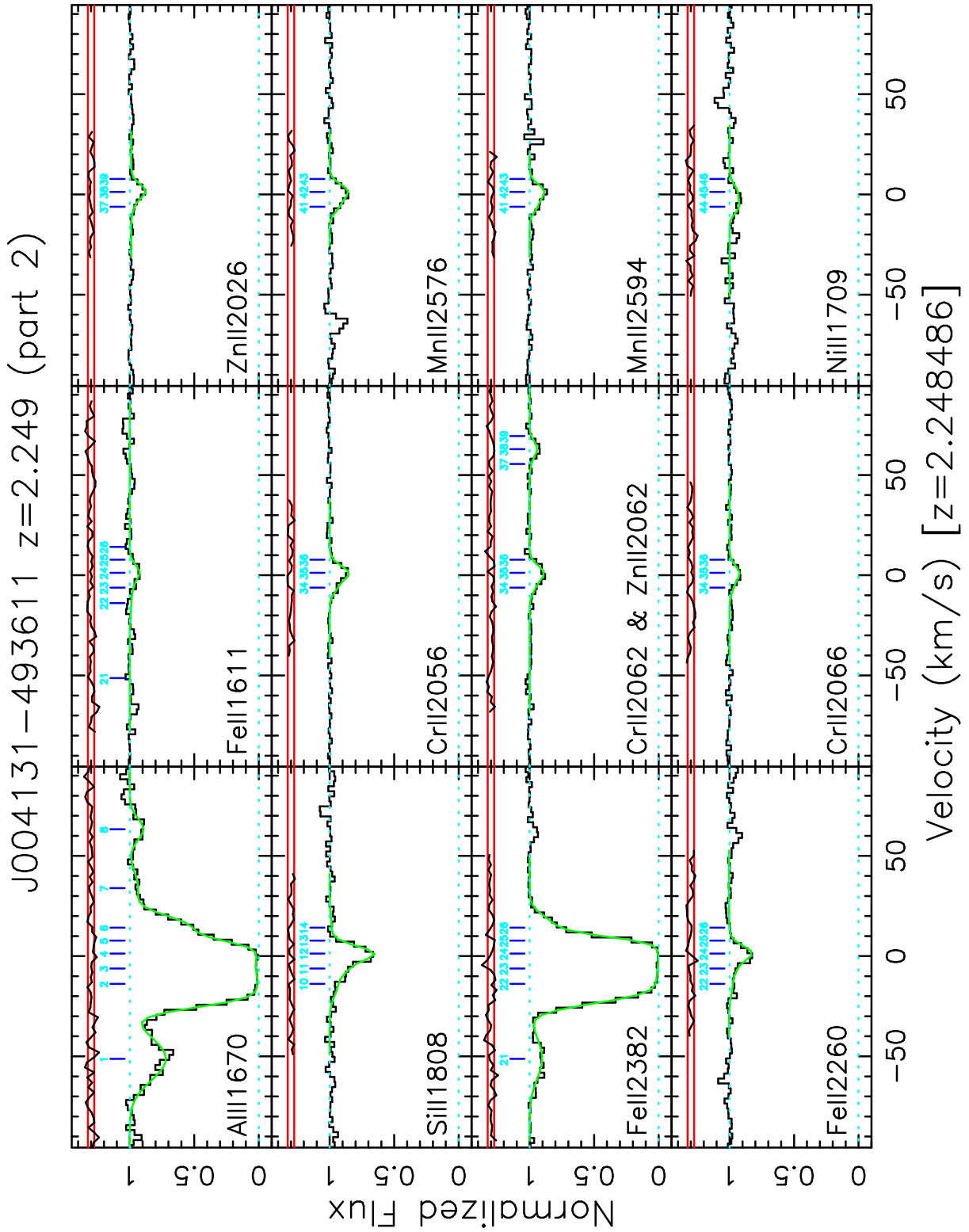
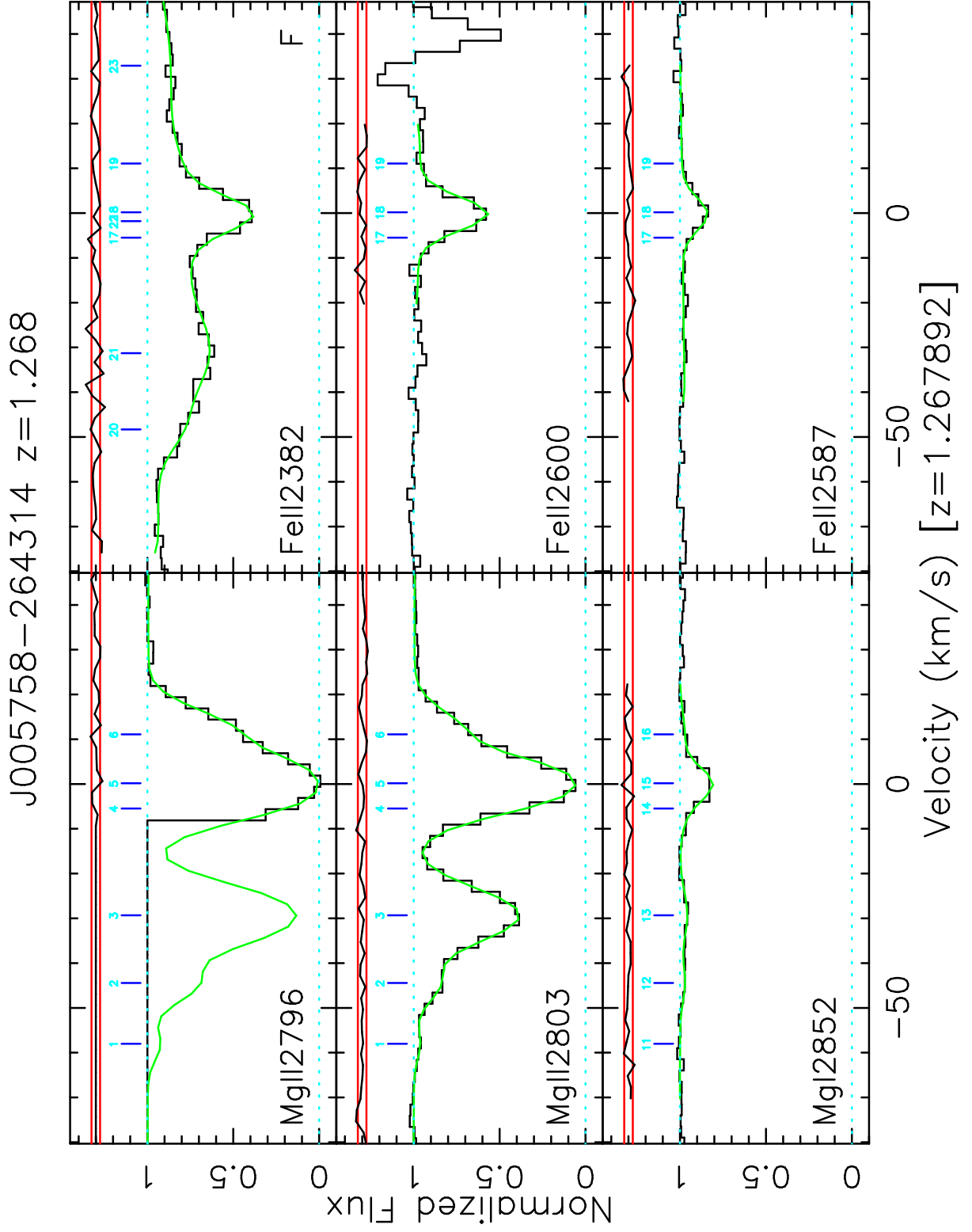


Figure 14. Many-multiplet fit for the  $z = 2.249$  absorber toward J004131–493611 (part 1).



**Figure 15.** Many-multiplet fit for the  $z = 2.249$  absorber toward J004131–493611 (part 2).





**Figure 16.** Many-multiplet fit for the  $z = 1.268$  absorber toward J005758–264314.

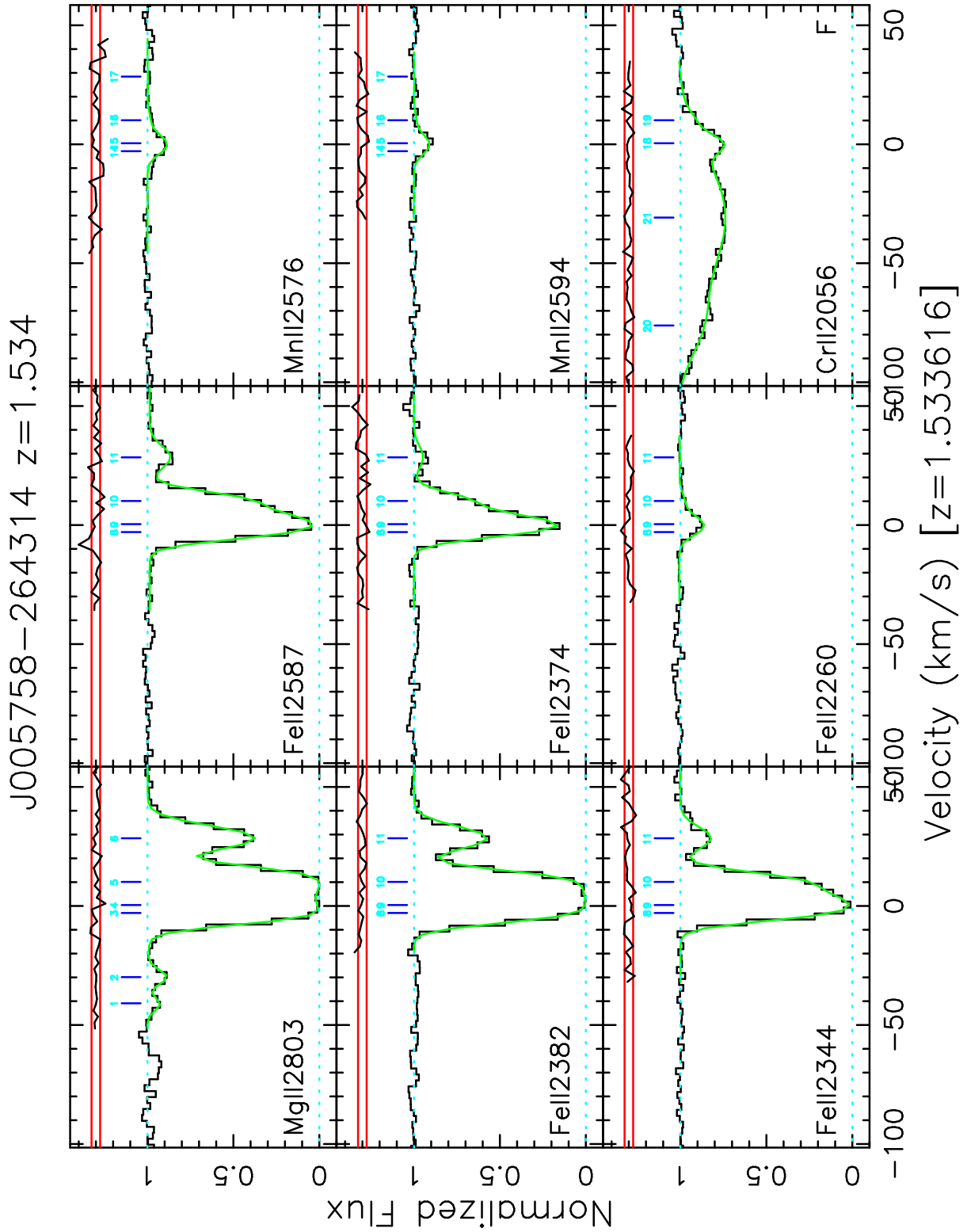
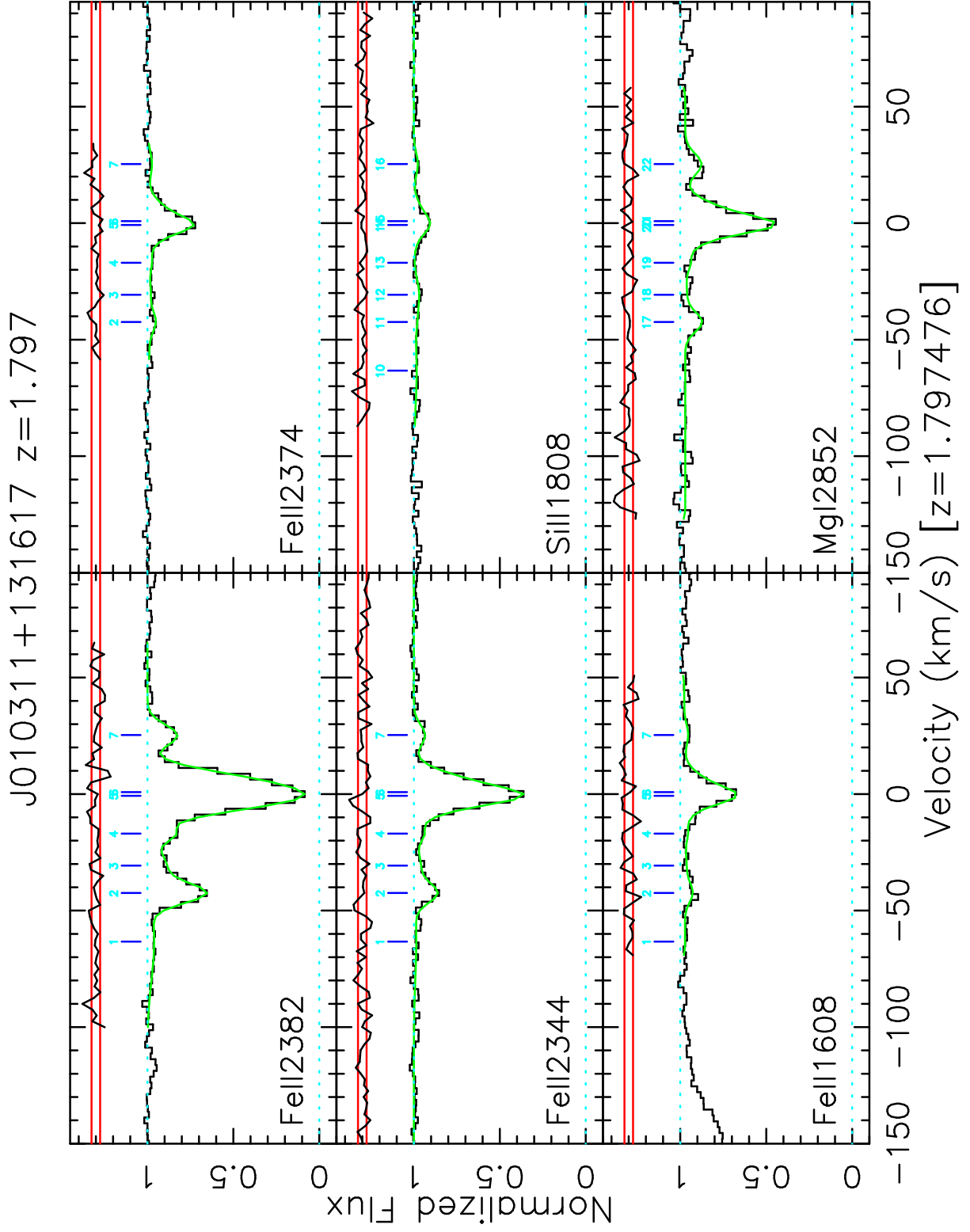


Figure 17. Many-multiplet fit for the  $z = 1.534$  absorber toward J005758–264314.



**Figure 18.** Many-multiplet fit for the  $z = 1.797$  absorber toward J010311+131617.



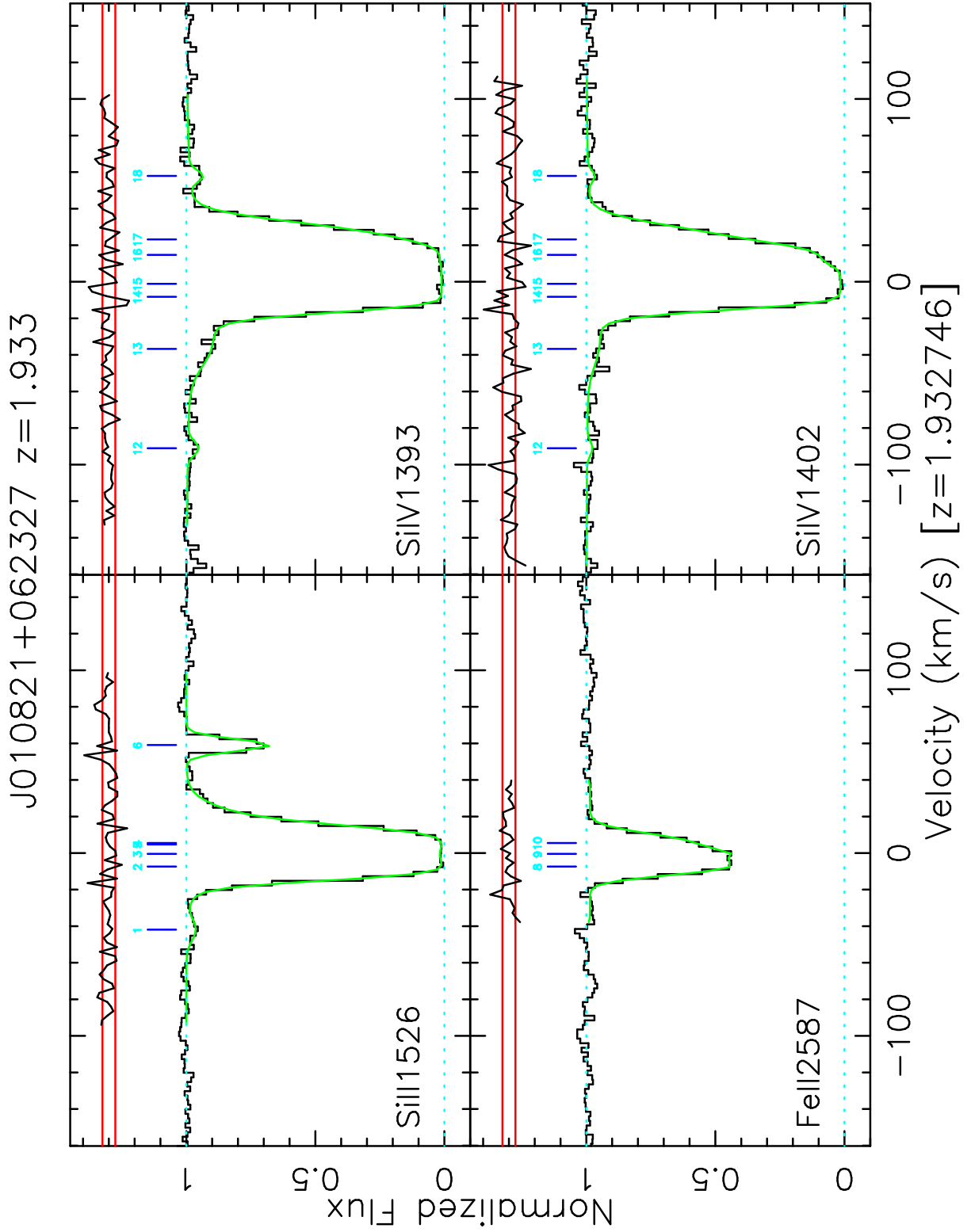
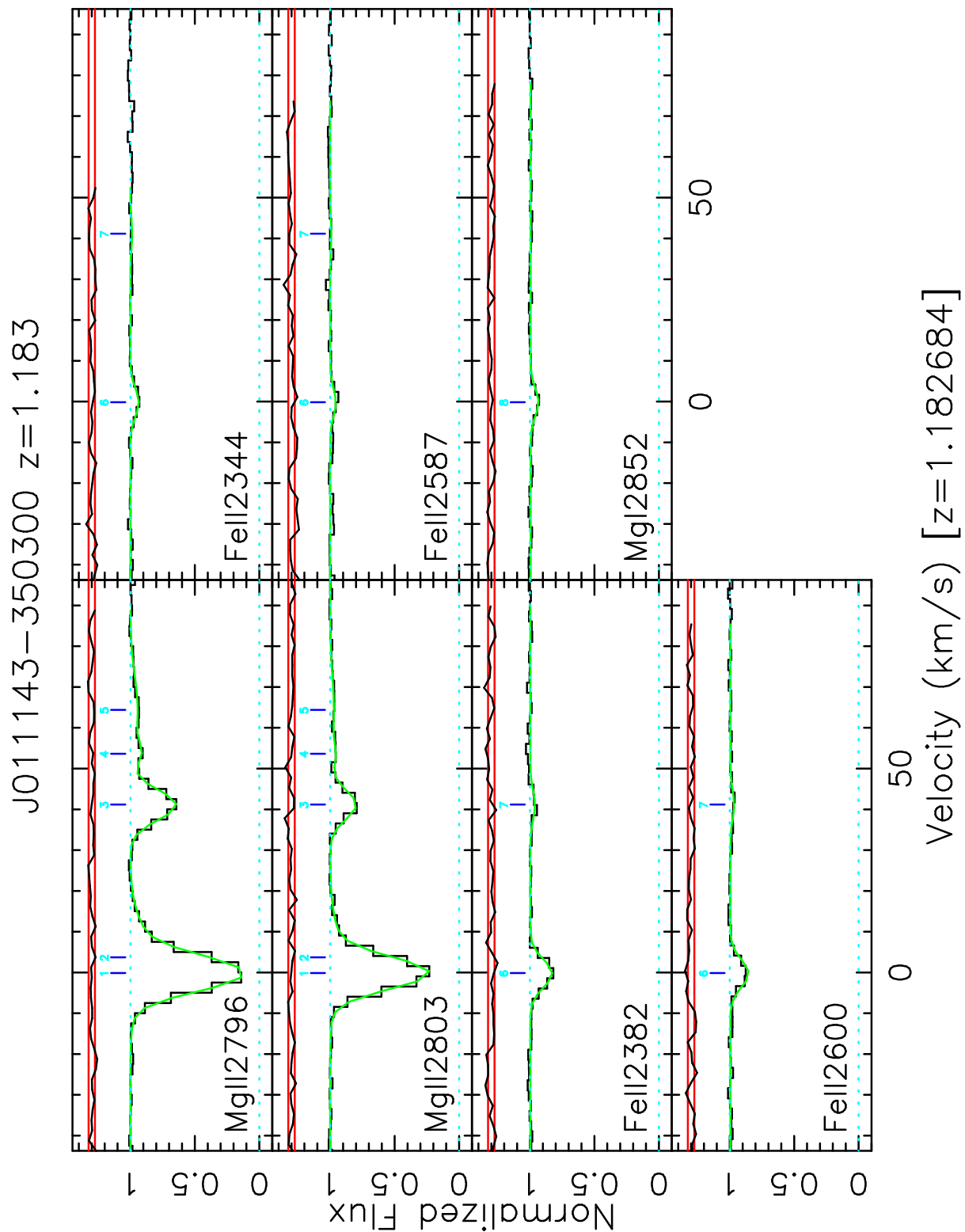


Figure 20. Many-multiplet fit for the  $z = 1.933$  absorber toward J010821+062327.



**Figure 21.** Many-multiplet fit for the  $z = 1.183$  absorber toward J011143–350300.

J011143–350300  $z=1.348$

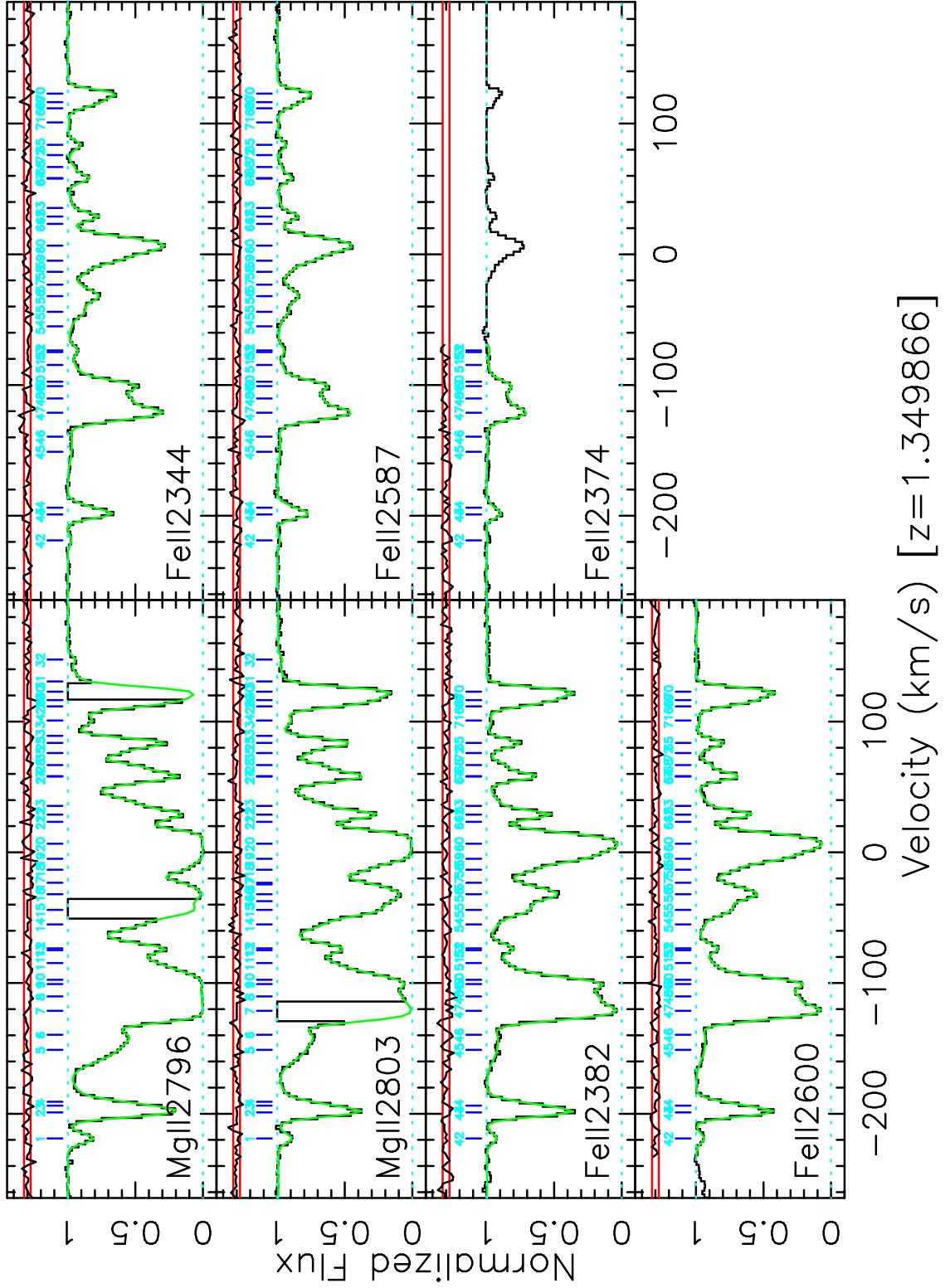
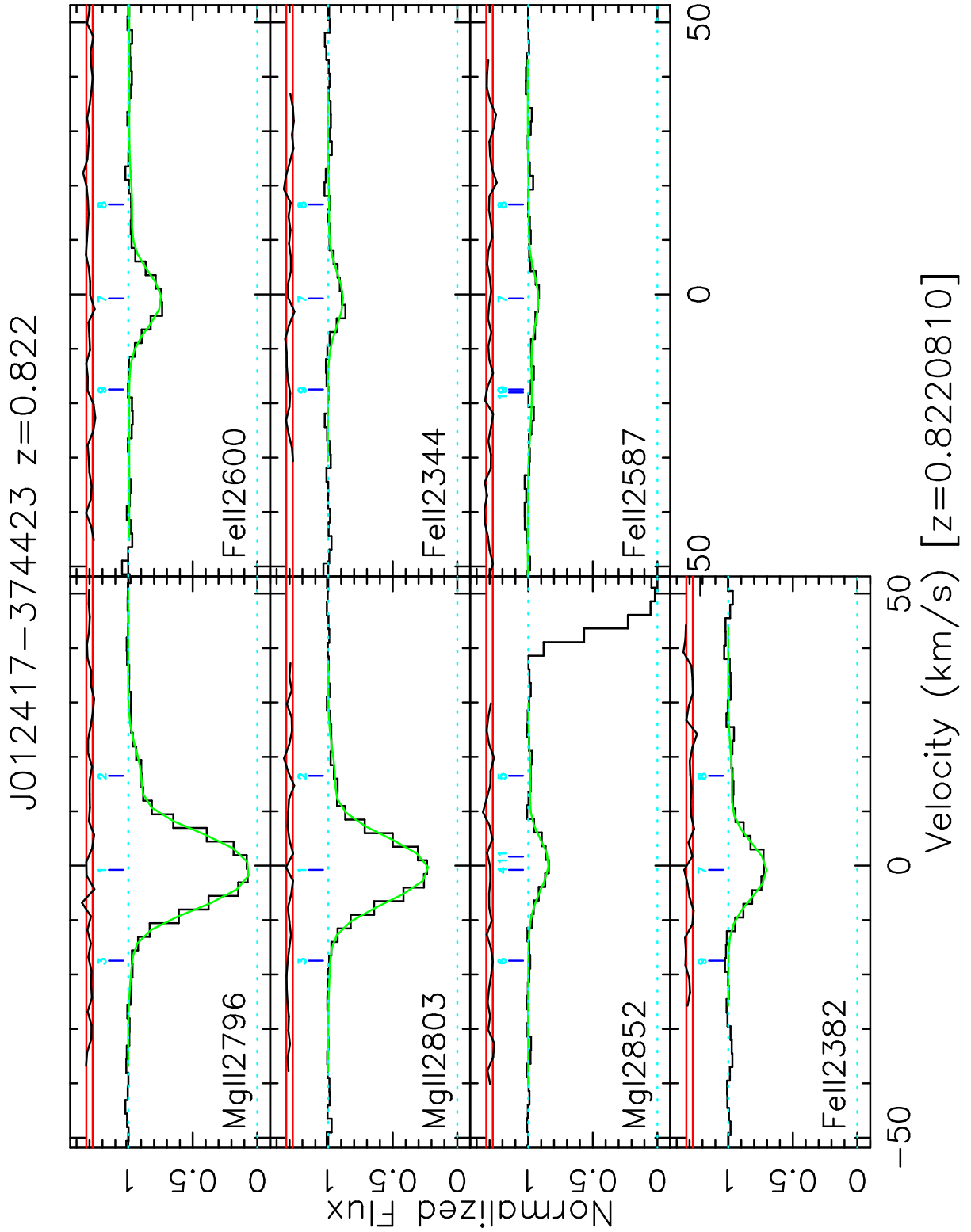


Figure 22. Many-multiplet fit for the  $z = 1.348$  absorber toward J011143–350300.



**Figure 23.** Many-multiplet fit for the  $z = 0.822$  absorber toward J012417-374423.



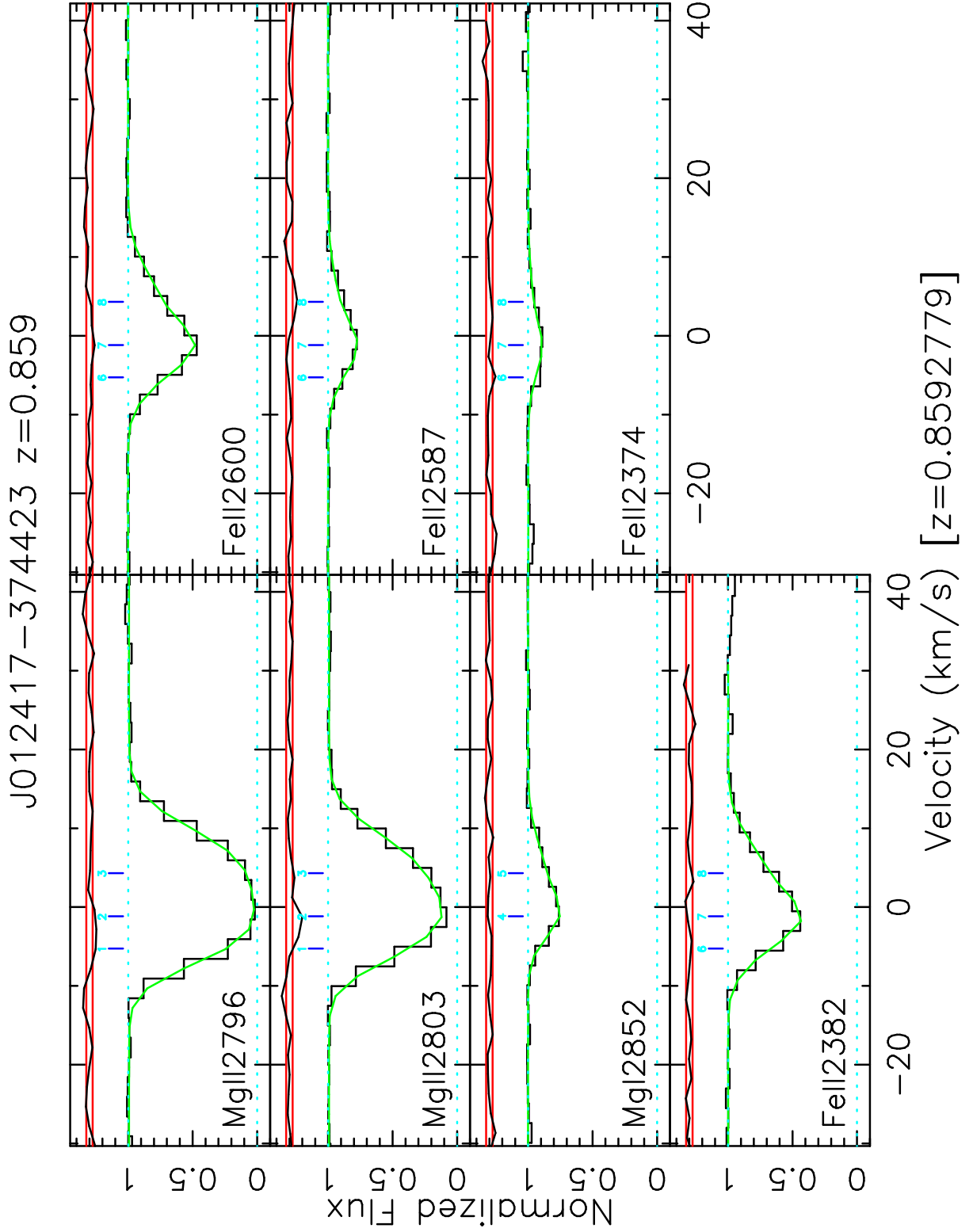


Figure 24. Many-multiplet fit for the  $z = 0.859$  absorber toward J012417-374423.

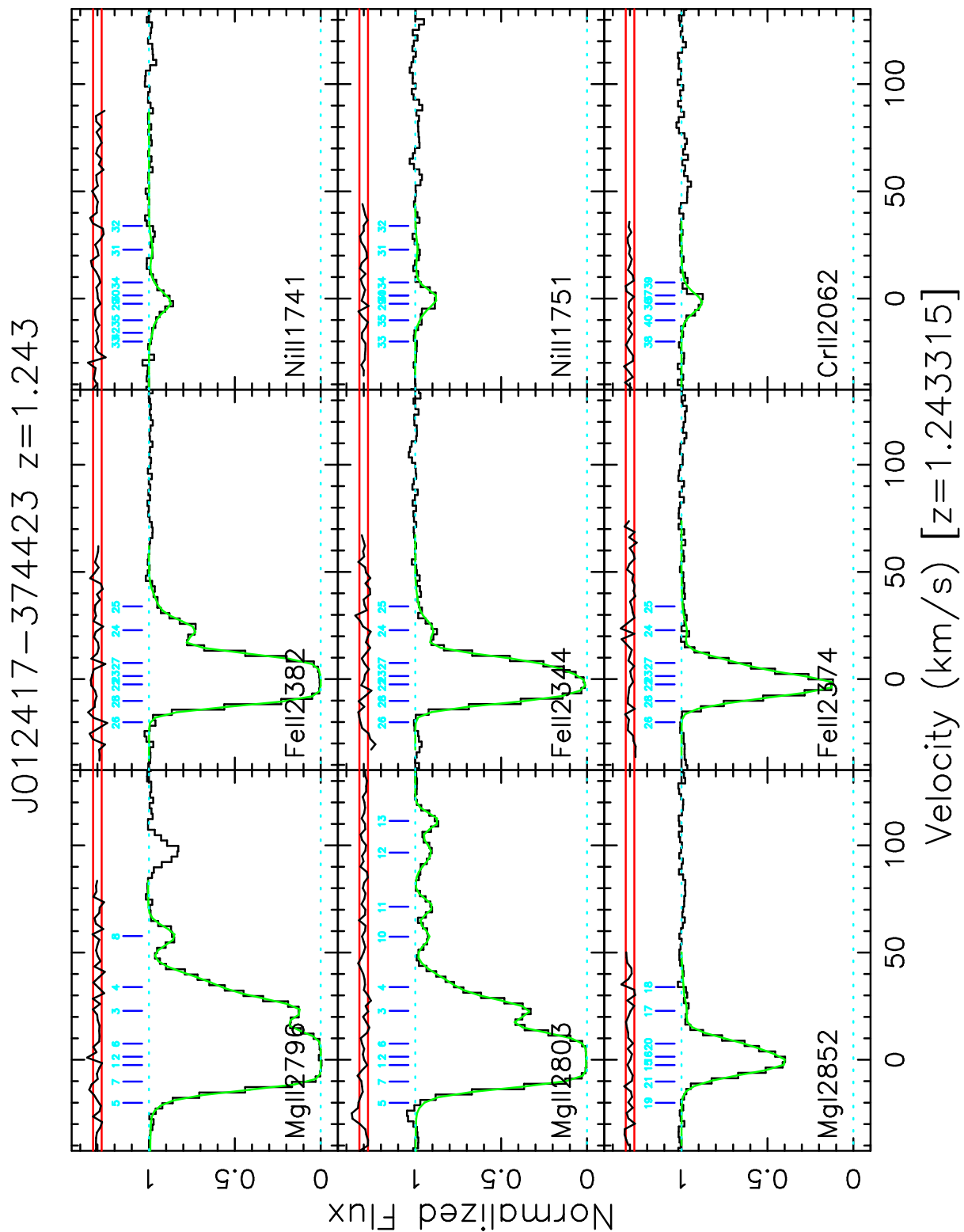
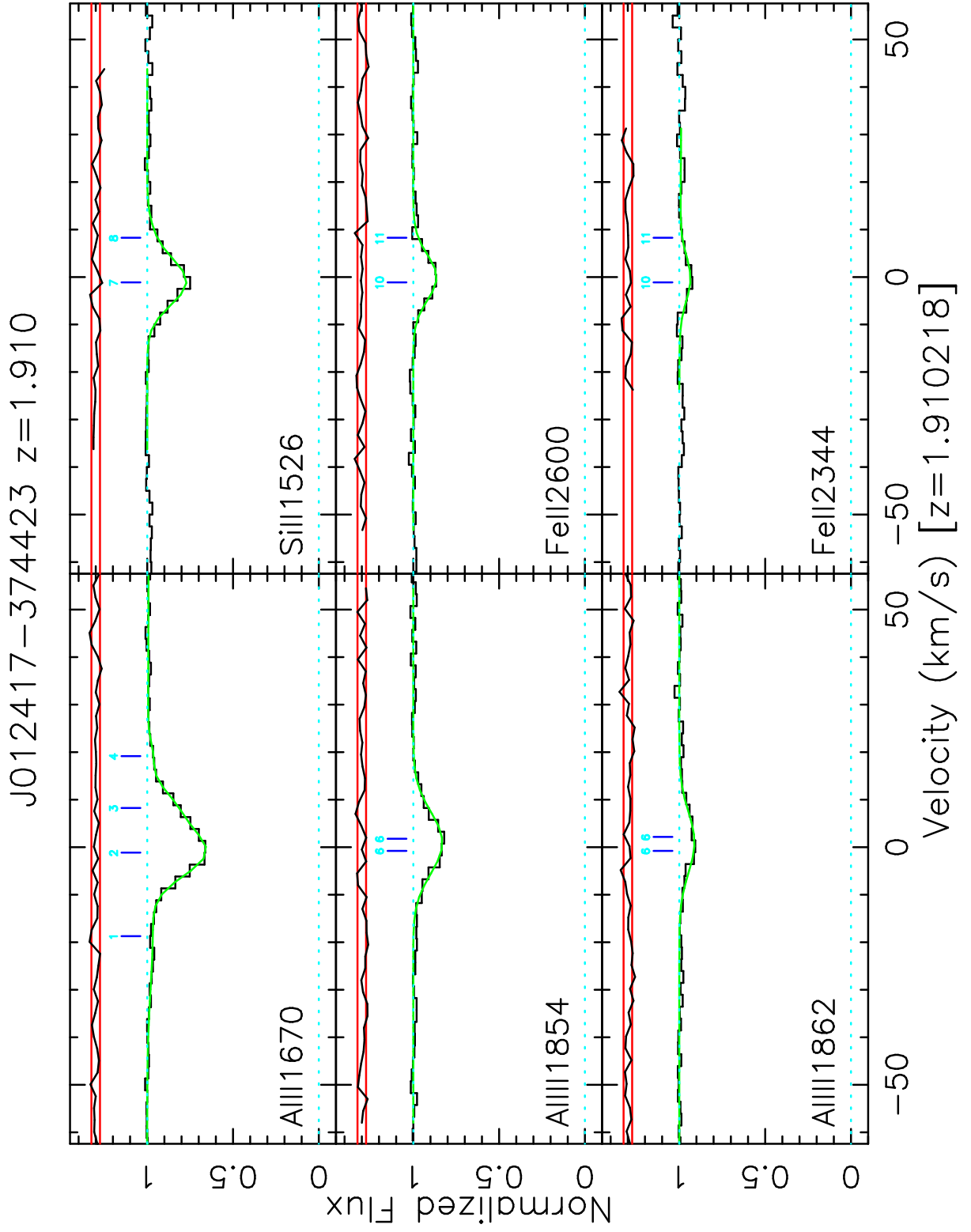
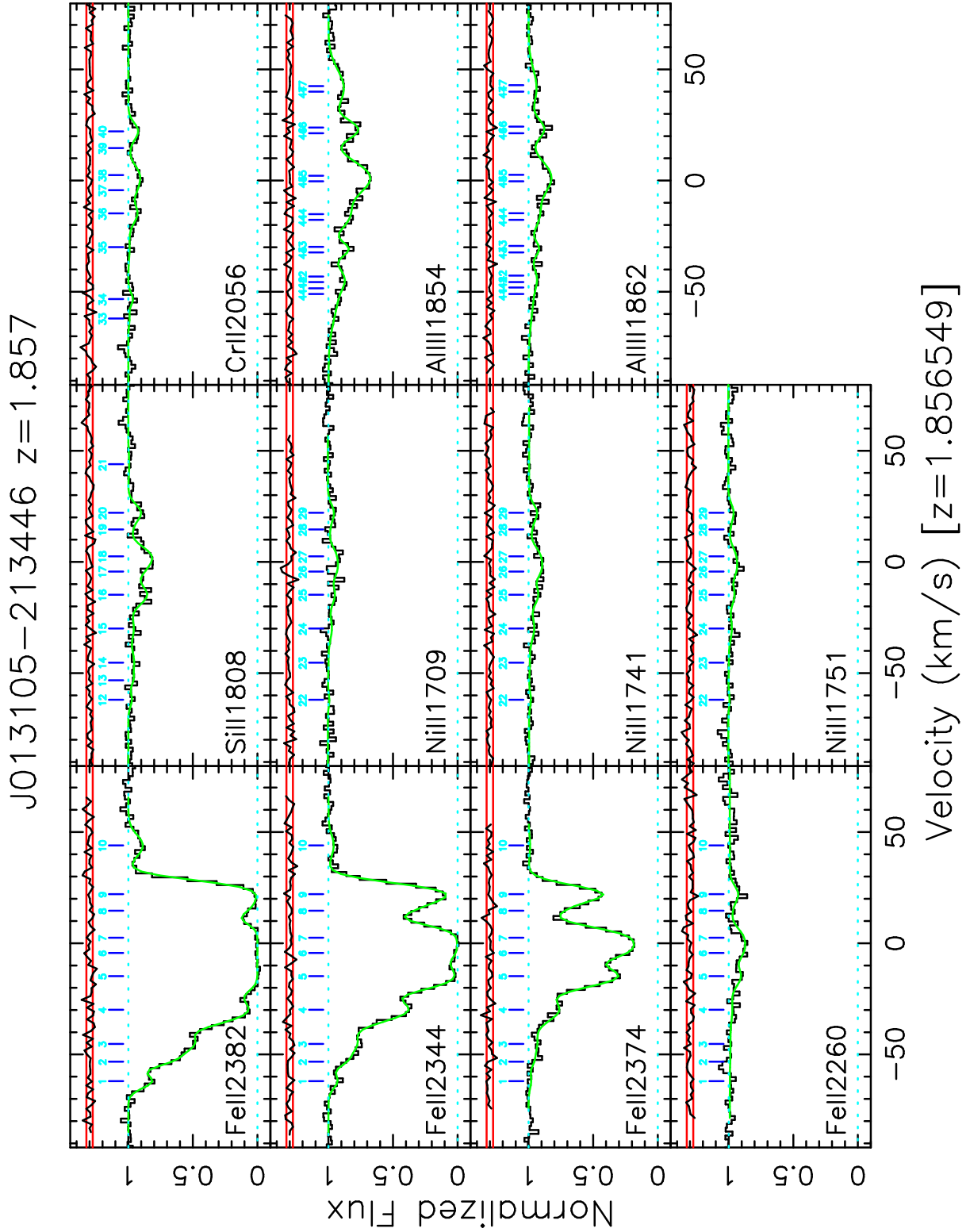


Figure 25. Many-multiplet fit for the  $z = 1.243$  absorber toward J012417–374423.



**Figure 26.** Many-multiplet fit for the  $z = 1.910$  absorber toward J012417-374423.



**Figure 27.** Many-multiplet fit for the  $z = 1.857$  absorber toward J013105–213446.

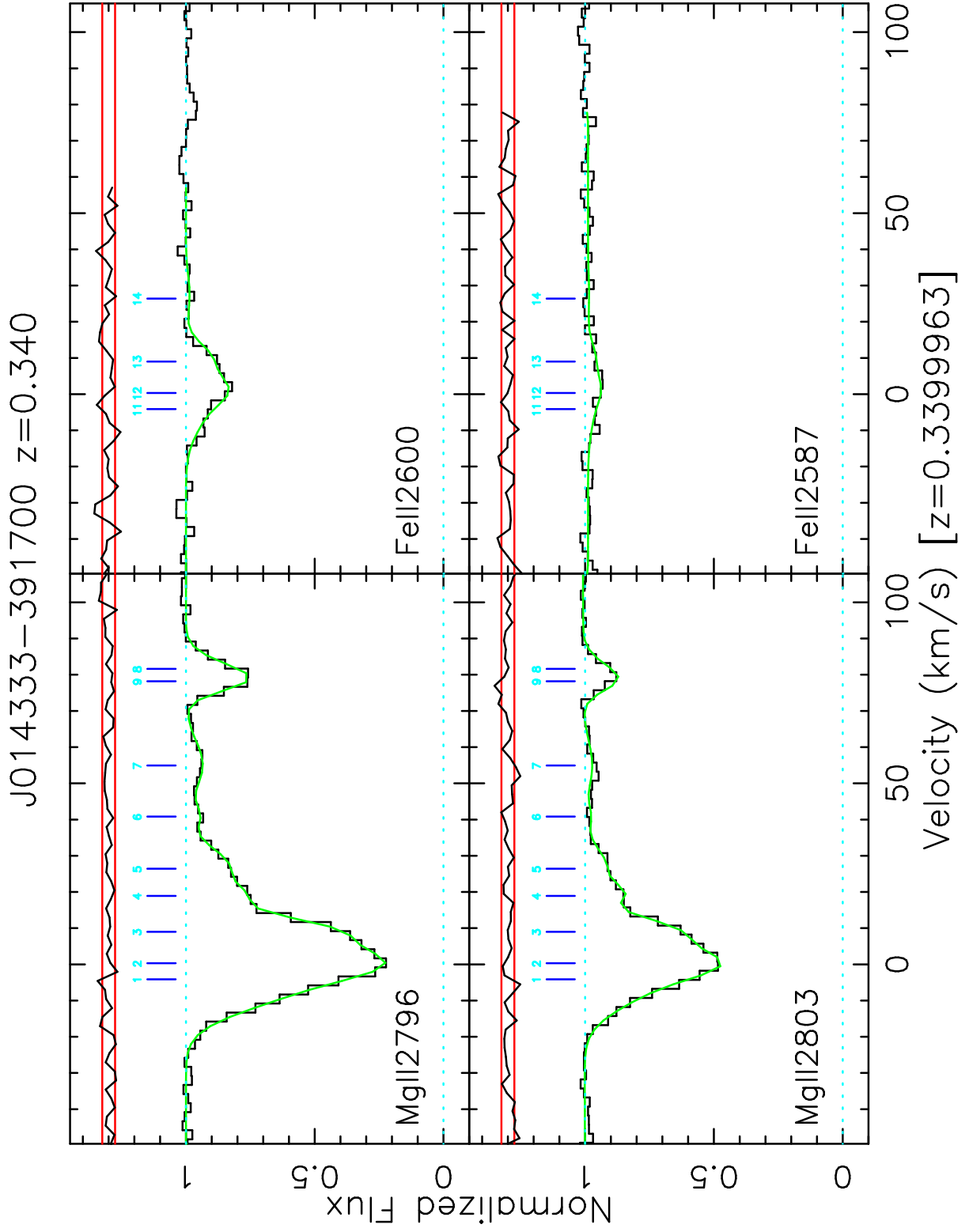
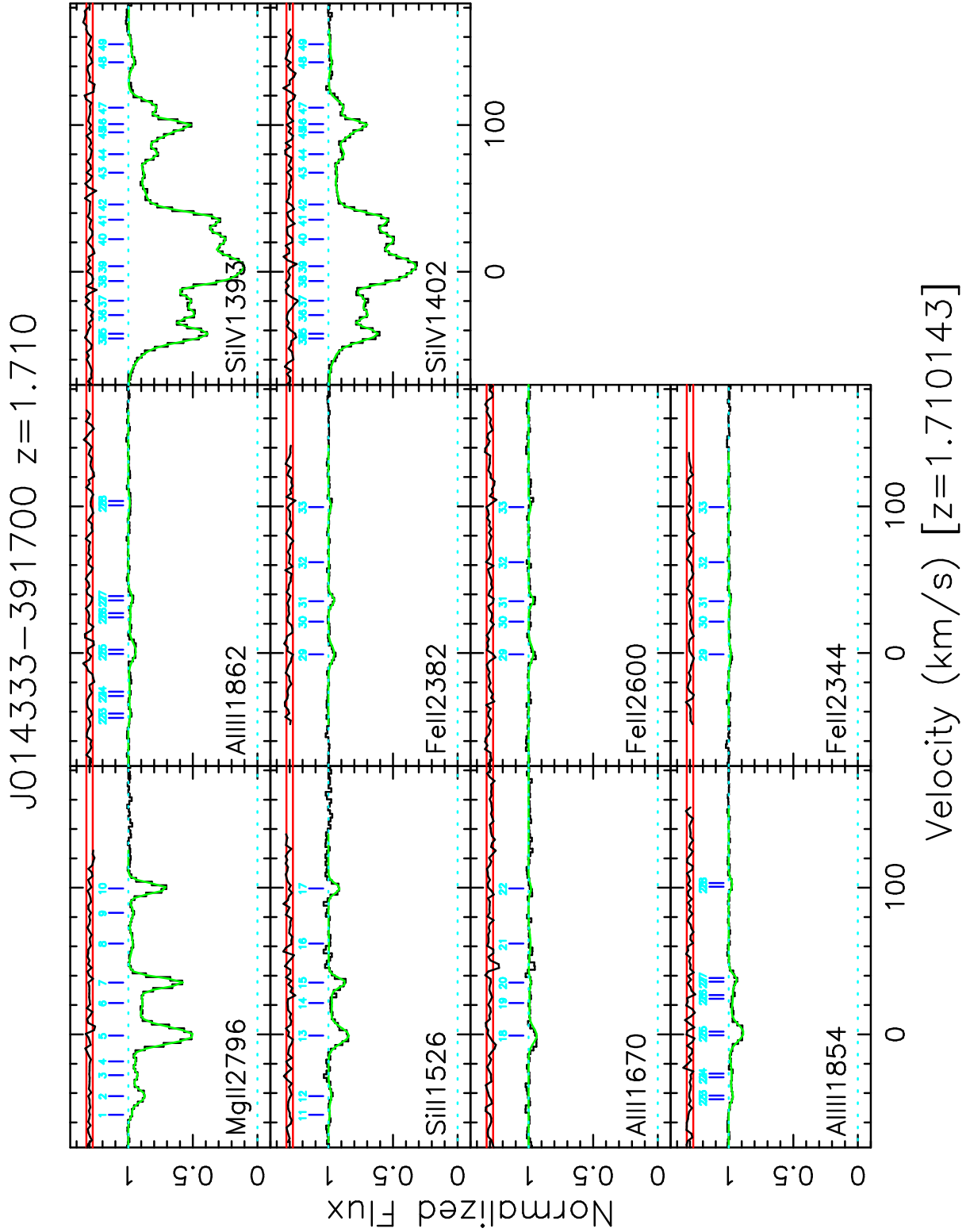


Figure 28. Many-multiplet fit for the  $z = 0.340$  absorber toward J014333-391700.



**Figure 29.** Many-multiplet fit for the  $z = 1.710$  absorber toward J014333–391700.

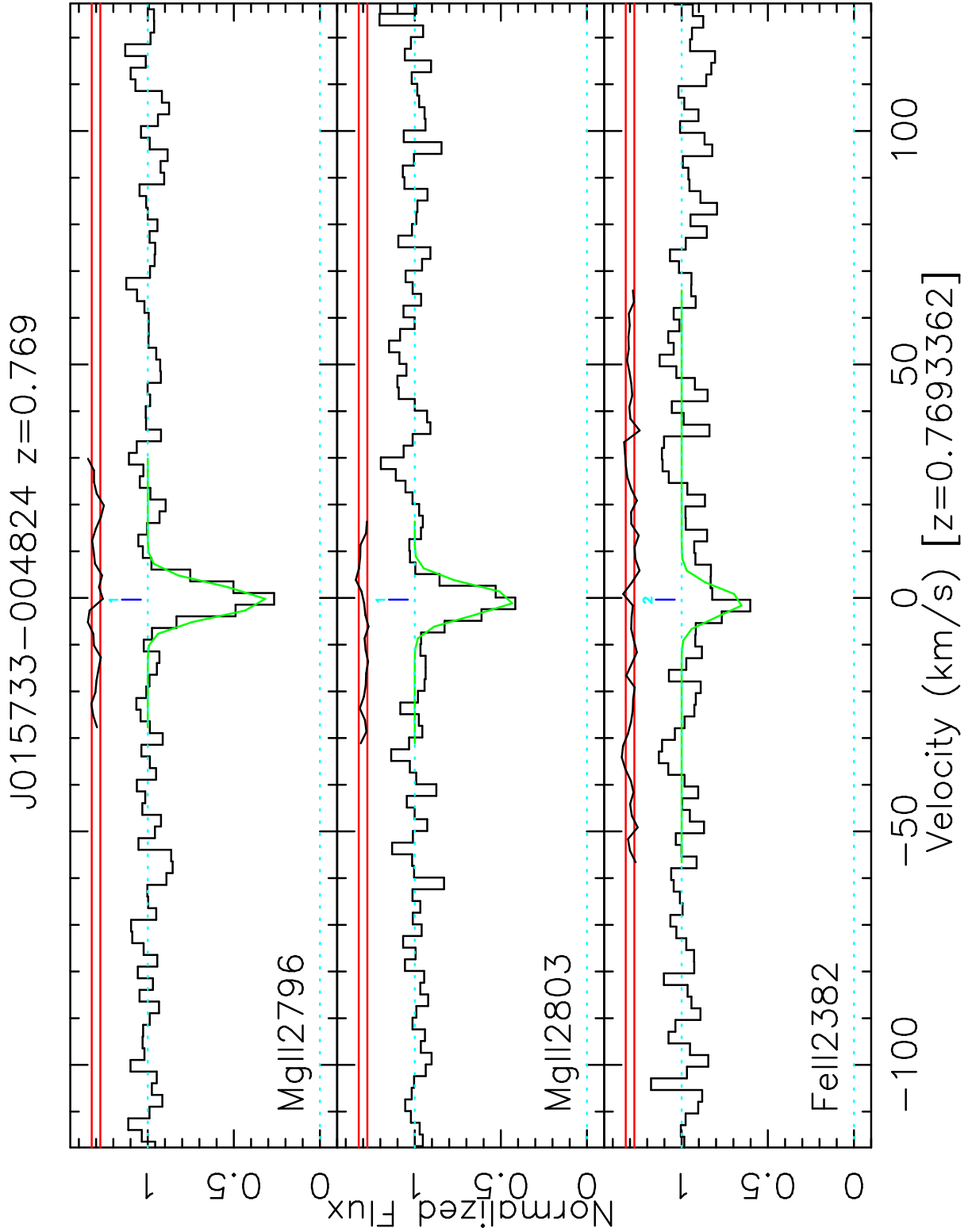
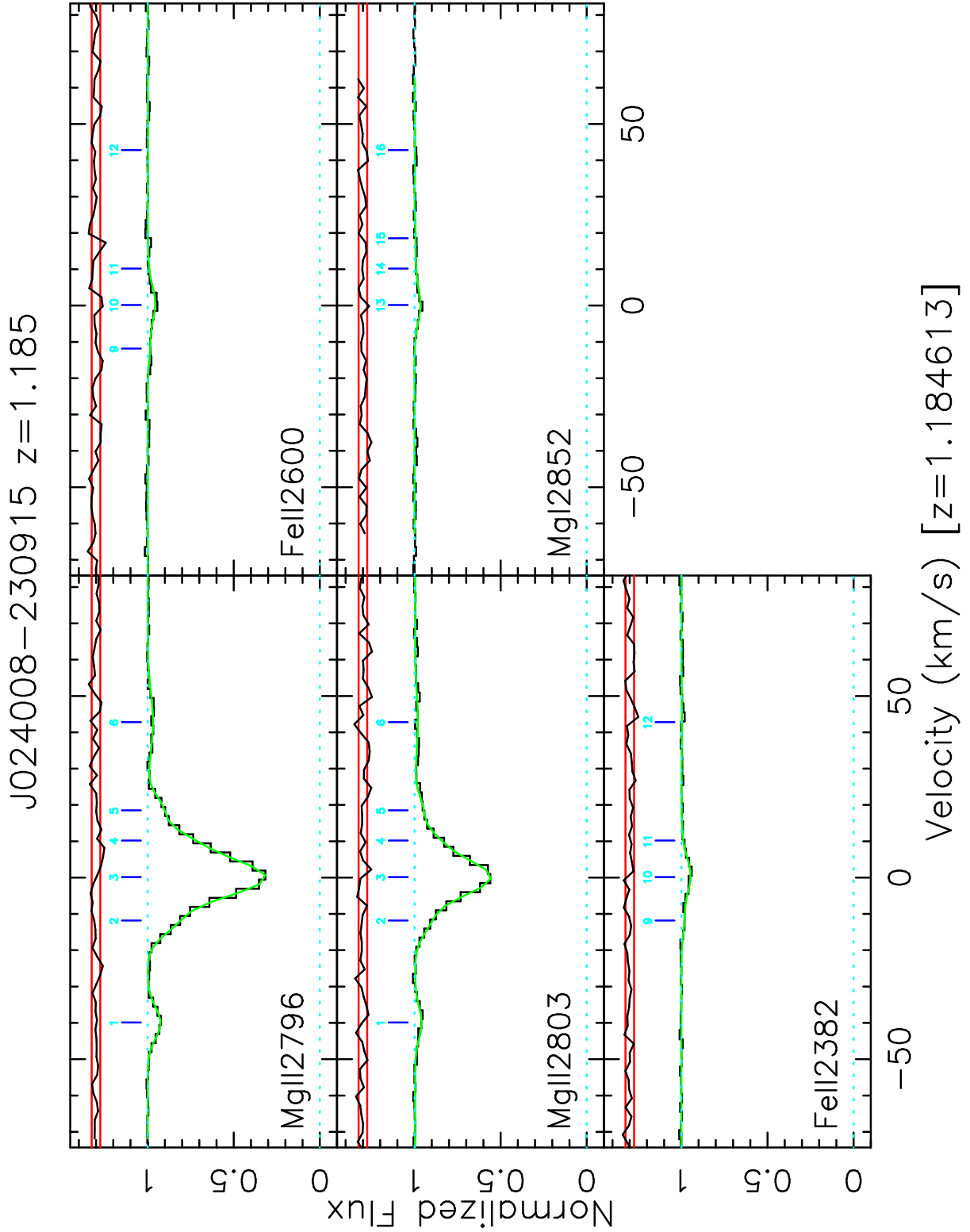


Figure 30. Many-multiplet fit for the  $z = 0.769$  absorber toward J015733-004824.



**Figure 31.** Many-multiplet fit for the  $z = 1.185$  absorber toward J024008-230915.



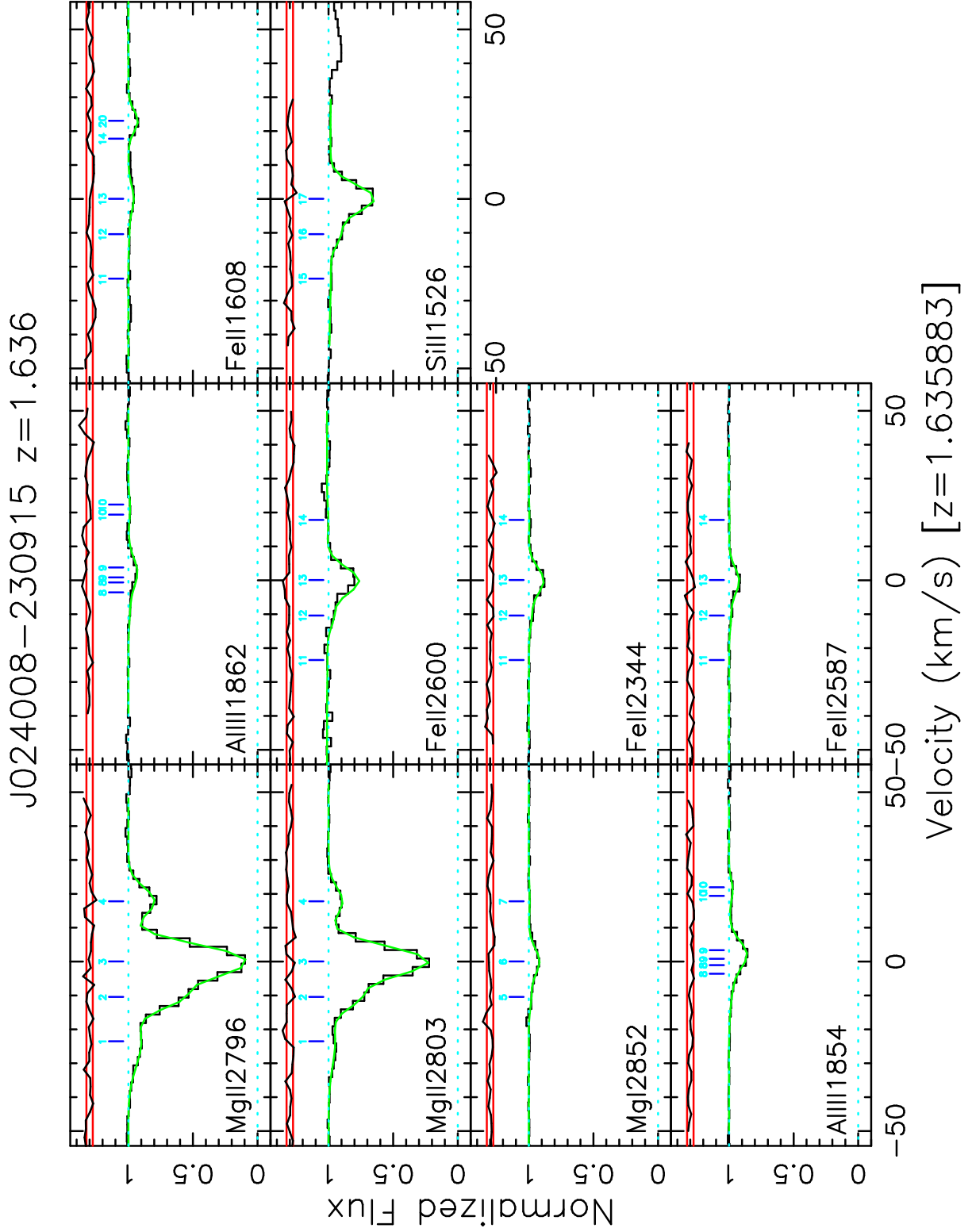
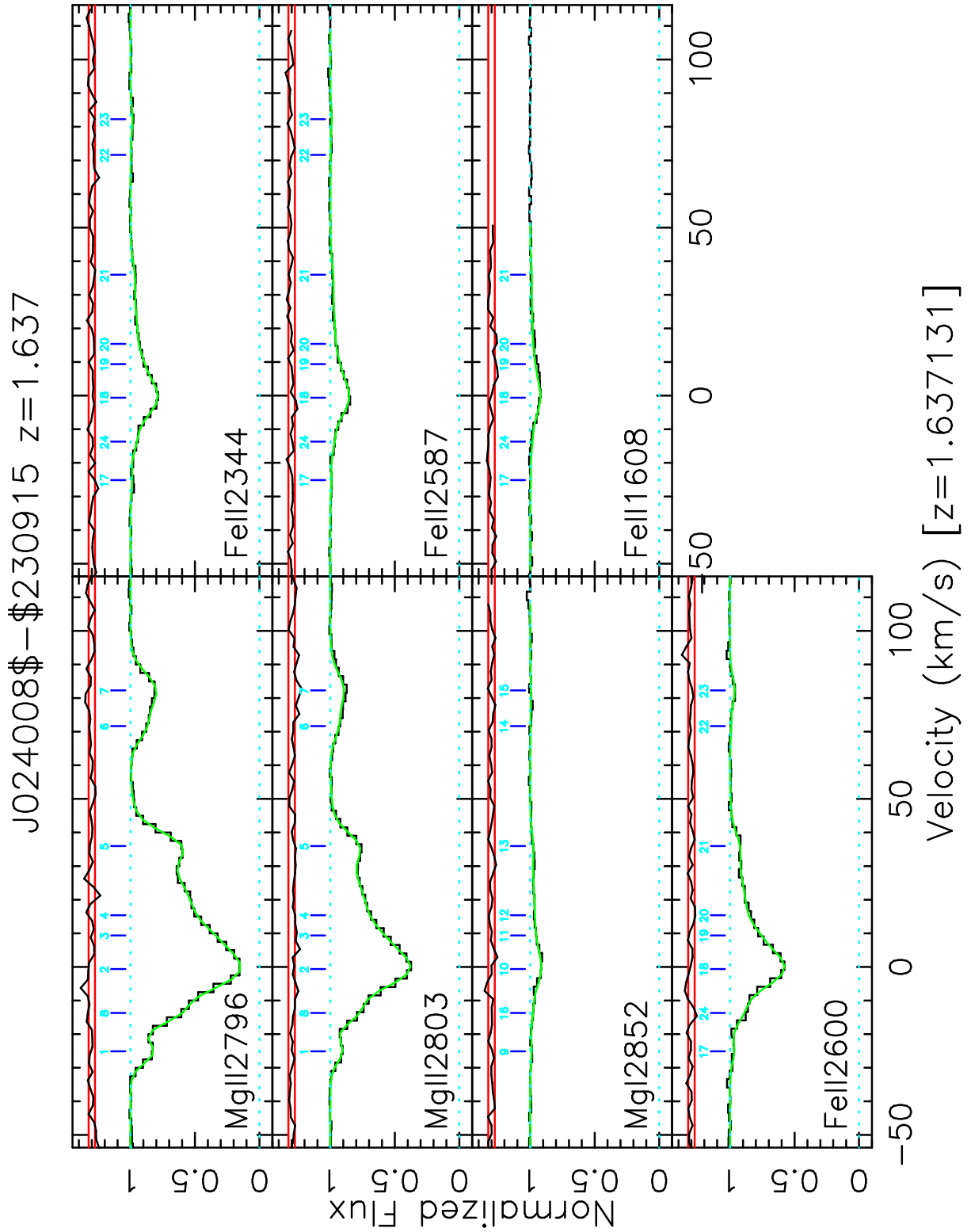


Figure 32. Many-multiplet fit for the  $z = 1.636$  absorber toward J024008-230915.



**Figure 33.** Many-multiplet fit for the  $z = 1.637$  absorber toward J024008–230915.

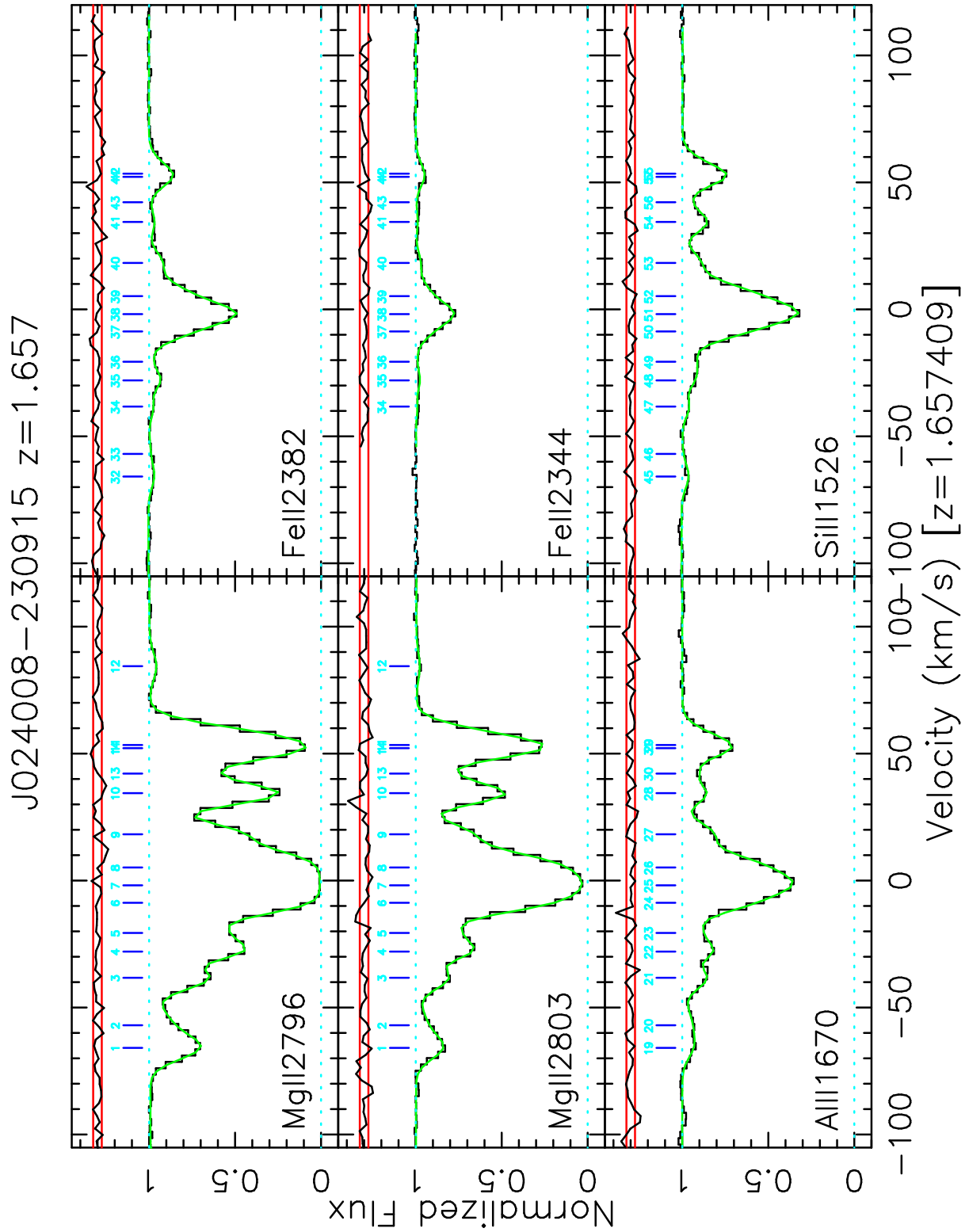


Figure 34. Many-multiplet fit for the  $z = 1.657$  absorber toward J024008–230915.

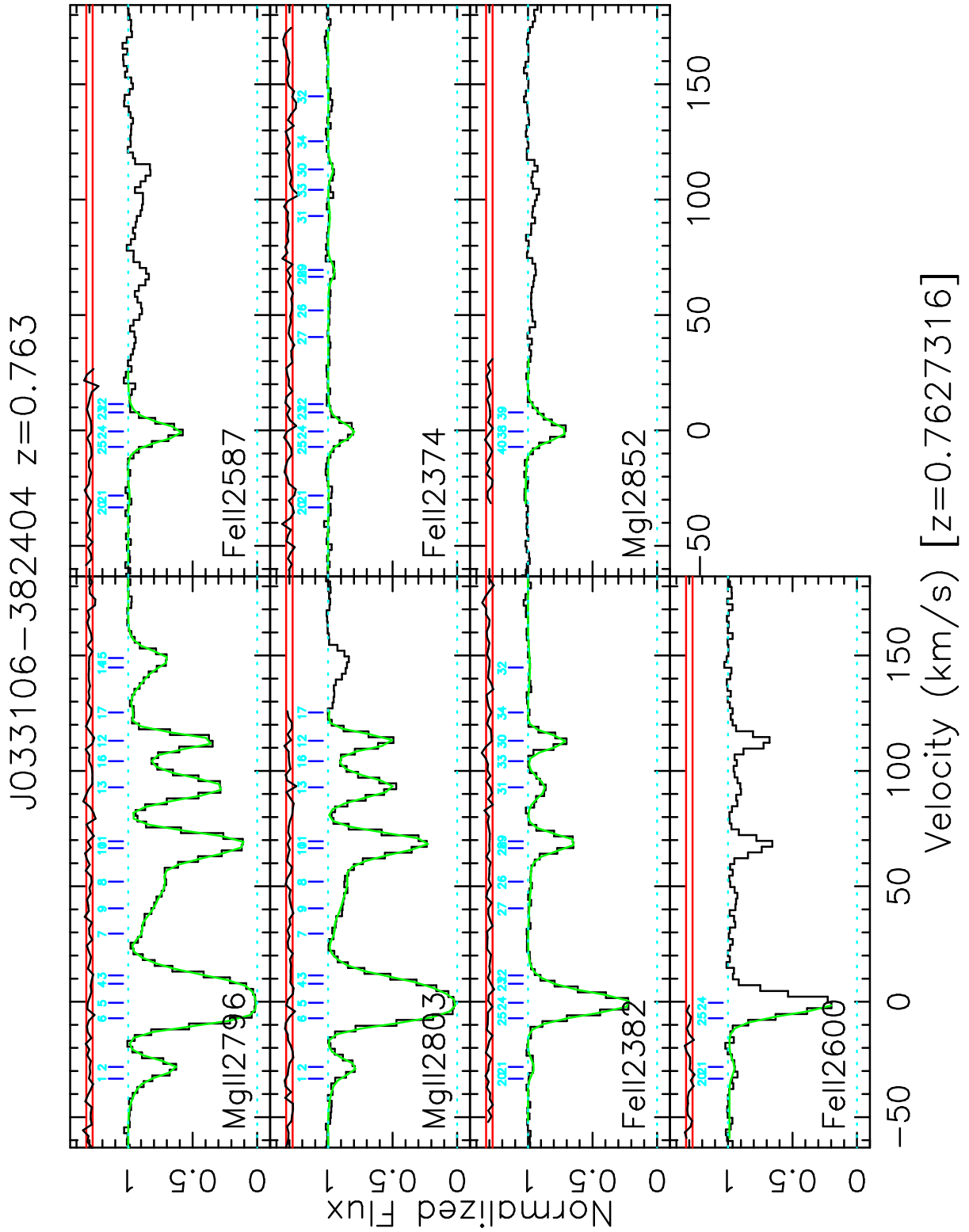


Figure 35. Many-multiplet fit for the  $z = 0.763$  absorber toward J033106–382404.

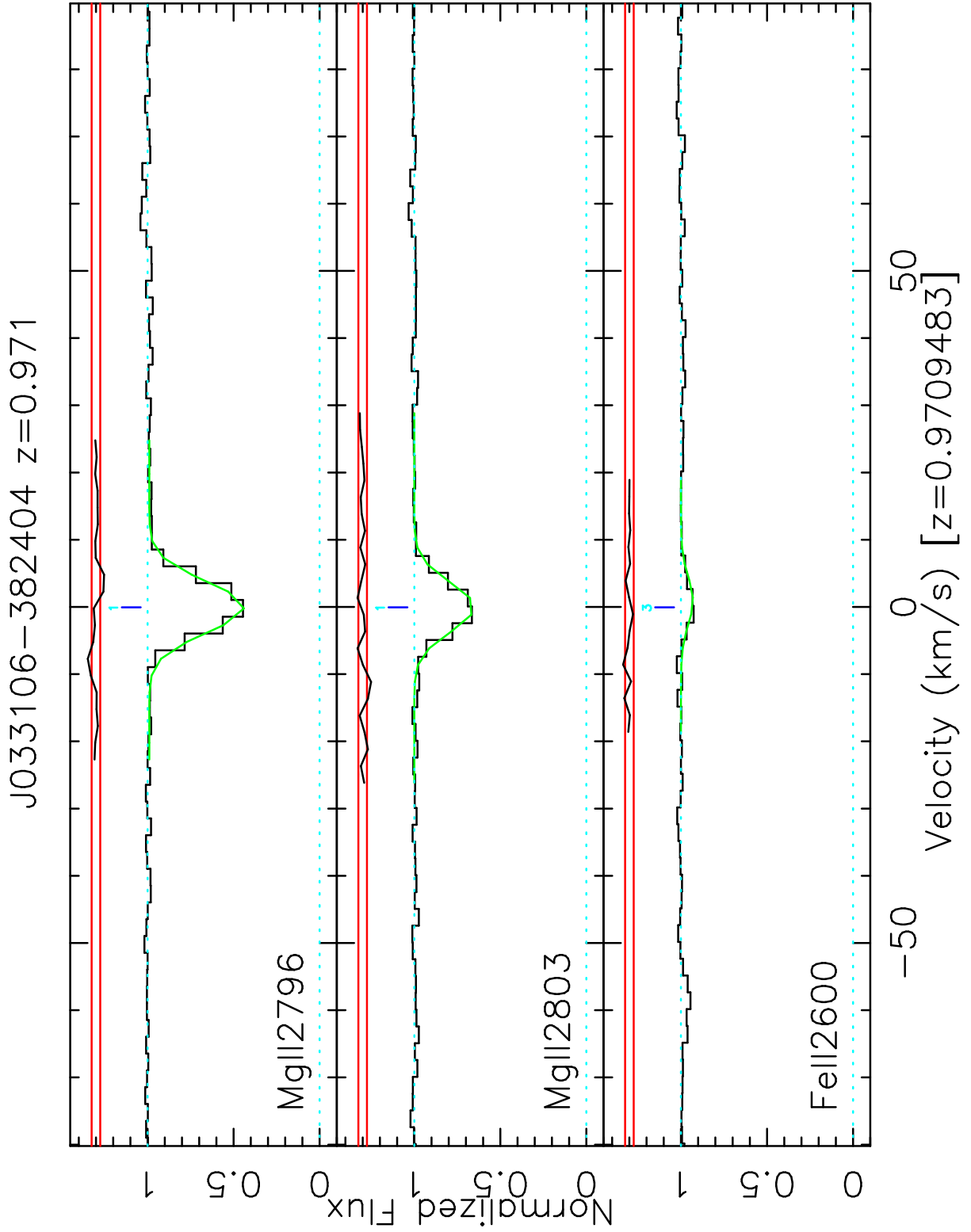


Figure 36. Many-multiplet fit for the  $z = 0.971$  absorber toward J033106-382404.

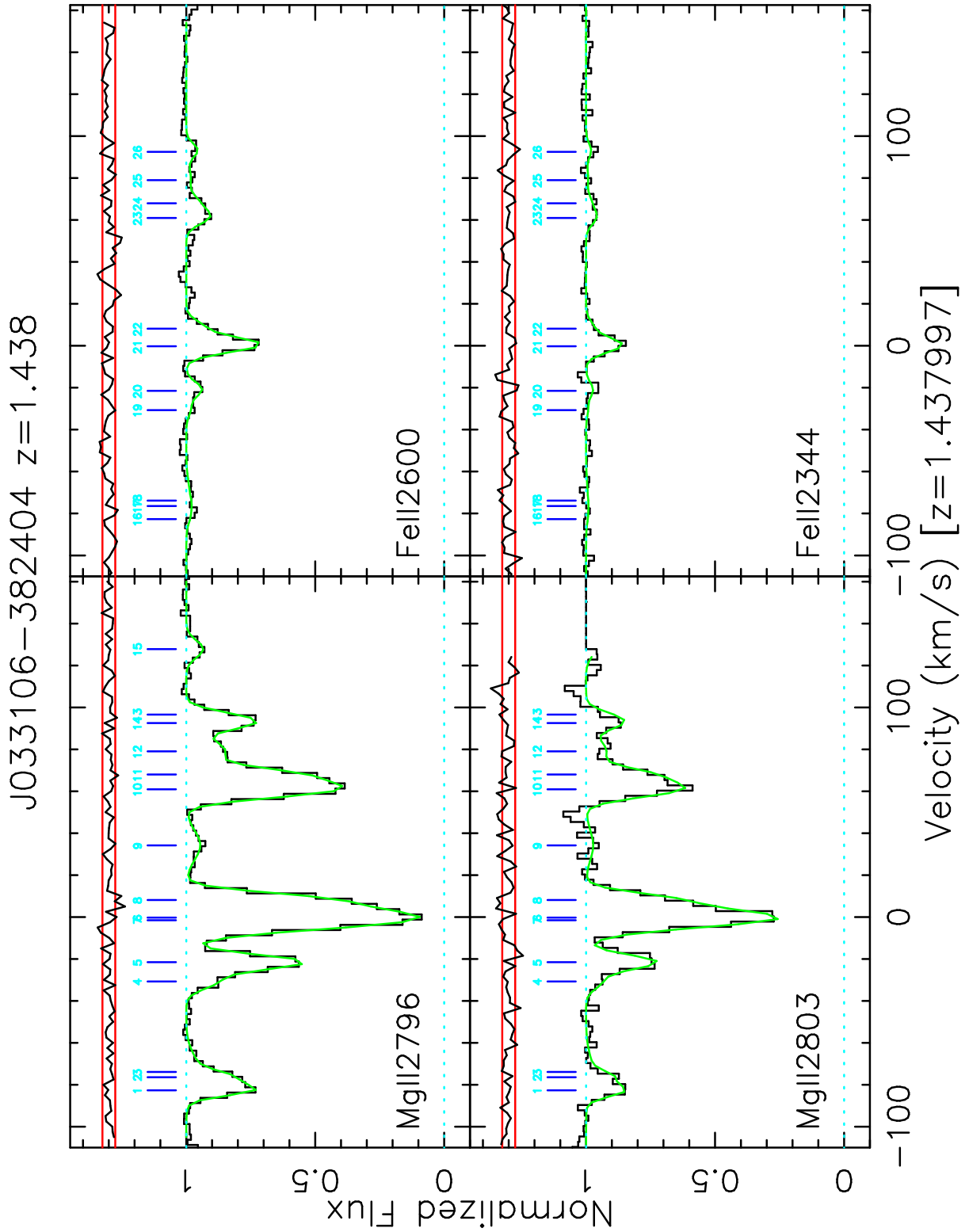


Figure 37. Many-multiplet fit for the  $z = 1.438$  absorber toward J033106-382404.

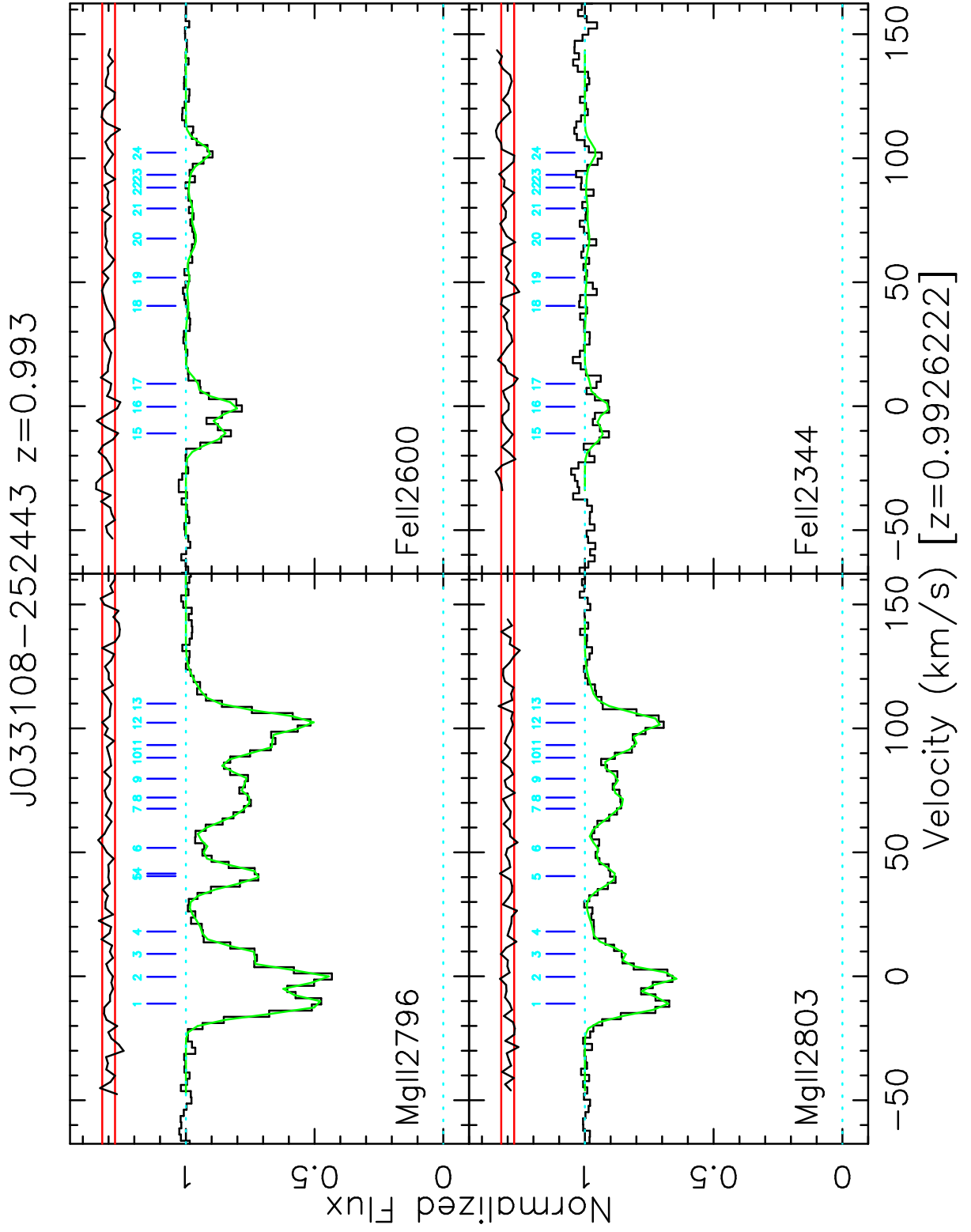
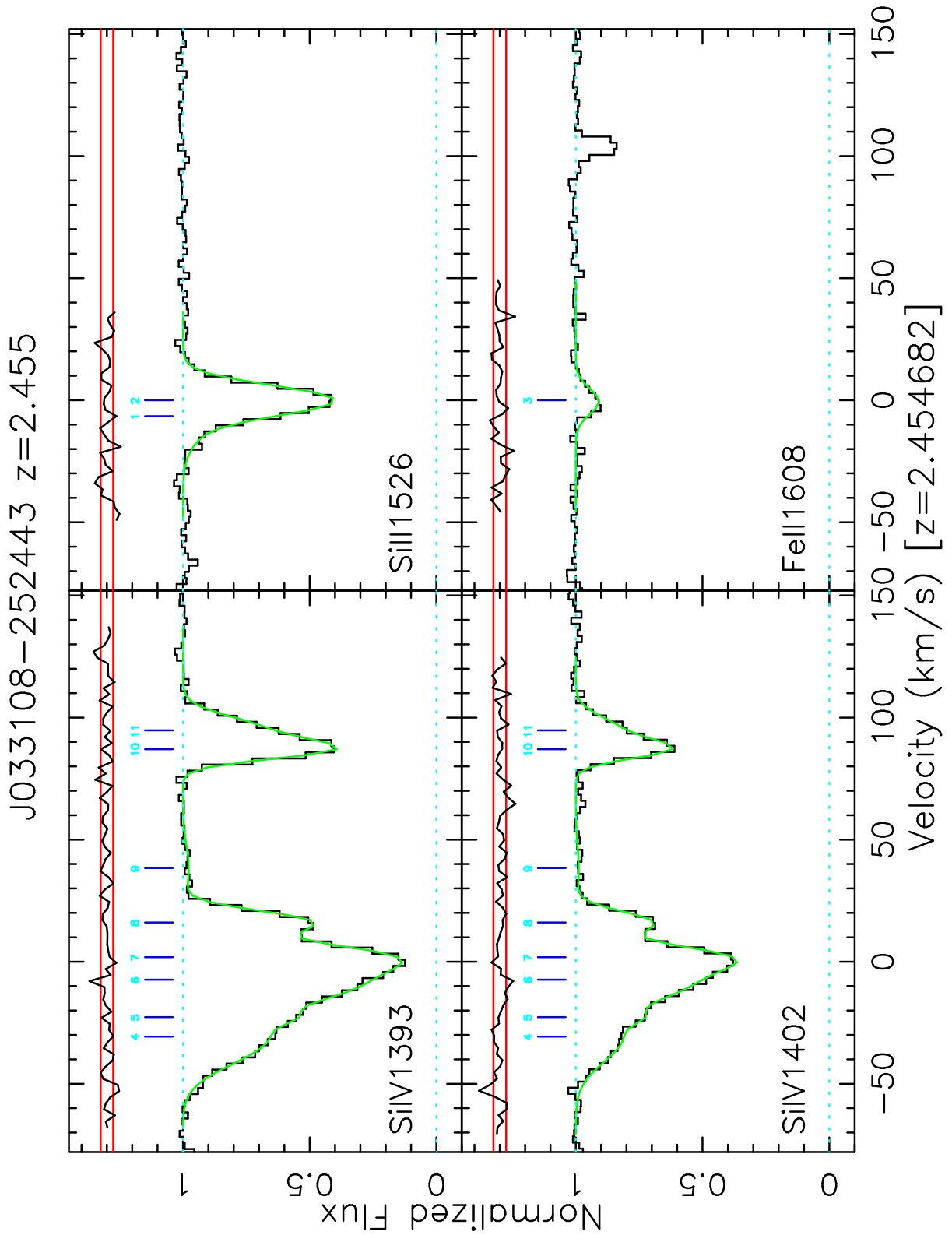


Figure 38. Many-multiplet fit for the  $z = 0.993$  absorber toward J033108–252443.



**Figure 39.** Many-multiplet fit for the  $z = 2.455$  absorber toward J033108-252443.



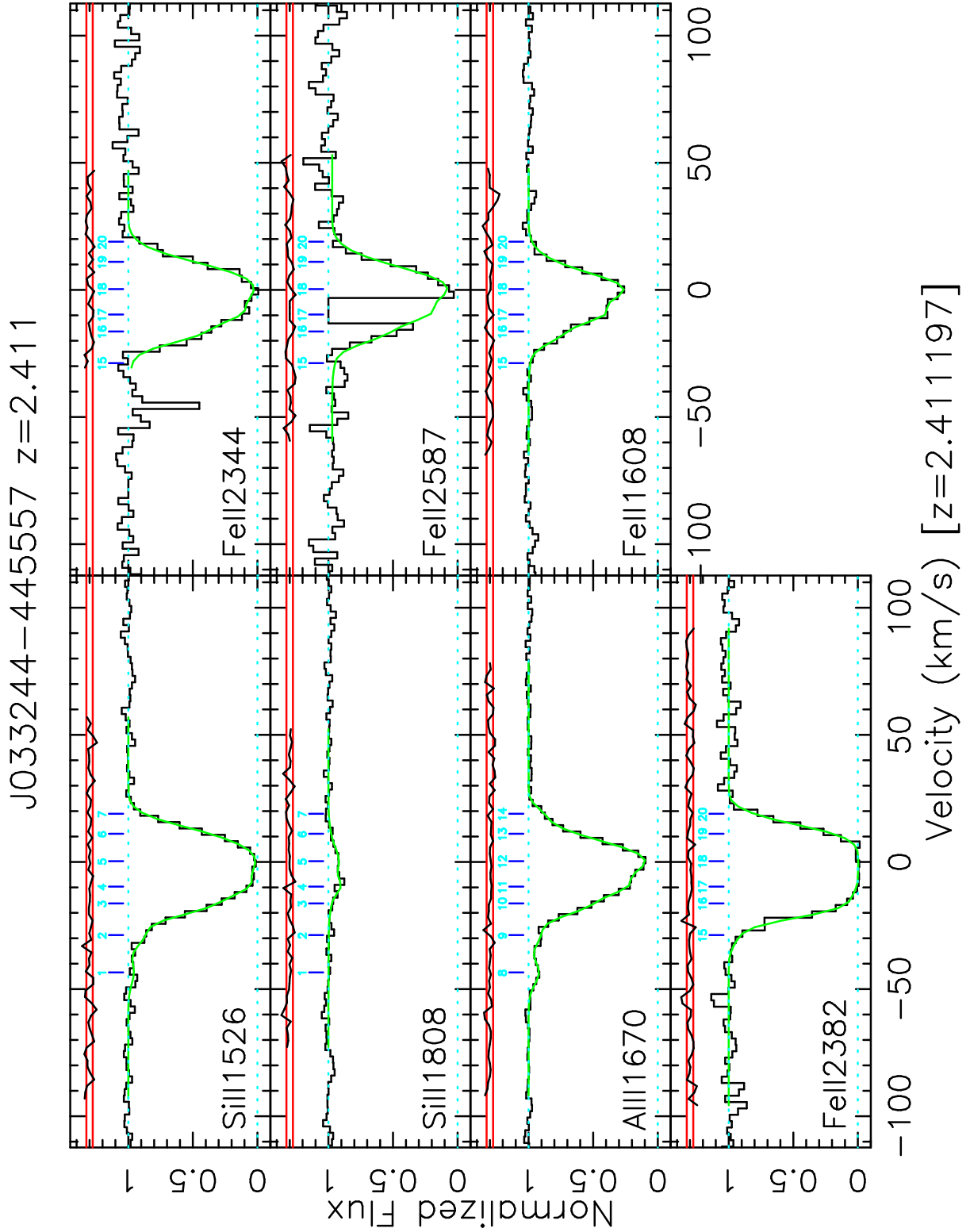
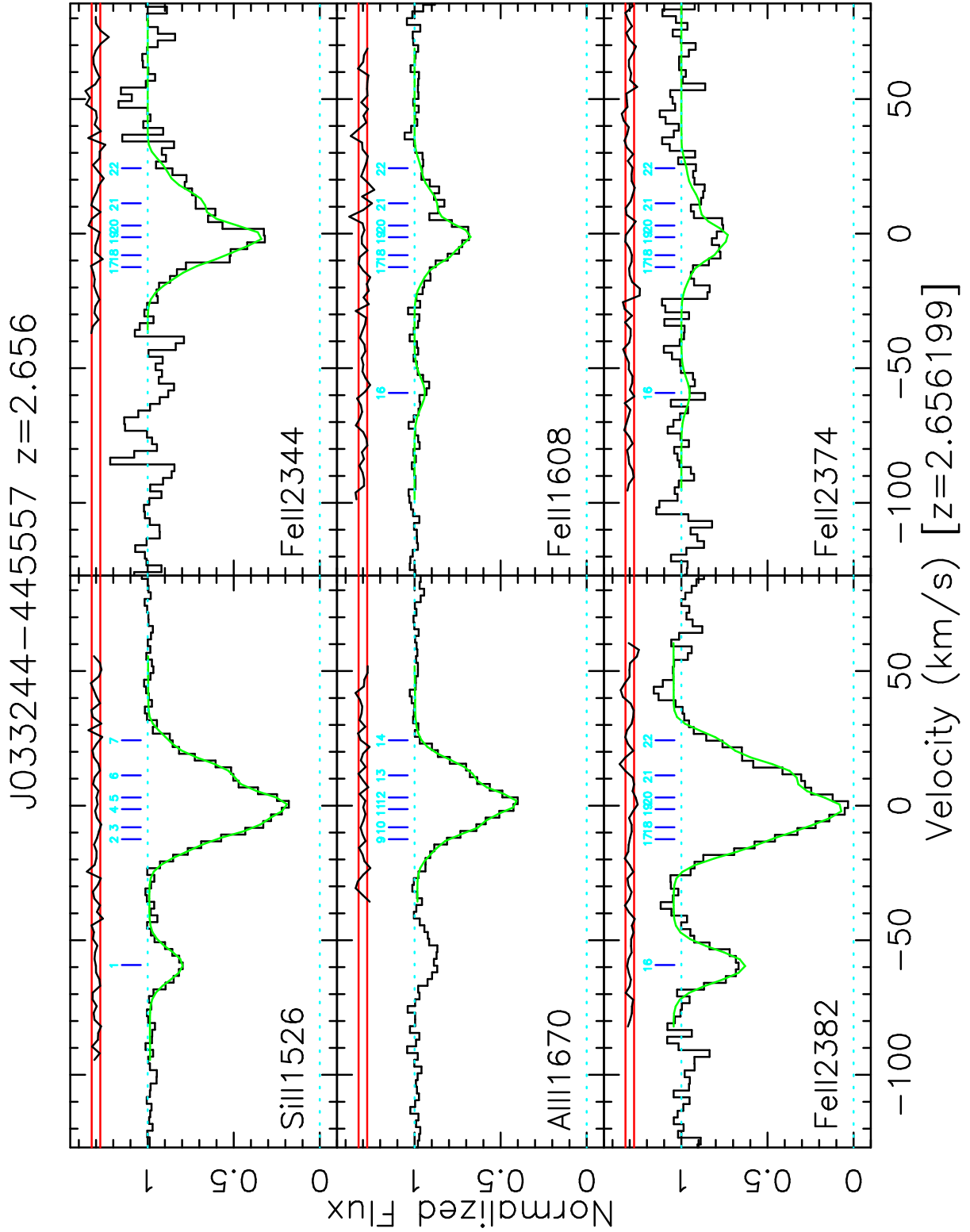


Figure 40. Many-multiplet fit for the  $z = 2.411$  absorber toward J033244-445557.



**Figure 41.** Many-multiplet fit for the  $z = 2.656$  absorber toward J033244-445557.

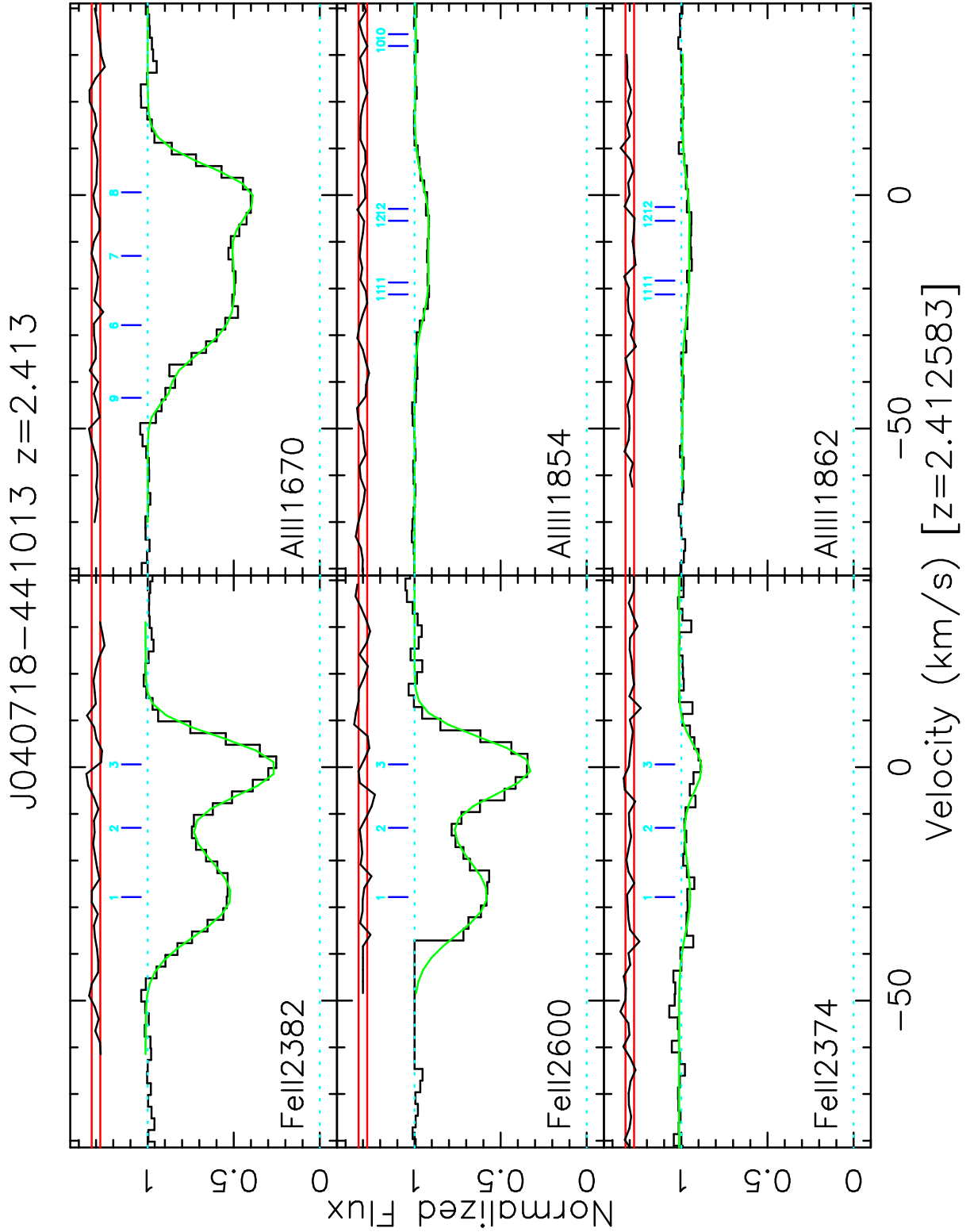


Figure 42. Many-multiplet fit for the  $z = 2.413$  absorber toward J040718-441013.

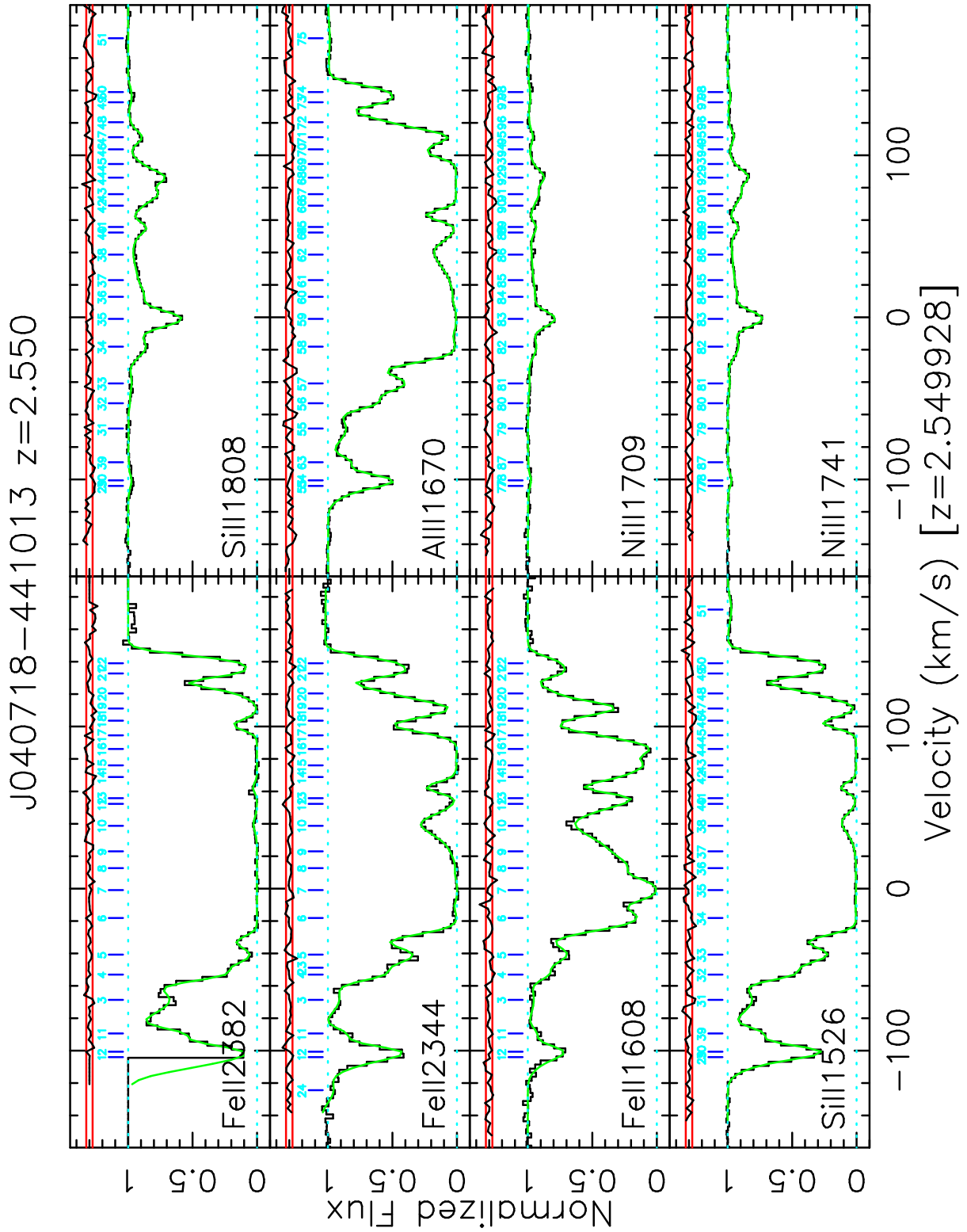


Figure 43. Many-multiplet fit for the  $z = 2.550$  absorber toward J040718–441013.

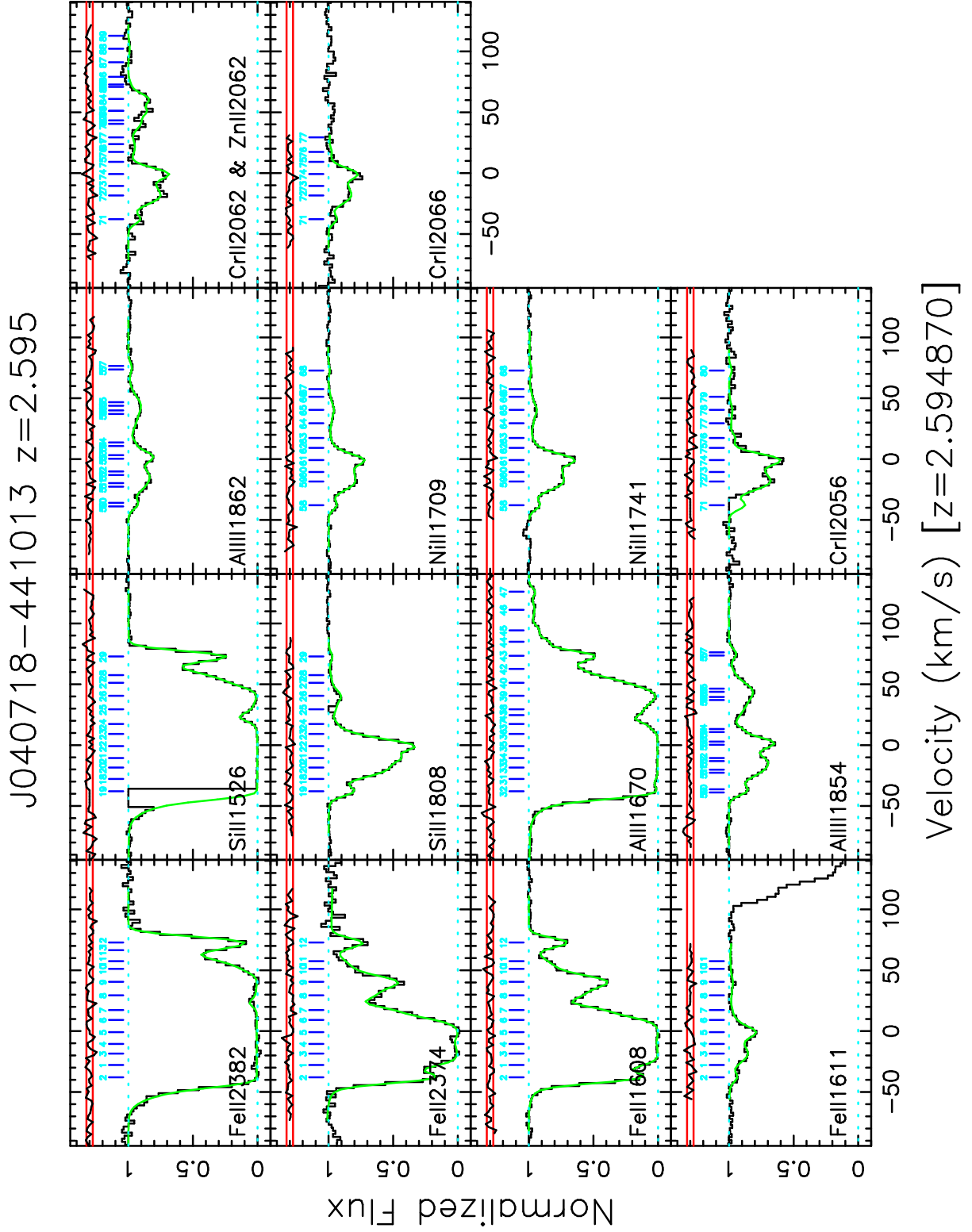
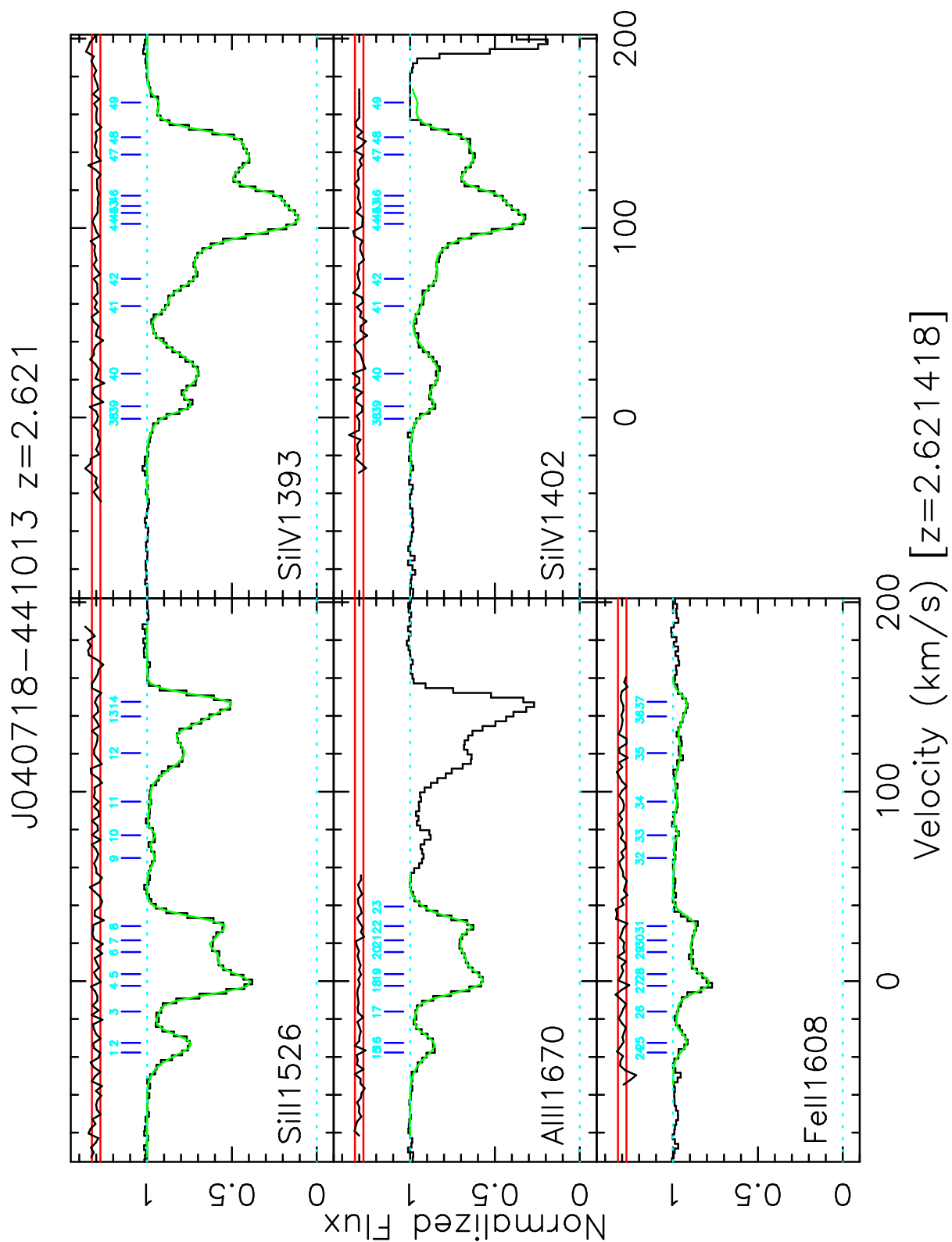


Figure 44. Many-multiplet fit for the  $z = 2.595$  absorber toward J040718-441013.



**Figure 45.** Many-multiplet fit for the  $z = 2.621$  absorber toward J040718–441013.

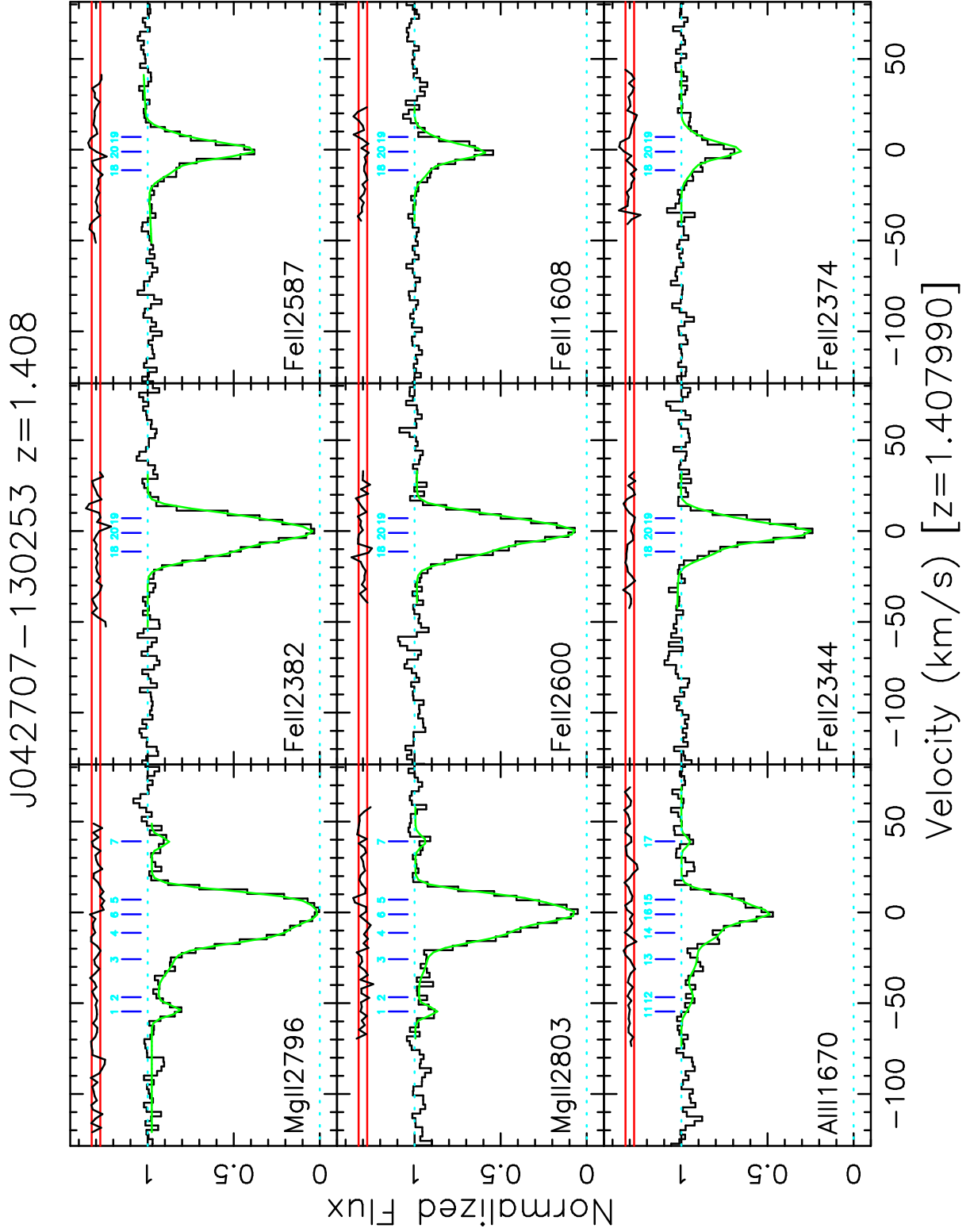
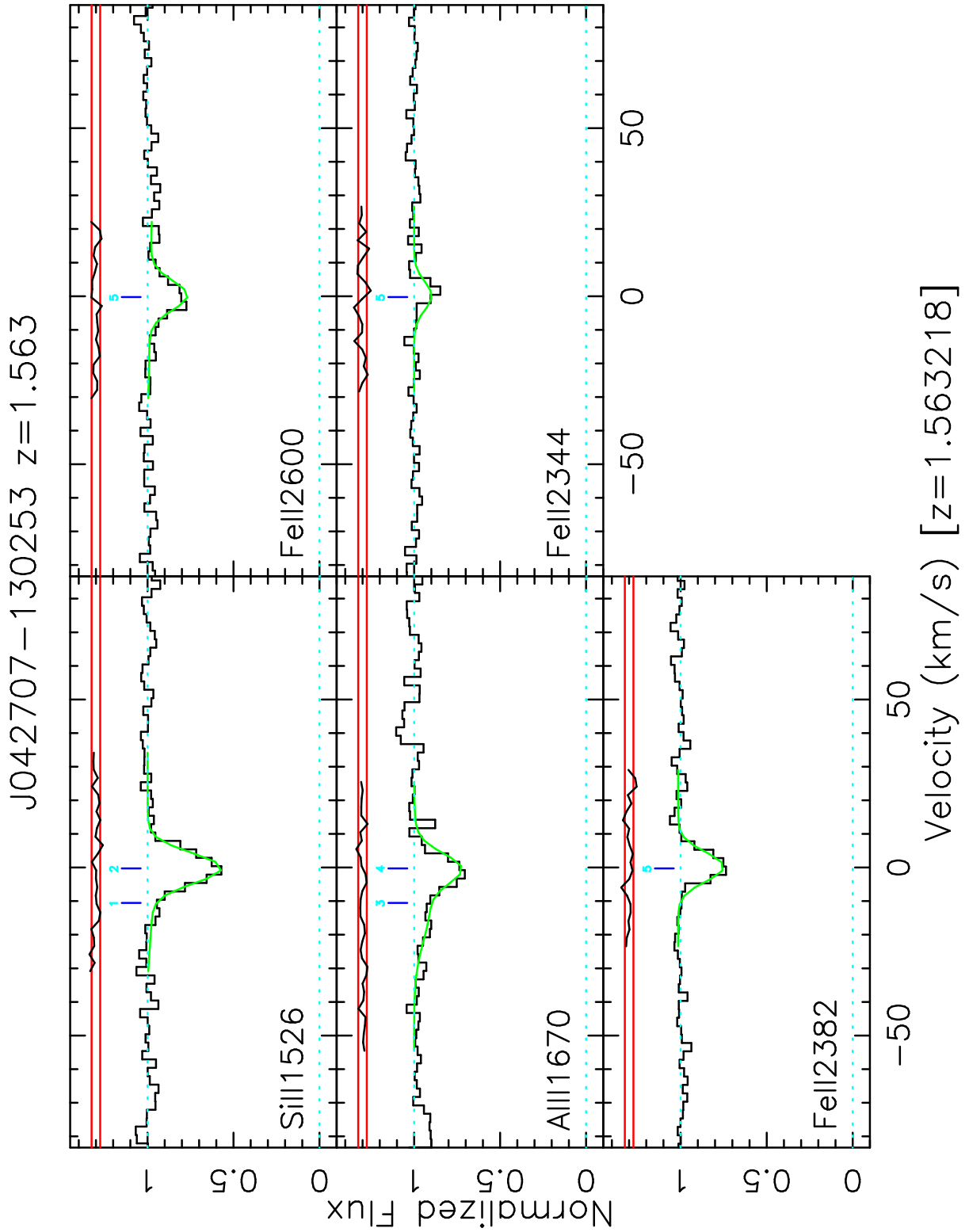


Figure 46. Many-multiplet fit for the  $z = 1.408$  absorber toward J042707-130253.



**Figure 47.** Many-multiplet fit for the  $z = 1.563$  absorber toward J042707–130253.



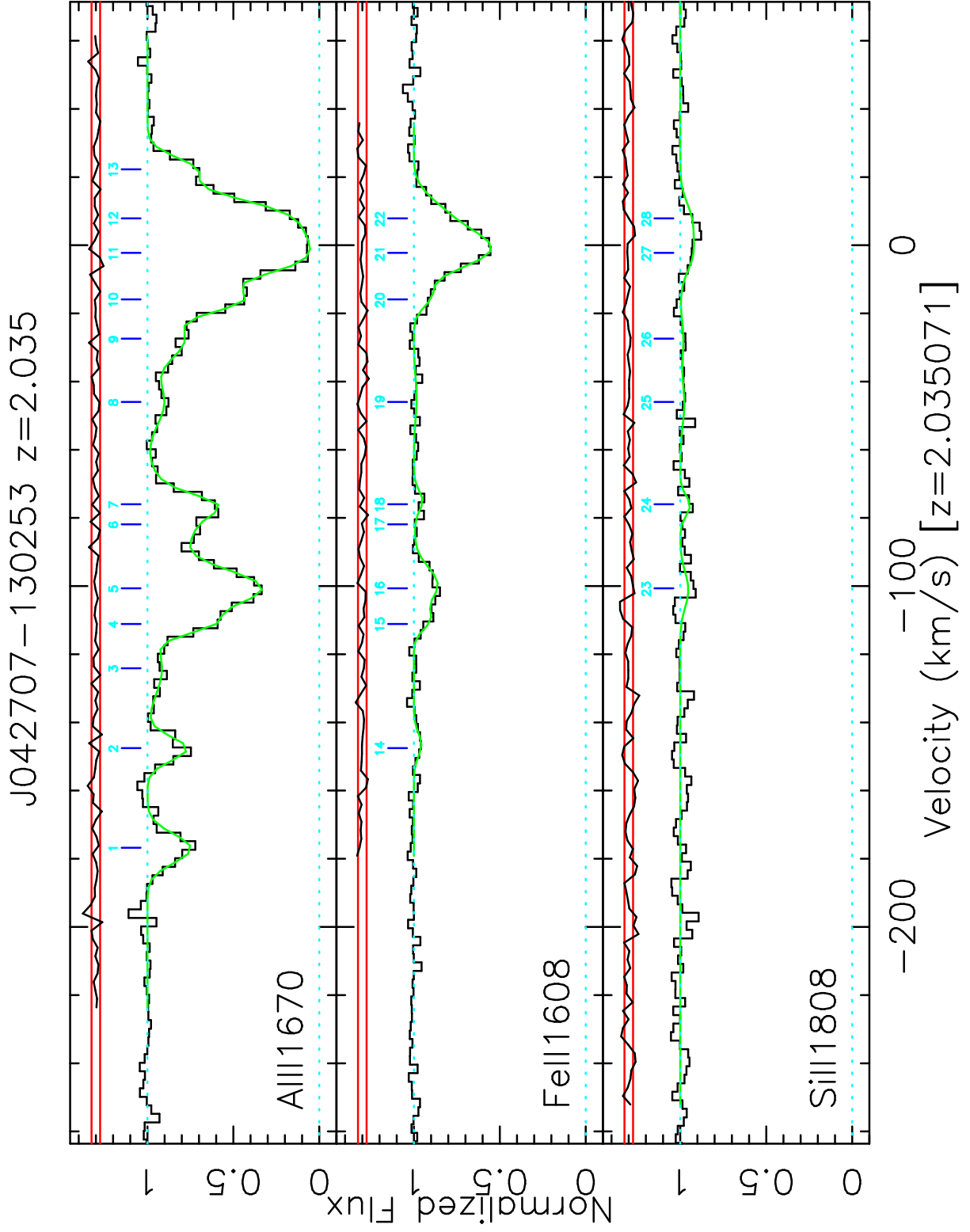
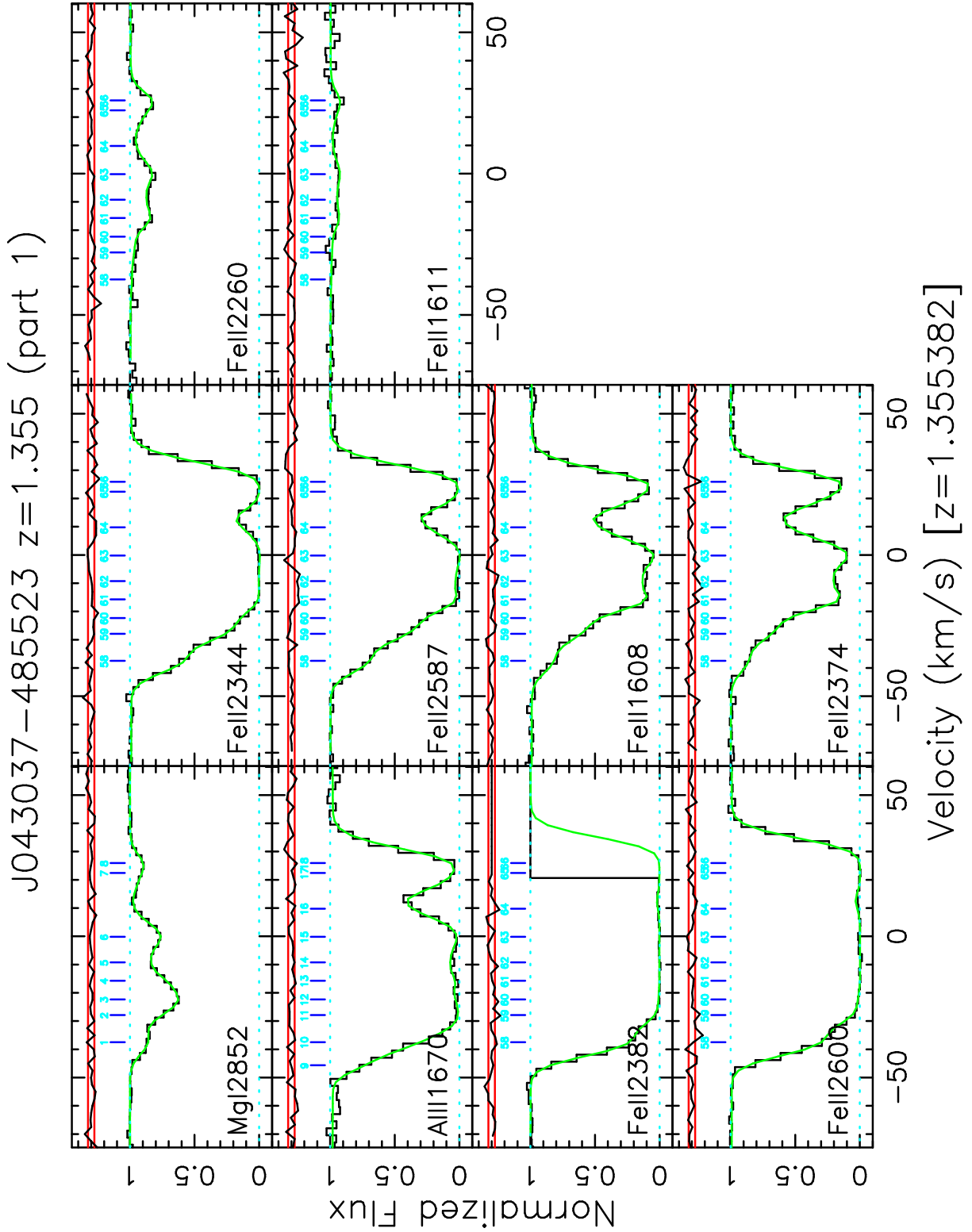


Figure 48. Many-multiplet fit for the  $z = 2.035$  absorber toward J042707-130253.



**Figure 49.** Many-multiplet fit for the  $z = 1.355$  absorber toward J043037–485523 (part 1).

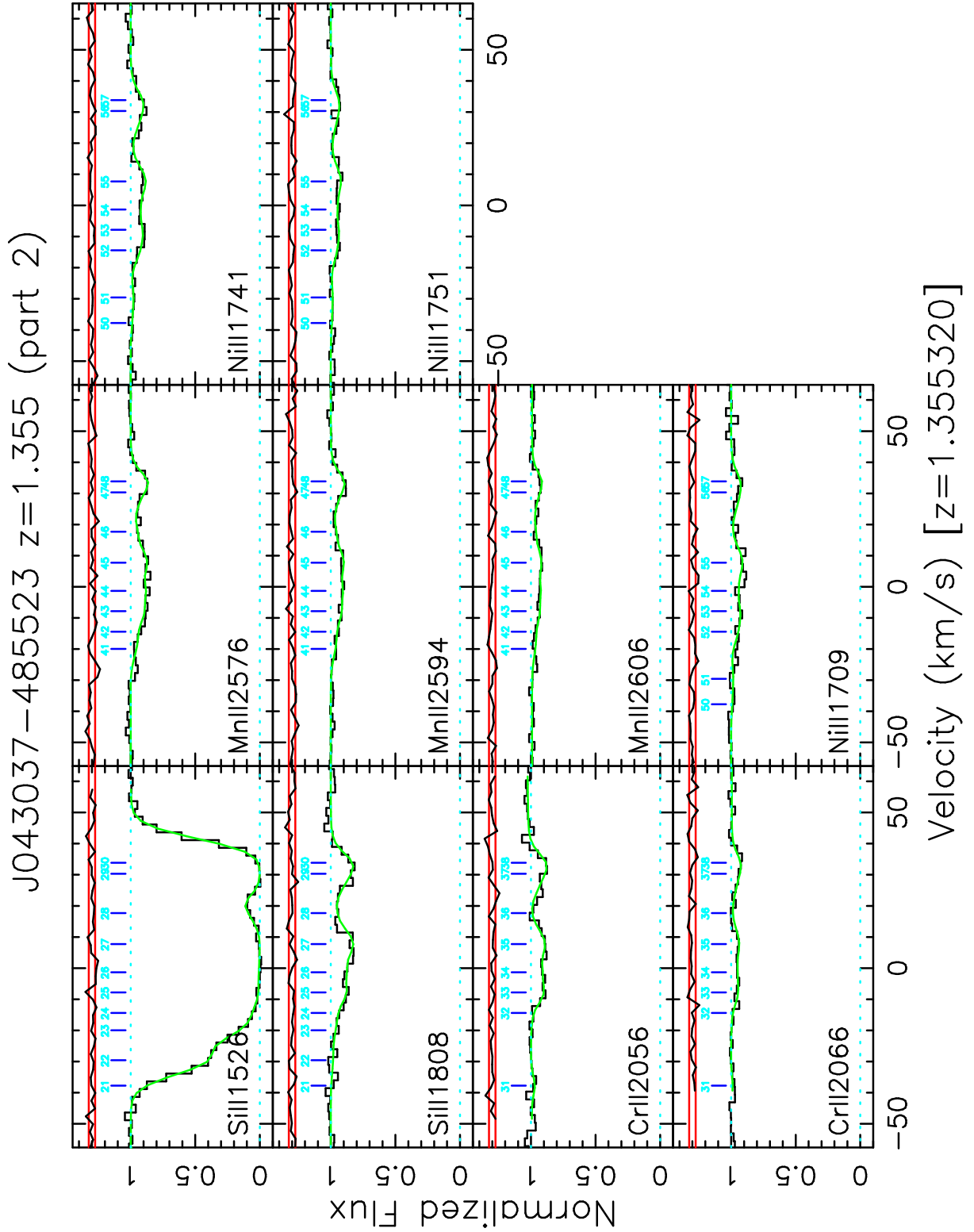
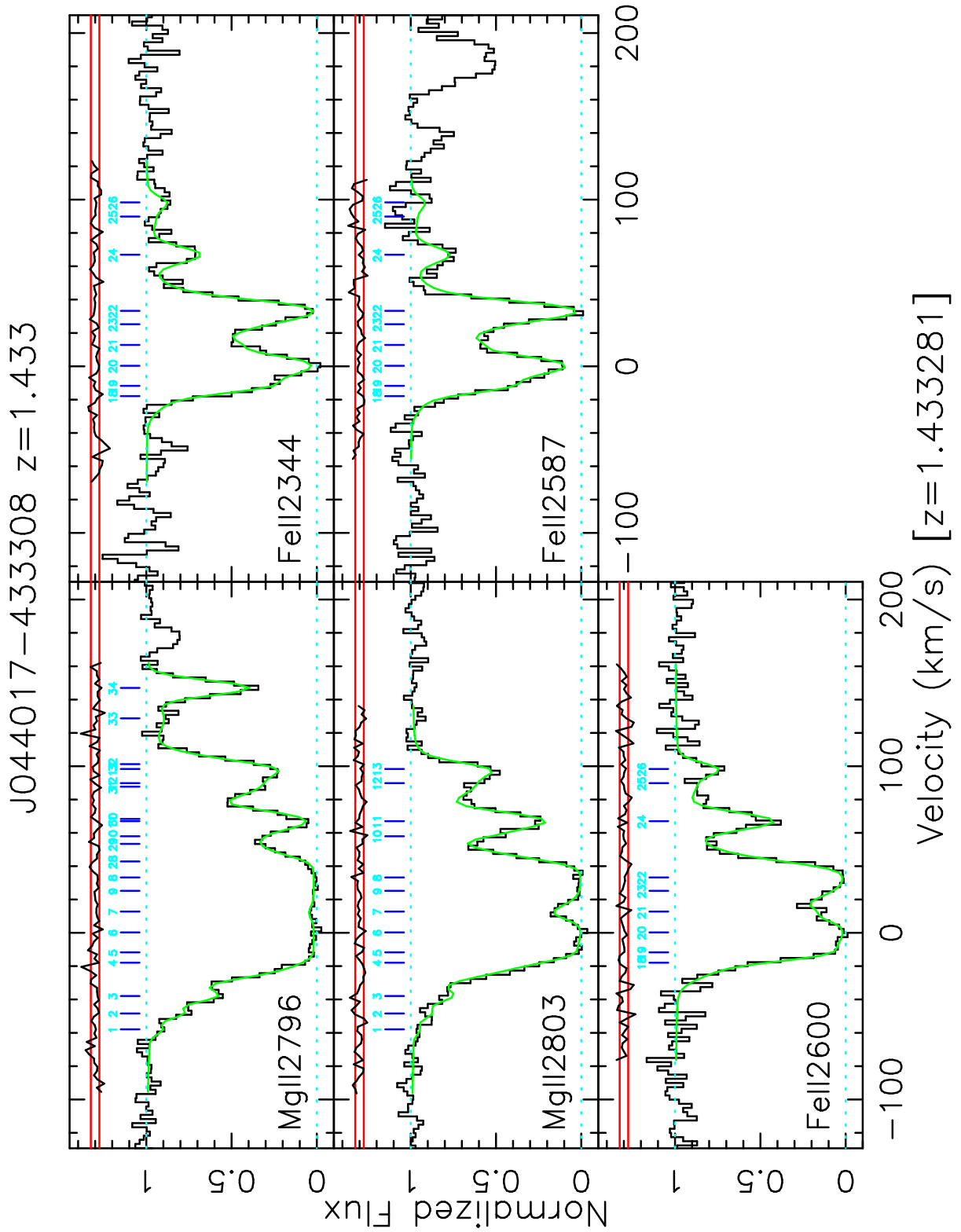


Figure 50. Many-multiplet fit for the  $z = 1.355$  absorber toward J043037–485523 (part 2).



**Figure 51.** Many-multiplet fit for the  $z = 1.433$  absorber toward J044017-433308.

J044017-433308  $z=2.048$

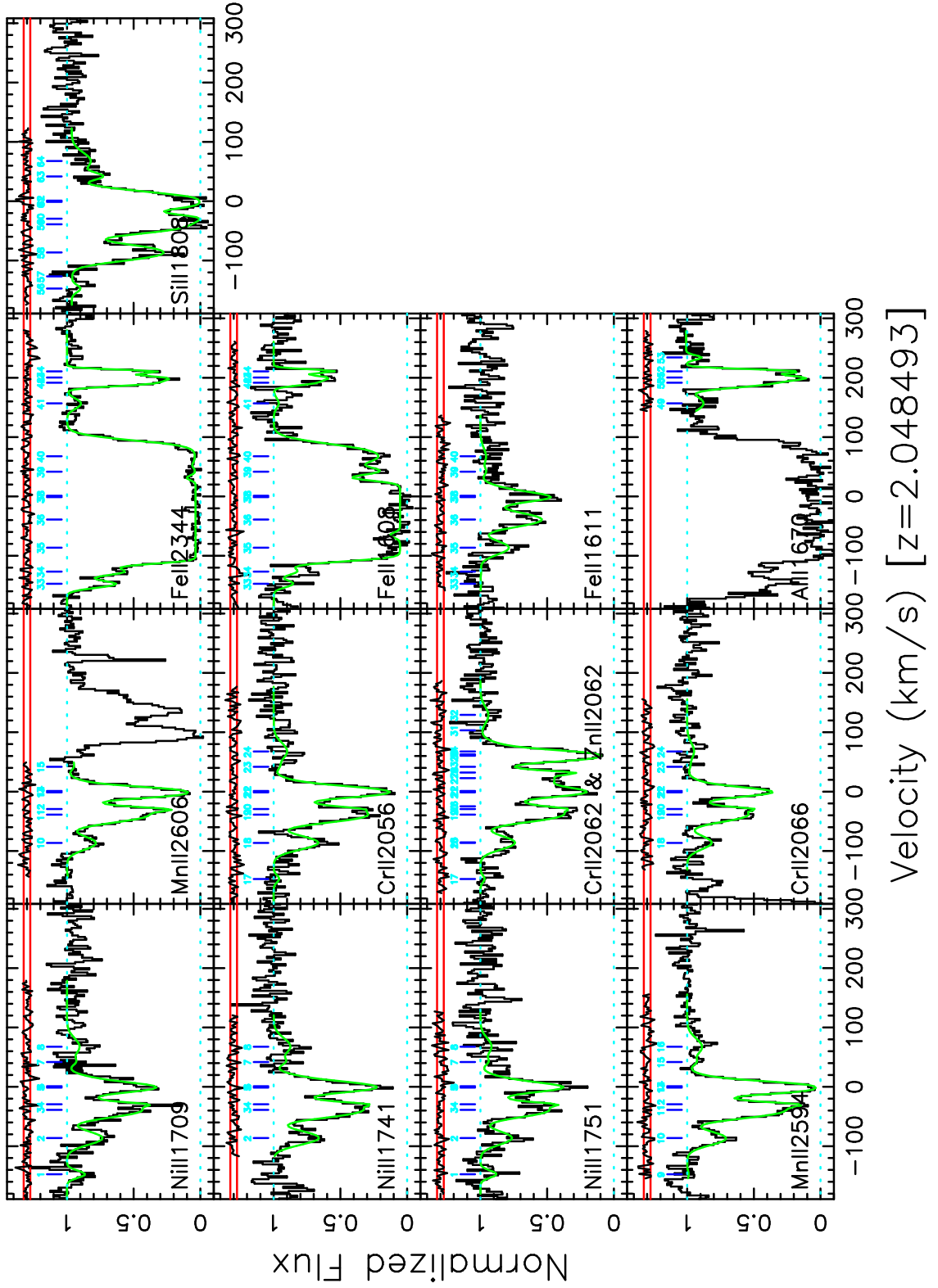
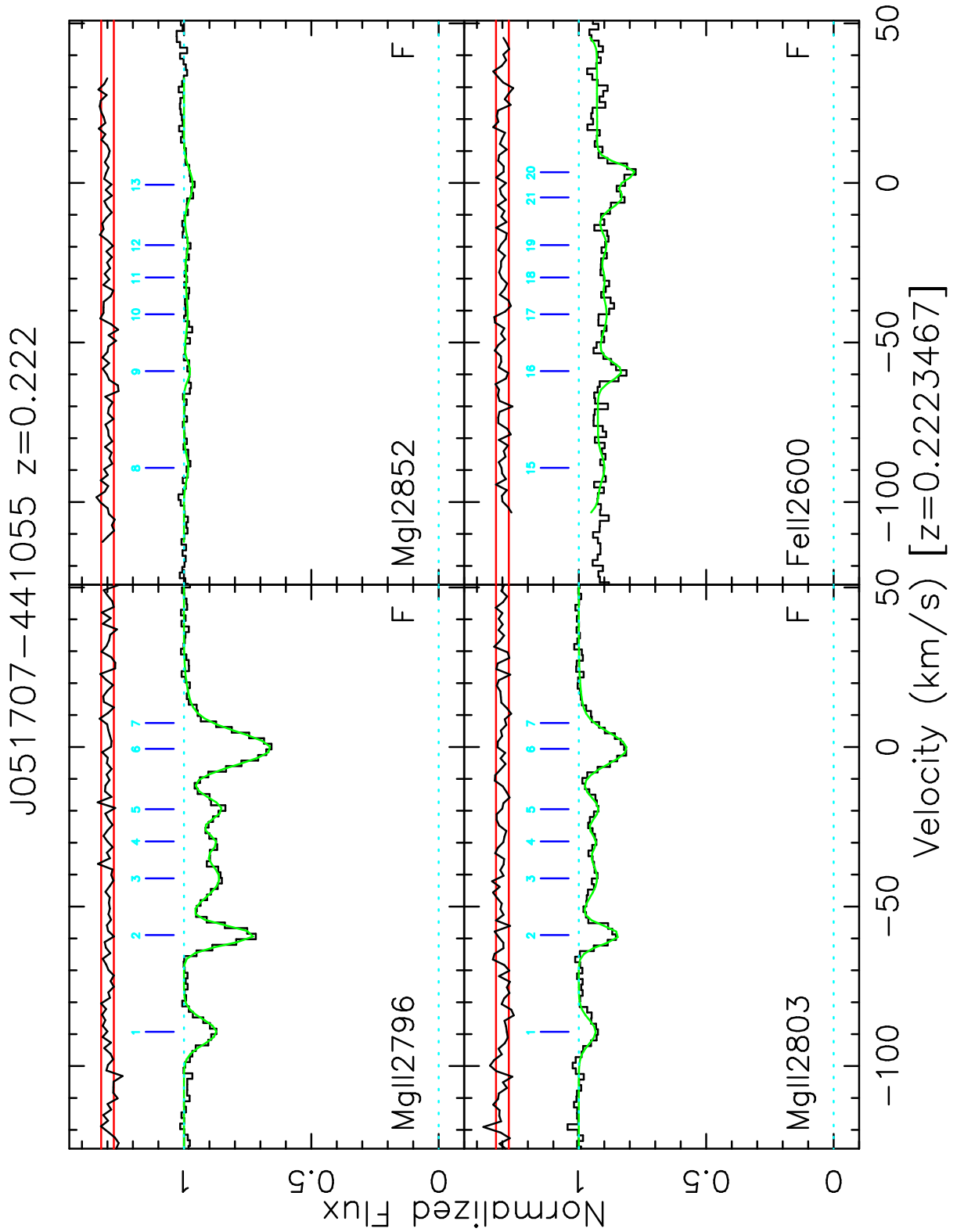
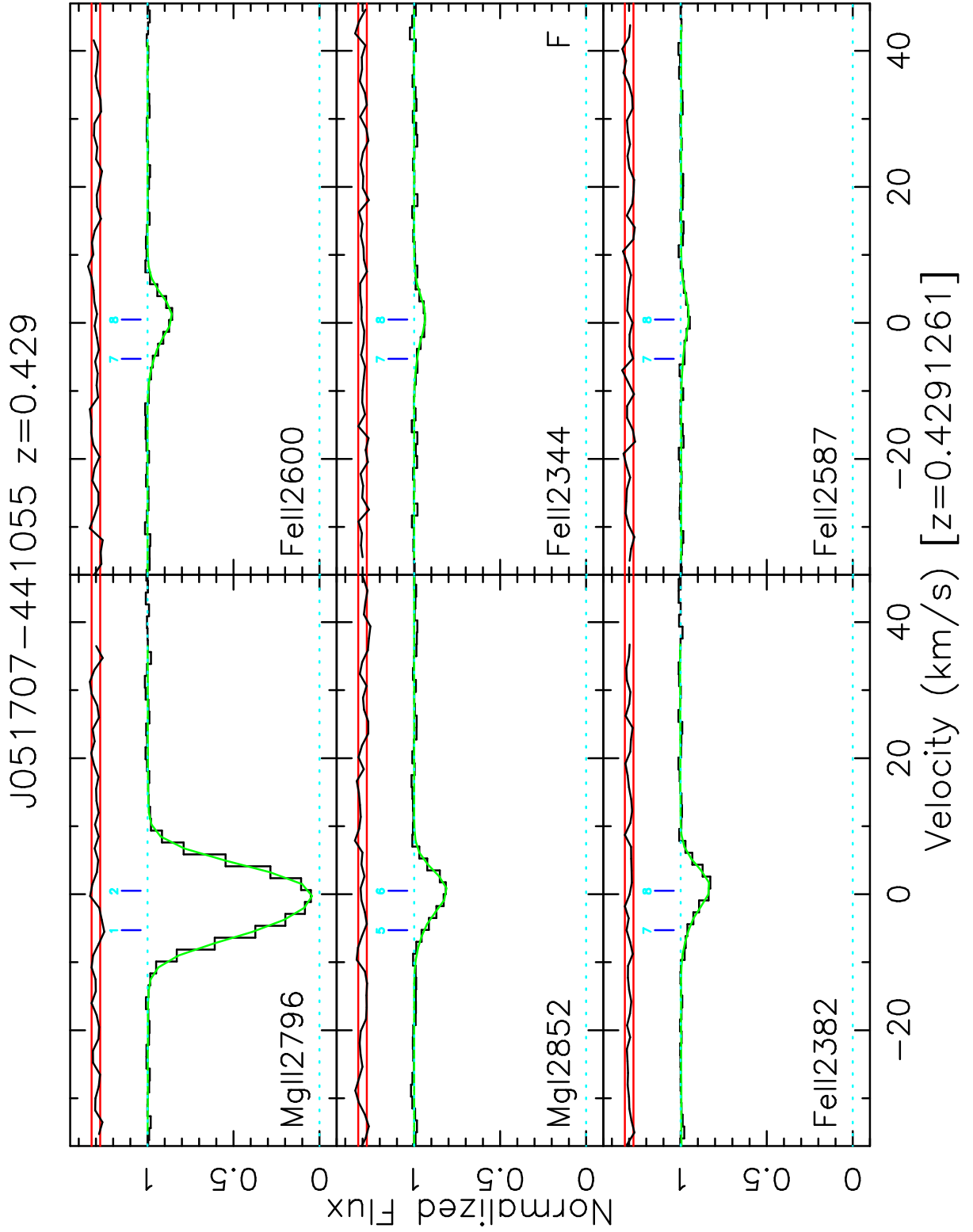


Figure 52. Many-multiplet fit for the  $z = 2.048$  absorber toward J044017-433308.



**Figure 53.** Many-multiplet fit for the  $z = 0.222$  absorber toward J051707-441055.



**Figure 54.** Many-multiplet fit for the  $z = 0.429$  absorber toward J051707–441055.

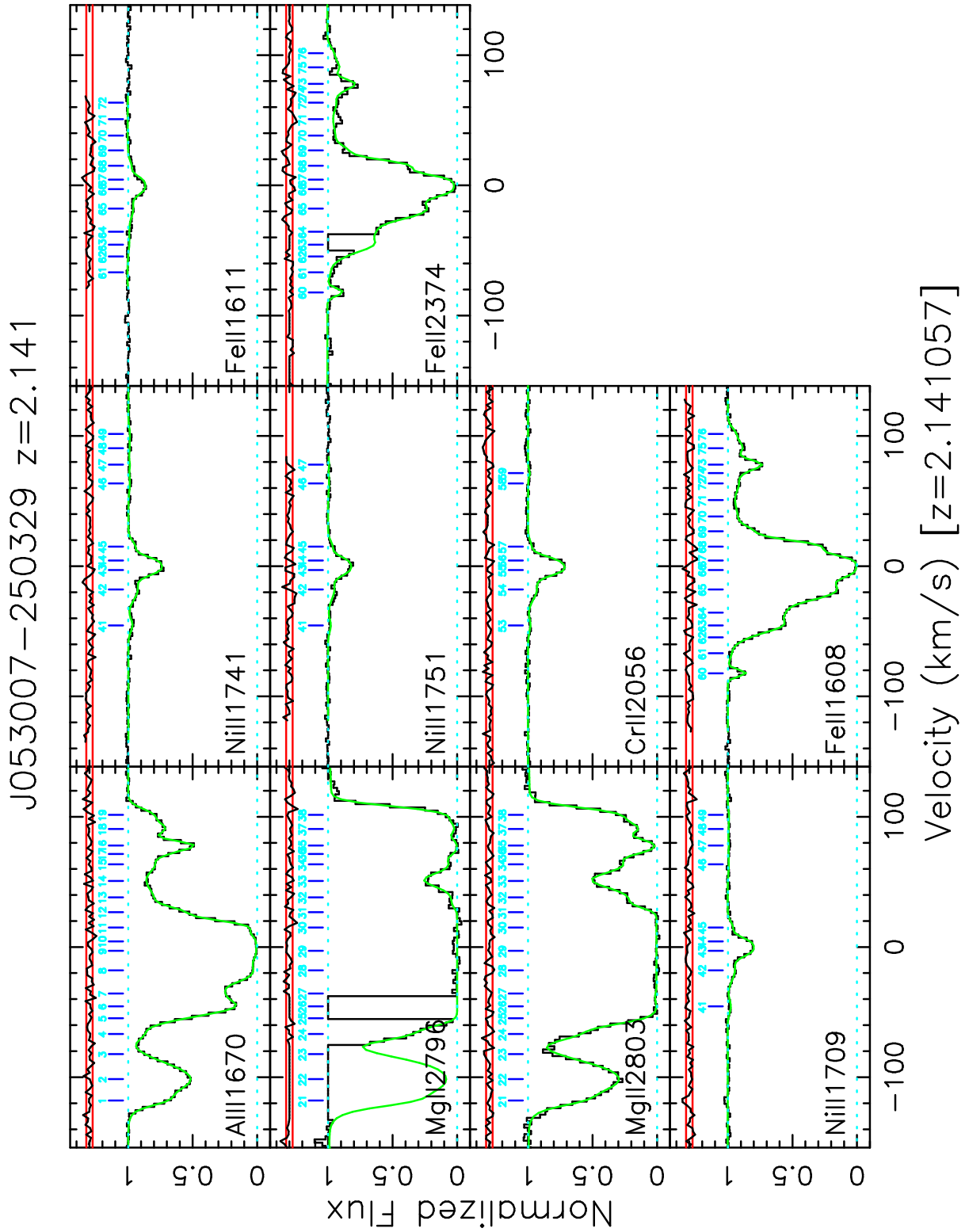


Figure 55. Many-multiplet fit for the  $z = 2.141$  absorber toward J053007–250329.



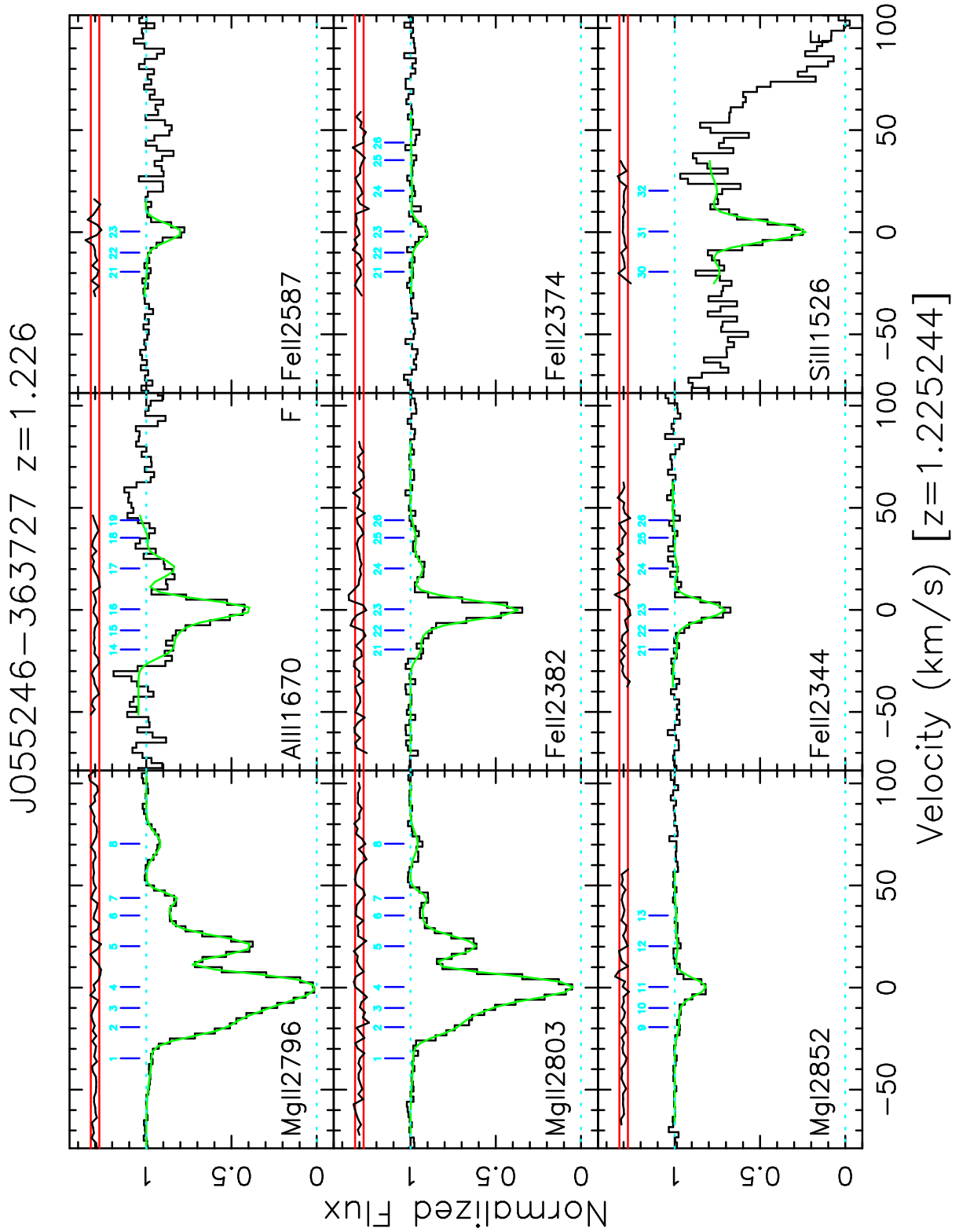
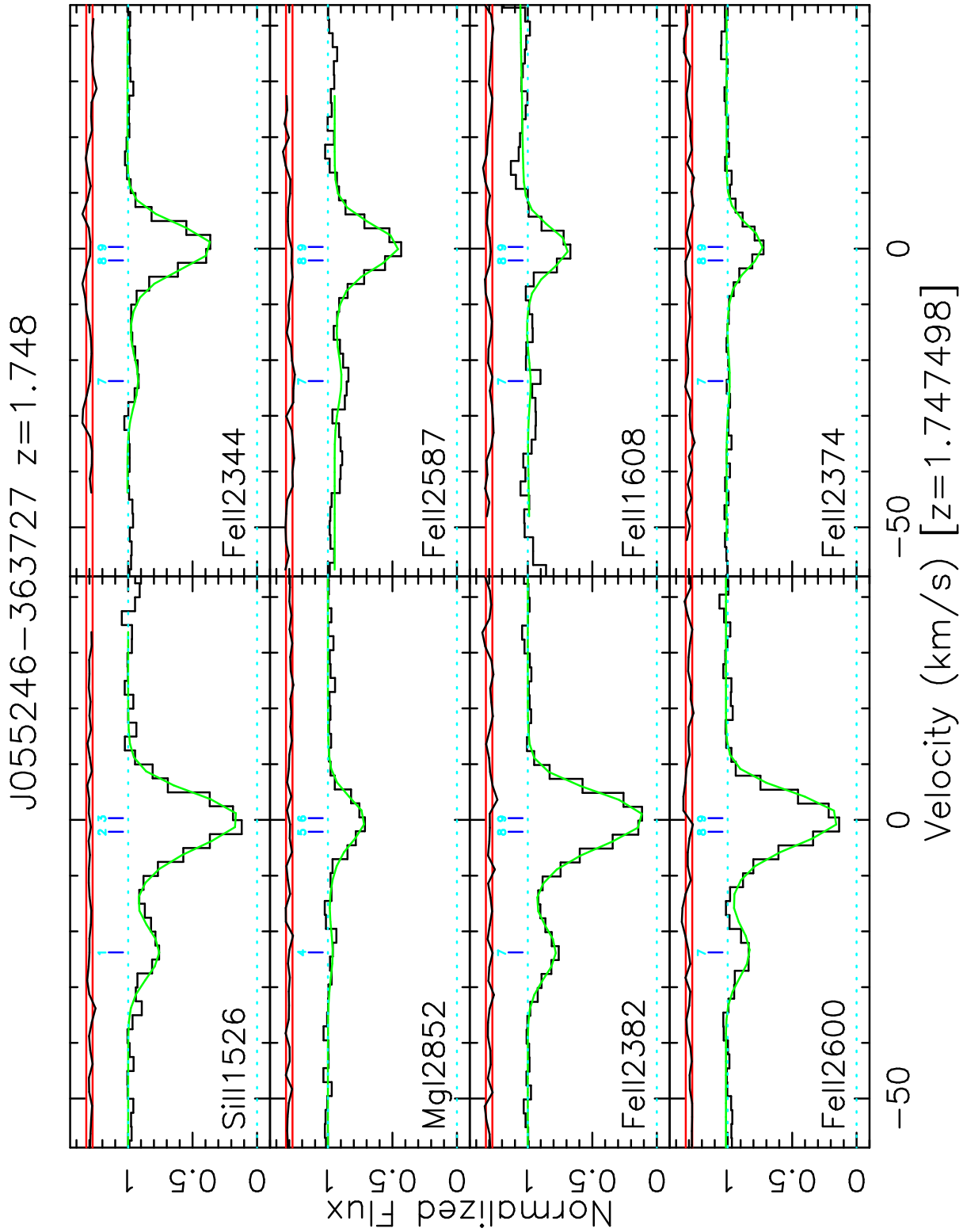


Figure 56. Many-multiplet fit for the  $z = 1.226$  absorber toward J055246–363727.



**Figure 57.** Many-multiplet fit for the  $z = 1.748$  absorber toward J055246–363727.

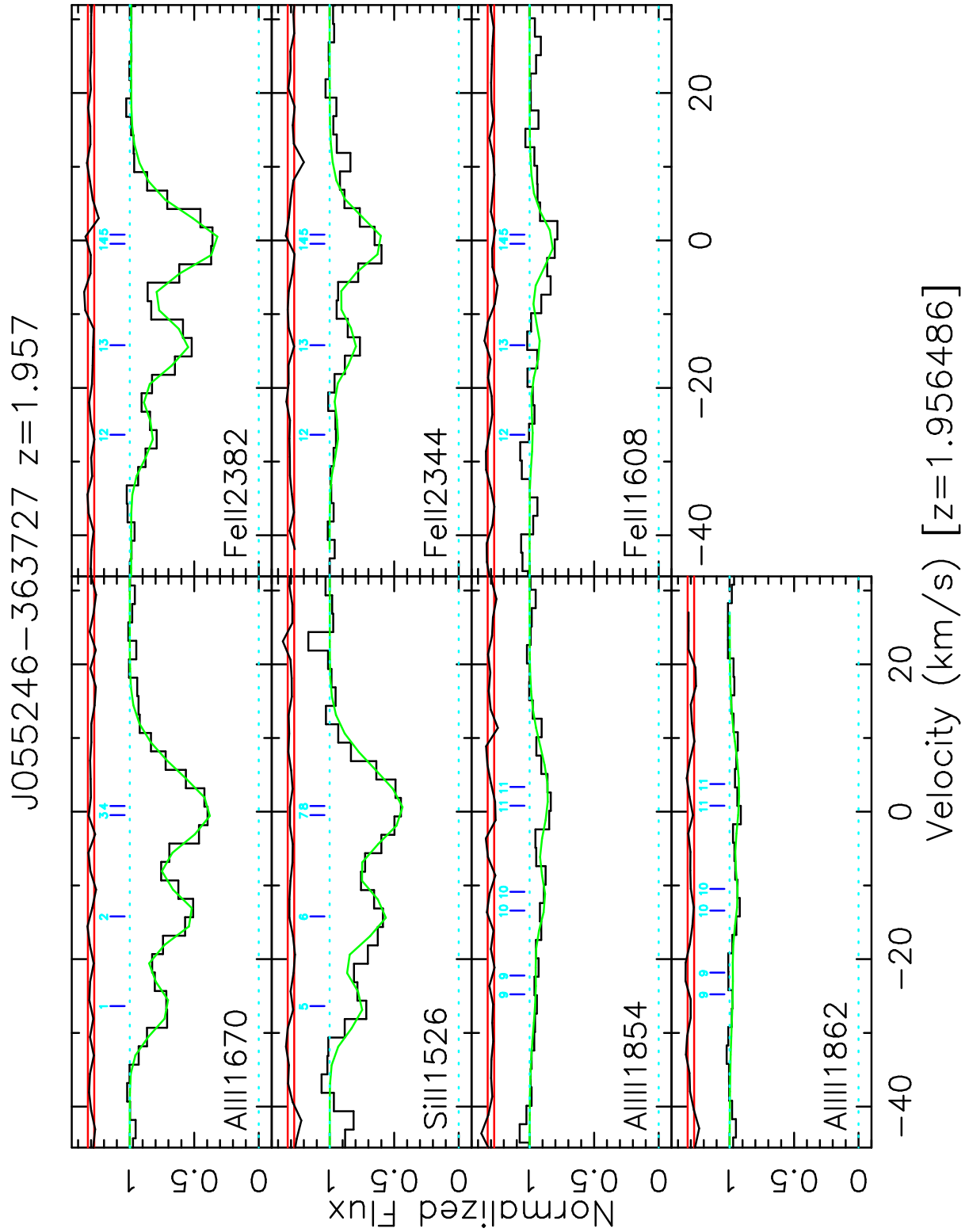


Figure 58. Many-multiplet fit for the  $z = 1.957$  absorber toward J055246–363727.

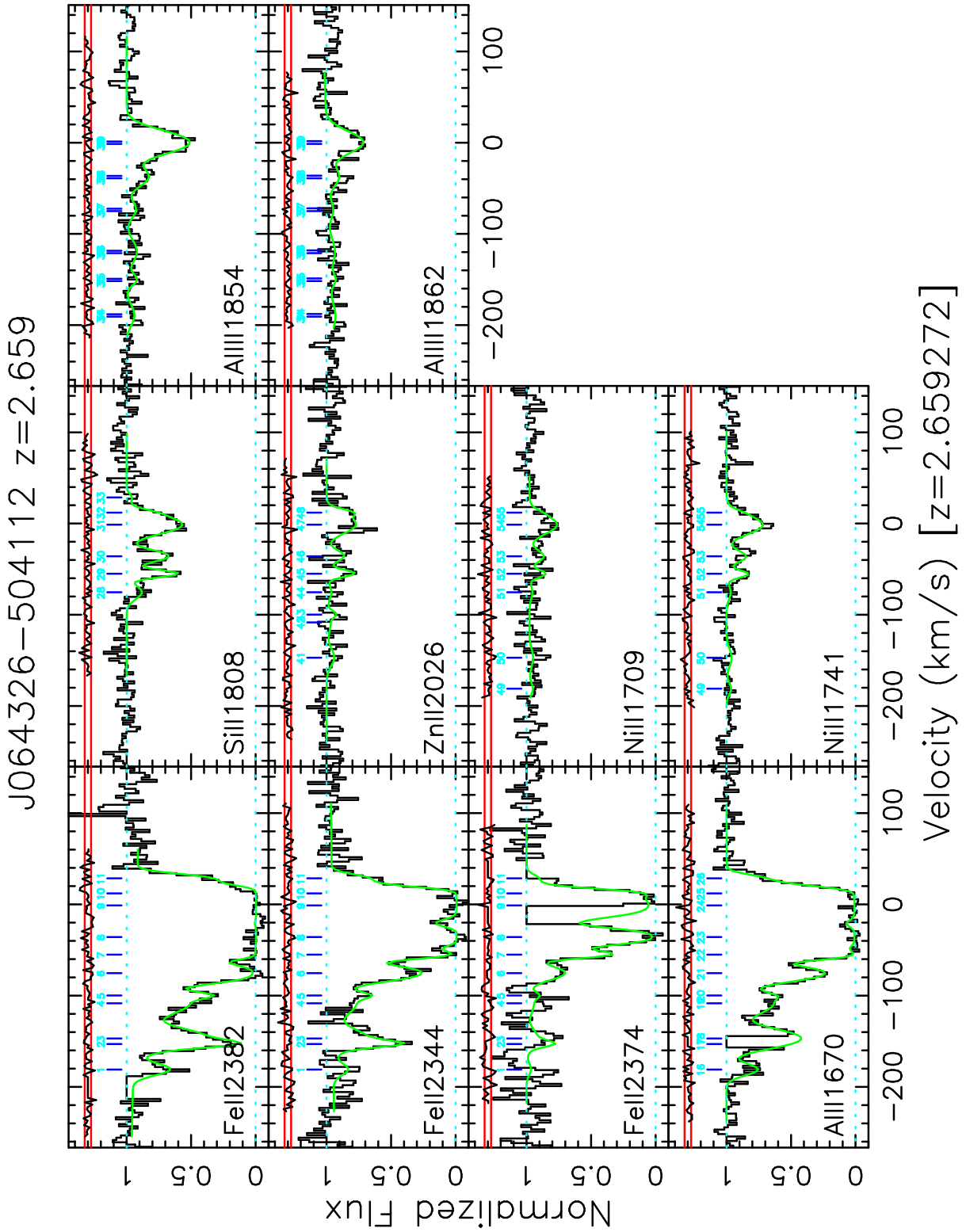


Figure 59. Many-multiplet fit for the  $z = 2.659$  absorber toward J064326–504112.

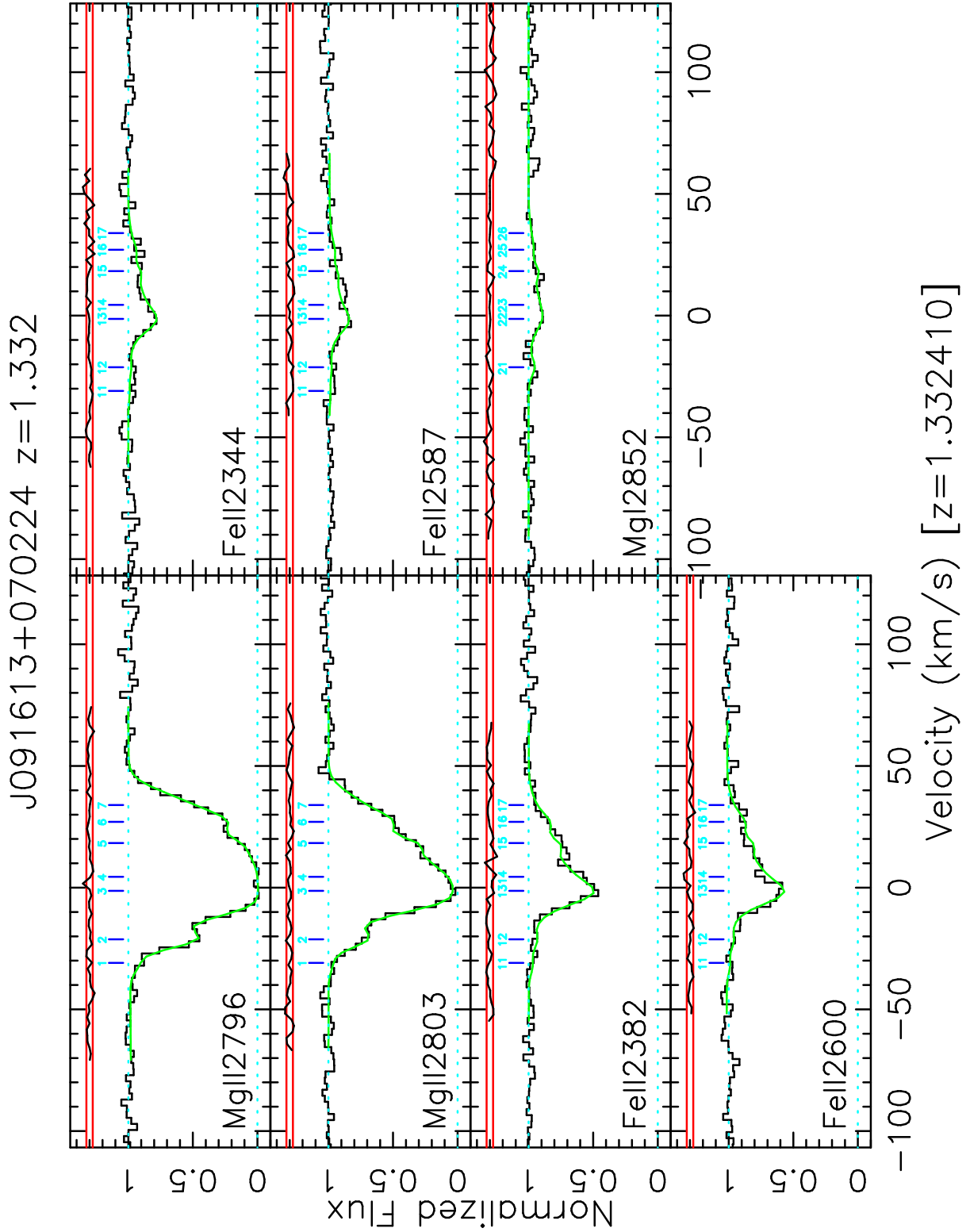
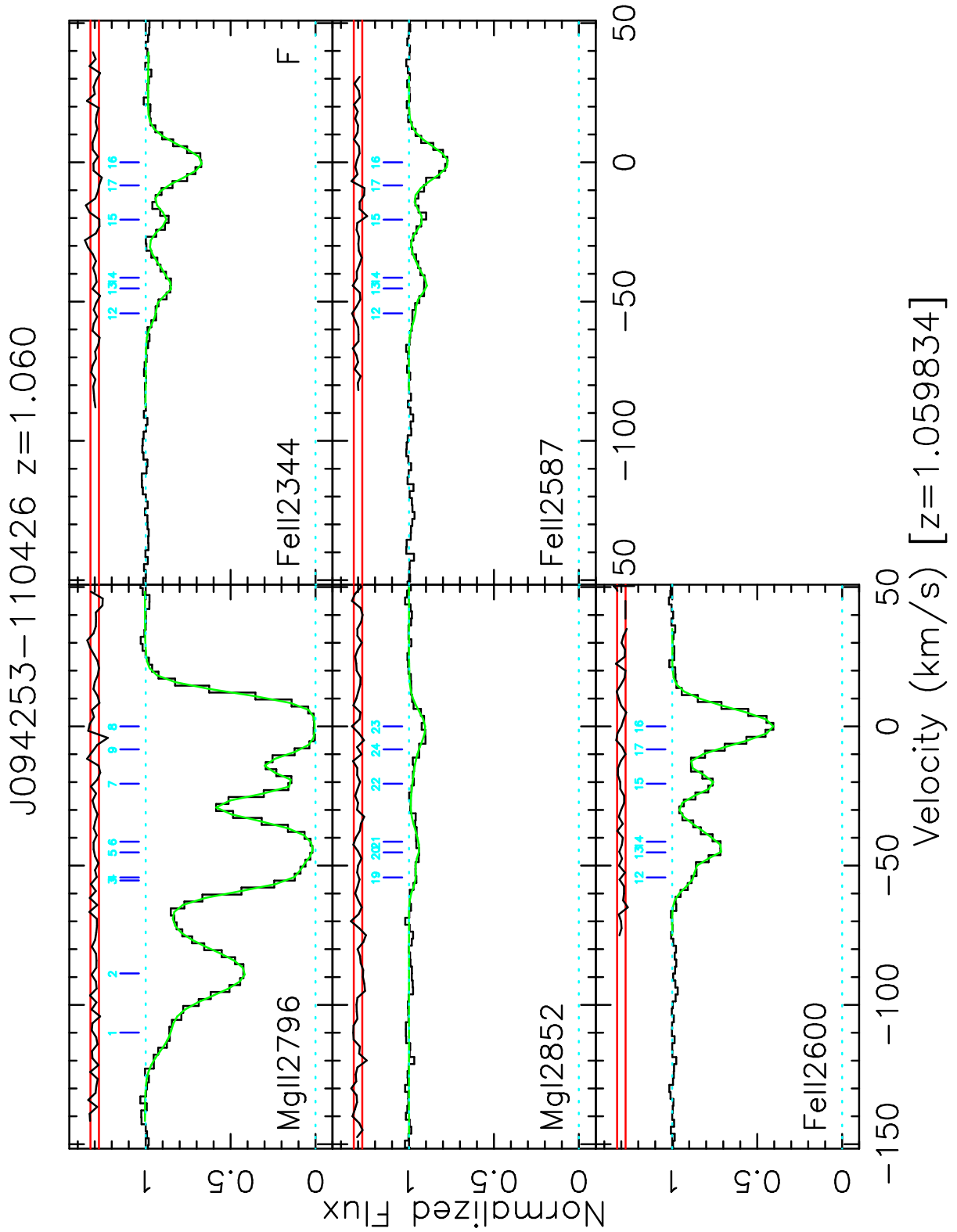


Figure 60. Many-multiplet fit for the  $z = 1.332$  absorber toward J091613+070224.



**Figure 61.** Many-multiplet fit for the  $z = 1.060$  absorber toward J094253-110426.

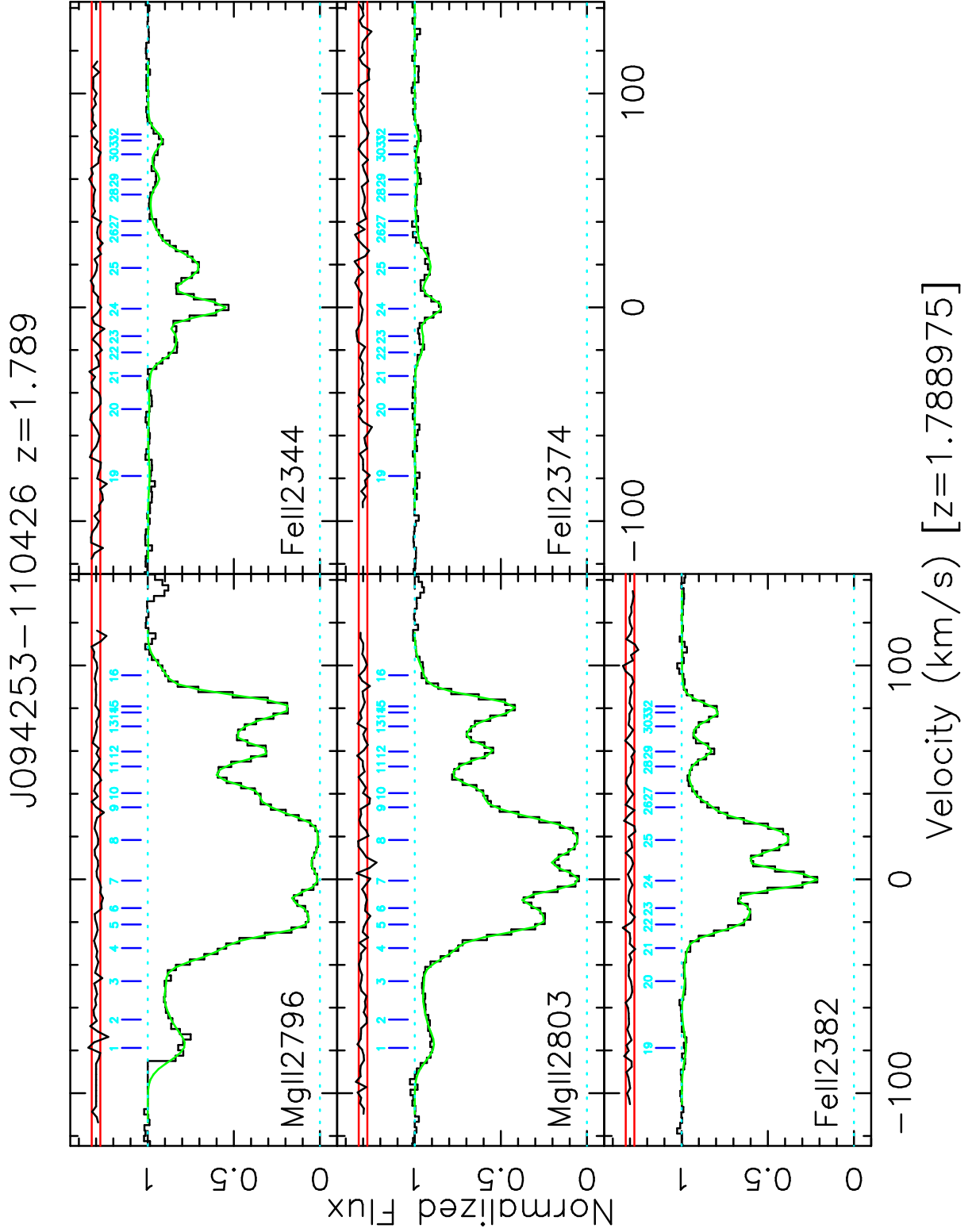
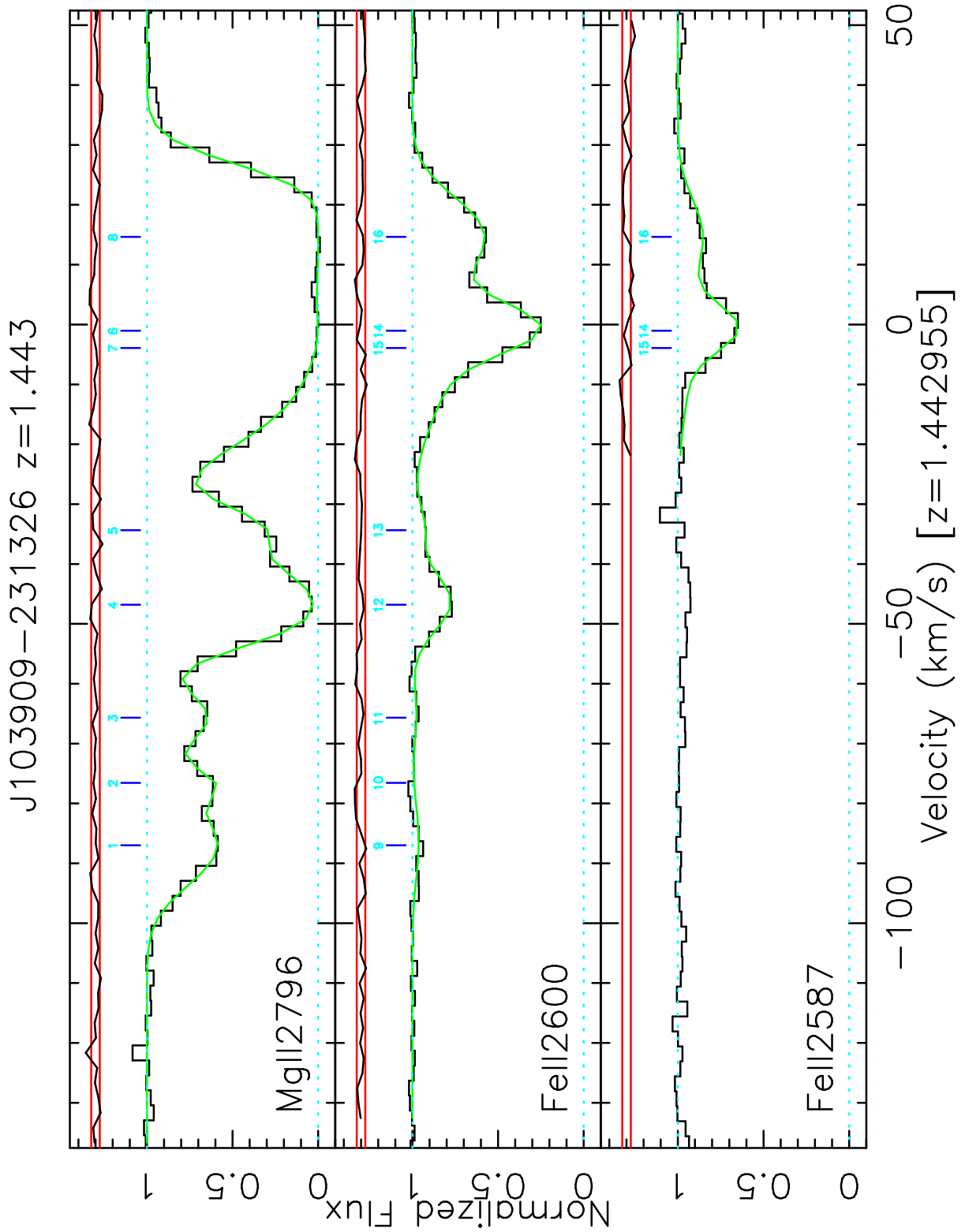


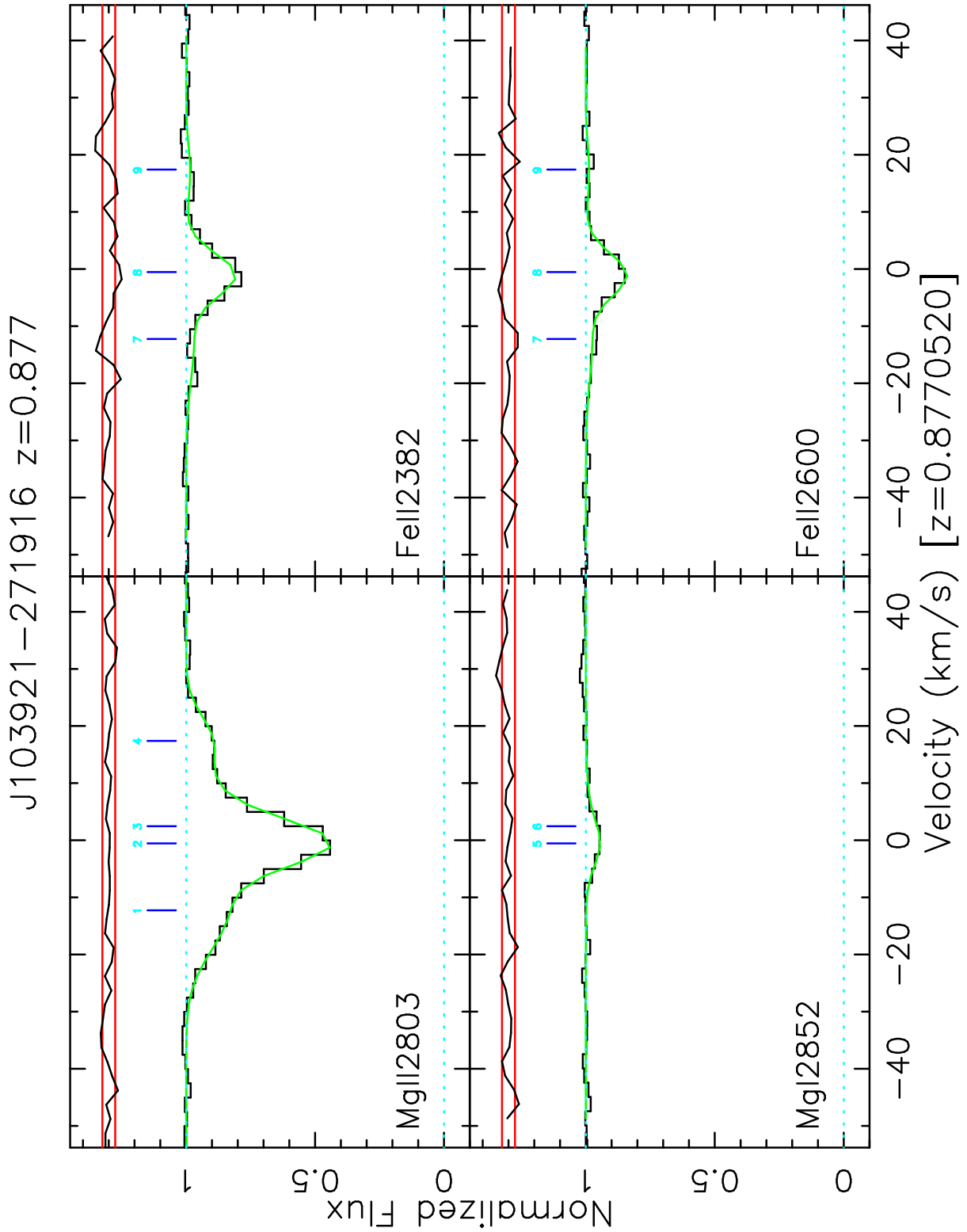
Figure 62. Many-multiplet fit for the  $z = 1.789$  absorber toward J094253-110426.



**Figure 63.** Many-multiplet fit for the  $z = 1.443$  absorber toward J103909–231326.







**Figure 65.** Many-multiplet fit for the  $z = 0.877$  absorber toward J103921–271916.

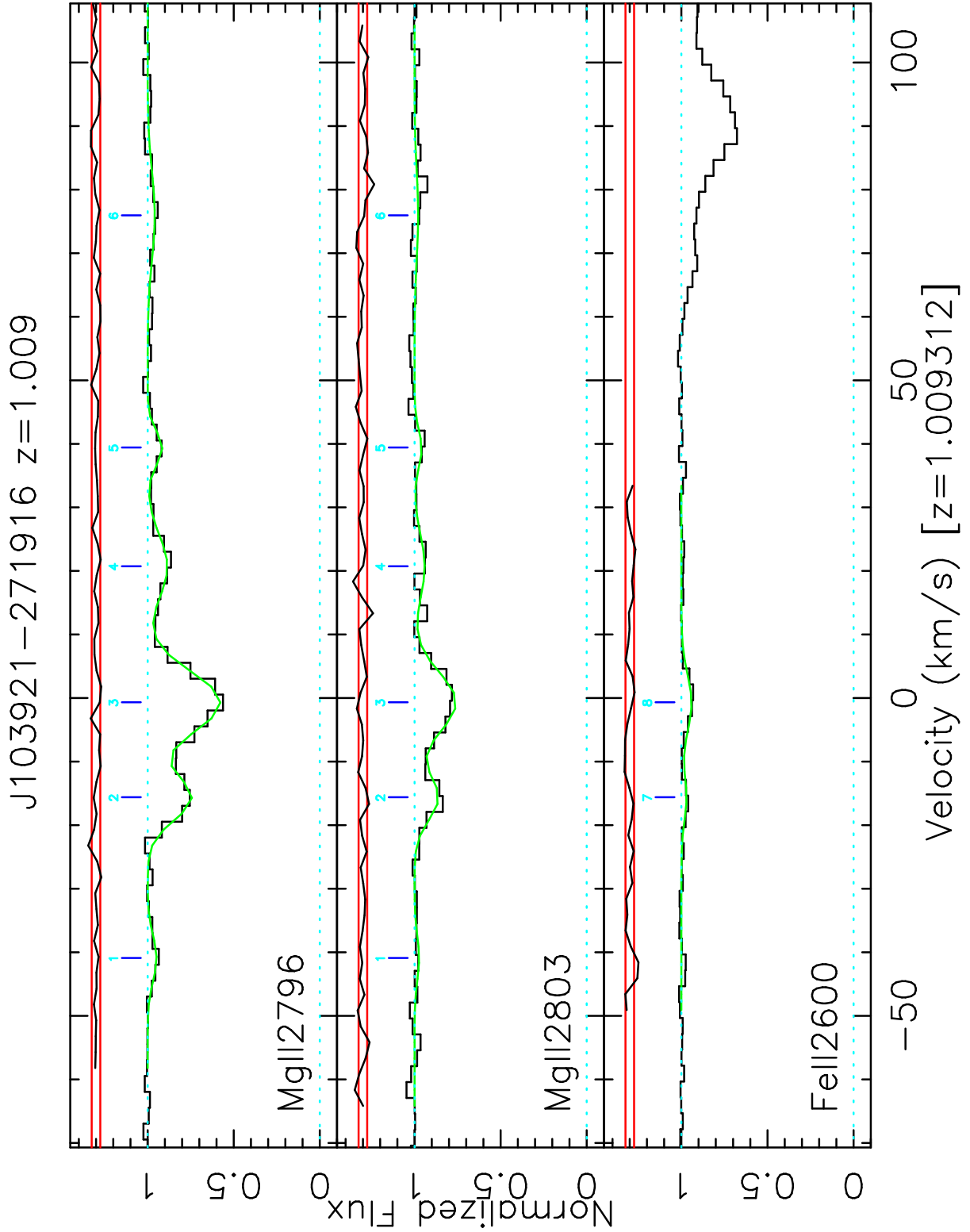
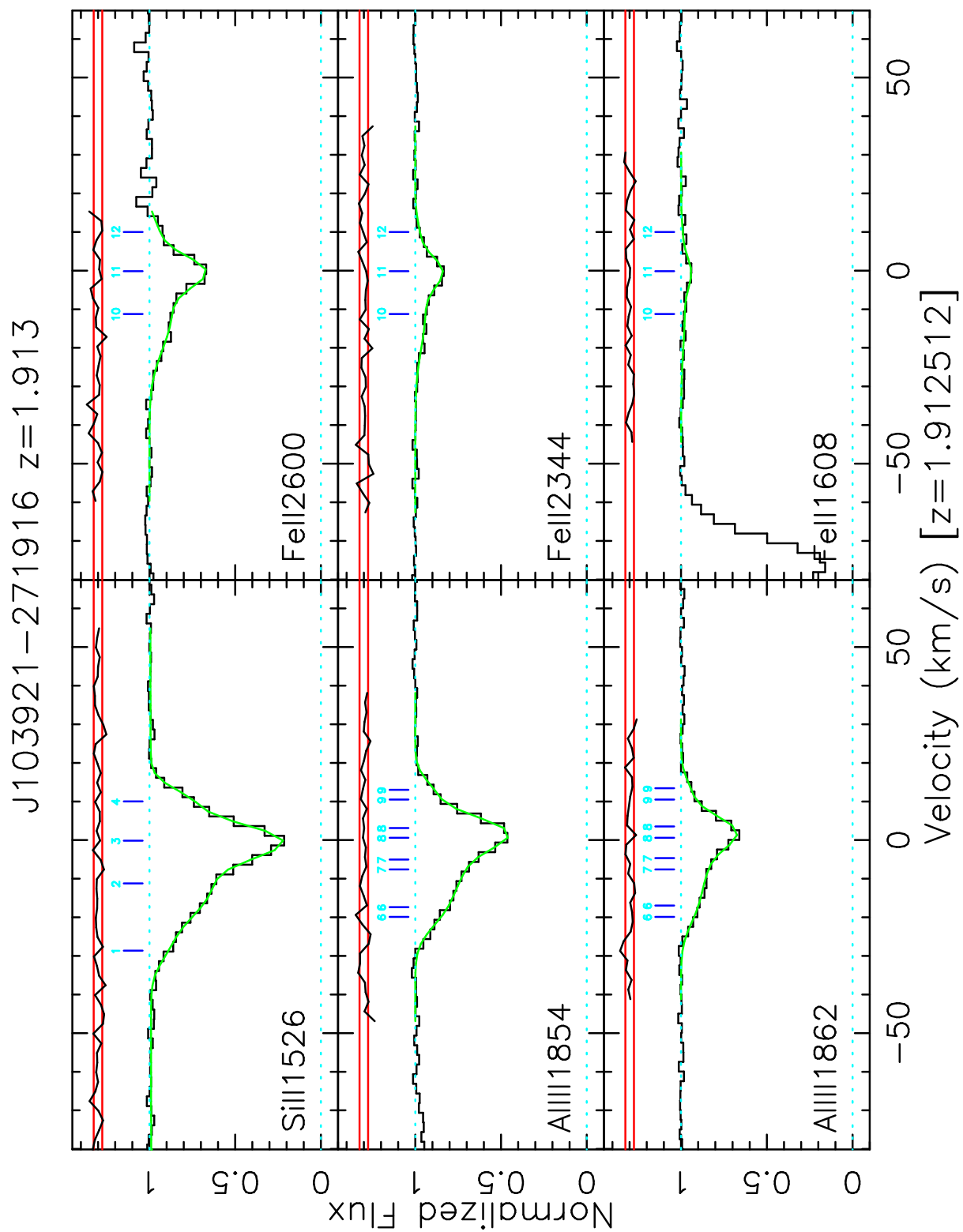
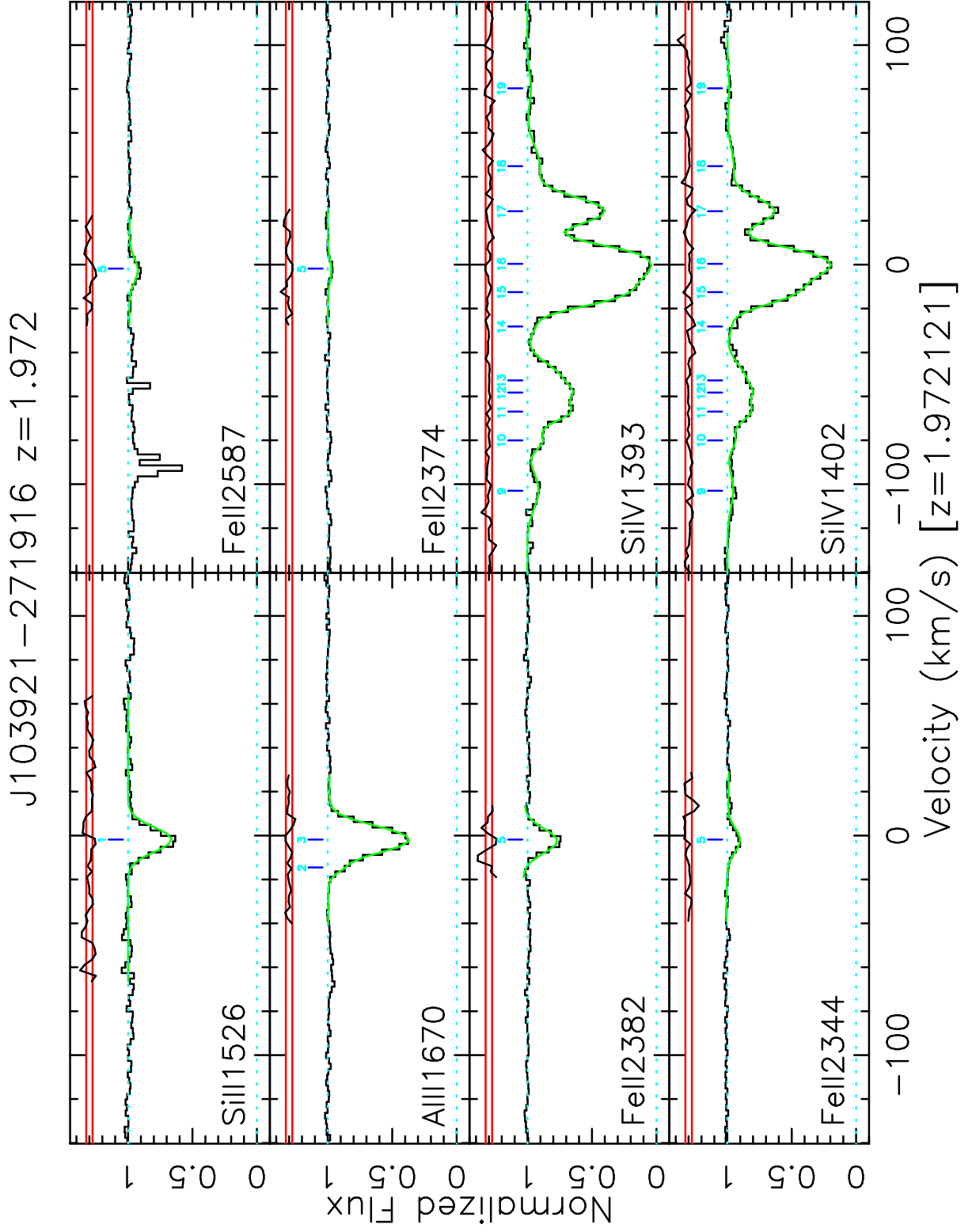


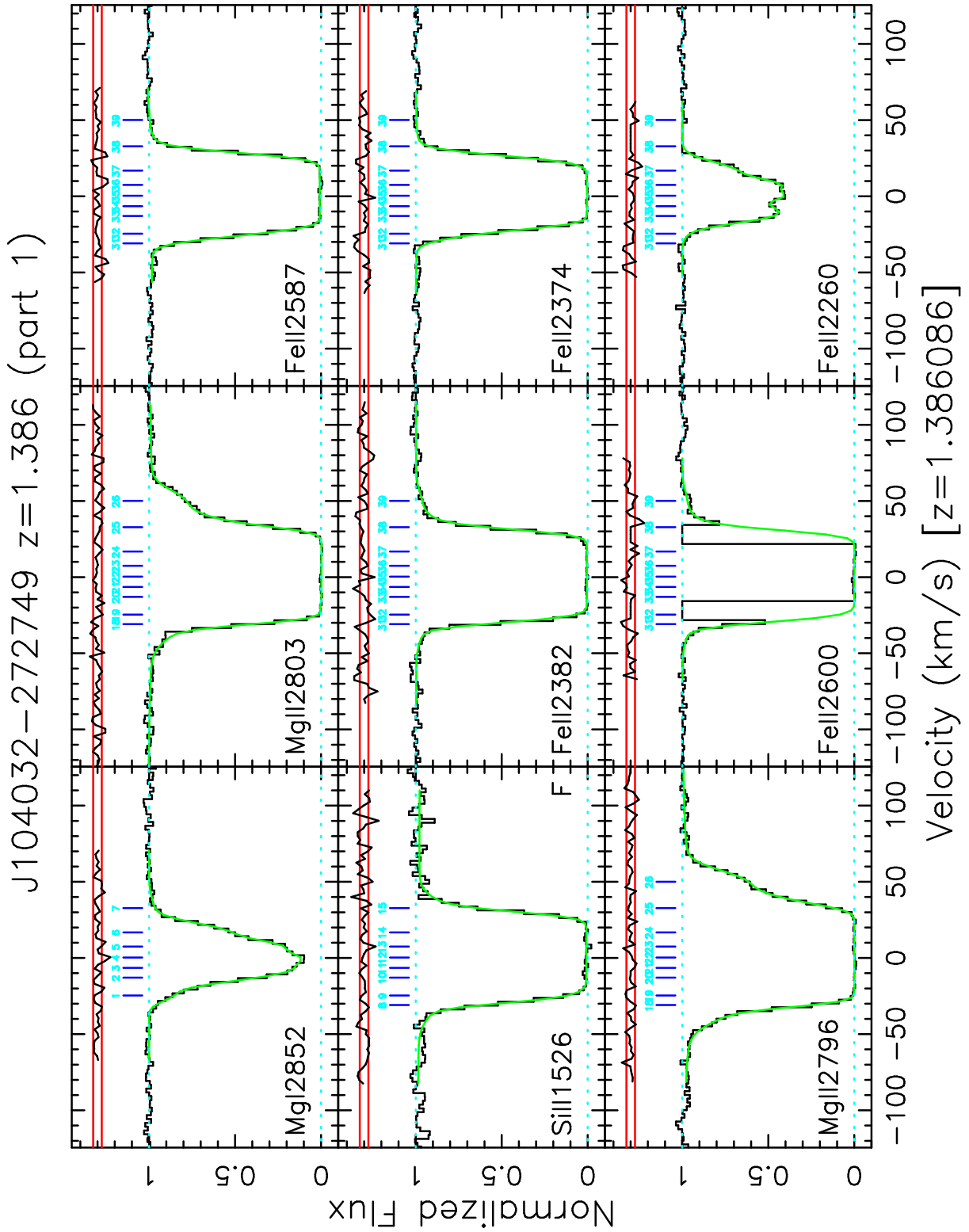
Figure 66. Many-multiplet fit for the  $z = 1.009$  absorber toward J103921-271916.



**Figure 67.** Many-multiplet fit for the  $z = 1.913$  absorber toward J103921–271916.



**Figure 68.** Many-multiplet fit for the  $z = 1.972$  absorber toward J103921–271916.



**Figure 69.** Many-multiplet fit for the  $z = 1.386$  absorber toward J104032–272749 (part 1).

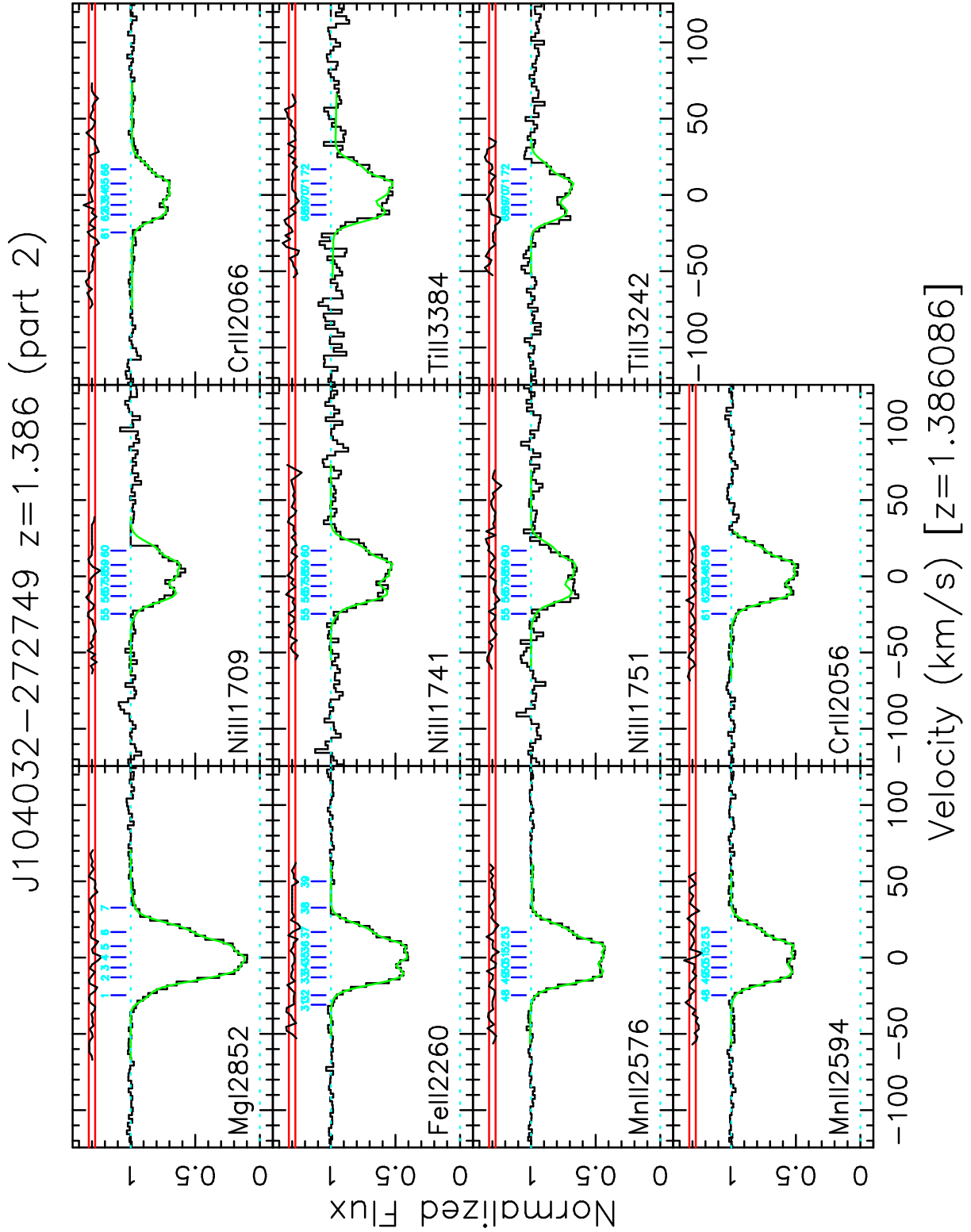
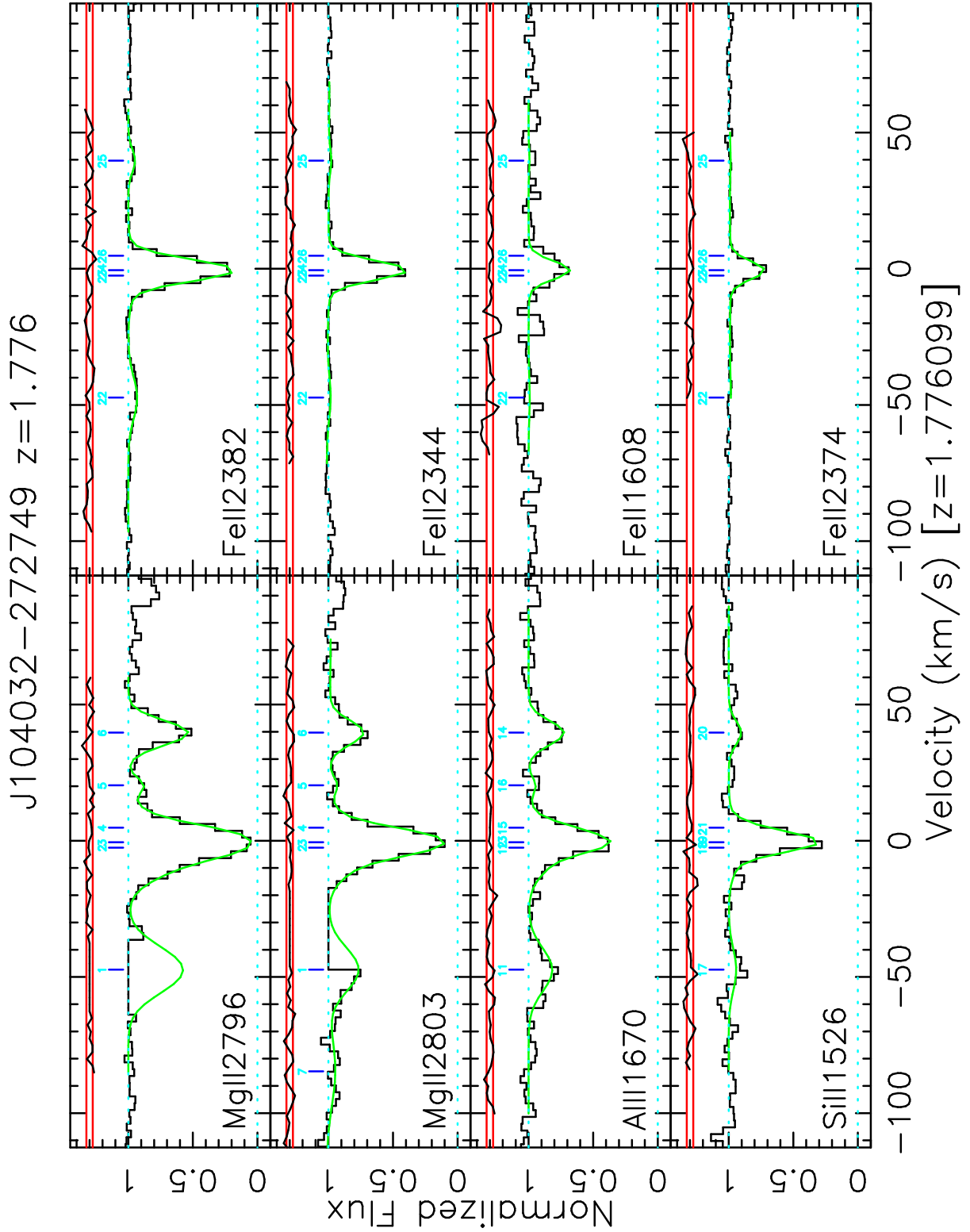


Figure 70. Many-multiplet fit for the  $z = 1.386$  absorber toward J104032–272749 (part 2).



**Figure 71.** Many-multiplet fit for the  $z = 1.776$  absorber toward J104032–272749.



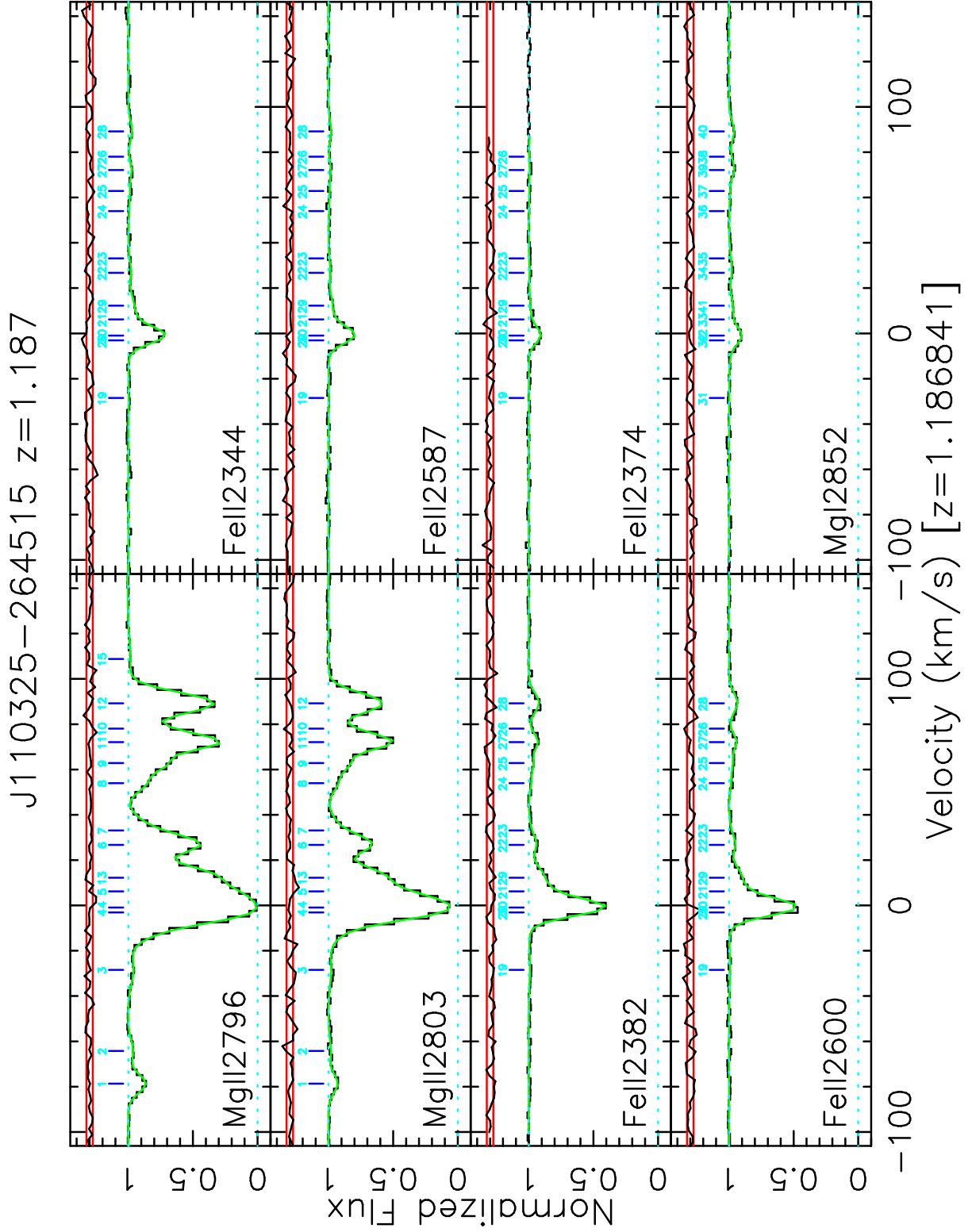
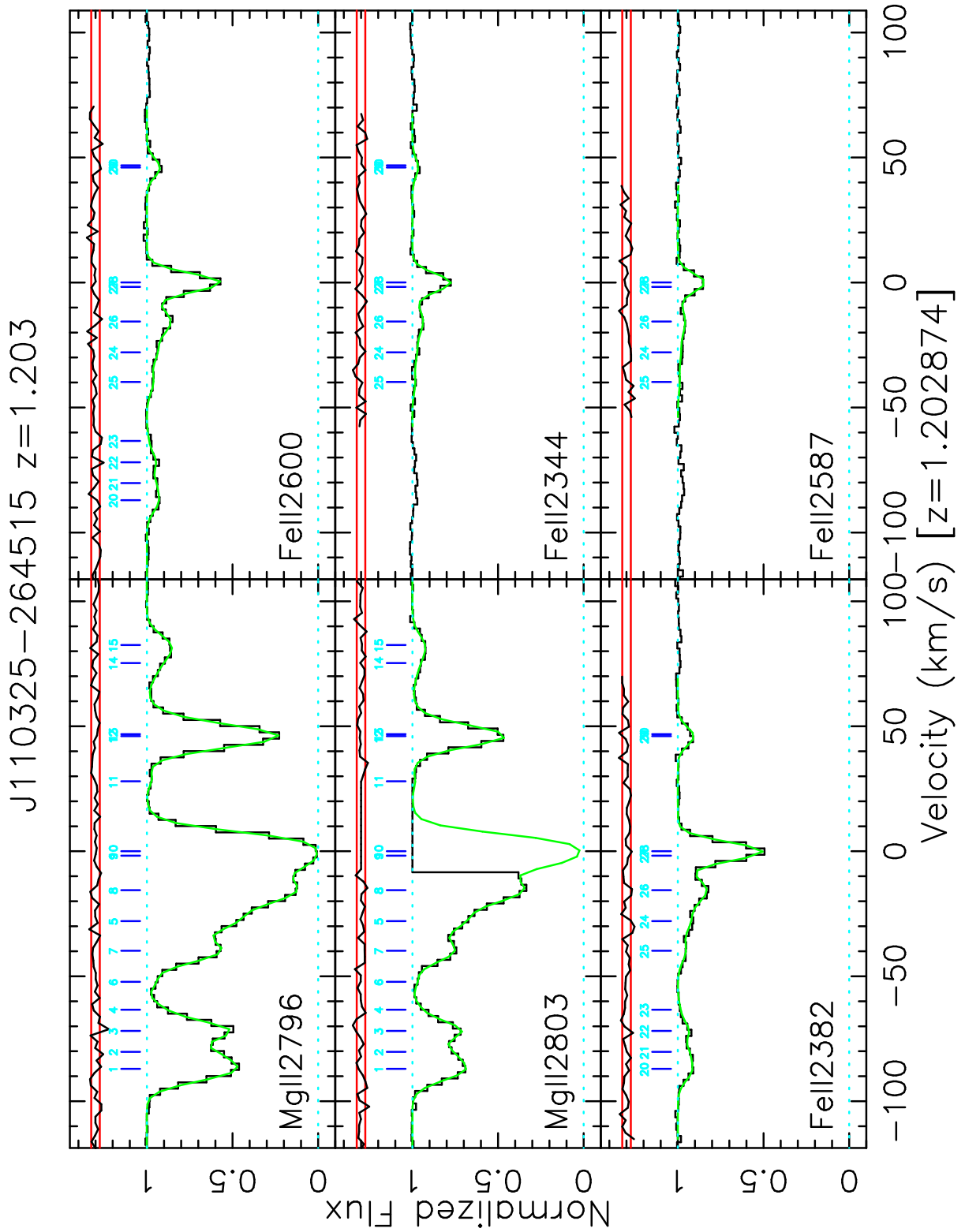


Figure 72. Many-multiplet fit for the  $z = 1.187$  absorber toward J110325–264515.



**Figure 73.** Many-multiplet fit for the  $z = 1.203$  absorber toward J110325–264515.

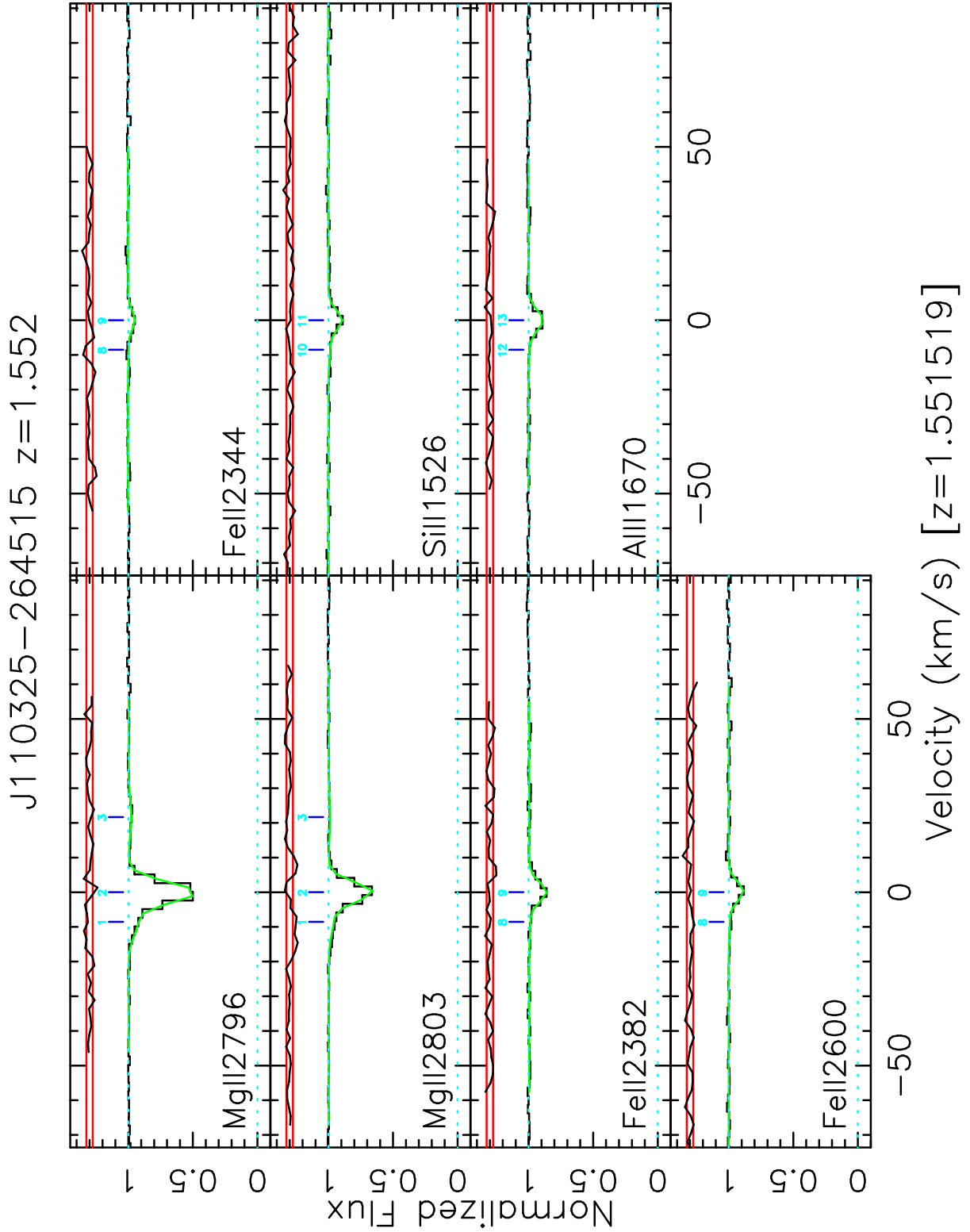
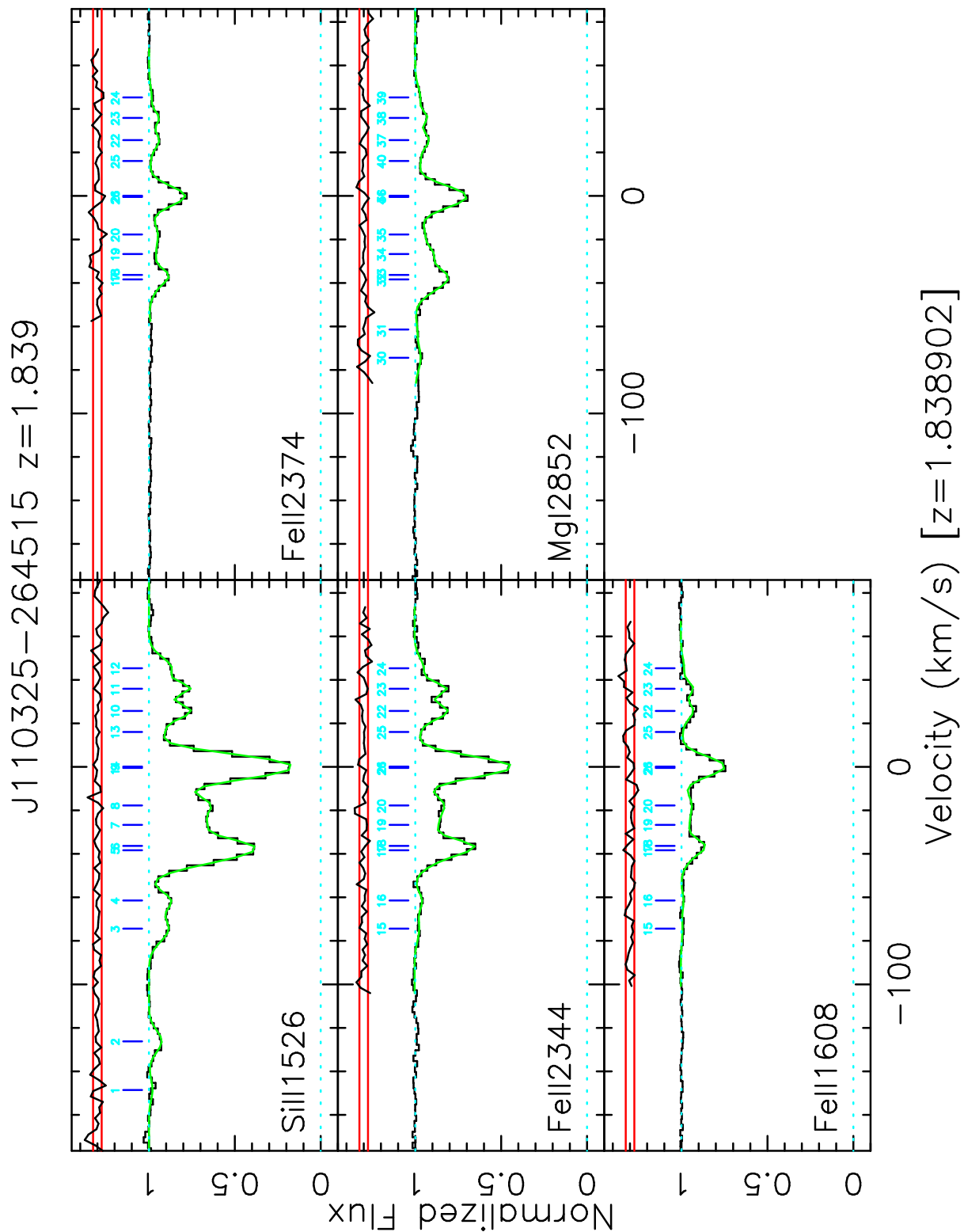
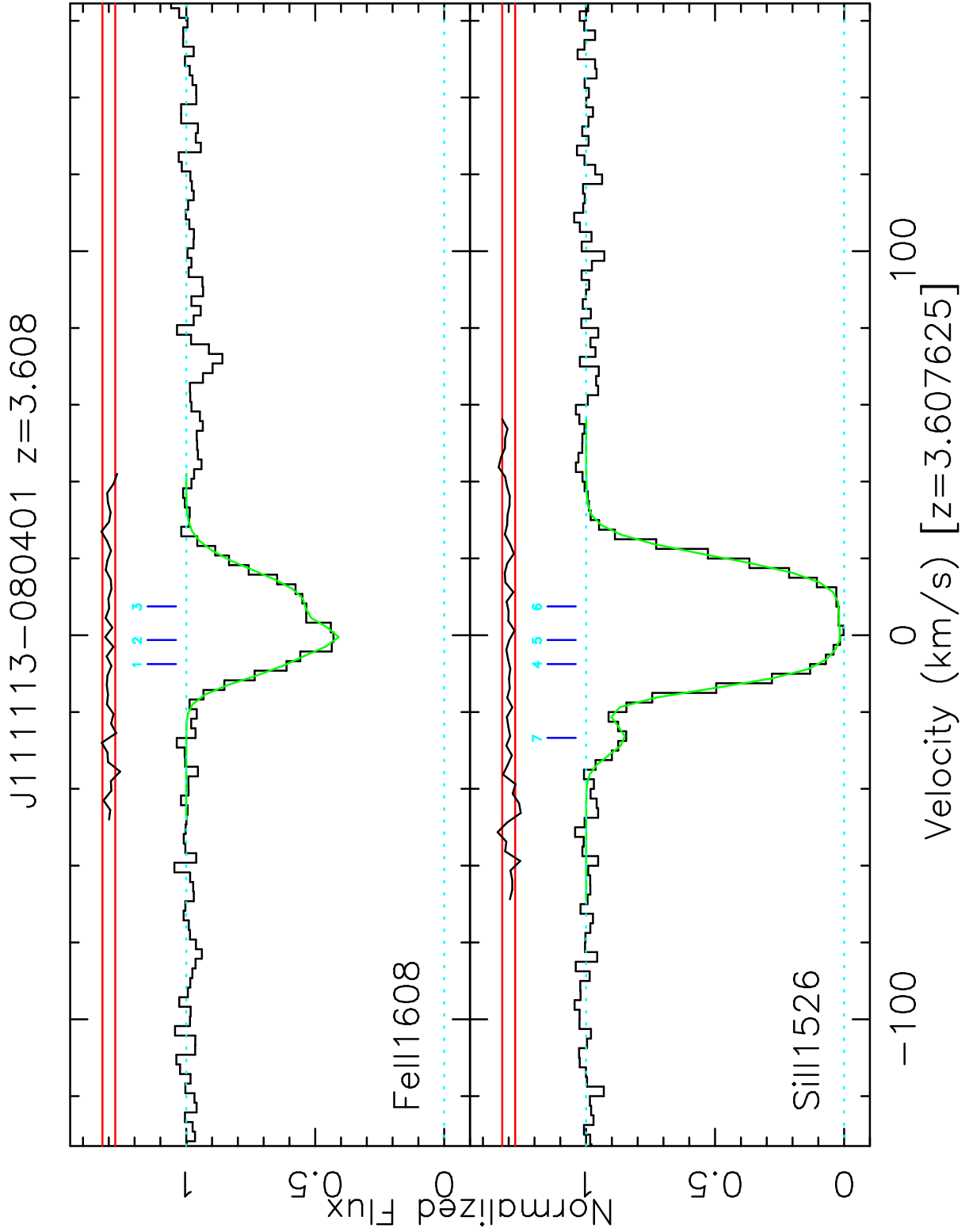


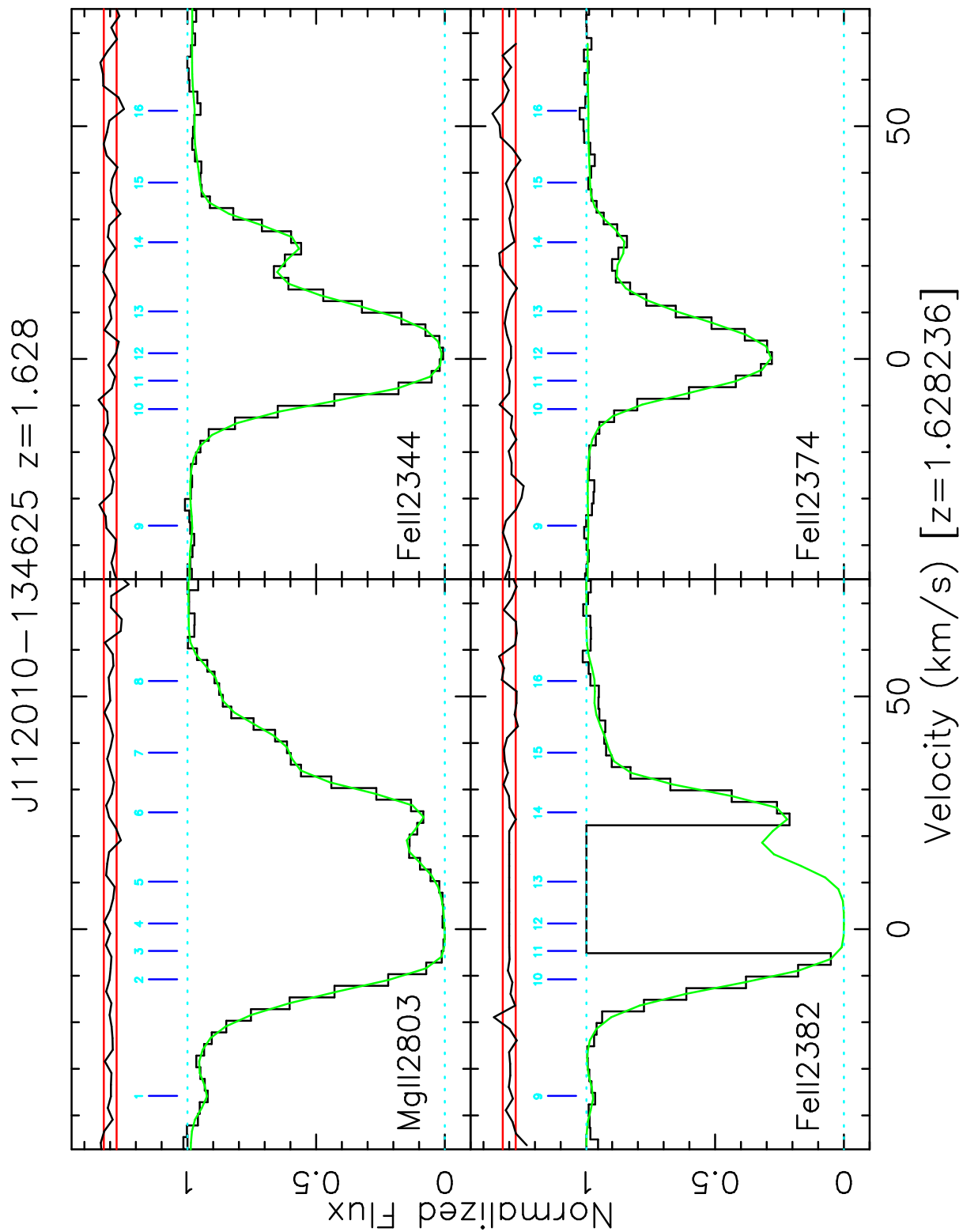
Figure 74. Many-multiplet fit for the  $z = 1.552$  absorber toward J110325-264515.



**Figure 75.** Many-multiplet fit for the  $z = 1.839$  absorber toward J110325-264515.

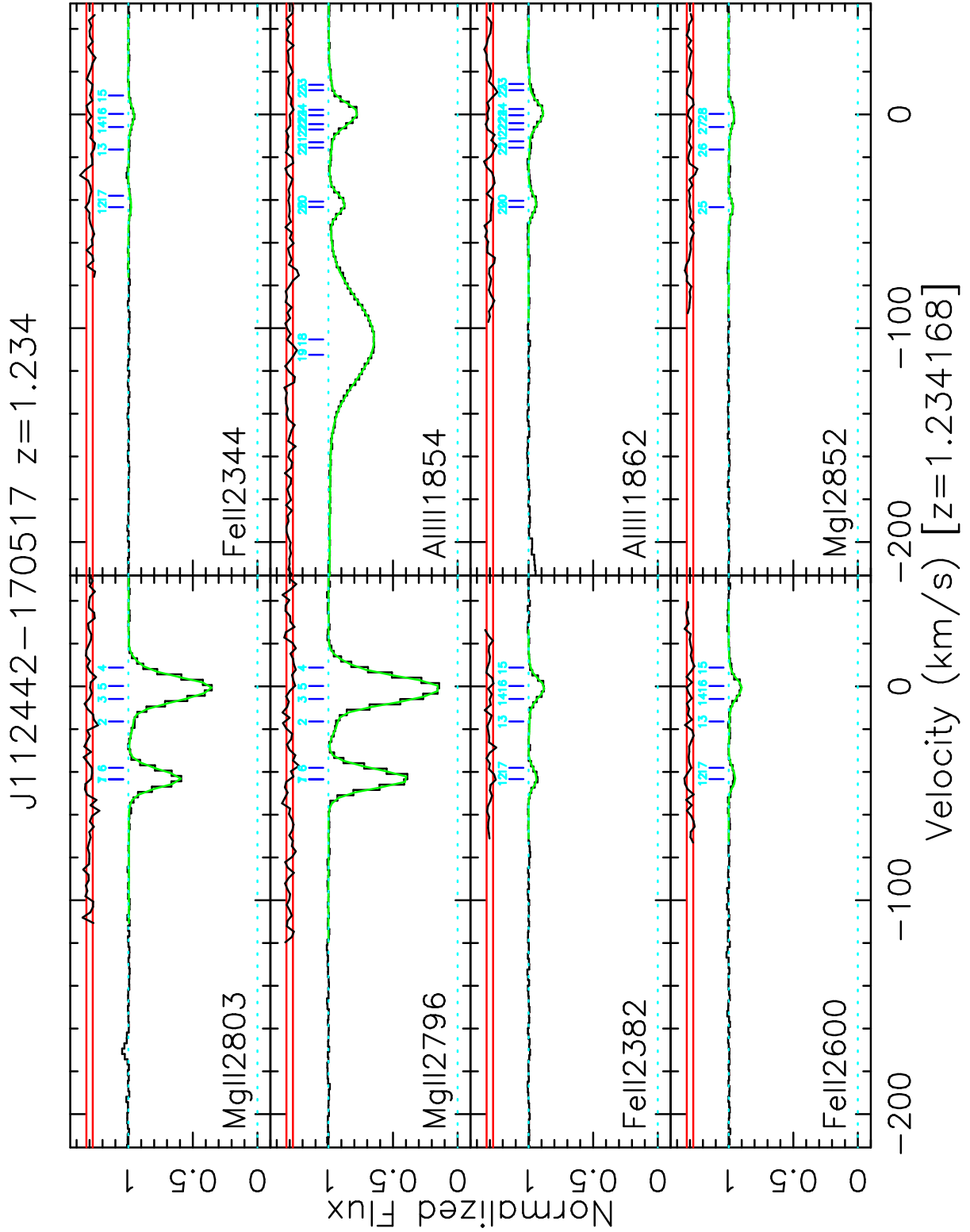


**Figure 76.** Many-multiplet fit for the  $z = 3.608$  absorber toward J111113-080401.



**Figure 77.** Many-multiplet fit for the  $z = 1.628$  absorber toward J112040–134625.





**Figure 79.** Many-multiplet fit for the  $z = 1.234$  absorber toward J112442-170517.



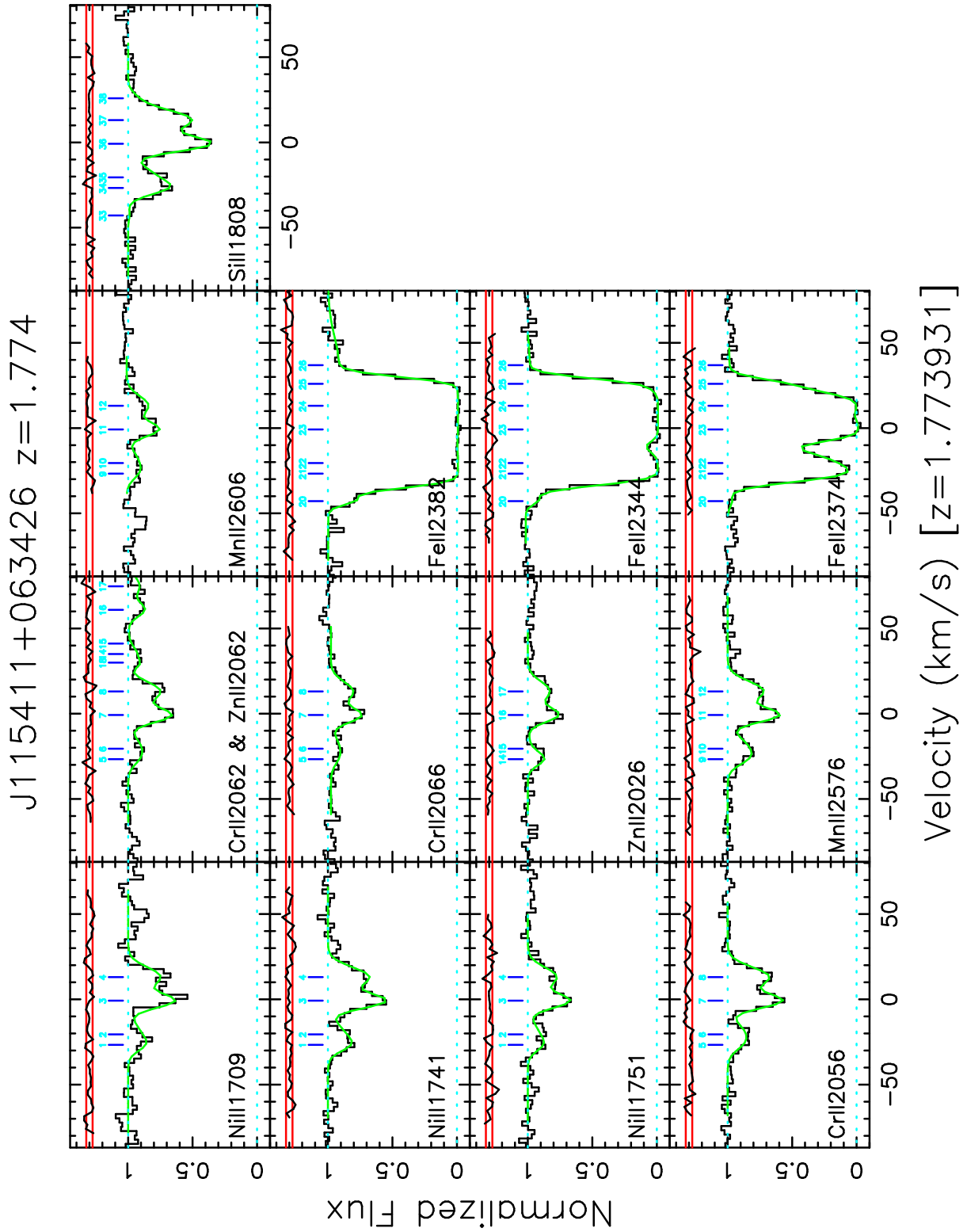


Figure 80. Many-multiplet fit for the  $z = 1.774$  absorber toward J115411+063426.

J115411+063426  $z=1.820$

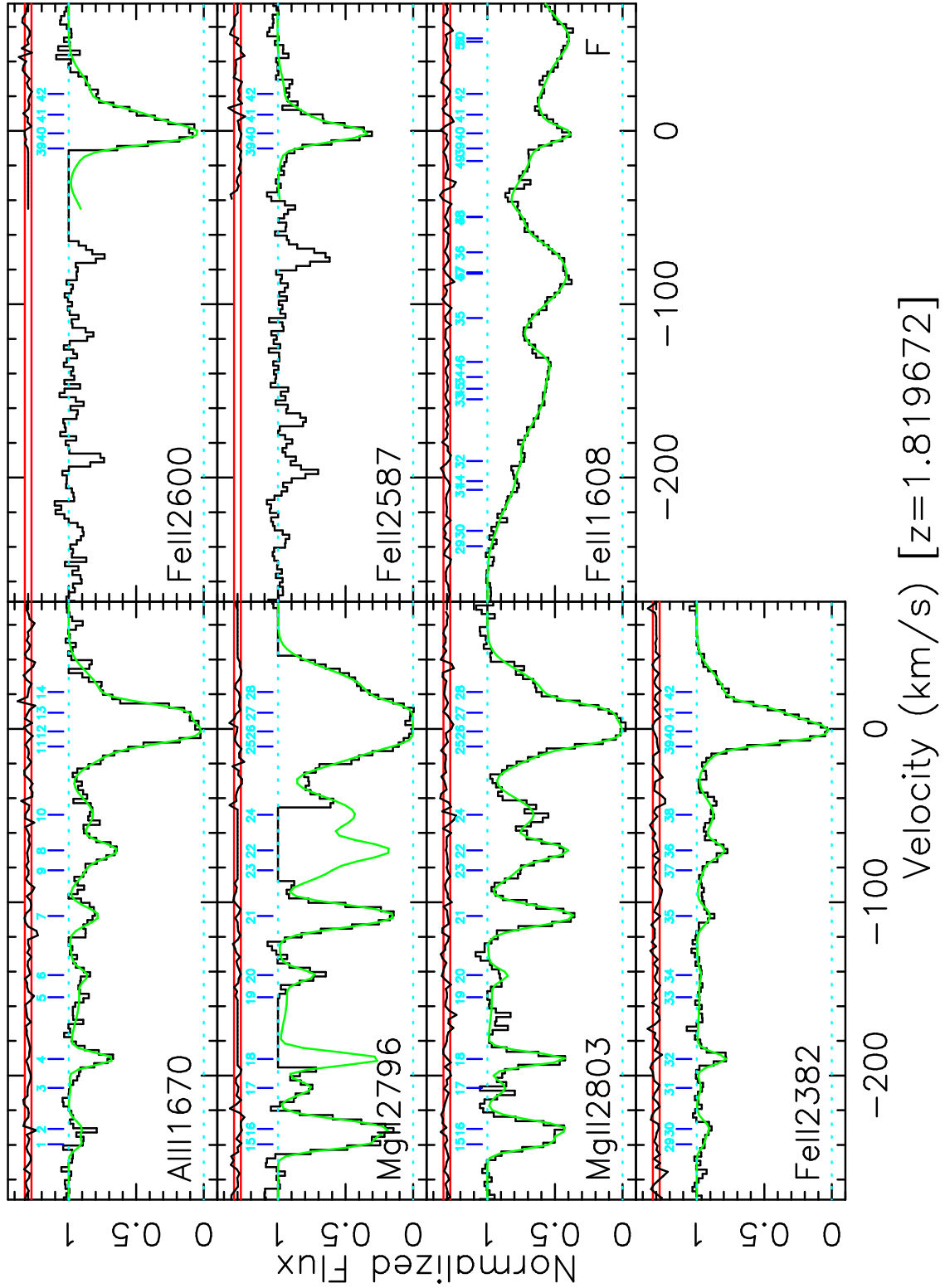


Figure 81. Many-multiplet fit for the  $z = 1.820$  absorber toward J115411+063426.

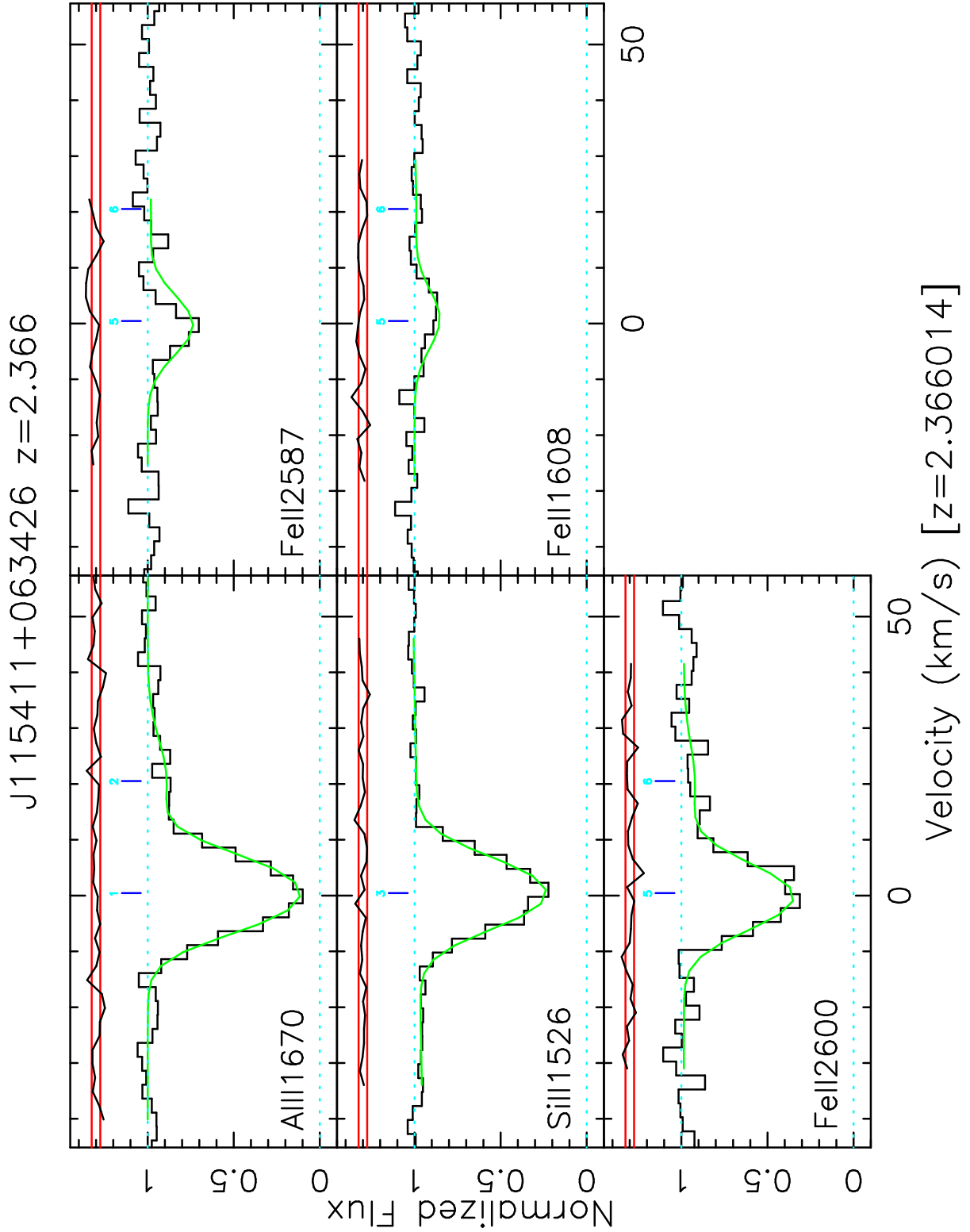
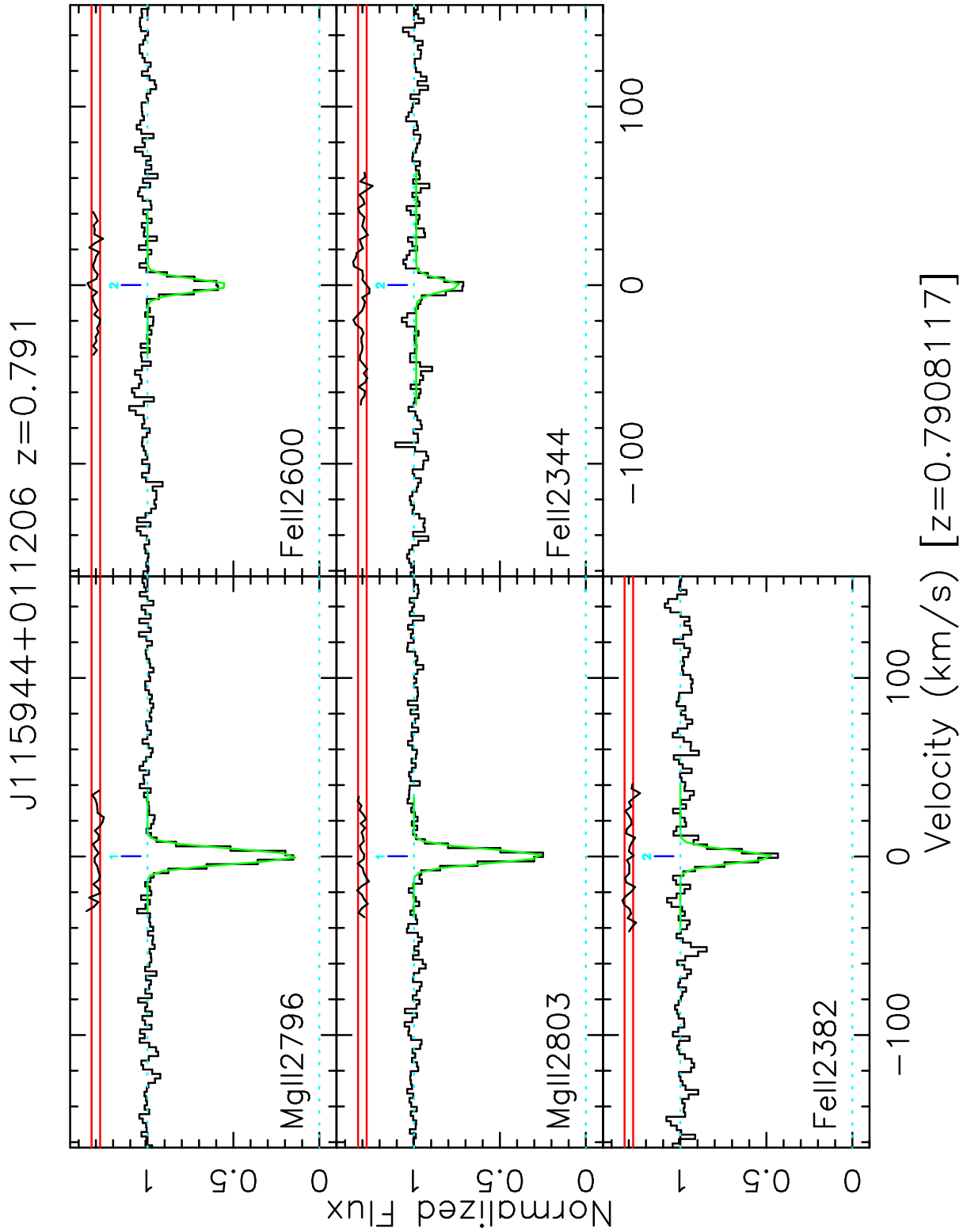


Figure 82. Many-multiplet fit for the  $z = 2.366$  absorber toward J115411+063426.



**Figure 83.** Many-multiplet fit for the  $z = 0.791$  absorber toward J115944+011206.

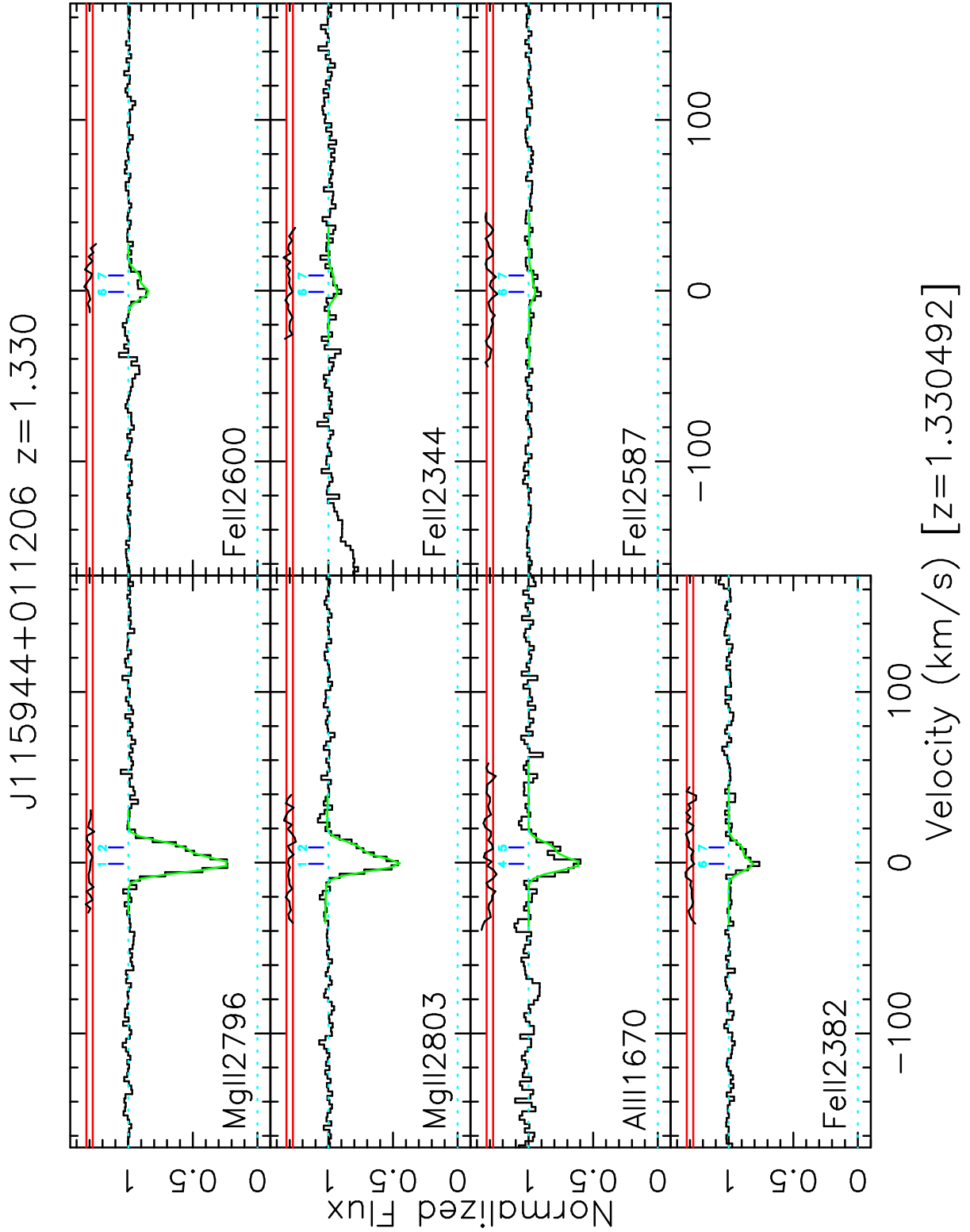


Figure 84. Many-multiplet fit for the  $z = 1.330$  absorber toward J115944+011206.

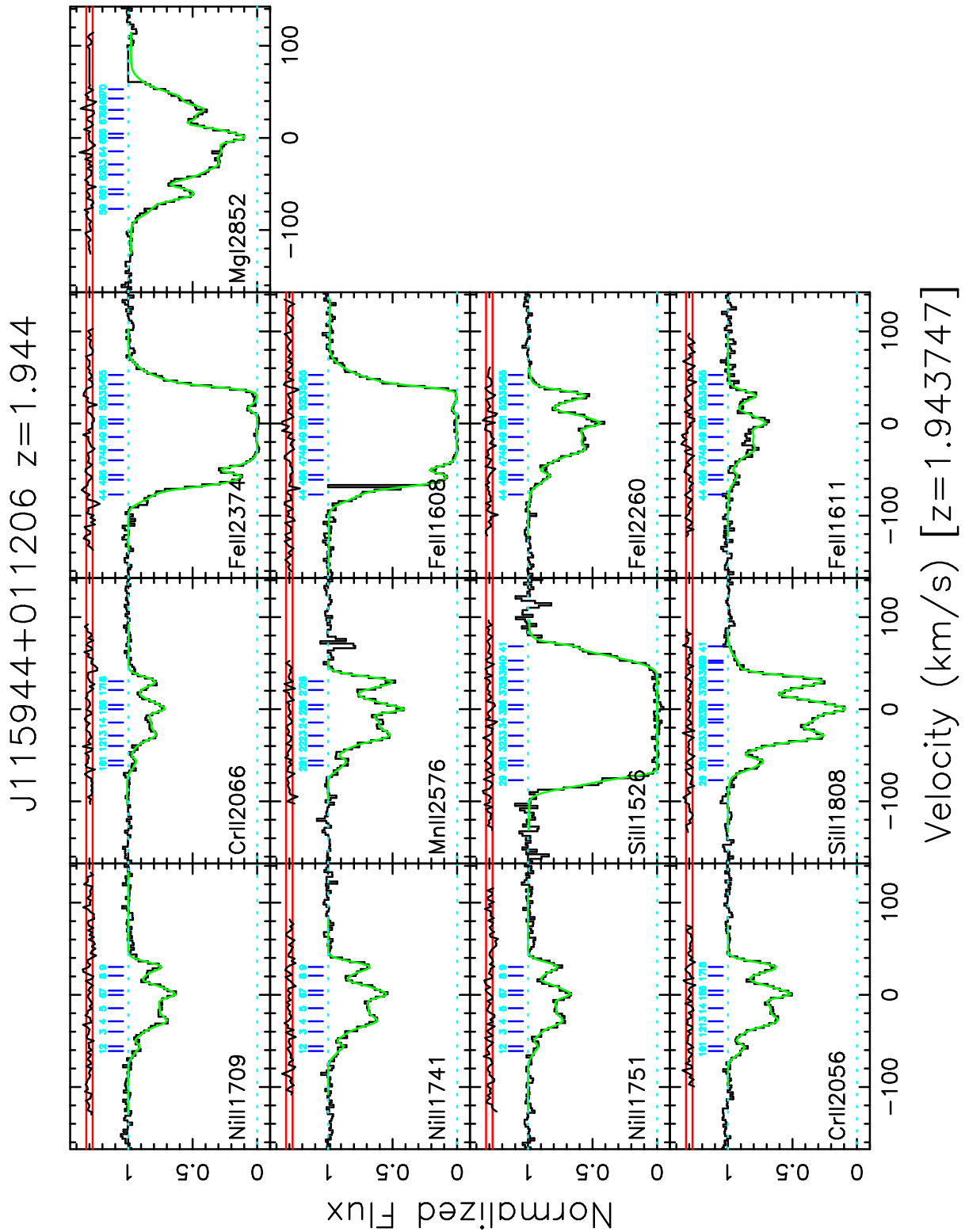


Figure 85. Many-multiplet fit for the  $z = 1.944$  absorber toward J115944+011206.

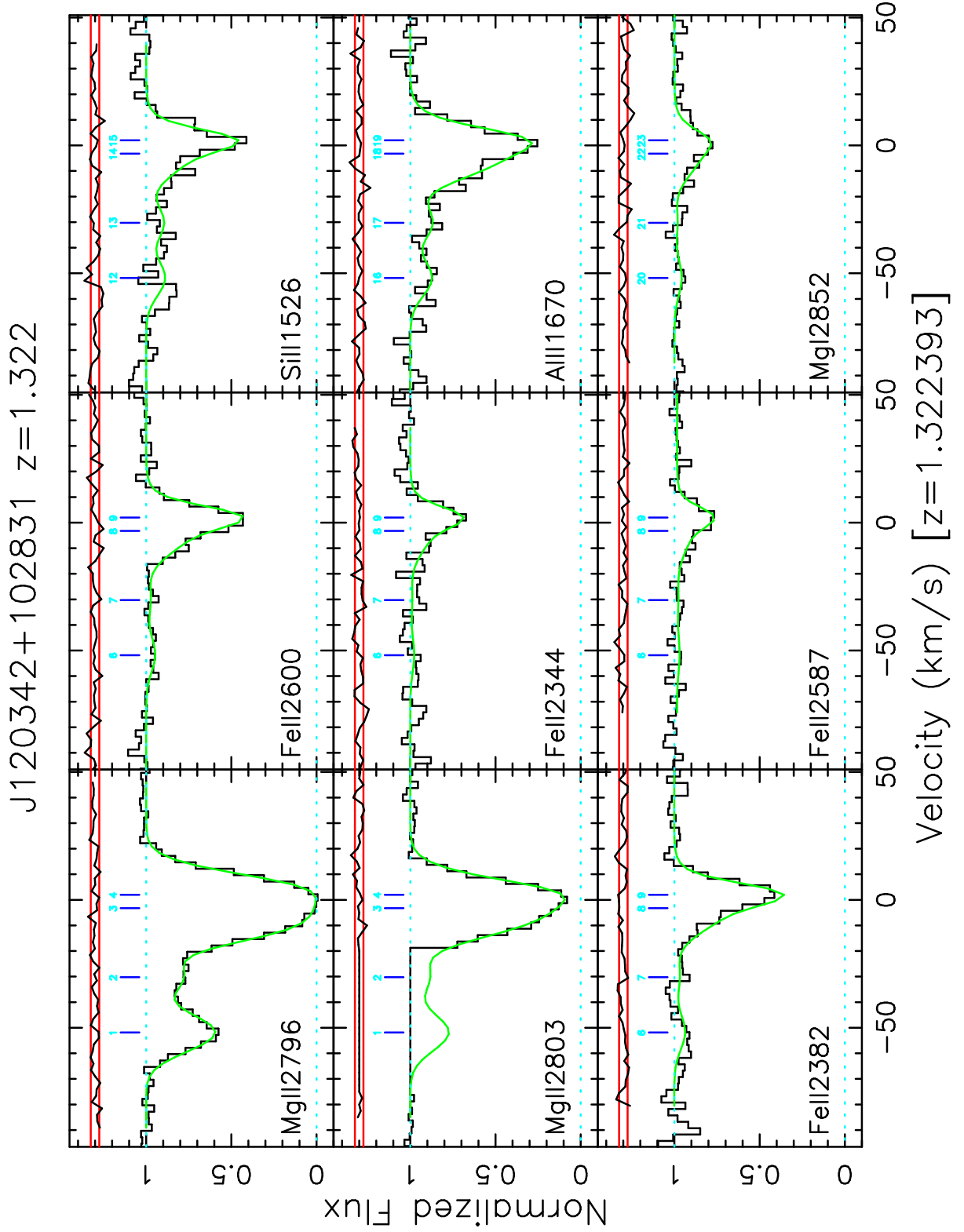
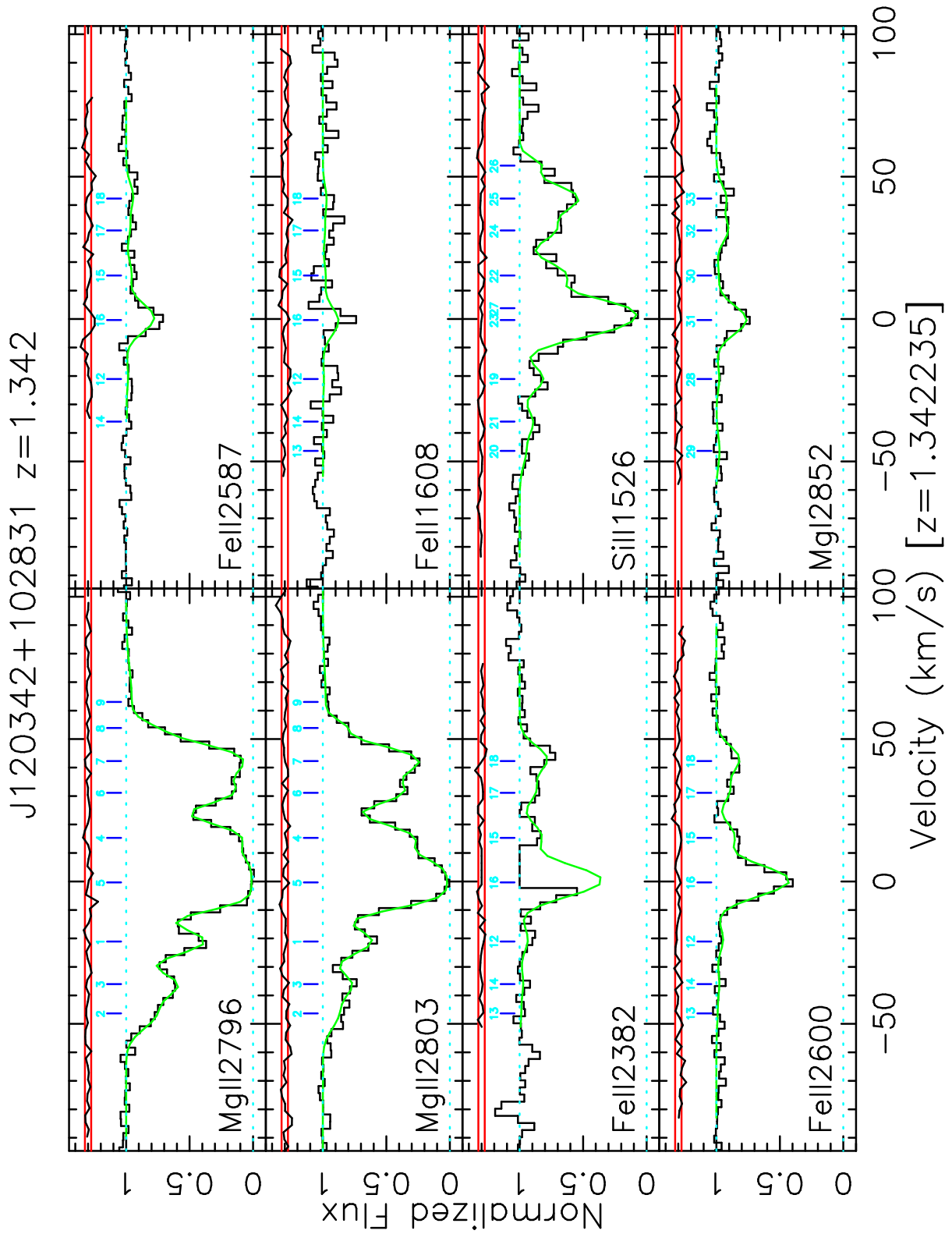


Figure 86. Many-multiplet fit for the  $z = 1.322$  absorber toward J120342+102831.



**Figure 87.** Many-multiplet fit for the  $z = 1.342$  absorber toward J120342+102831.



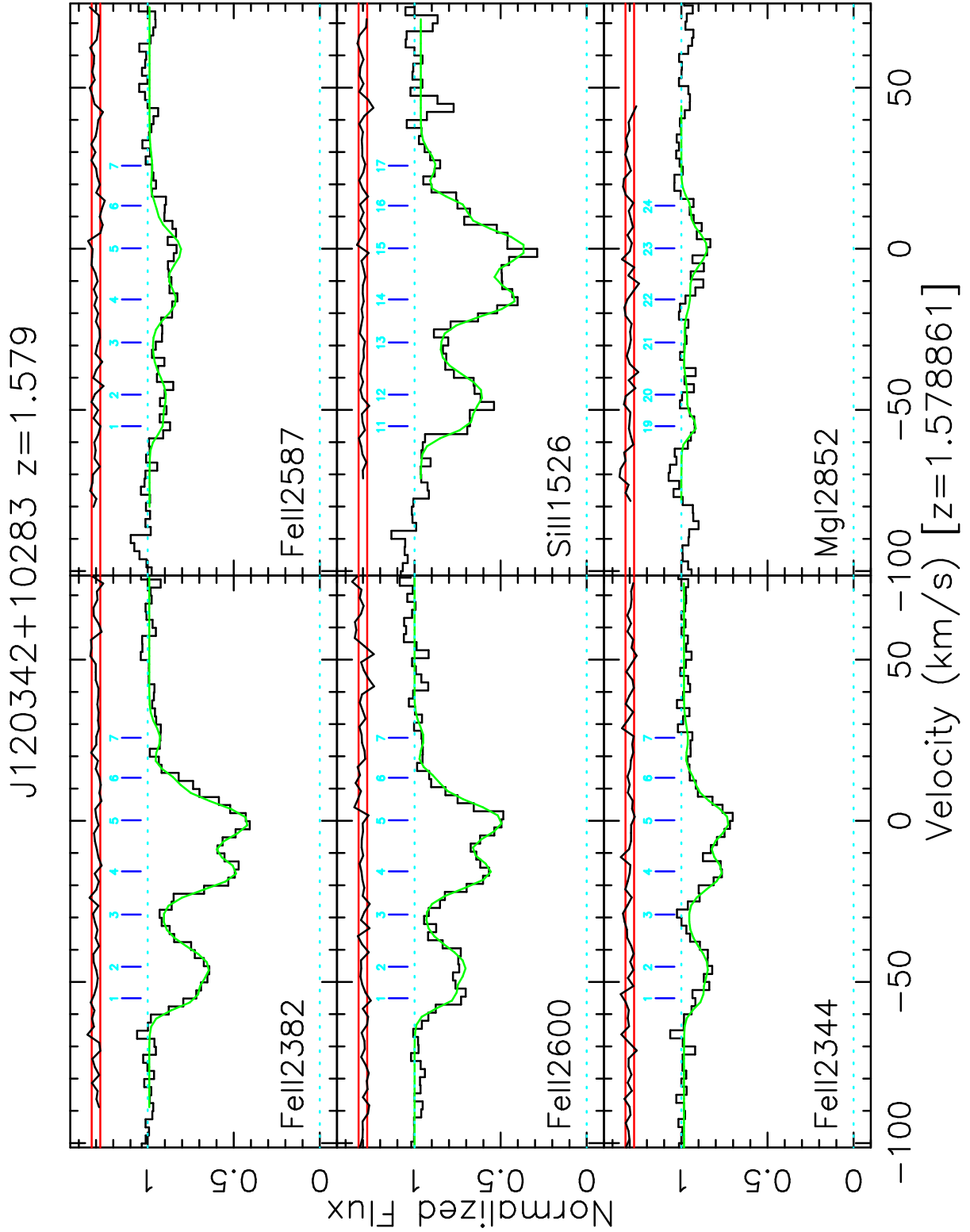
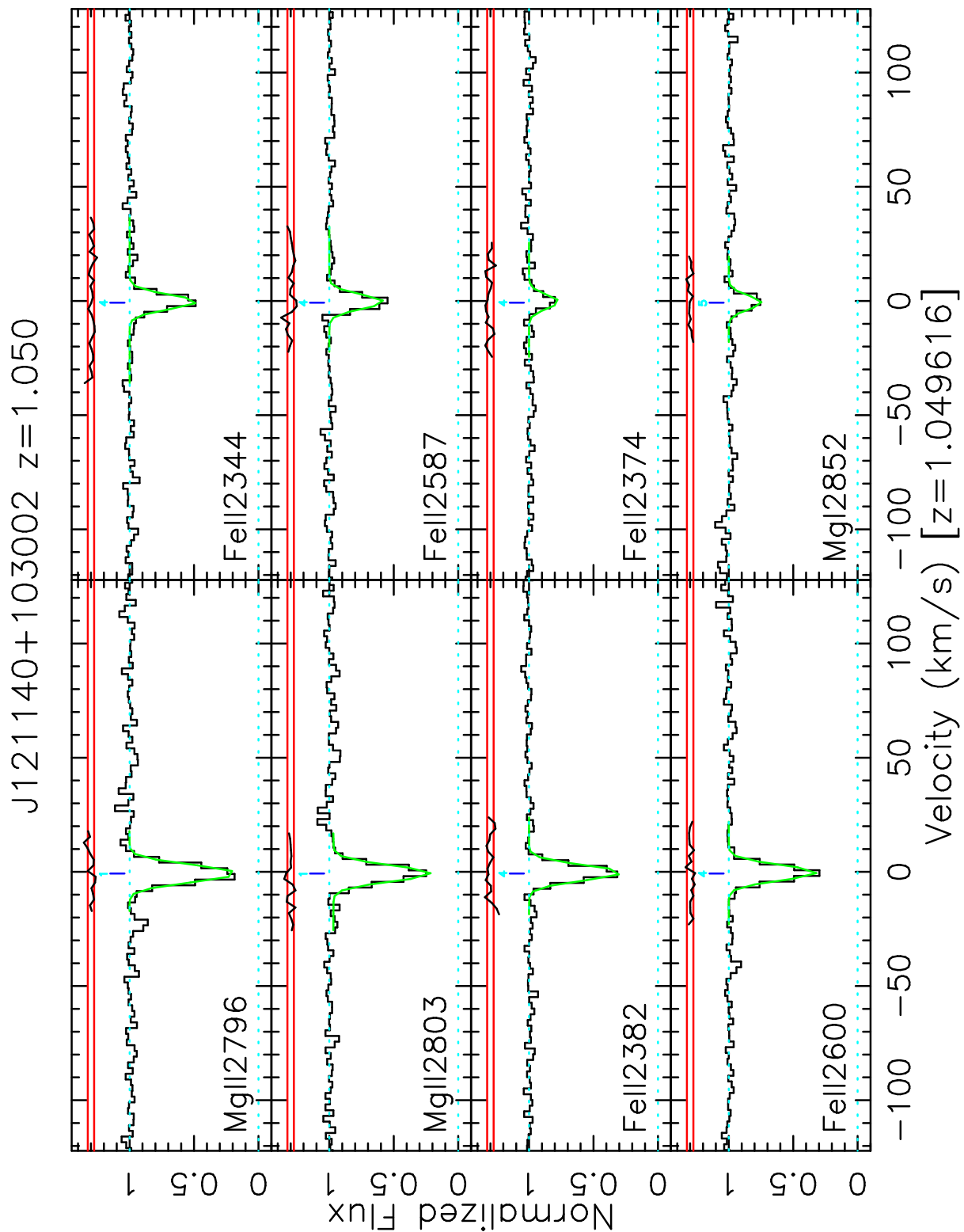


Figure 88. Many-multiplet fit for the  $z = 1.579$  absorber toward J120342+102831.



**Figure 89.** Many-multiplet fit for the  $z = 1.050$  absorber toward J121140+103002.

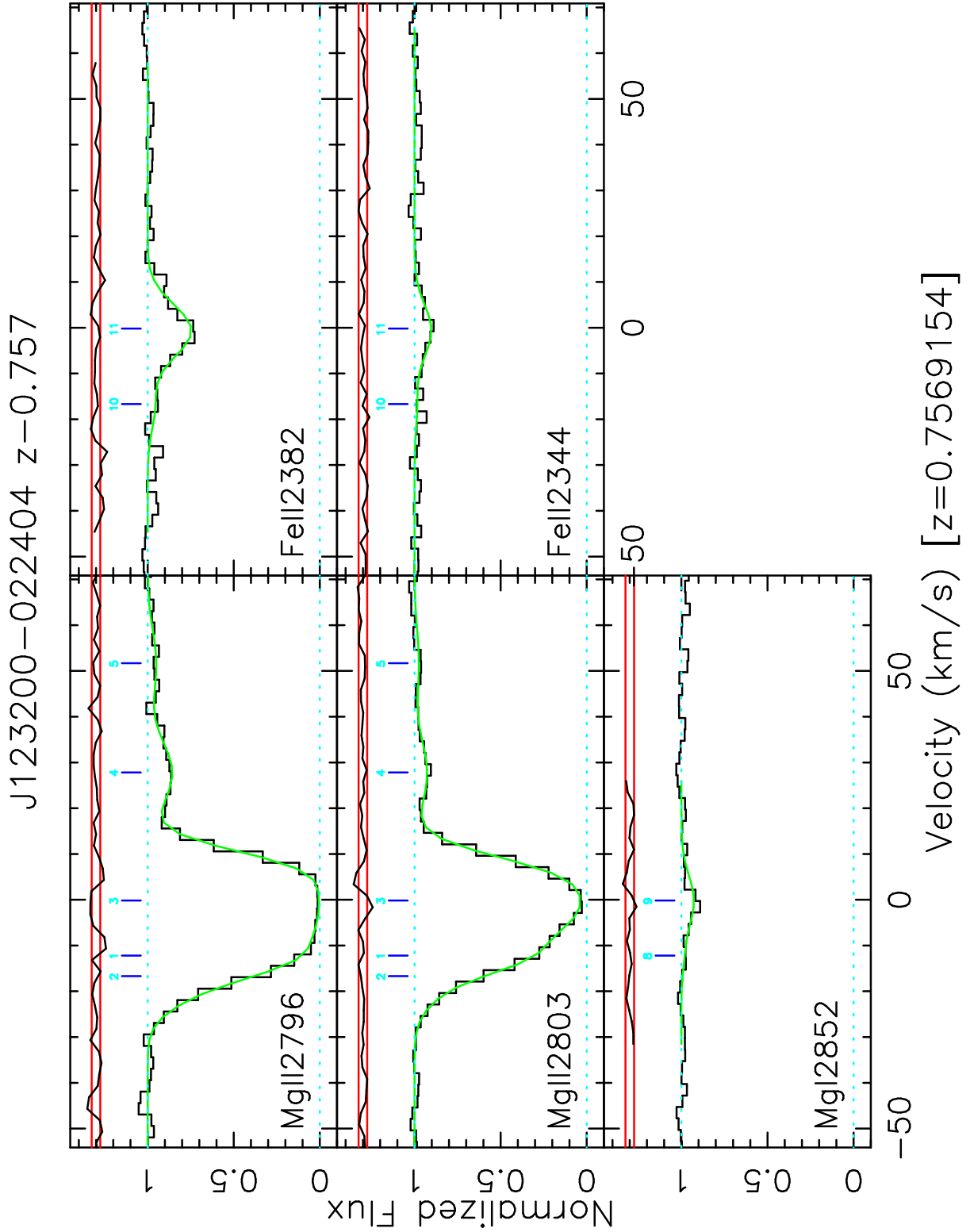
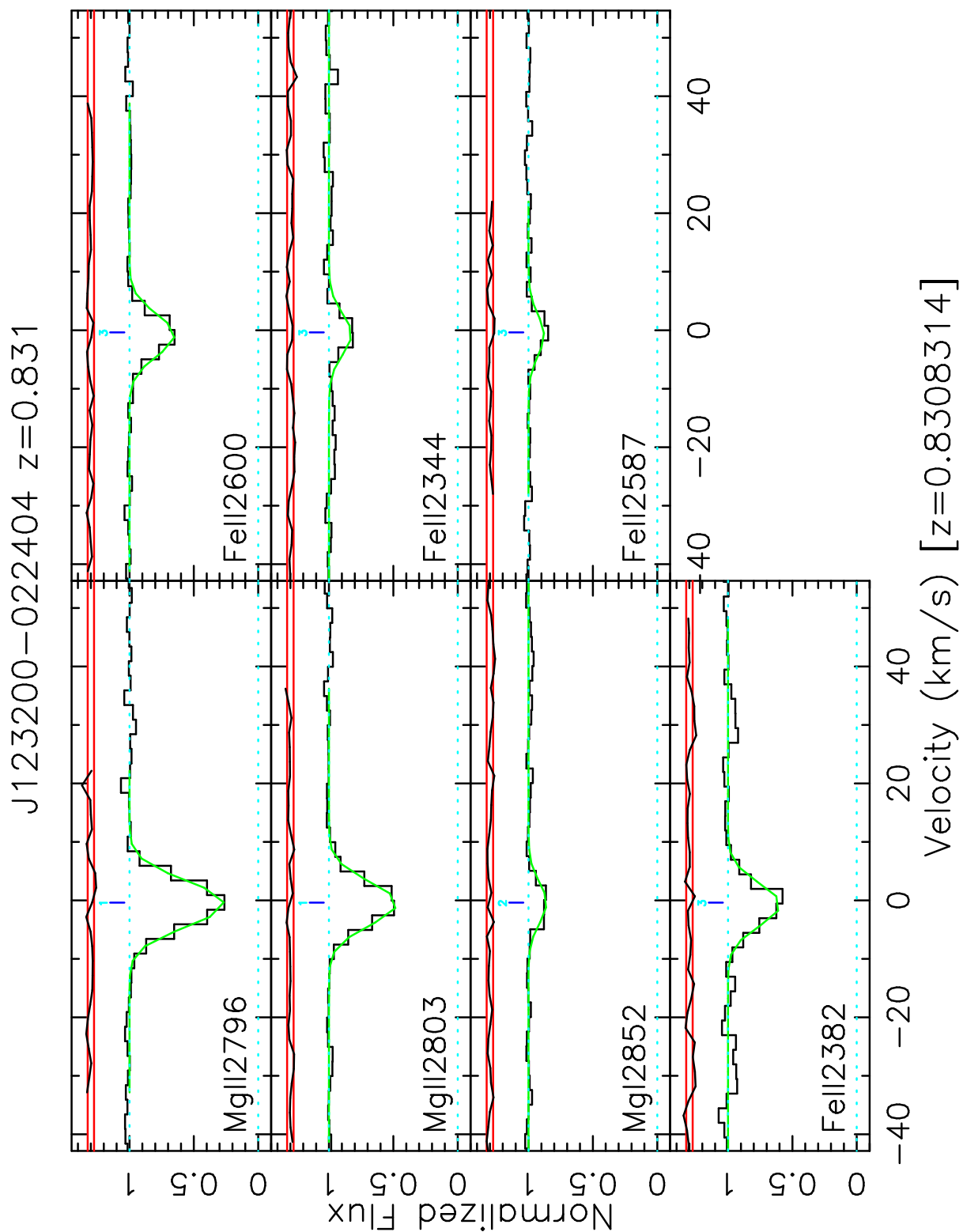


Figure 90. Many-multiplet fit for the  $z = 0.757$  absorber toward J123200–022404.



**Figure 91.** Many-multiplet fit for the  $z = 0.831$  absorber toward J123200–022404.

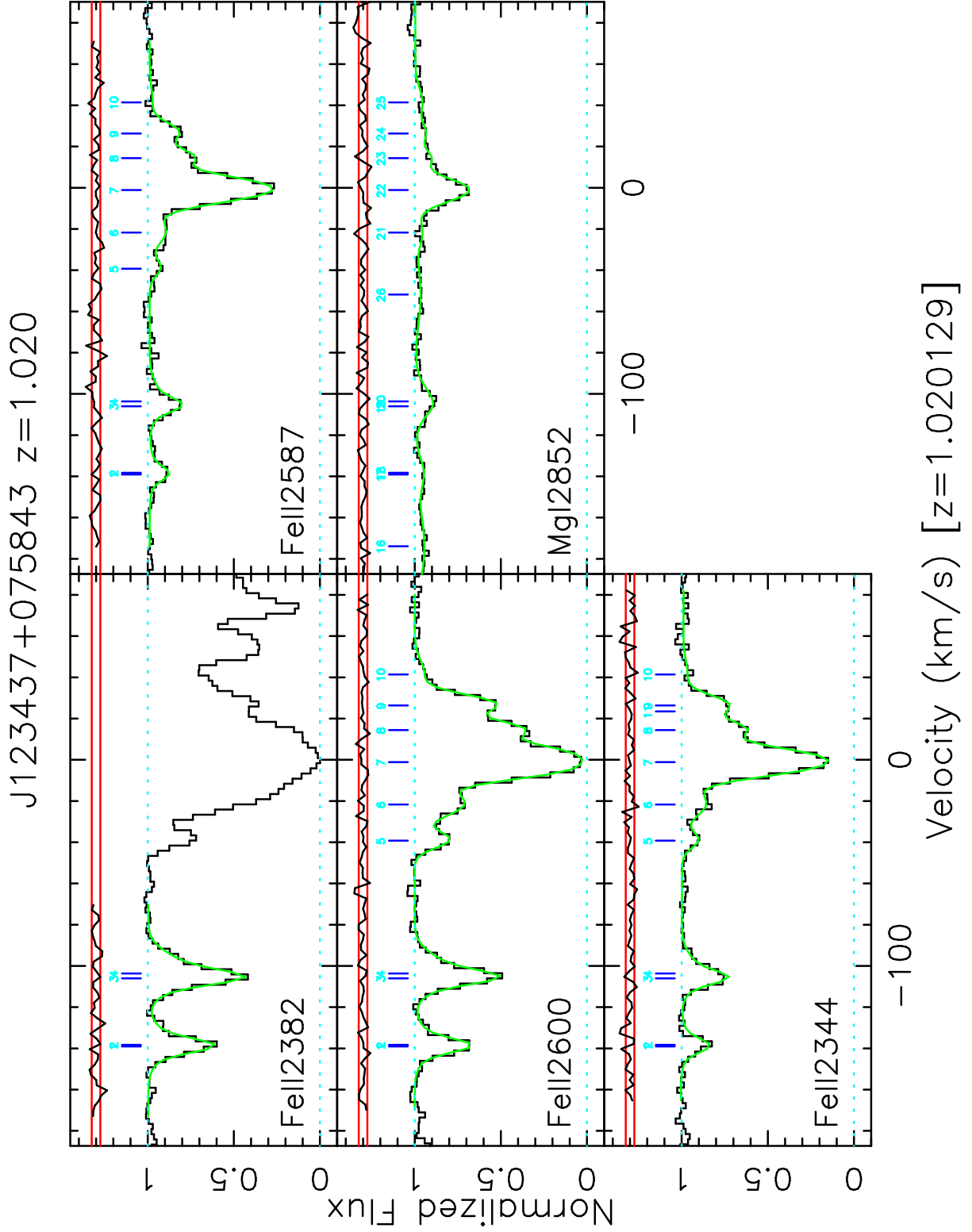
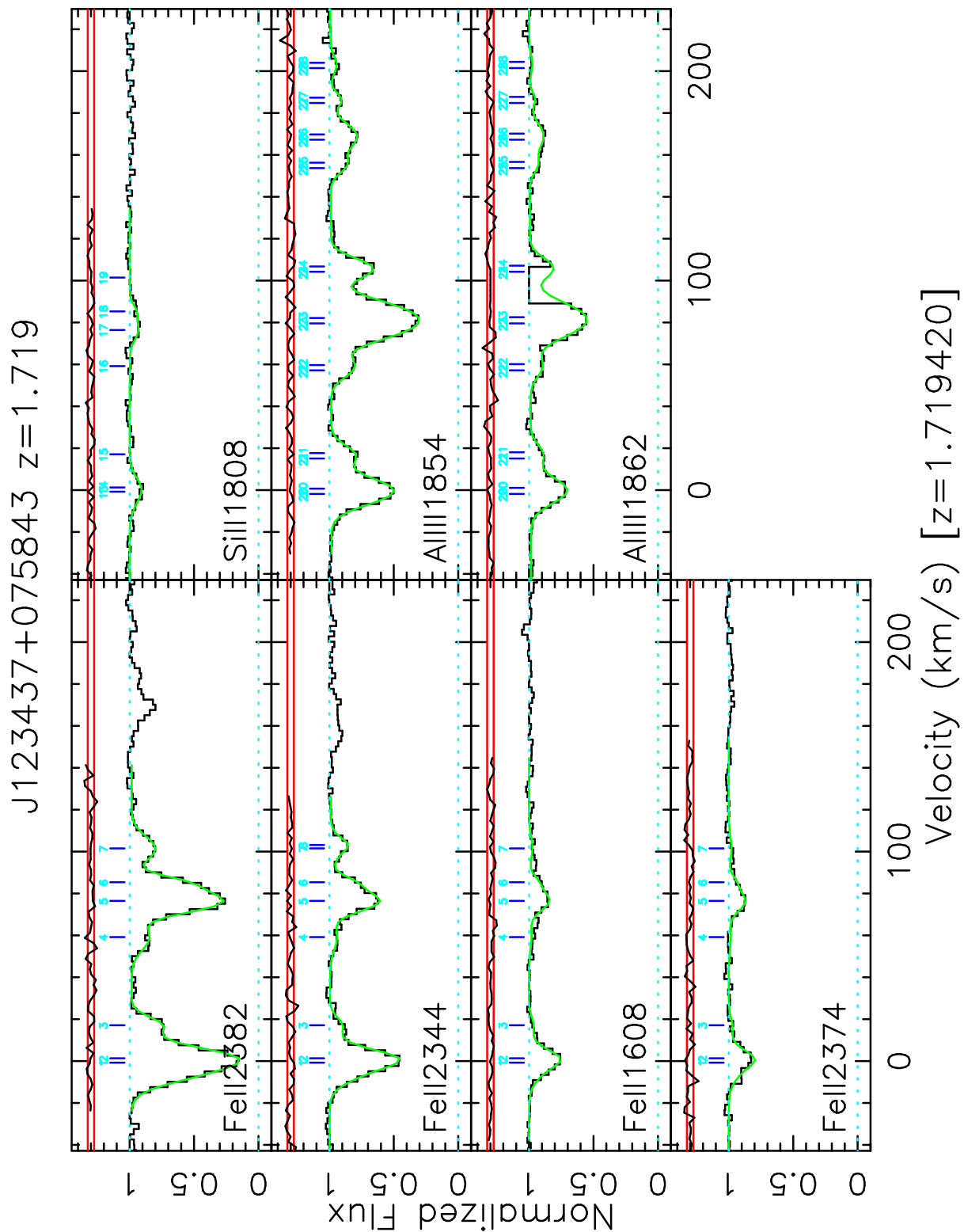


Figure 92. Many-multiplet fit for the  $z = 1.020$  absorber toward J123437+075843.



**Figure 93.** Many-multiplet fit for the  $z = 1.719$  absorber toward J123437+075843.

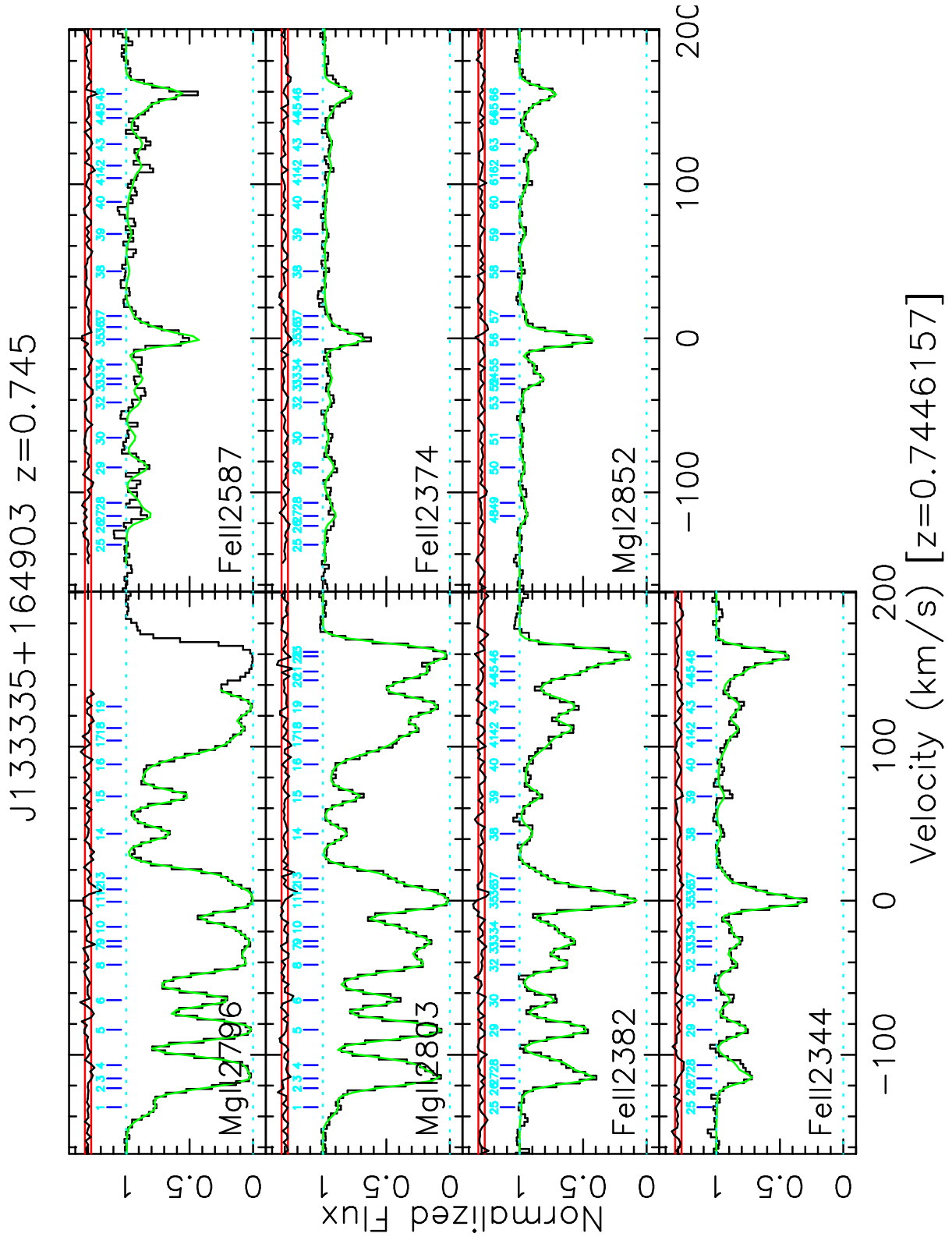
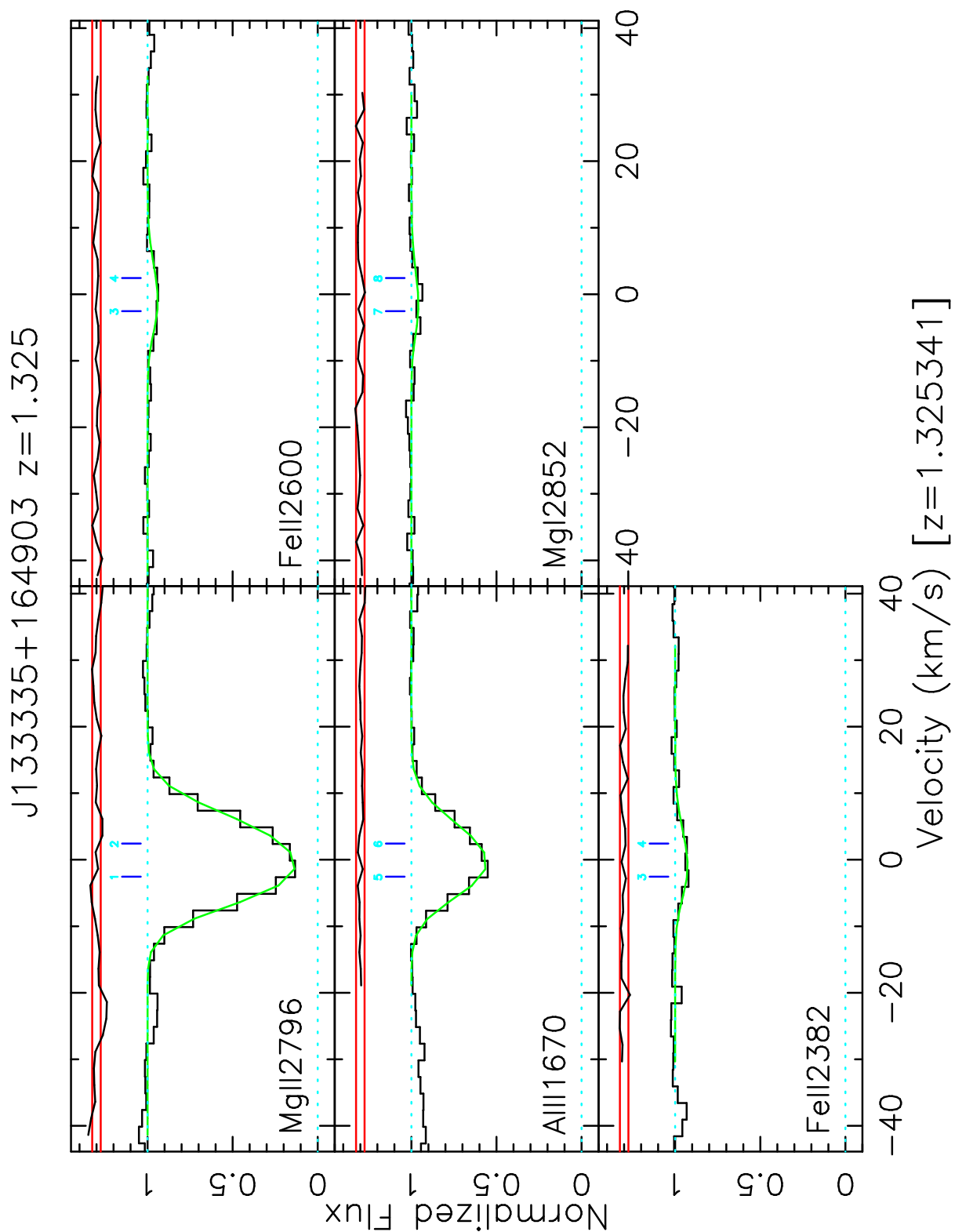


Figure 94. Many-multiplet fit for the  $z = 0.745$  absorber toward J1333335+164903.



**Figure 95.** Many-multiplet fit for the  $z = 1.325$  absorber toward J133335+164903.



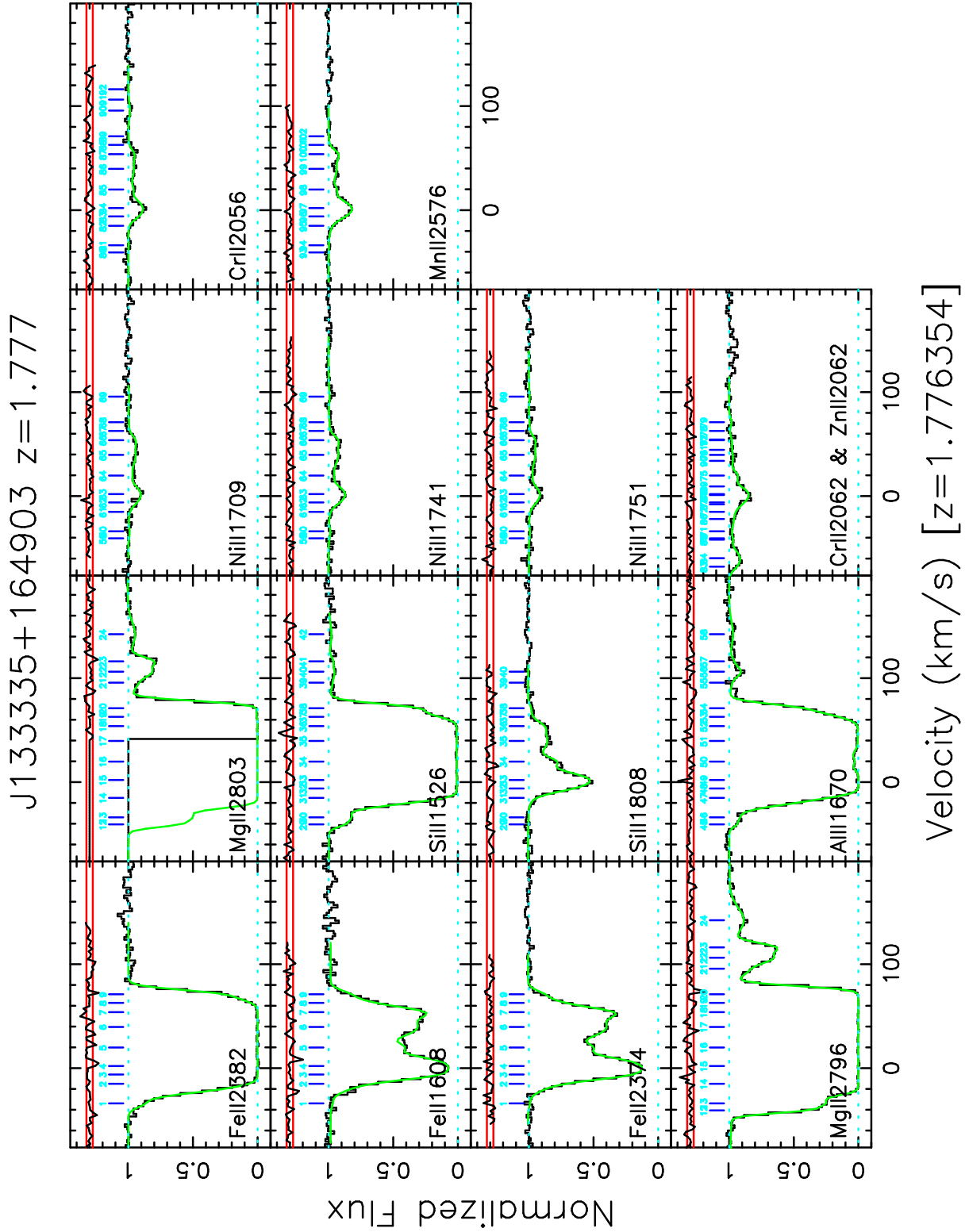


Figure 96. Many-multiplet fit for the  $z = 1.777$  absorber toward J1333335+164903.

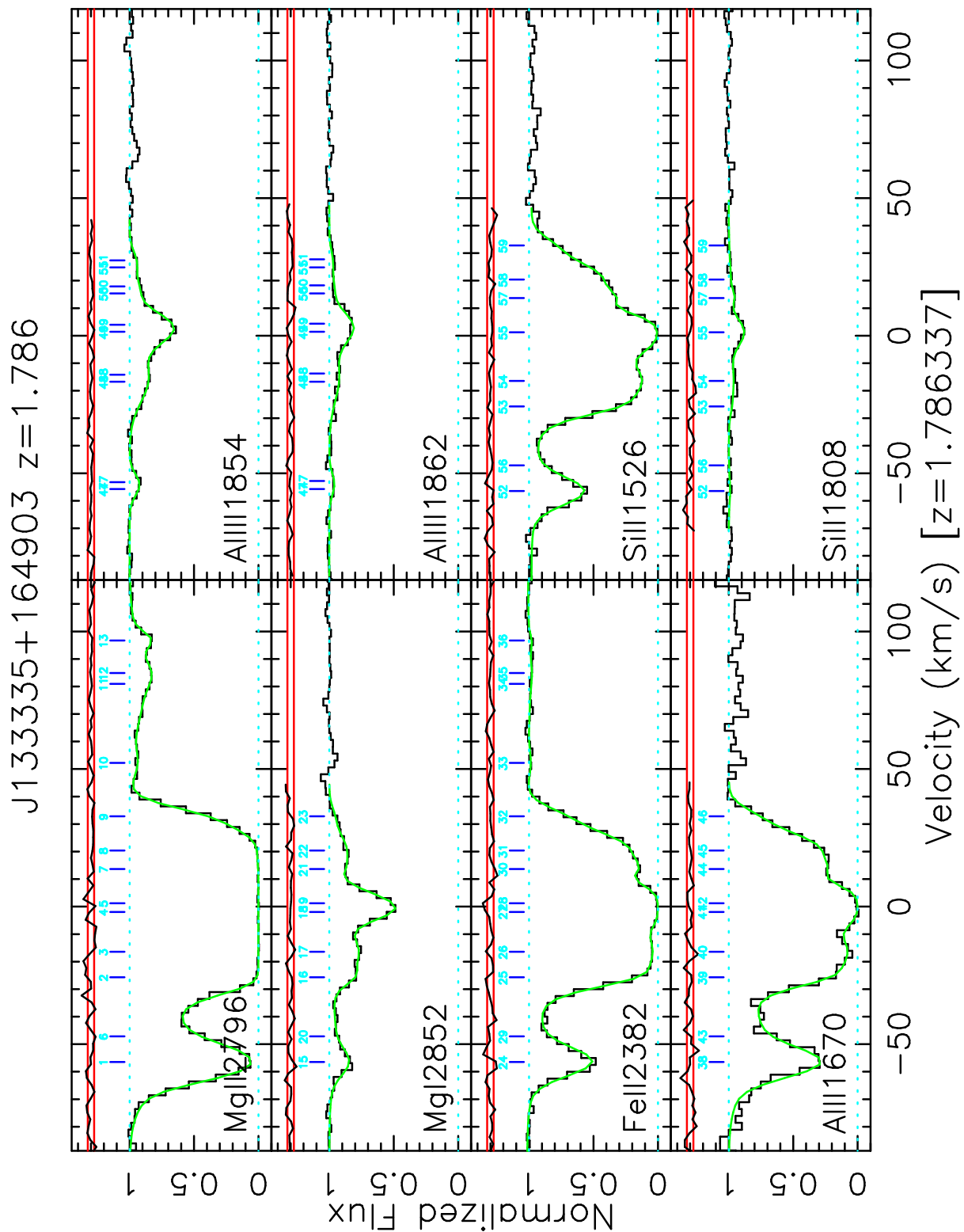


Figure 97. Many-multiplet fit for the  $z = 1.786$  absorber toward J1333335+164903.

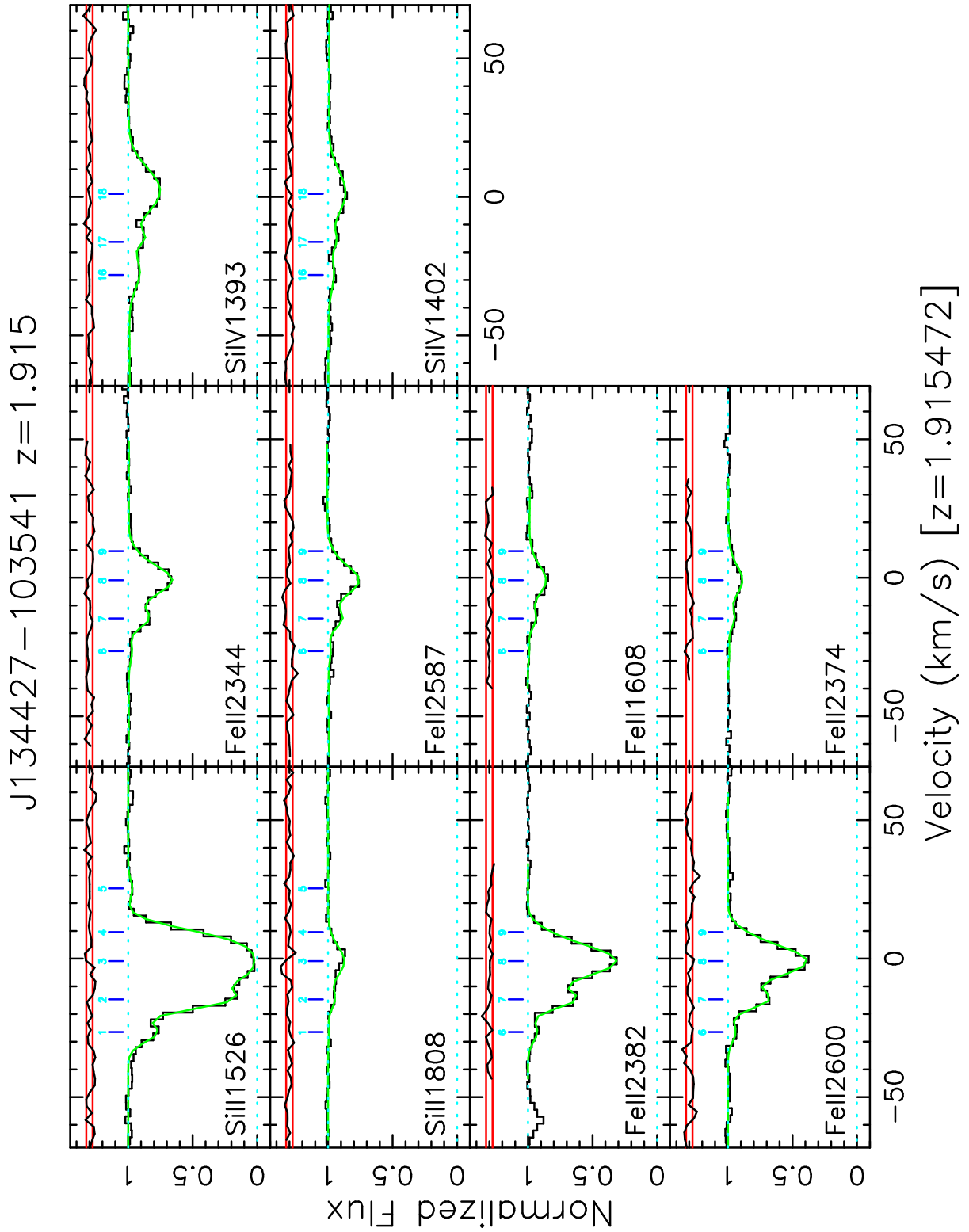
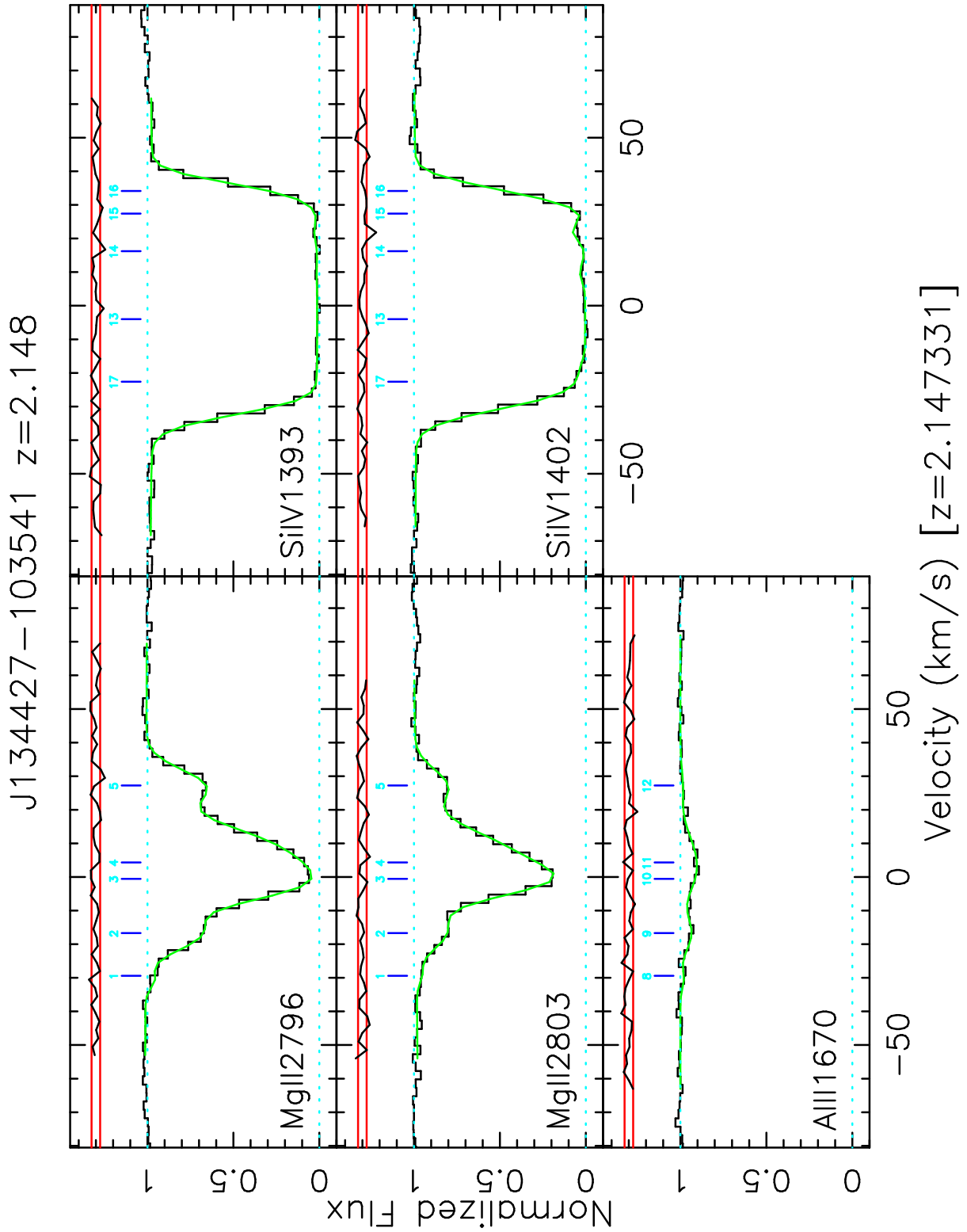


Figure 98. Many-multiplet fit for the  $z = 1.915$  absorber toward J133427-103541.



**Figure 99.** Many-multiplet fit for the  $z = 2.148$  absorber toward J133427–103541.

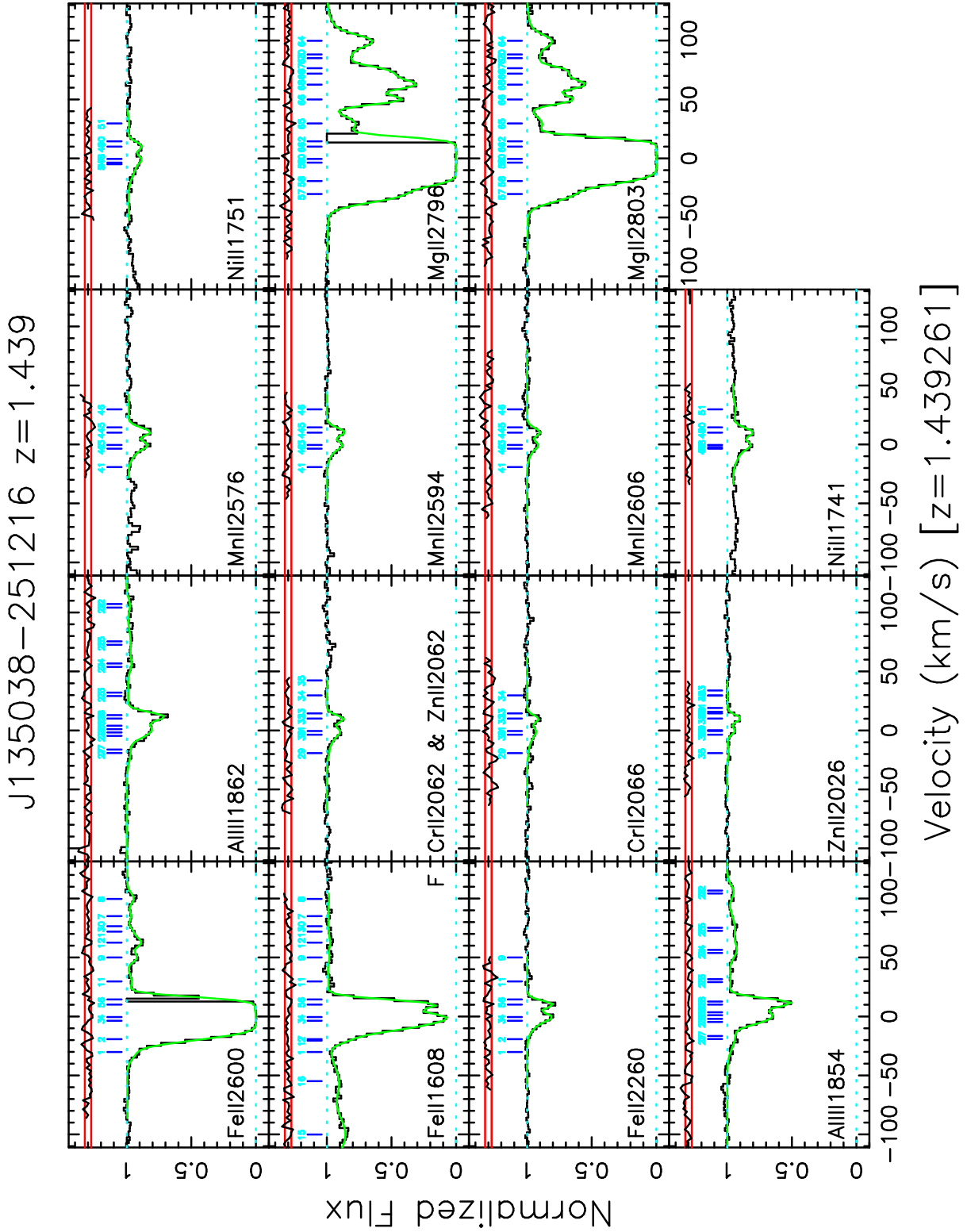
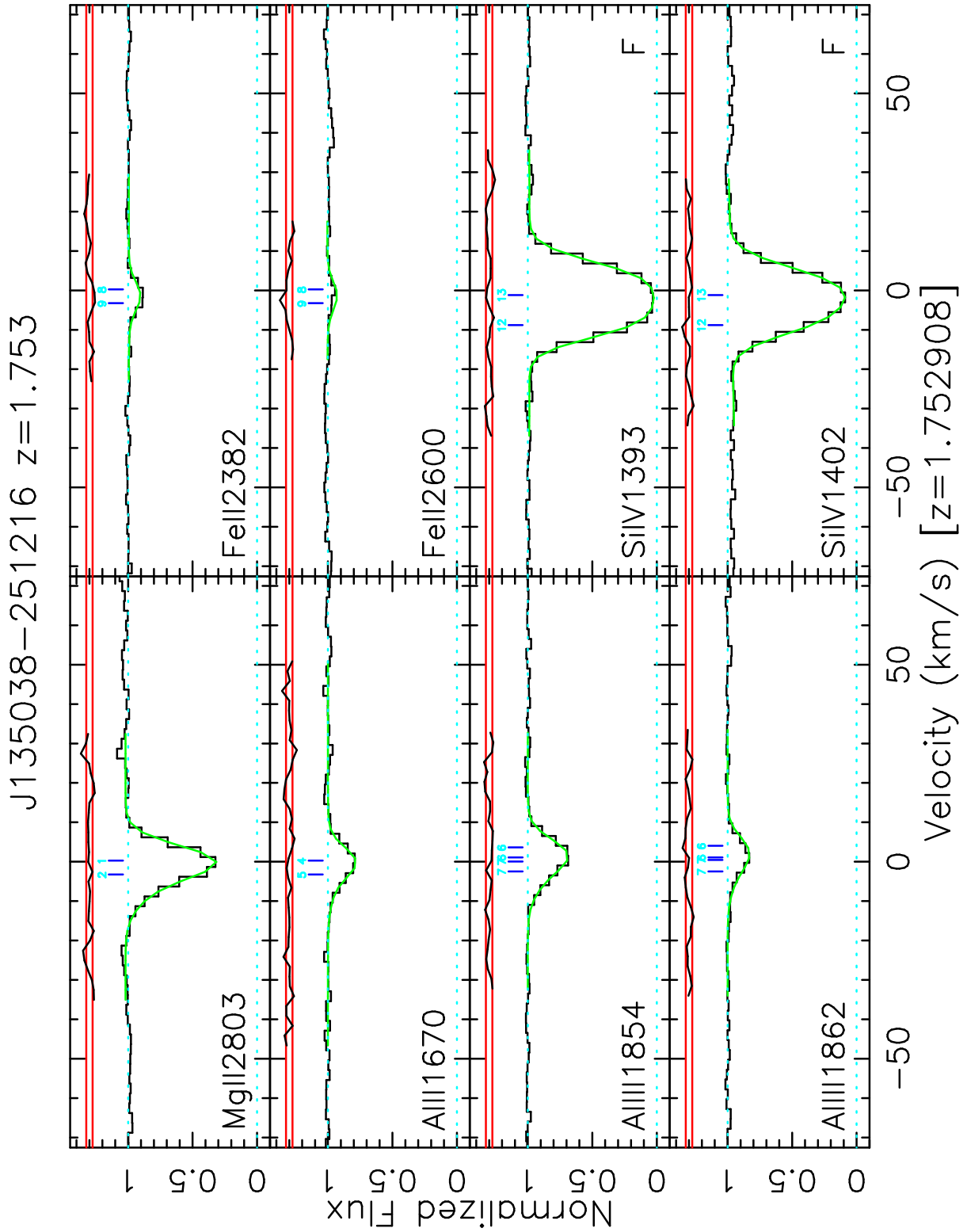


Figure 100. Many-multiplet fit for the  $z = 1.439$  absorber toward J135038–251216.



**Figure 101.** Many-multiplet fit for the  $z = 1.753$  absorber toward J135038-251216.

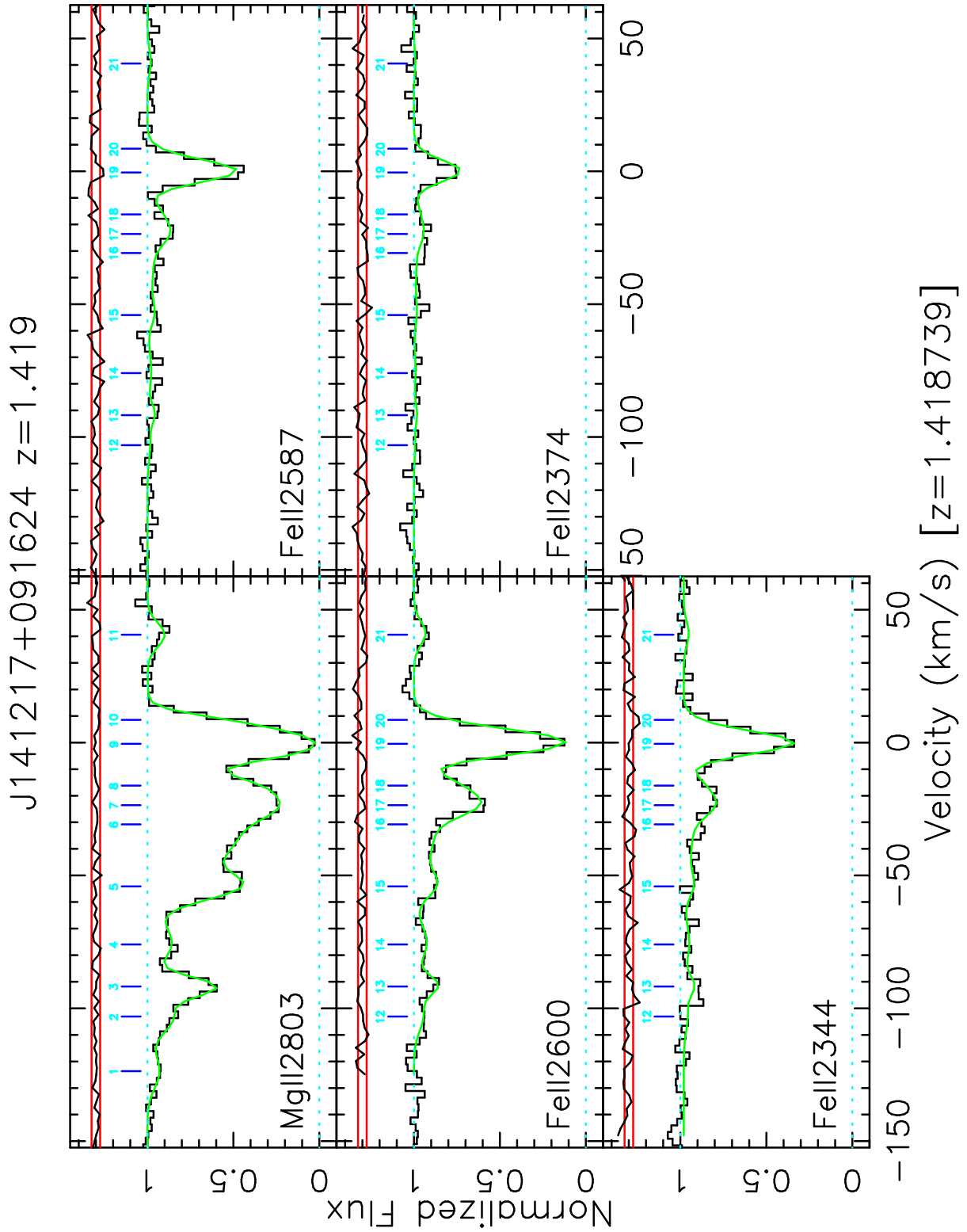
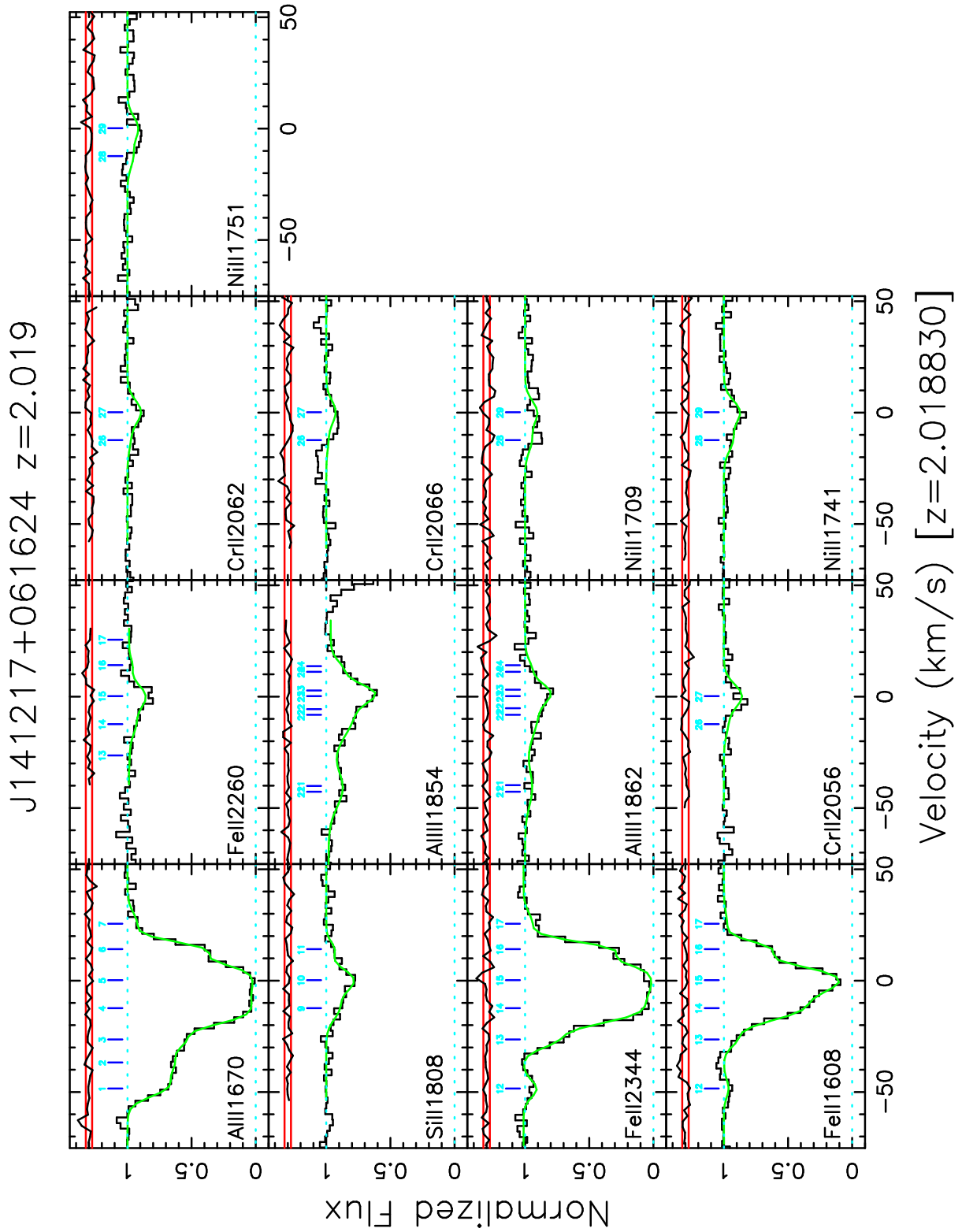
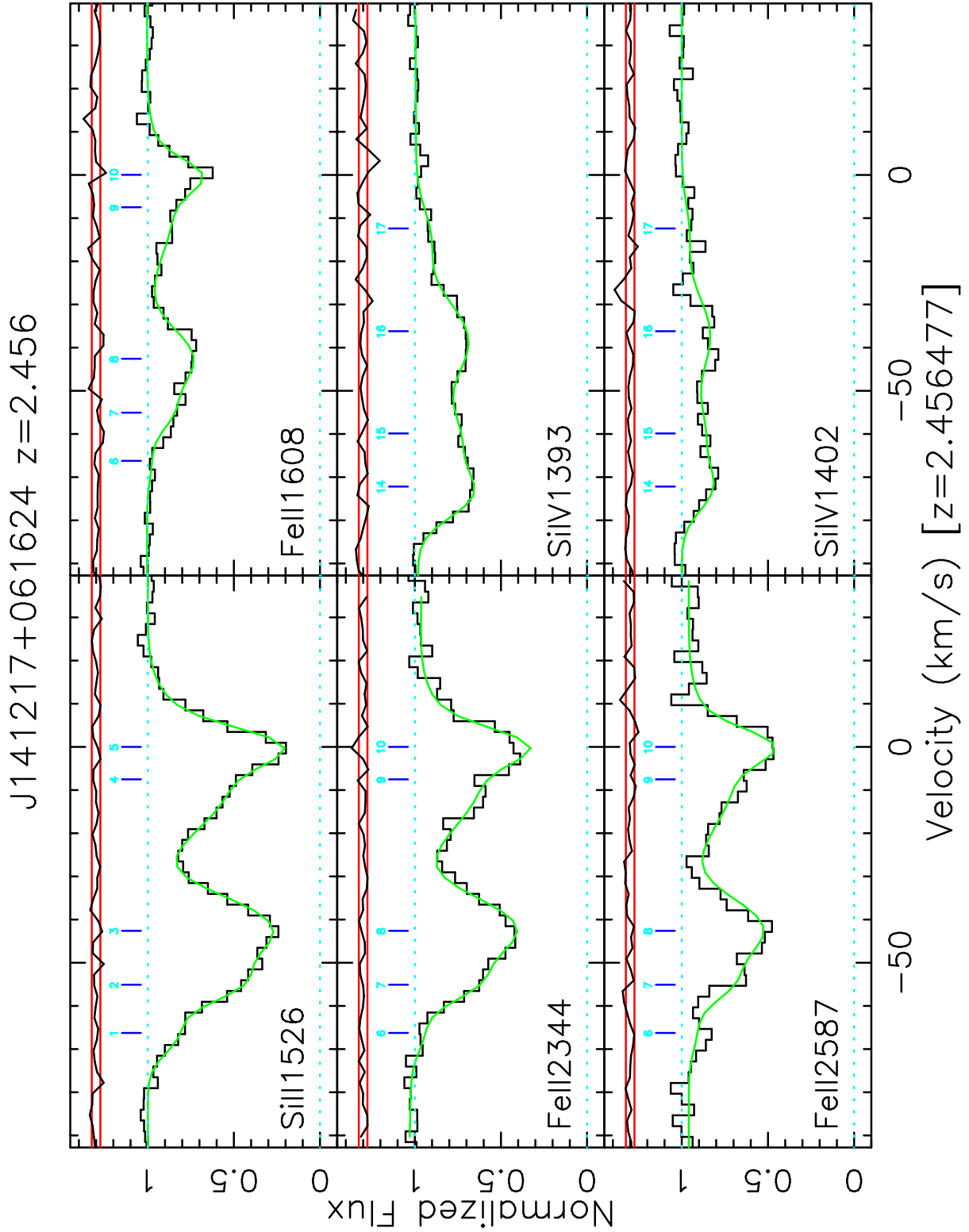


Figure 102. Many-multiplet fit for the  $z = 1.419$  absorber toward J141217+091624.

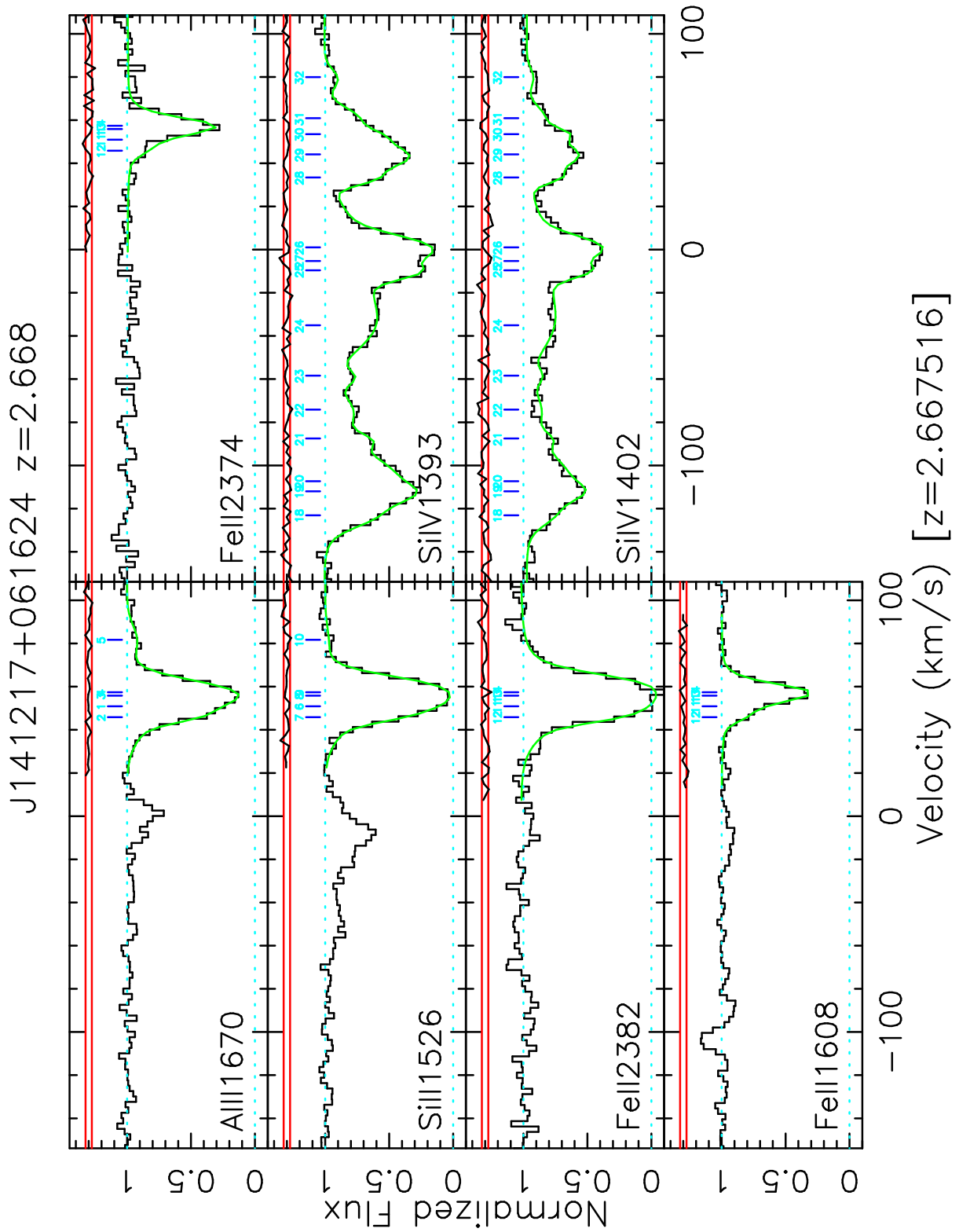


**Figure 103.** Many-multiplet fit for the  $z = 2.109$  absorber toward J141217+091624.

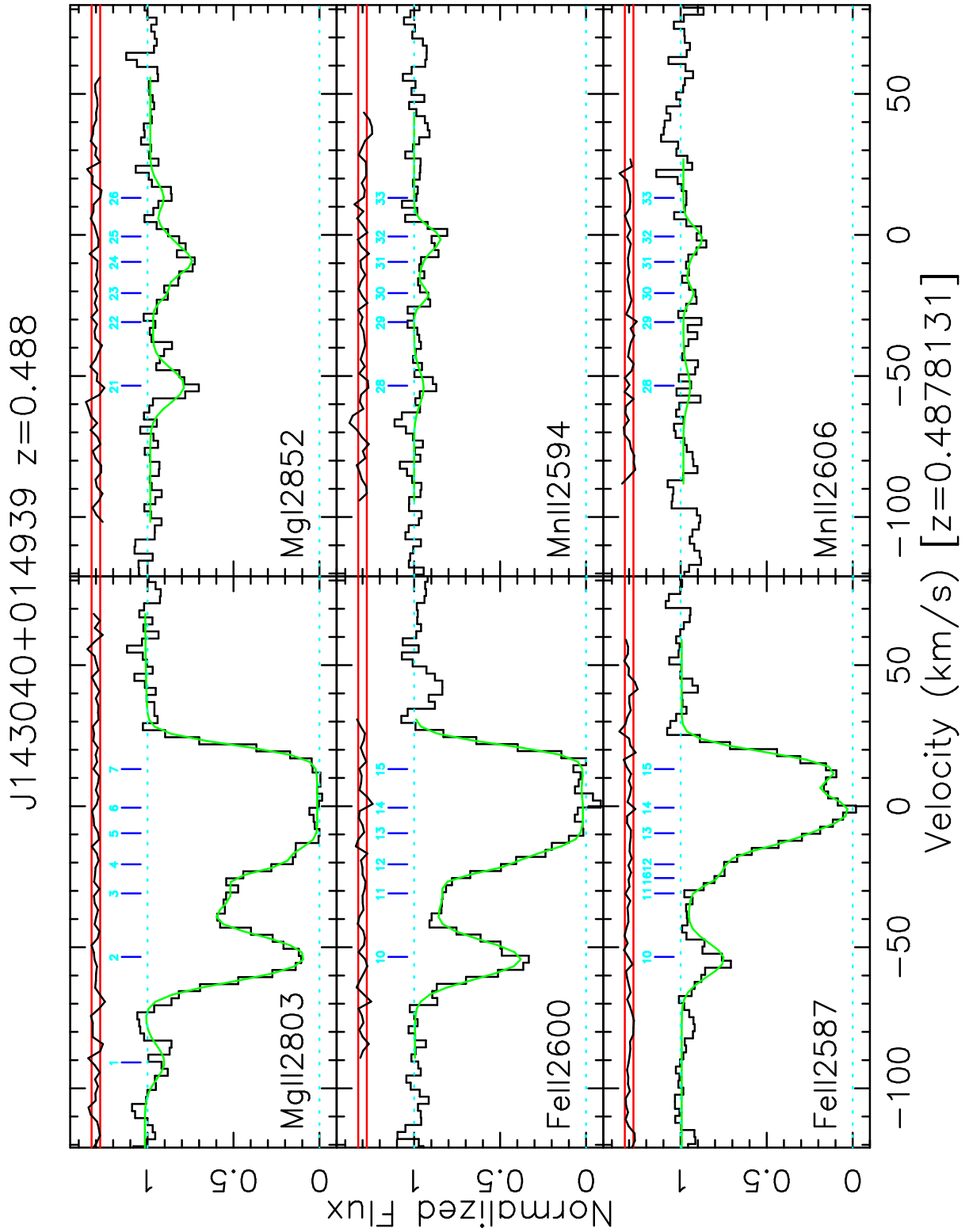




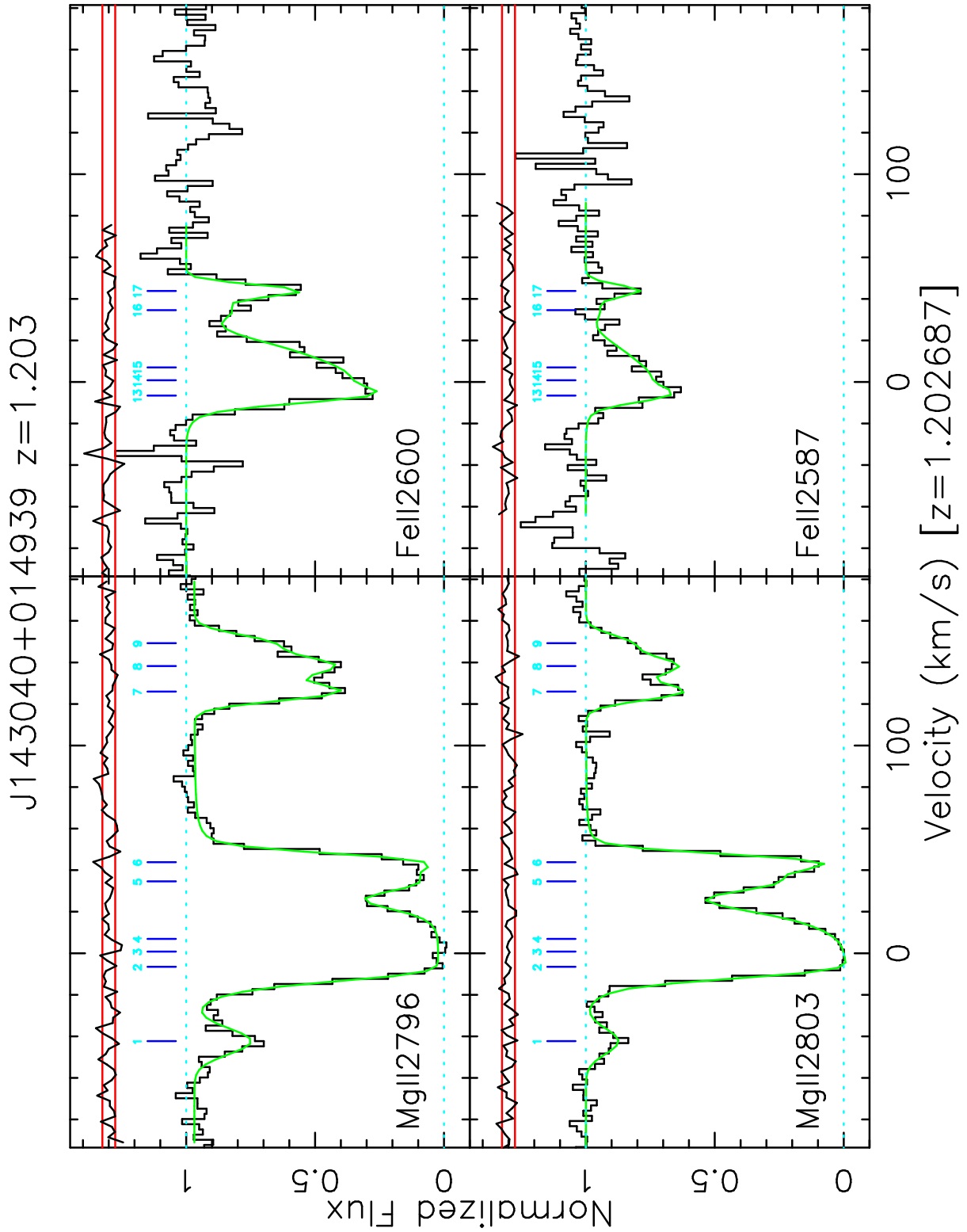
**Figure 104.** Many-multiplet fit for the  $z = 2.456$  absorber toward J141217+091624.



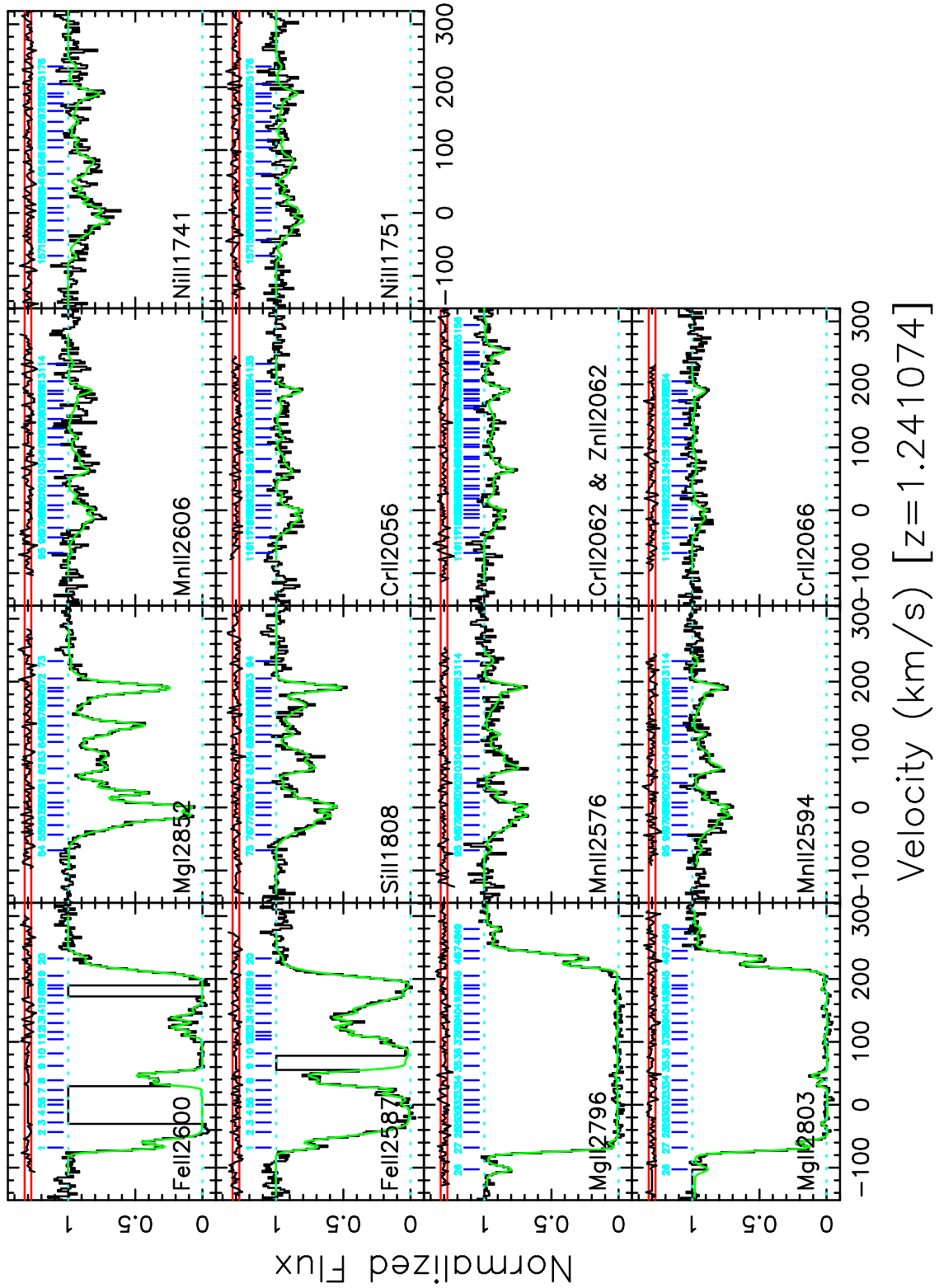
**Figure 105.** Many-multiplet fit for the  $z = 2.668$  absorber toward J141217+091624.

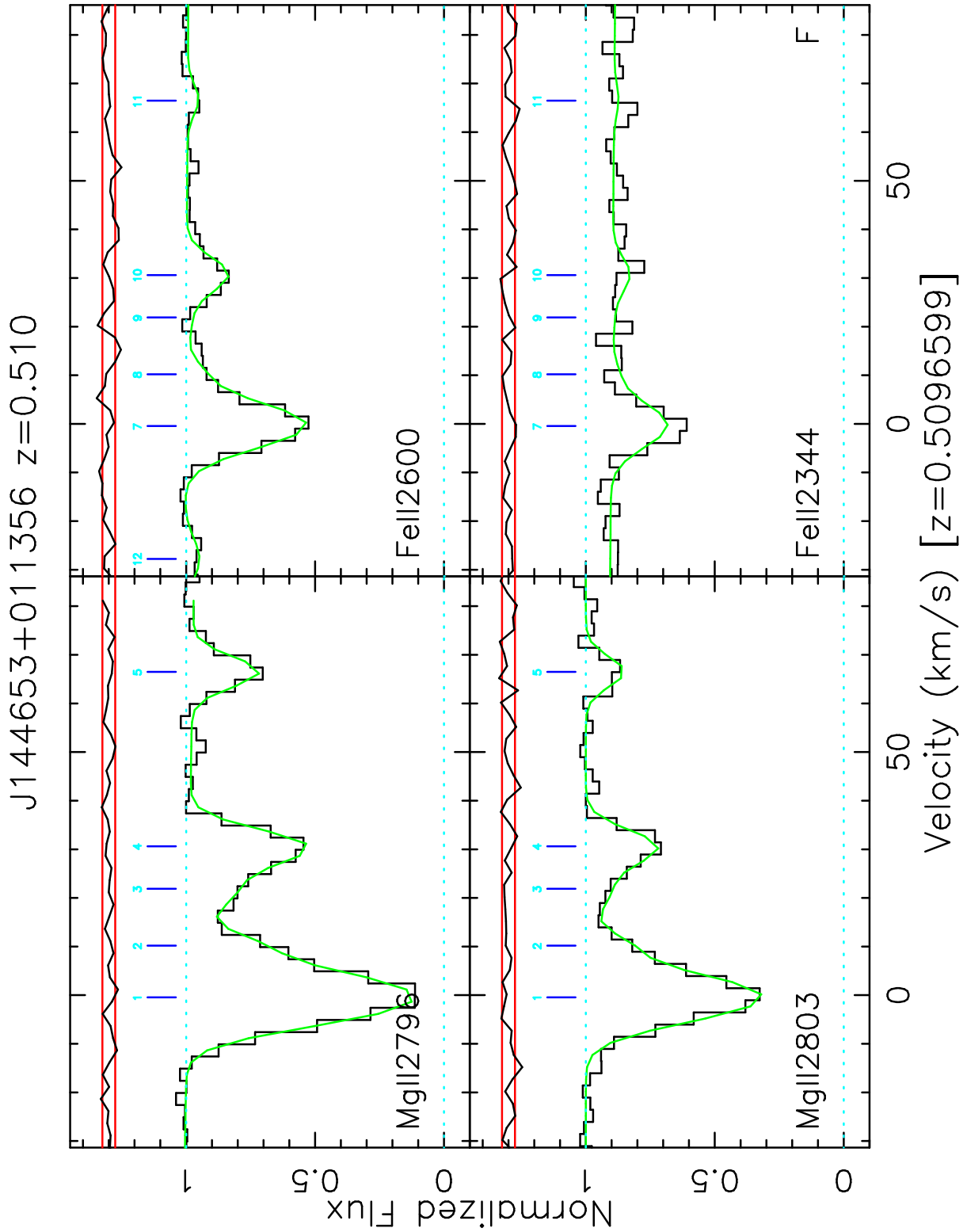


**Figure 106.** Many-multiplet fit for the  $z = 0.488$  absorber toward J143040+014939.



**Figure 107.** Many-multiplet fit for the  $z = 1.203$  absorber toward J143040+014939.

J143040+014939  $z=1.241$ 

 Figure 108. Many-multiplet fit for the  $z = 1.241$  absorber toward J143040+014939.



**Figure 109.** Many-multiplet fit for the  $z = 0.510$  absorber toward J144653+011356.

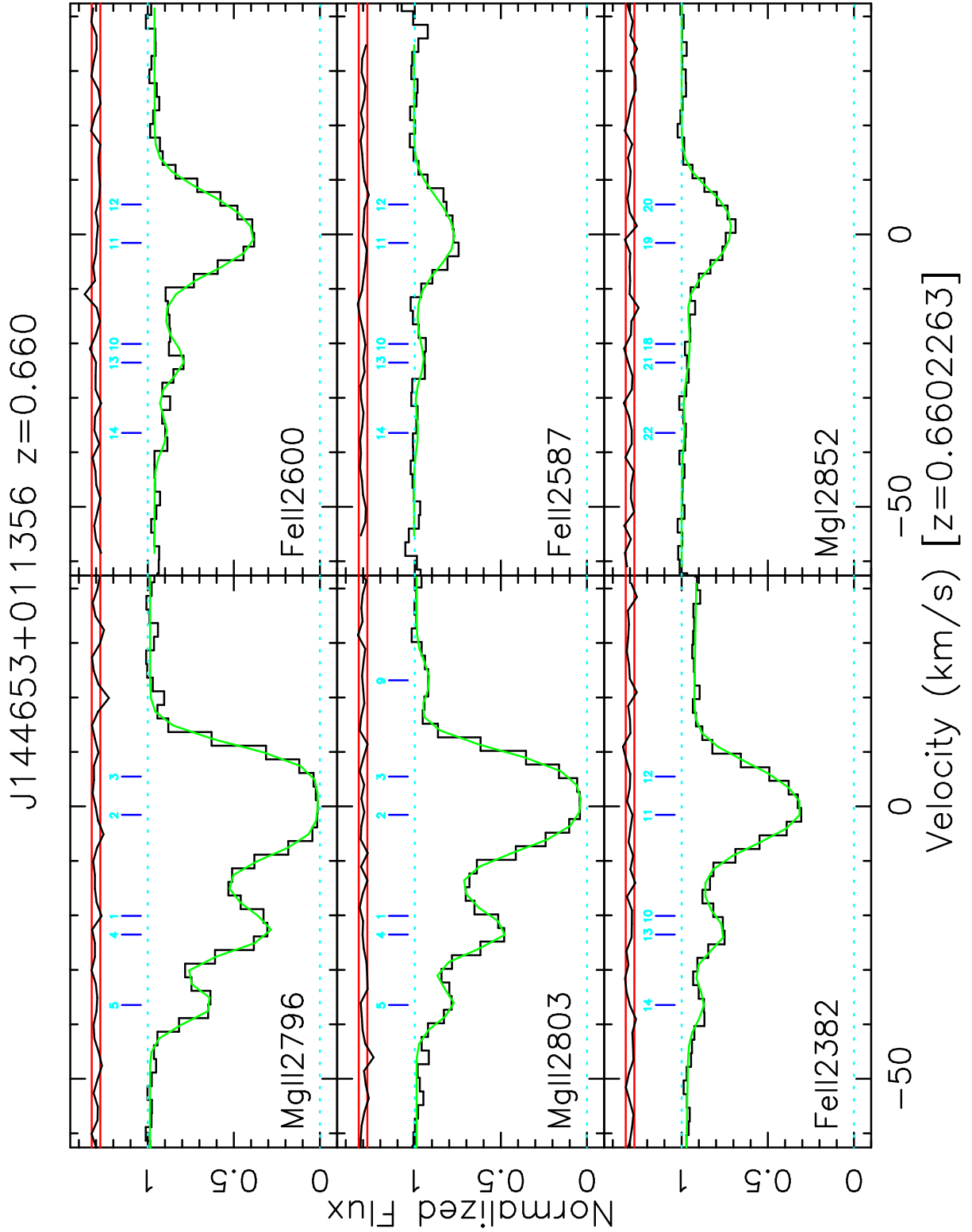
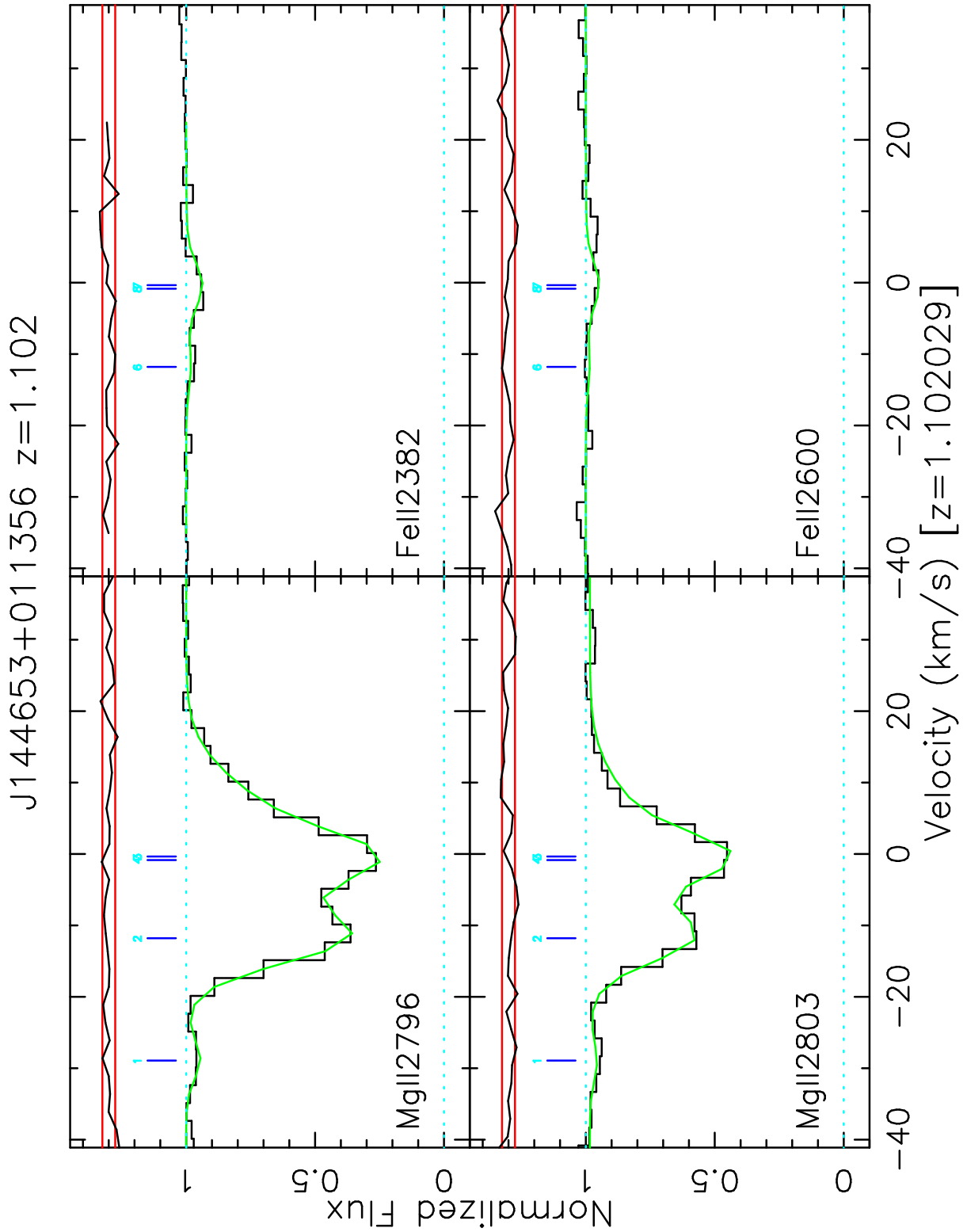


Figure 110. Many-multiplet fit for the  $z = 0.660$  absorber toward J144653+011356.



**Figure 111.** Many-multiplet fit for the  $z = 1.102$  absorber toward J144653+011356.



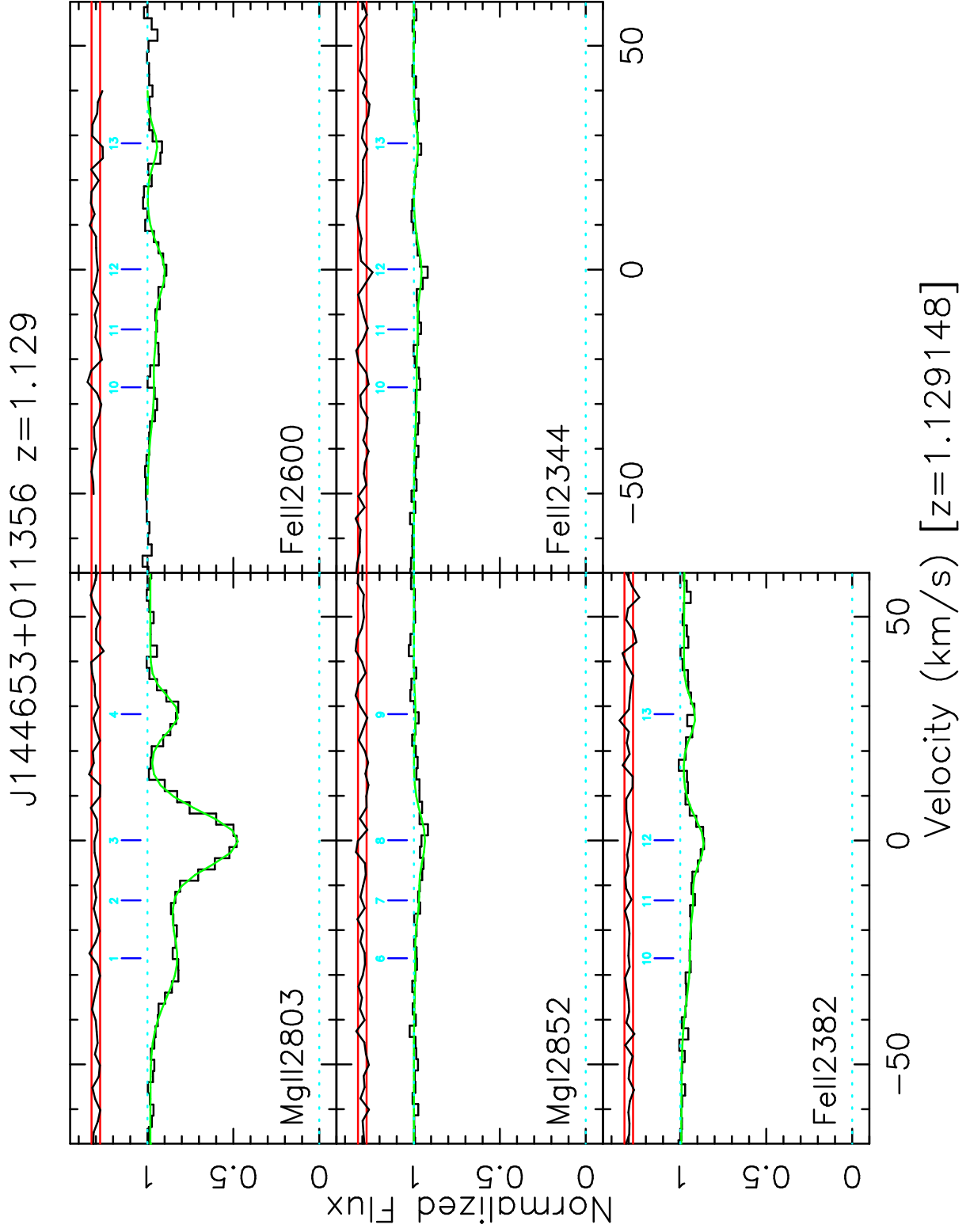


Figure 112. Many-multiplet fit for the  $z = 1.129$  absorber toward J144653+011356.

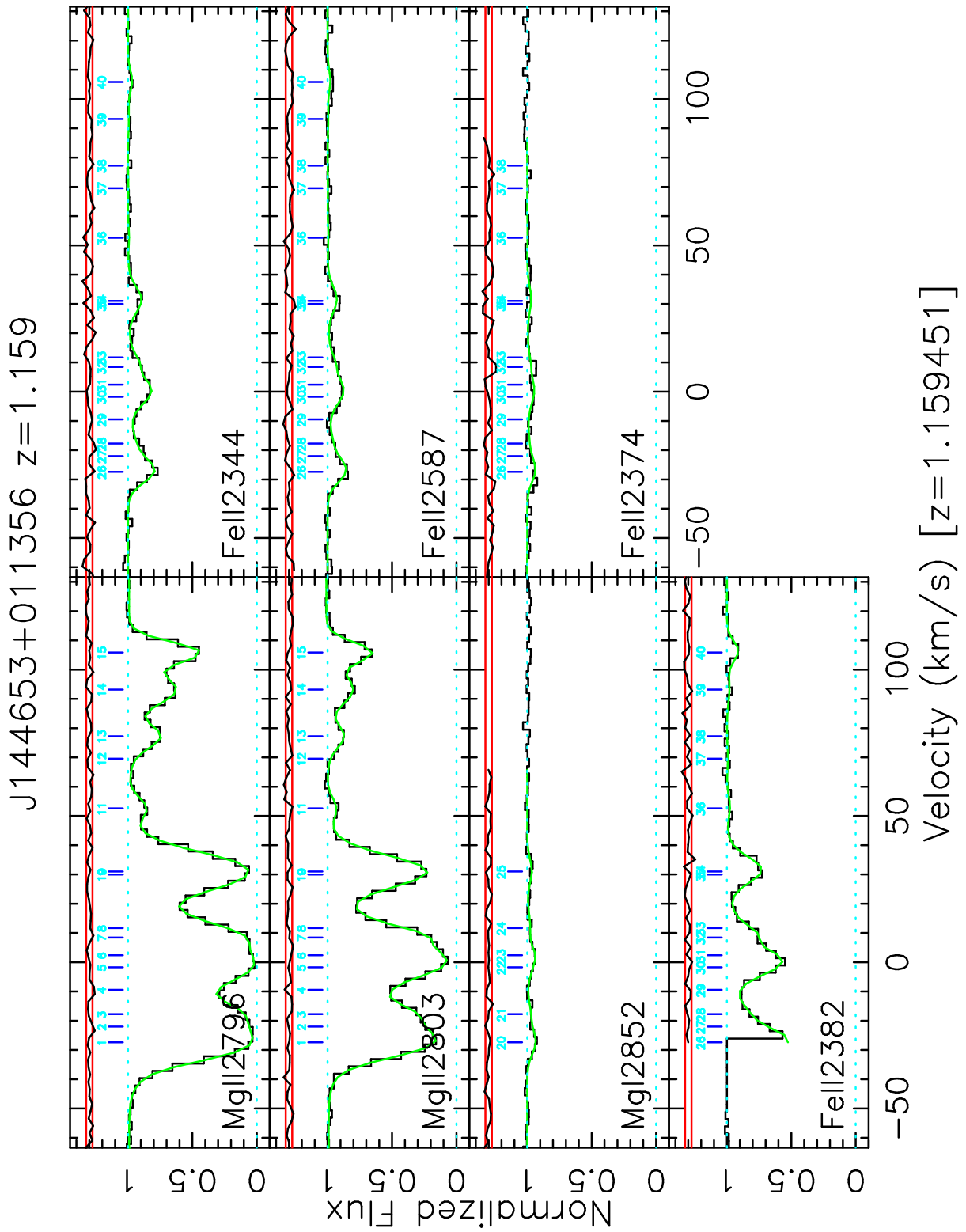


Figure 113. Many-multiplet fit for the  $z = 1.159$  absorber toward J144653+011356.

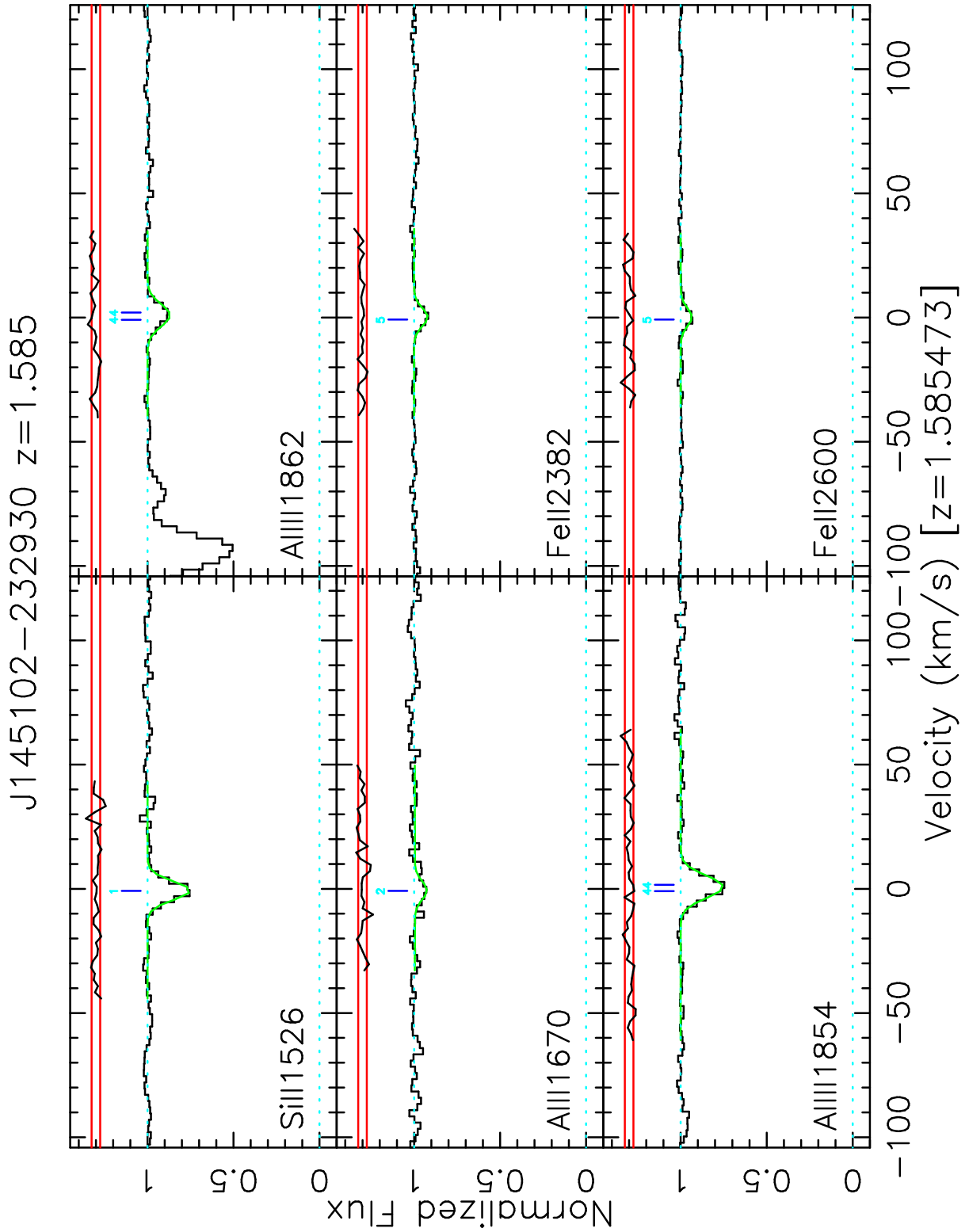
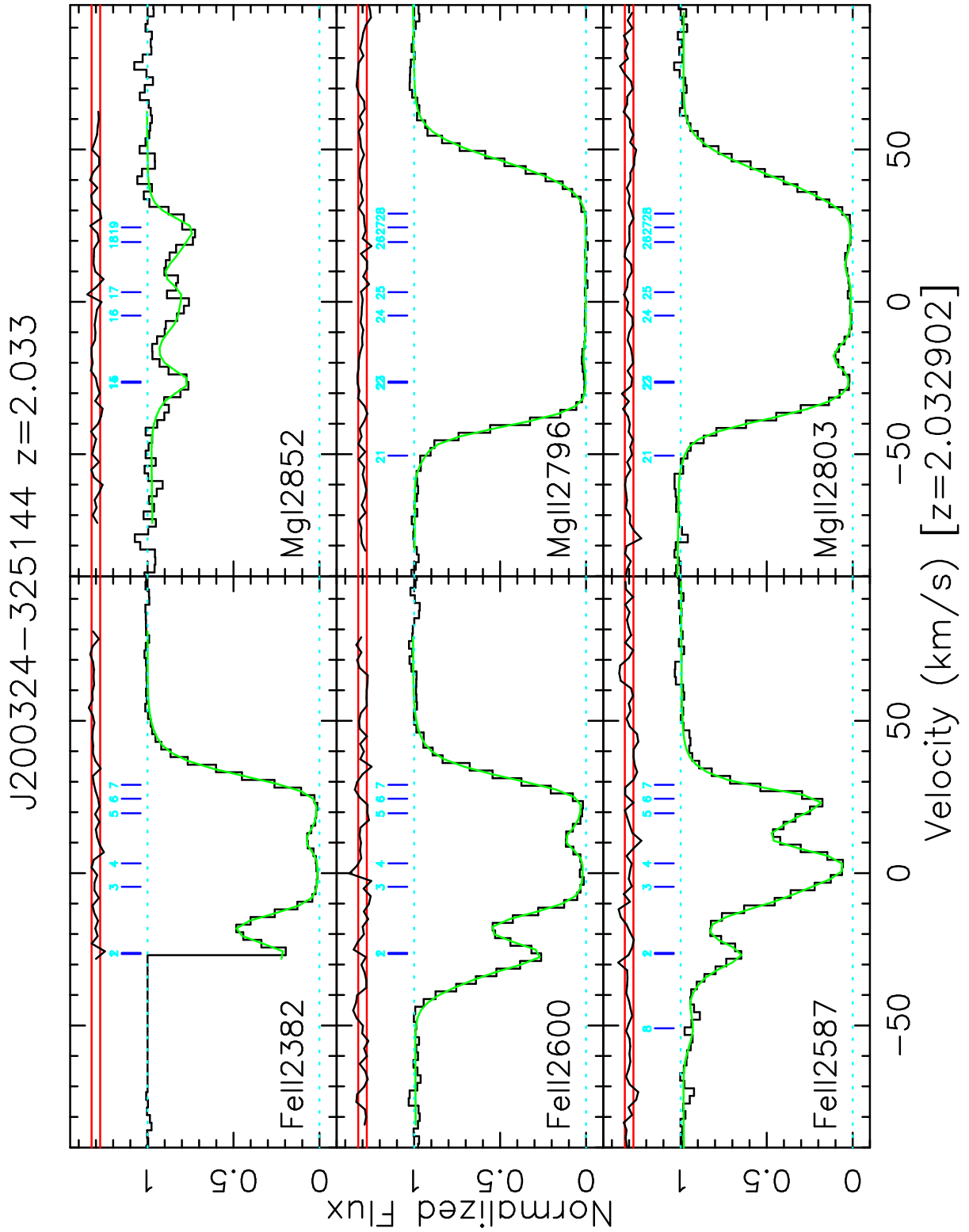
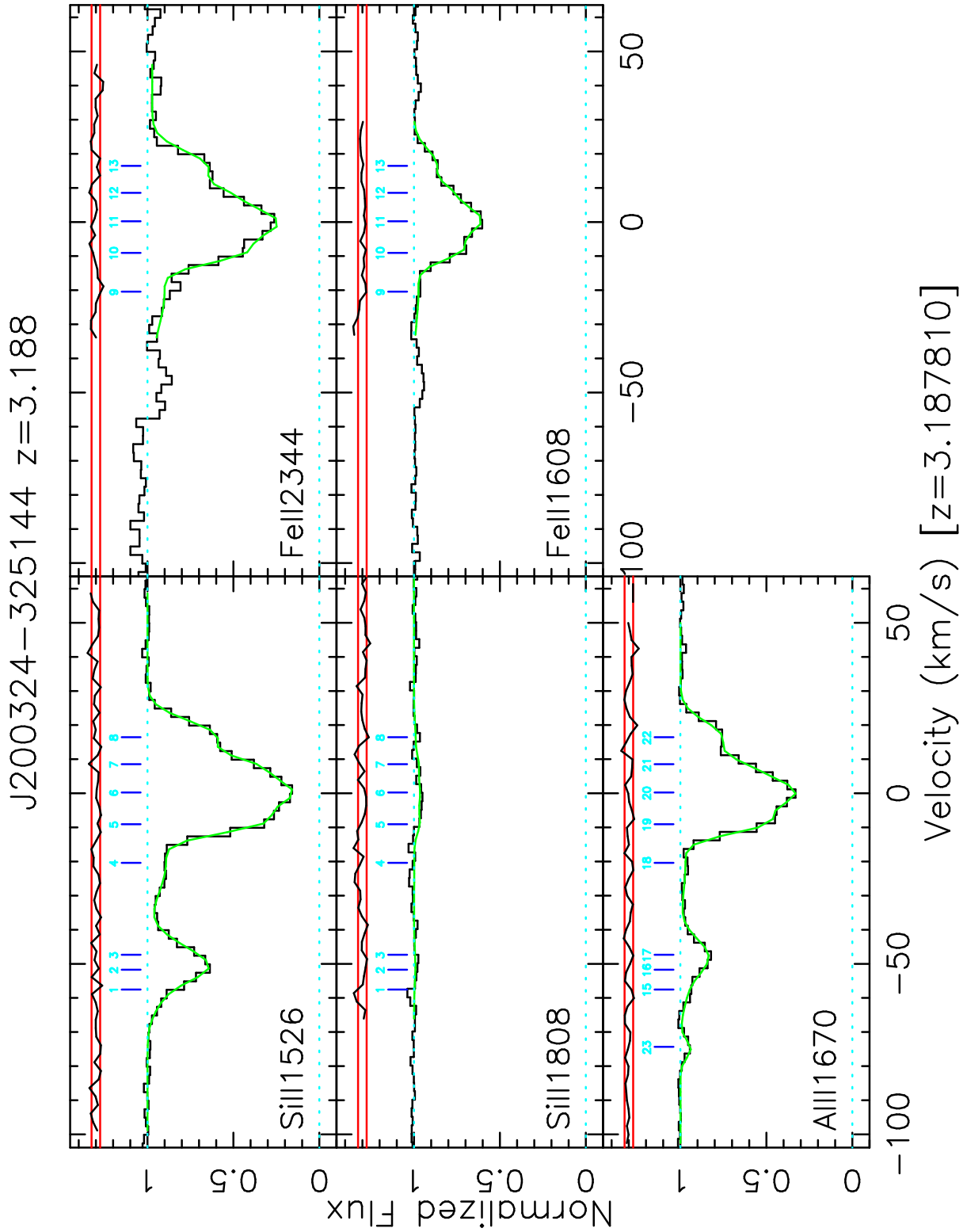


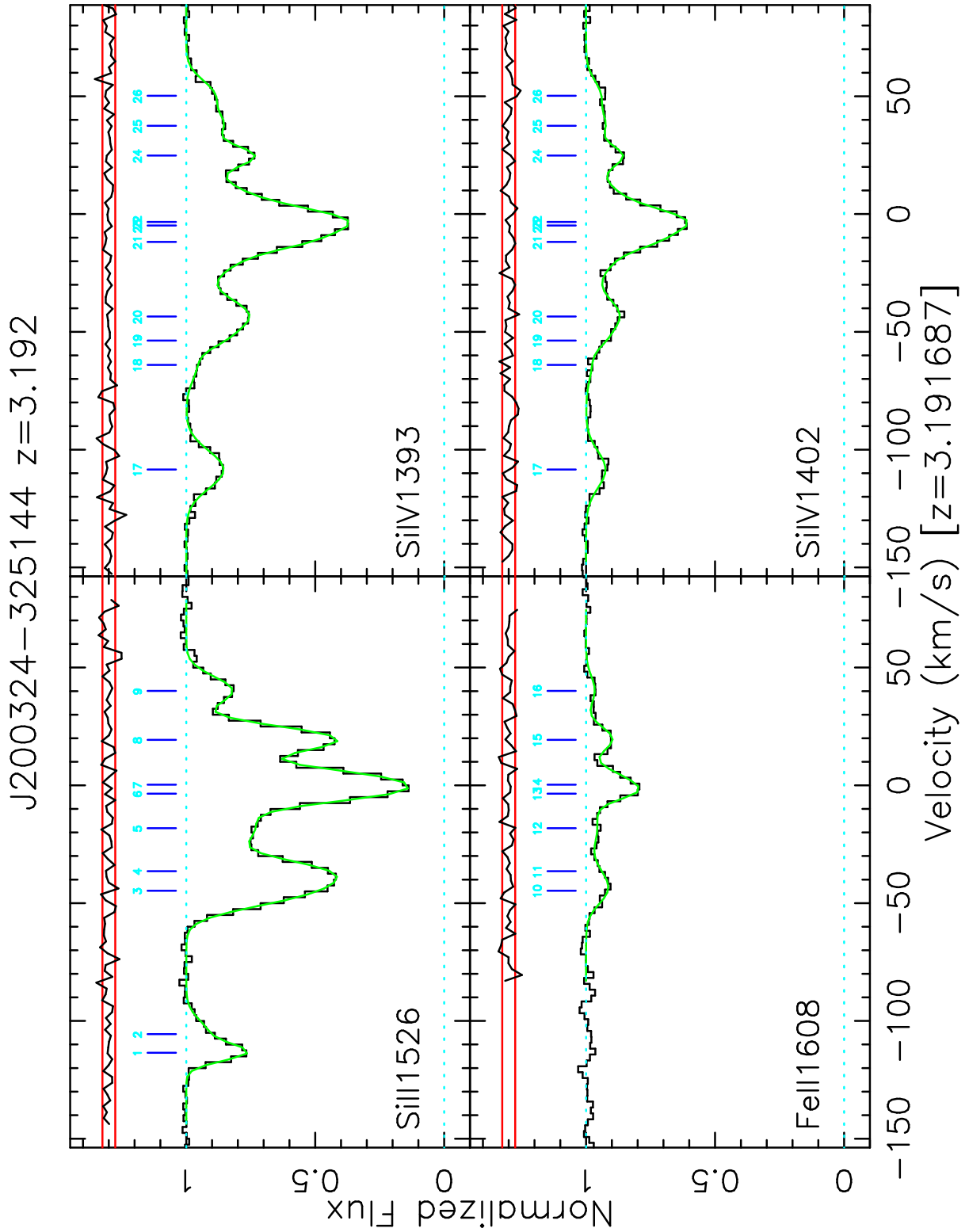
Figure 114. Many-multiplet fit for the  $z = 1.585$  absorber toward J145102–232930.



**Figure 115.** Many-multiplet fit for the  $z = 2.033$  absorber toward J200324–325144.



**Figure 116.** Many-multiplet fit for the  $z = 3.188$  absorber toward J200324–325144.



**Figure 117.** Many-multiplet fit for the  $z = 3.192$  absorber toward J200324–325144.

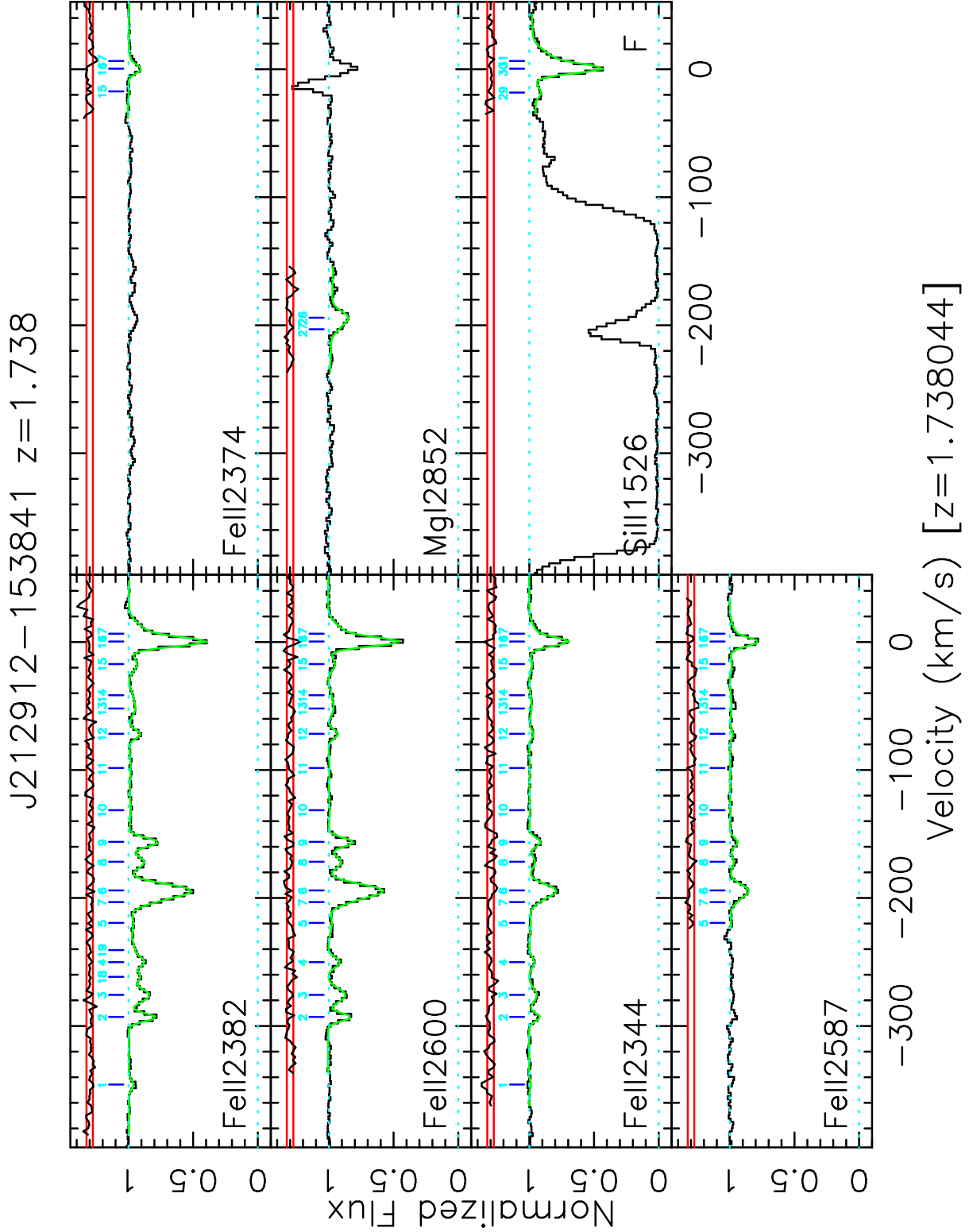
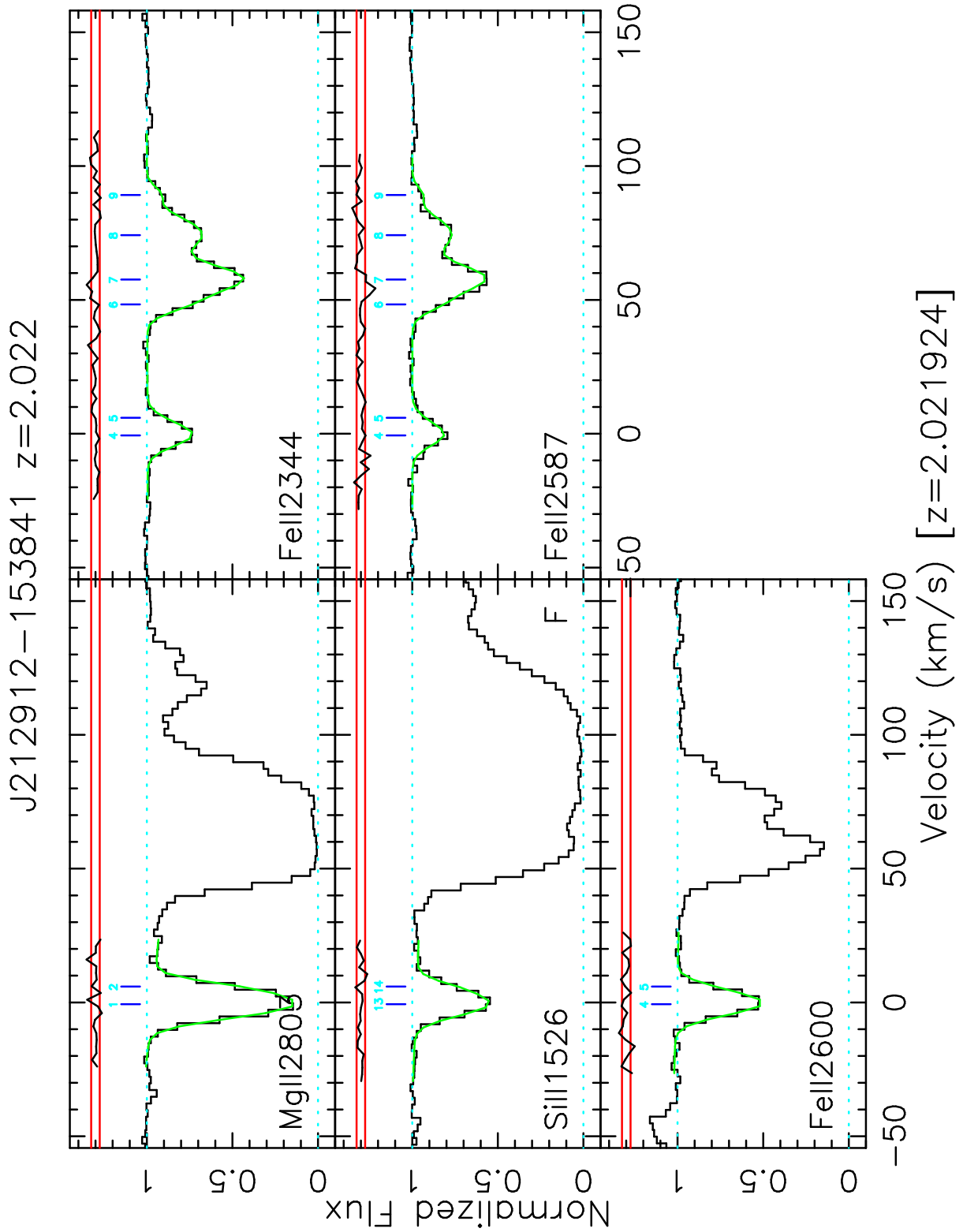
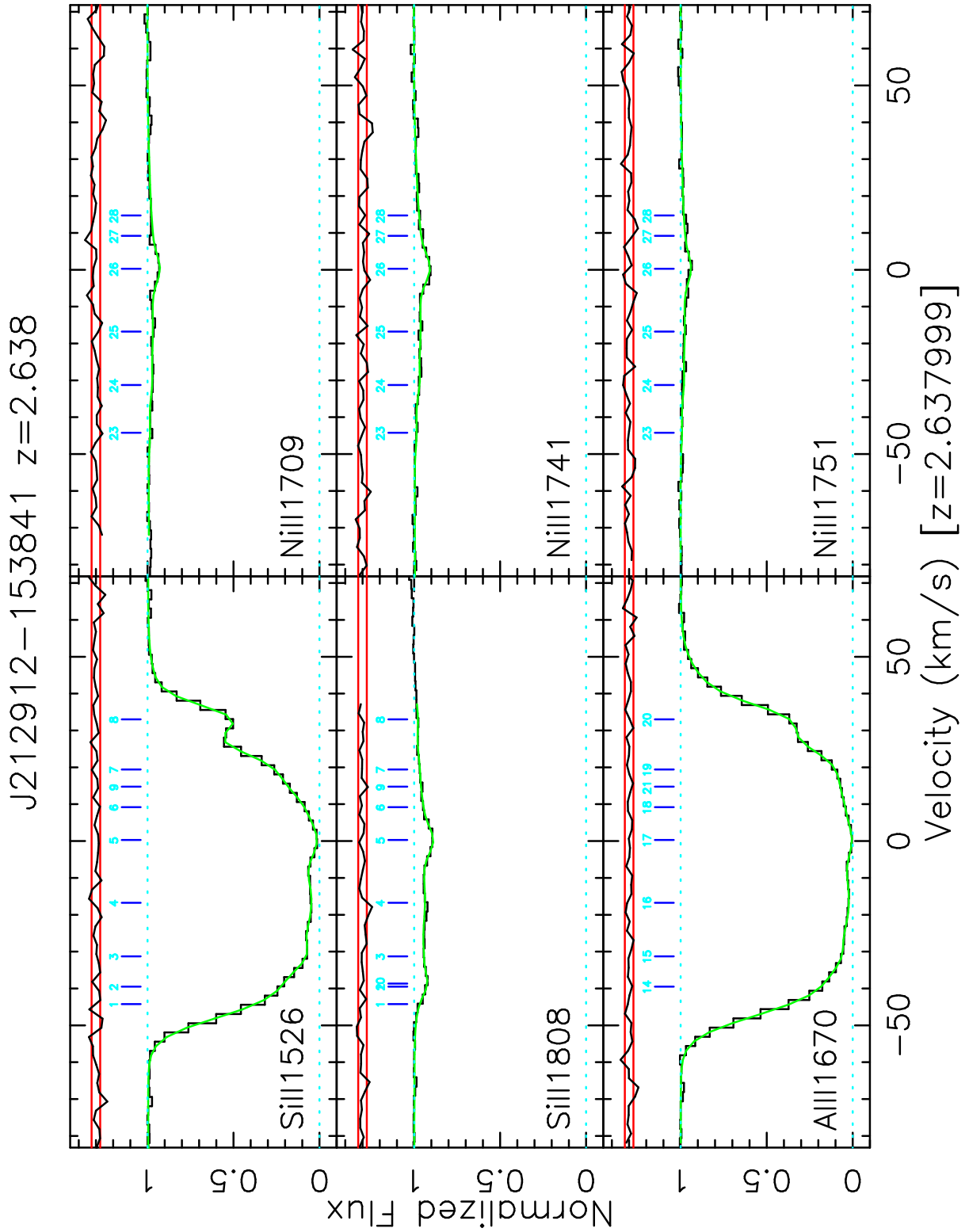


Figure 118. Many-multiplet fit for the  $z = 1.738$  absorber toward J212912-153841.

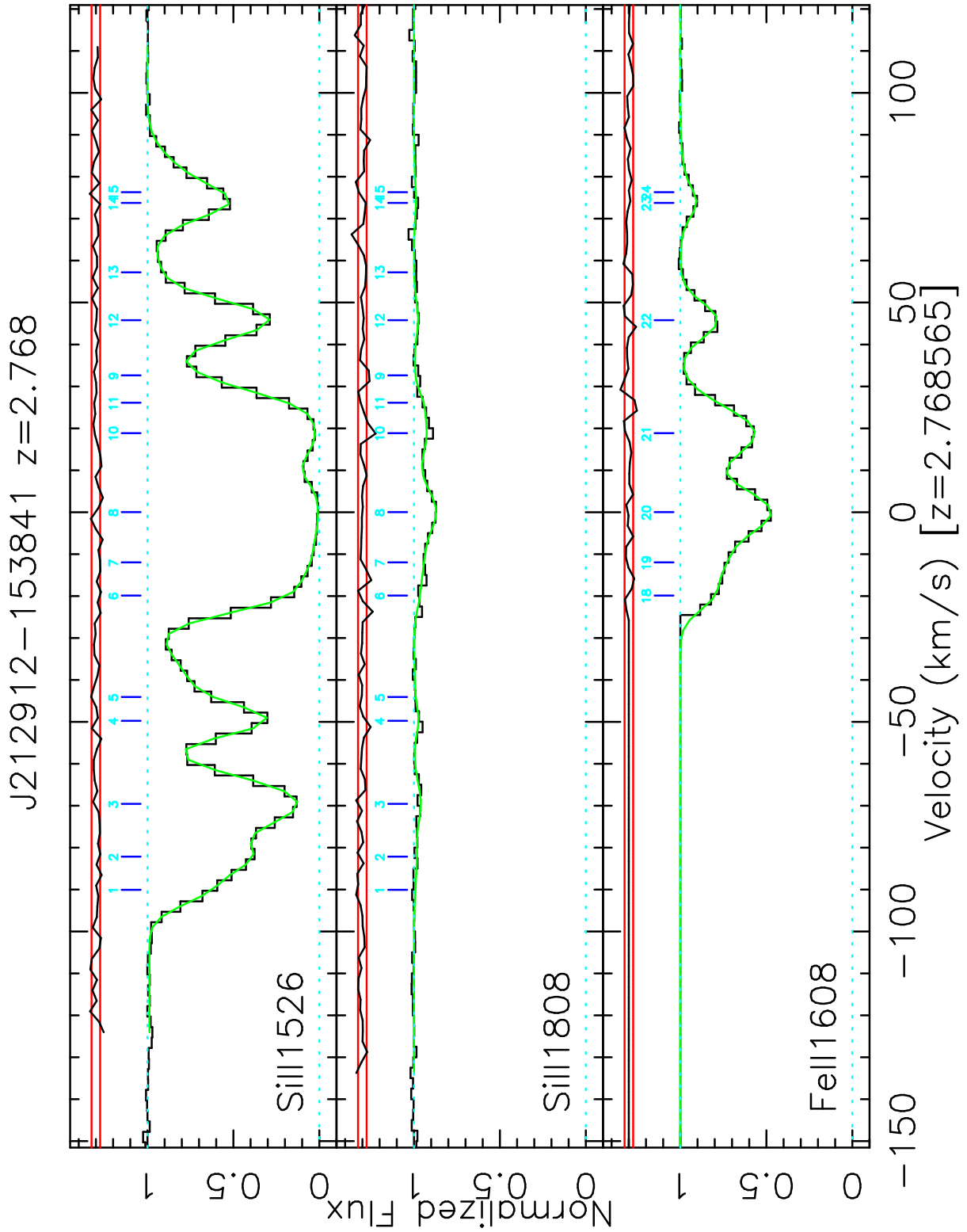


**Figure 119.** Many-multiplet fit for the  $z = 2.022$  absorber toward J212912-153841.





**Figure 120.** Many-multiplet fit for the  $z = 2.638$  absorber toward J212912-153841.



**Figure 121.** Many-multiplet fit for the  $z = 2.768$  absorber toward J212912–153841.

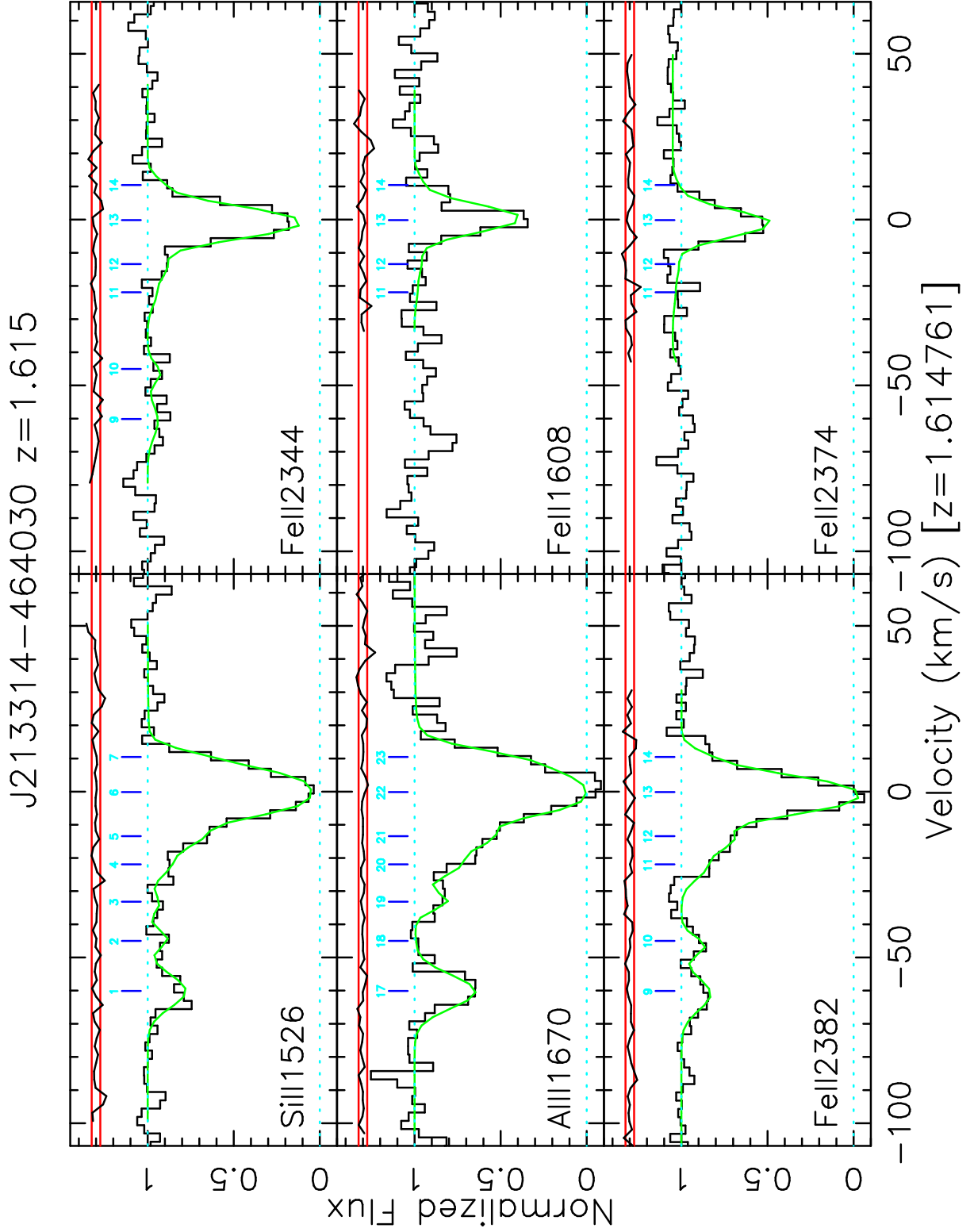
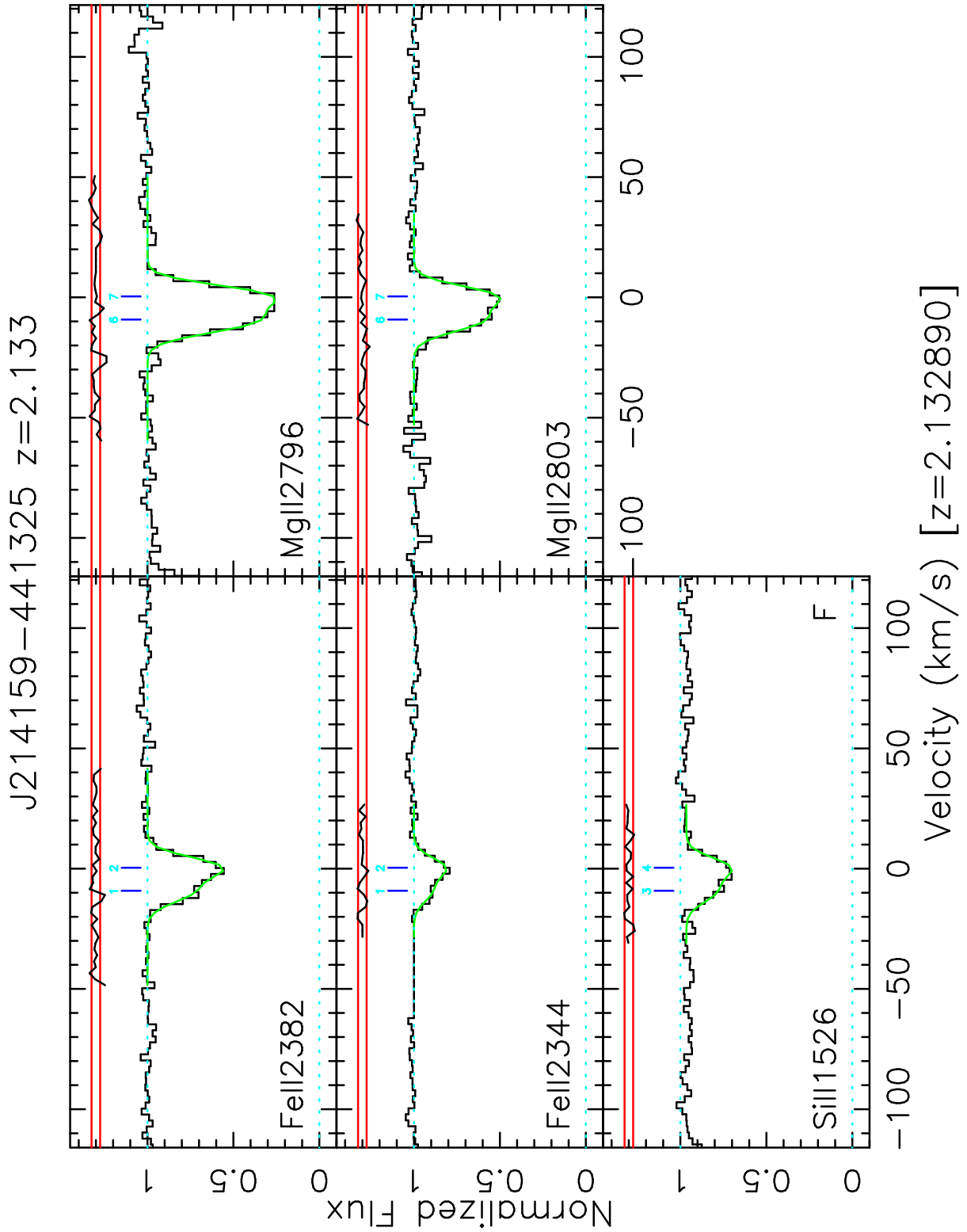


Figure 122. Many-multiplet fit for the  $z = 1.615$  absorber toward J213314-464030.



**Figure 123.** Many-multiplet fit for the  $z = 2.133$  absorber toward J214159-441325.

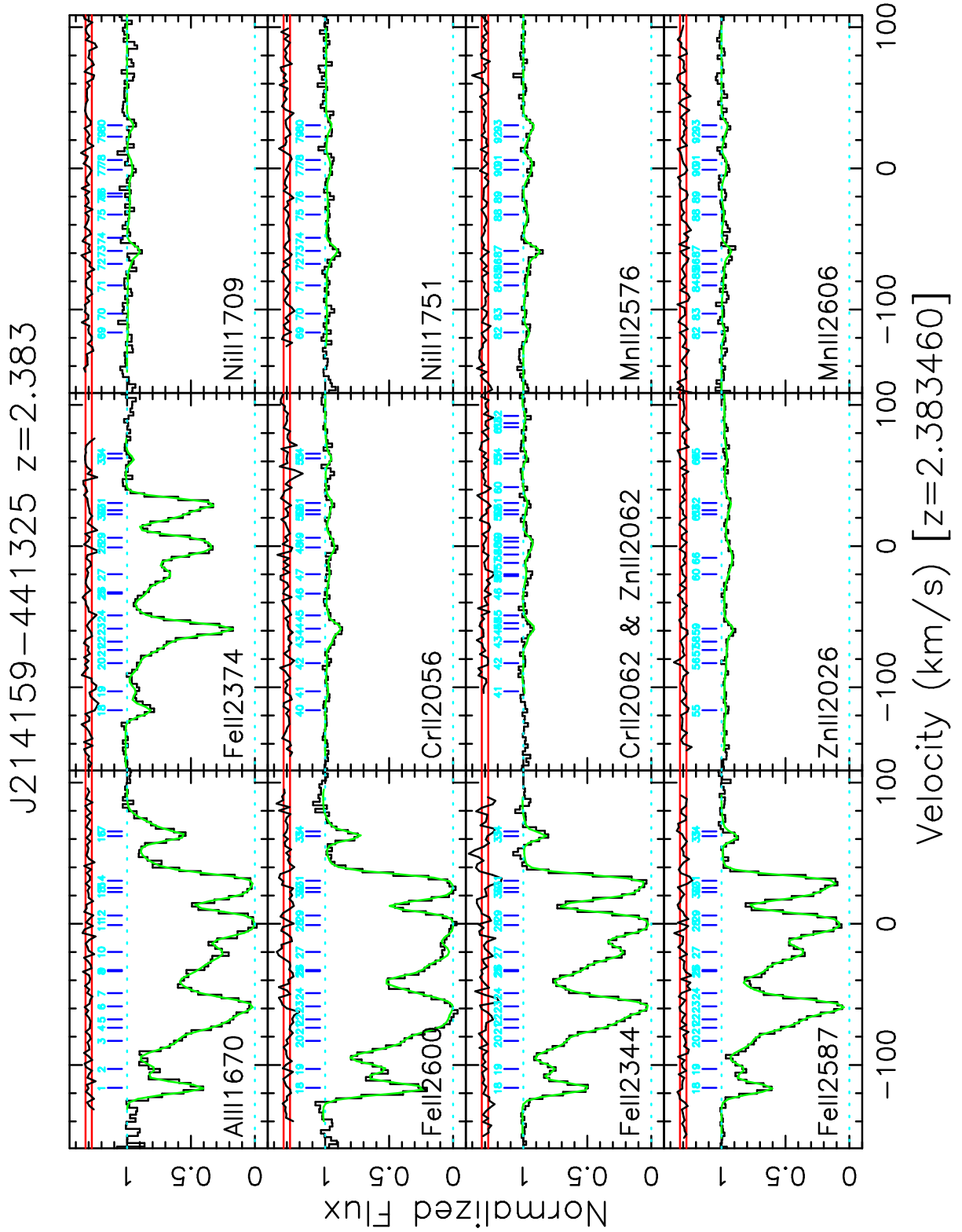


Figure 124. Many-multiplet fit for the  $z = 2.383$  absorber toward J214159–441325.

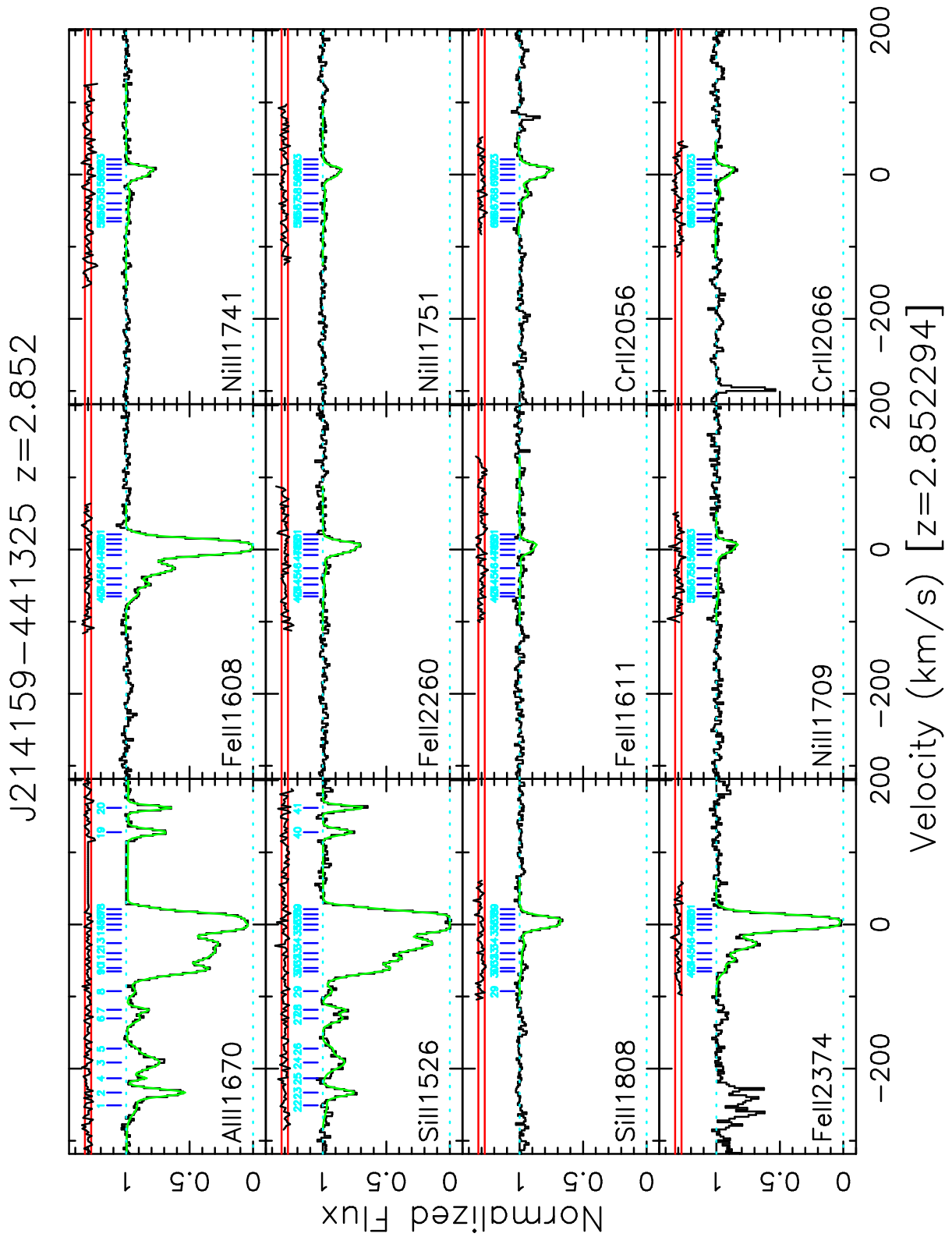
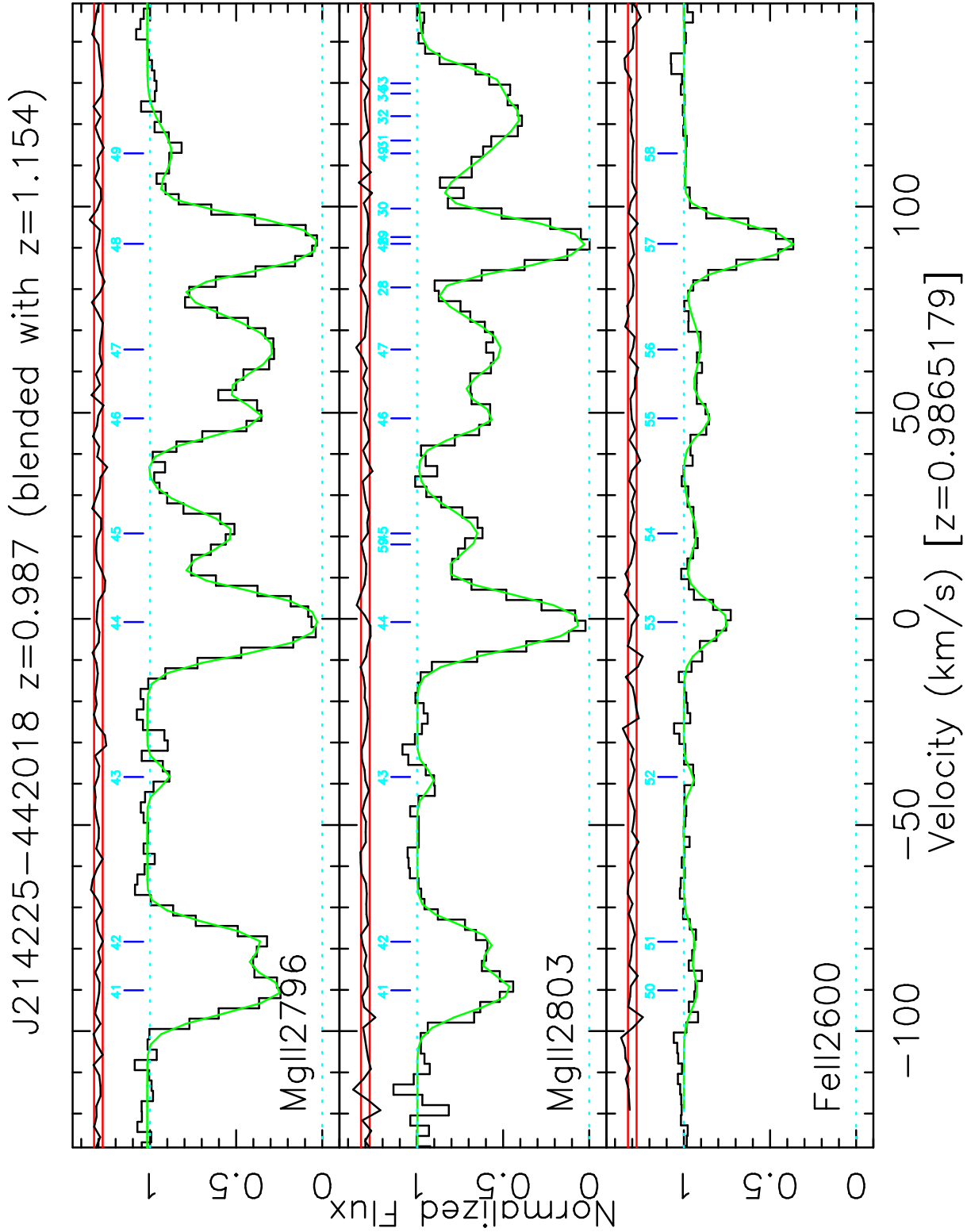
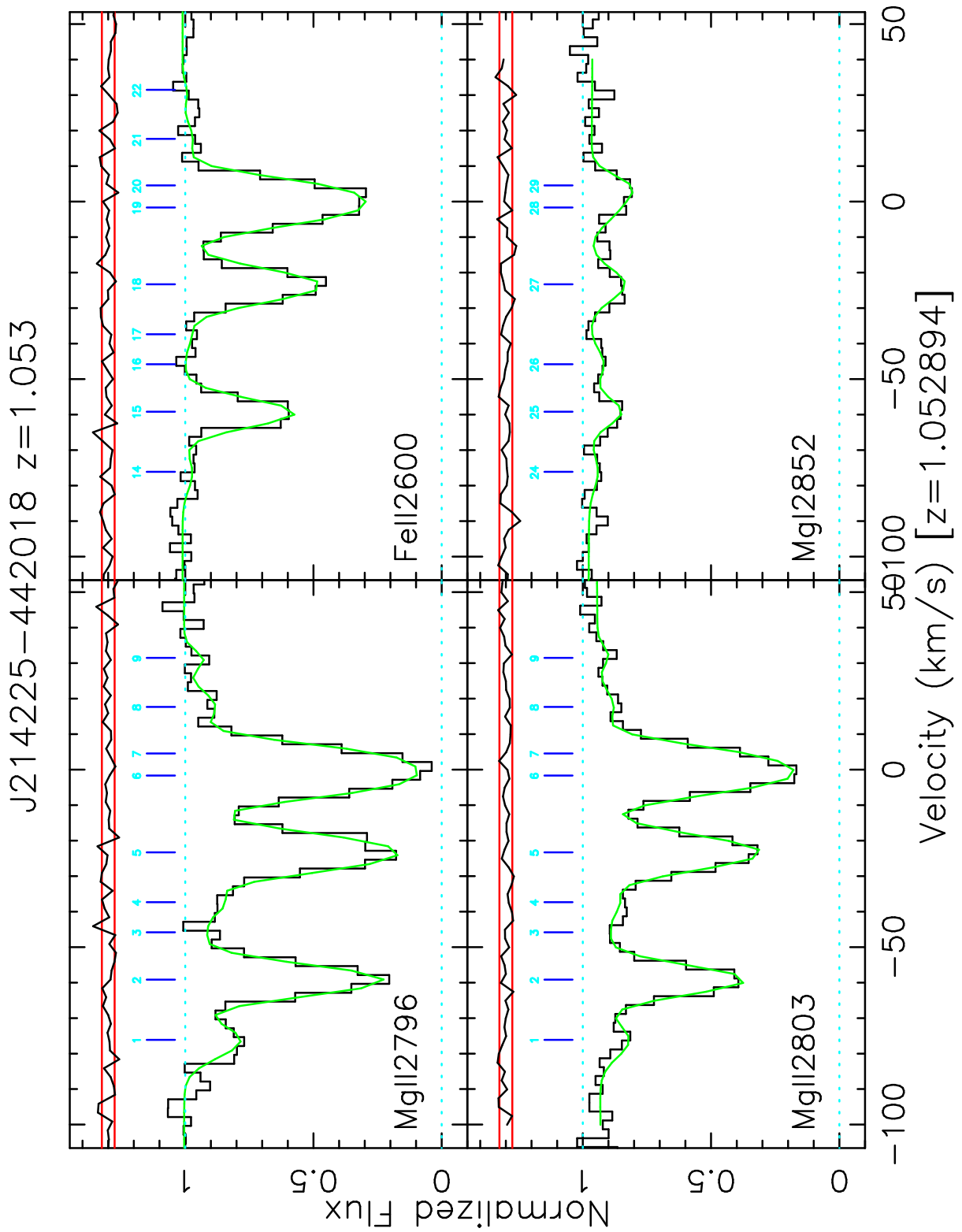


Figure 125. Many-multiplet fit for the  $z = 2.852$  absorber toward J214159-441325.



**Figure 126.** Many-multiplet fit for the  $z = 0.987$  absorber toward J214225–442018.



**Figure 127.** Many-multiplet fit for the  $z = 1.053$  absorber toward J214225–442018.



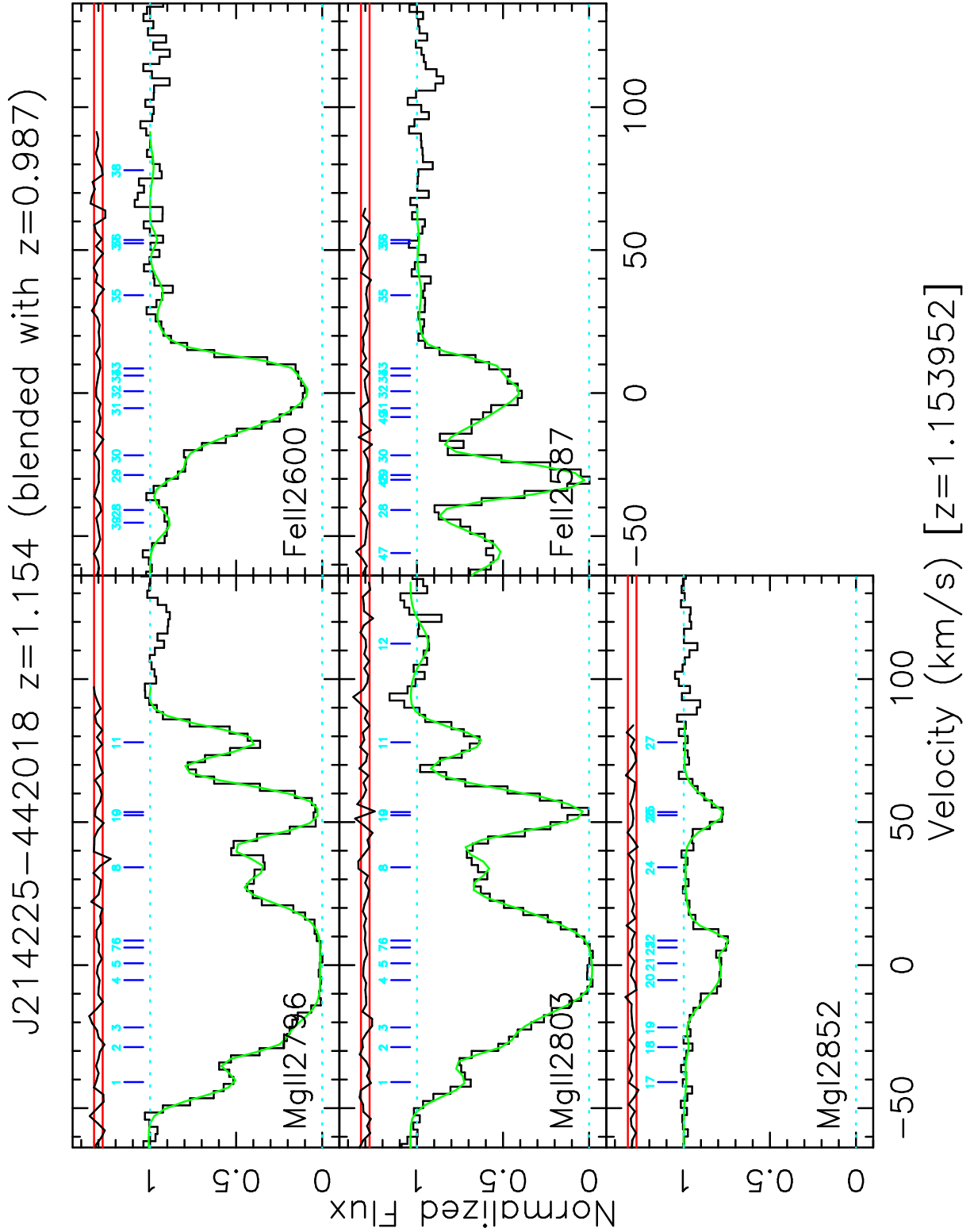
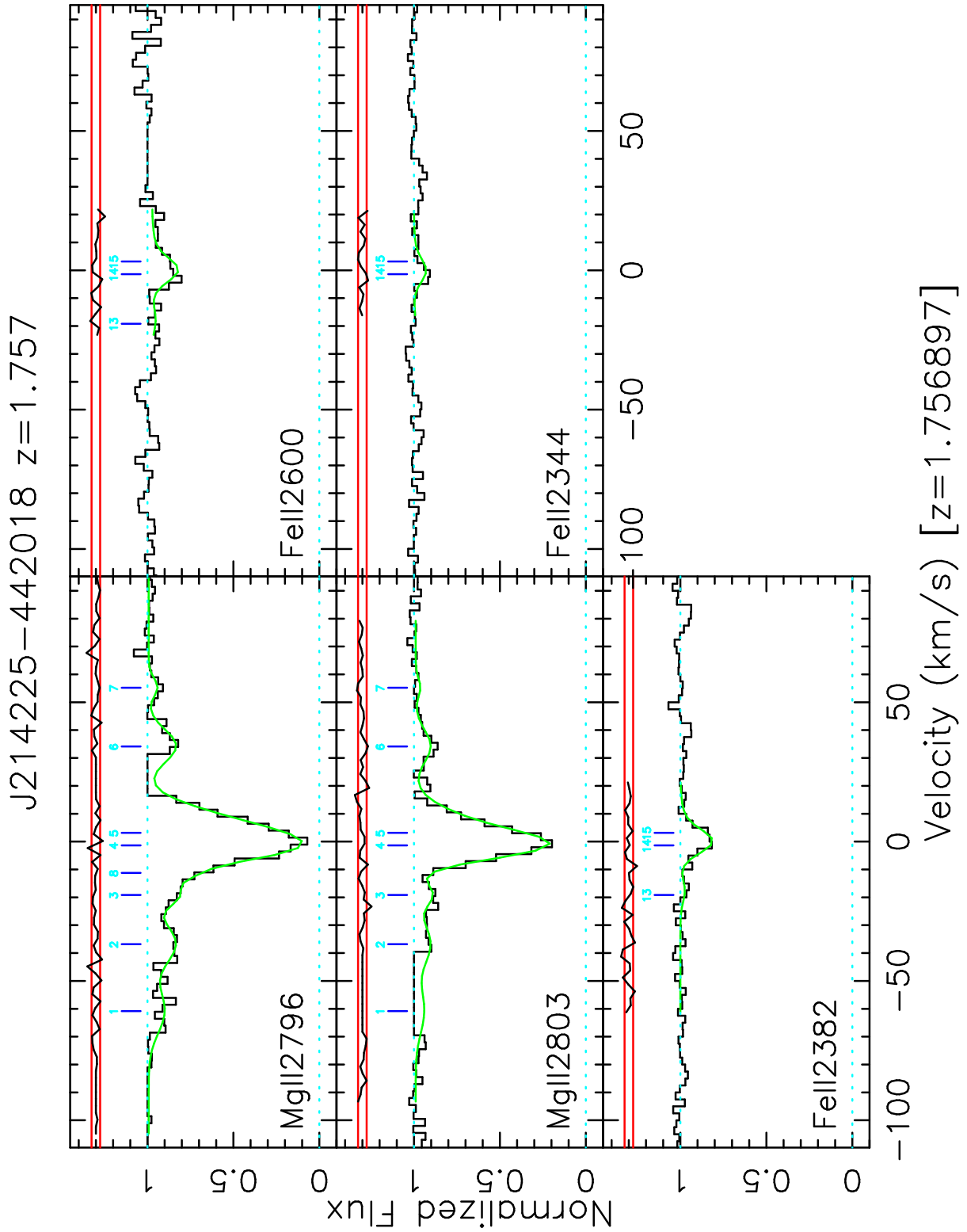


Figure 128. Many-multiplet fit for the  $z = 1.154$  absorber toward J214225–442018.



**Figure 129.** Many-multiplet fit for the  $z = 1.757$  absorber toward J214225-442018.

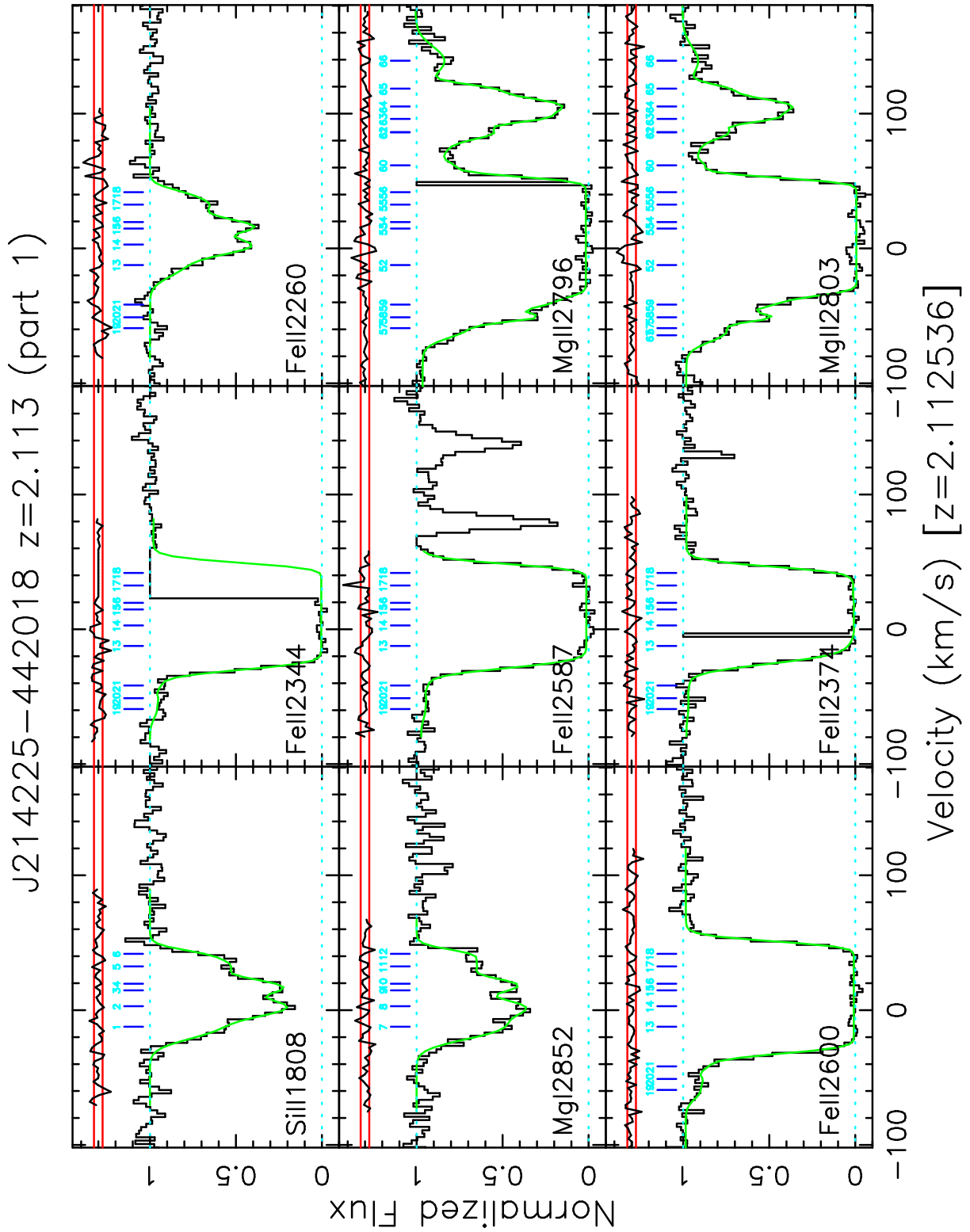


Figure 130. Many-multiplet fit for the  $z = 2.113$  absorber toward J214225–442018 (part 1).

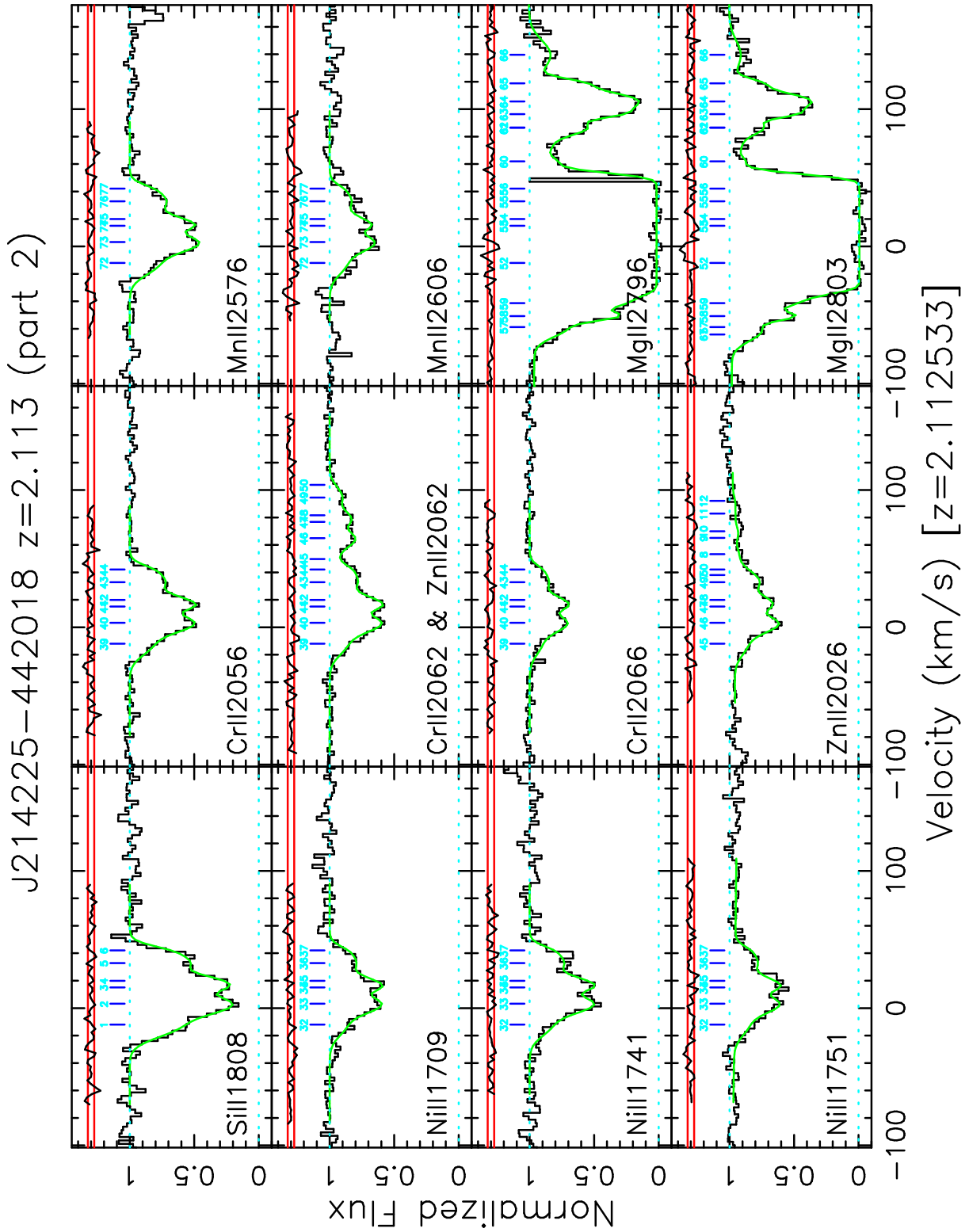


Figure 131. Many-multiplet fit for the  $z = 2.113$  absorber toward J214225–442018 (part 2).

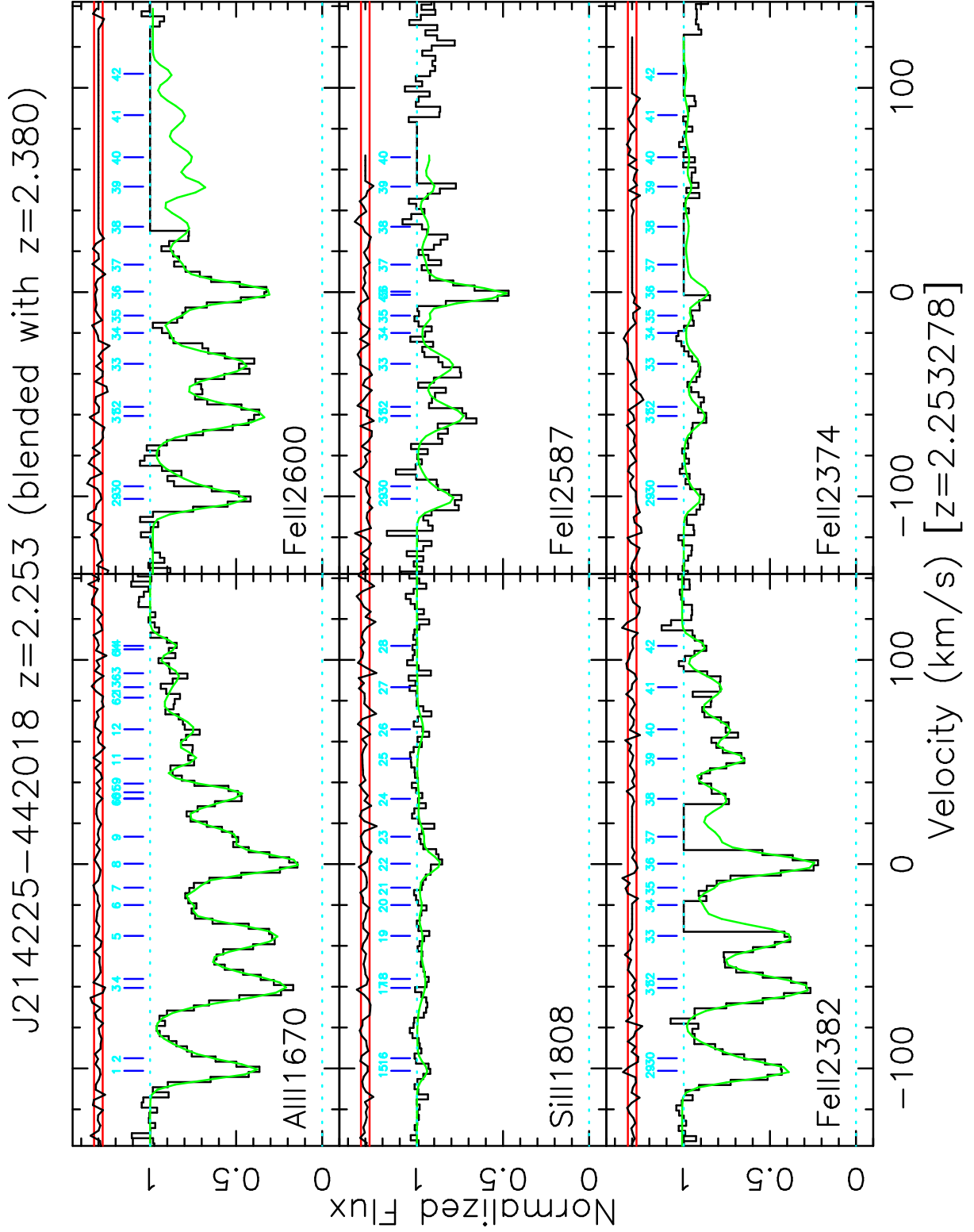
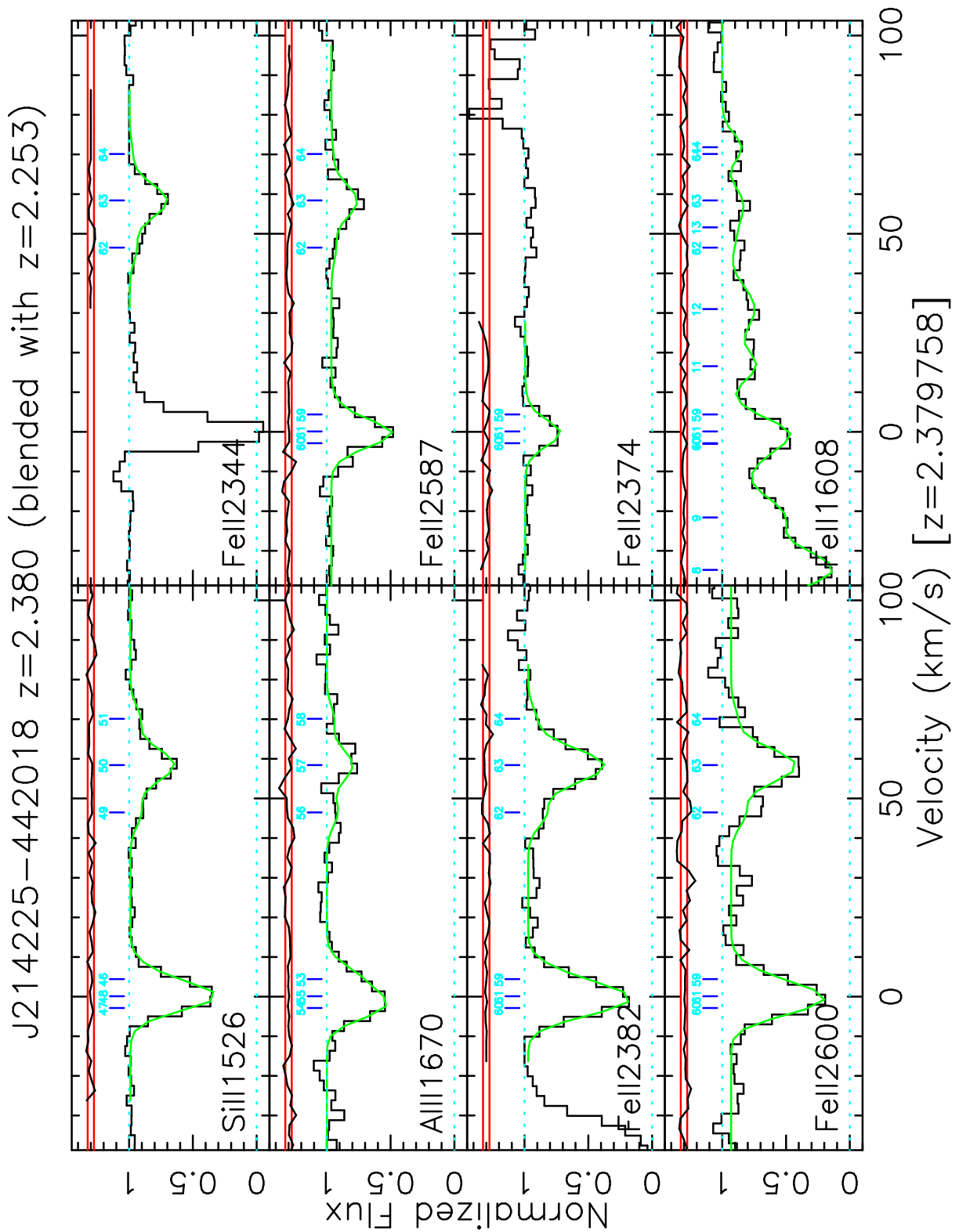
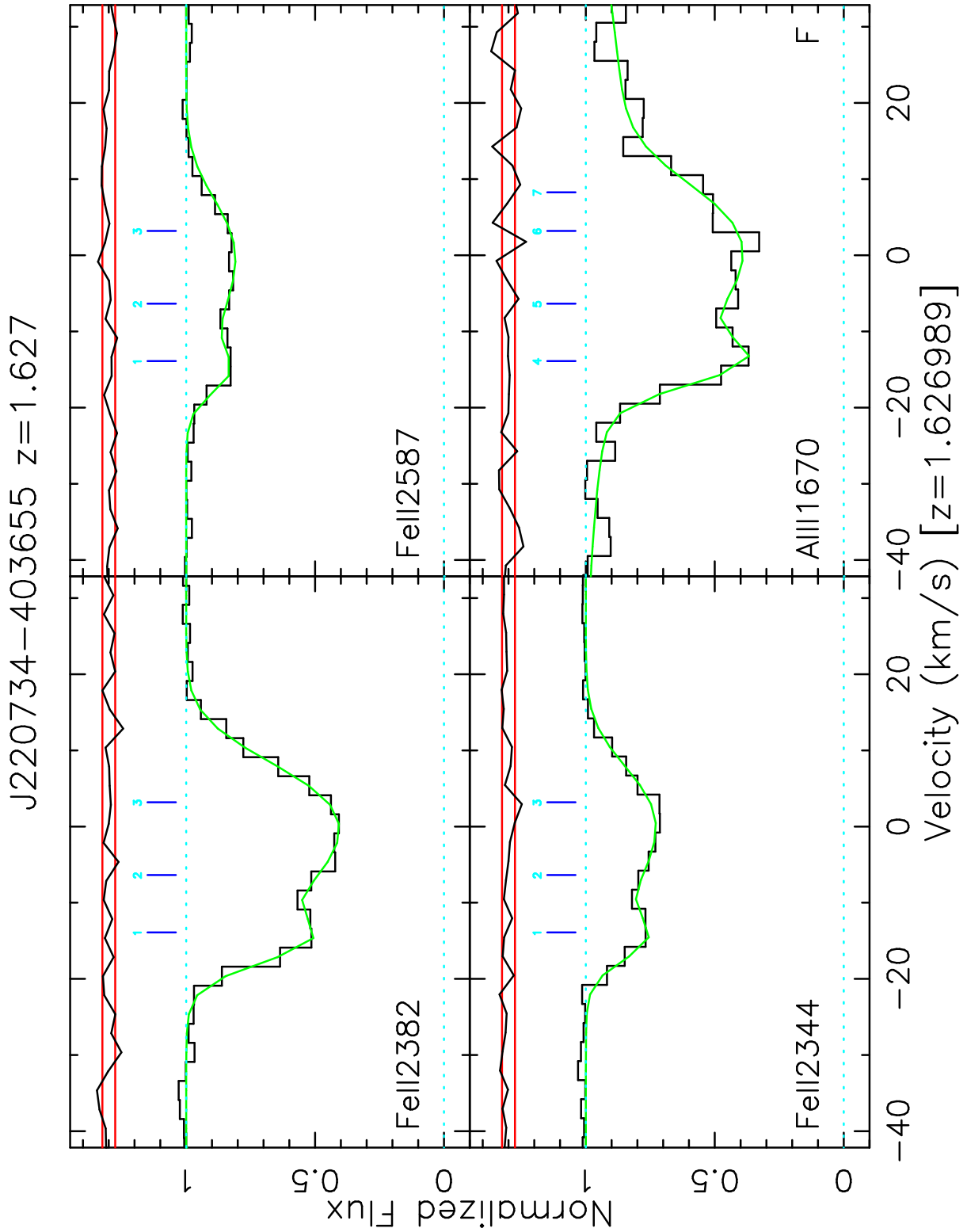


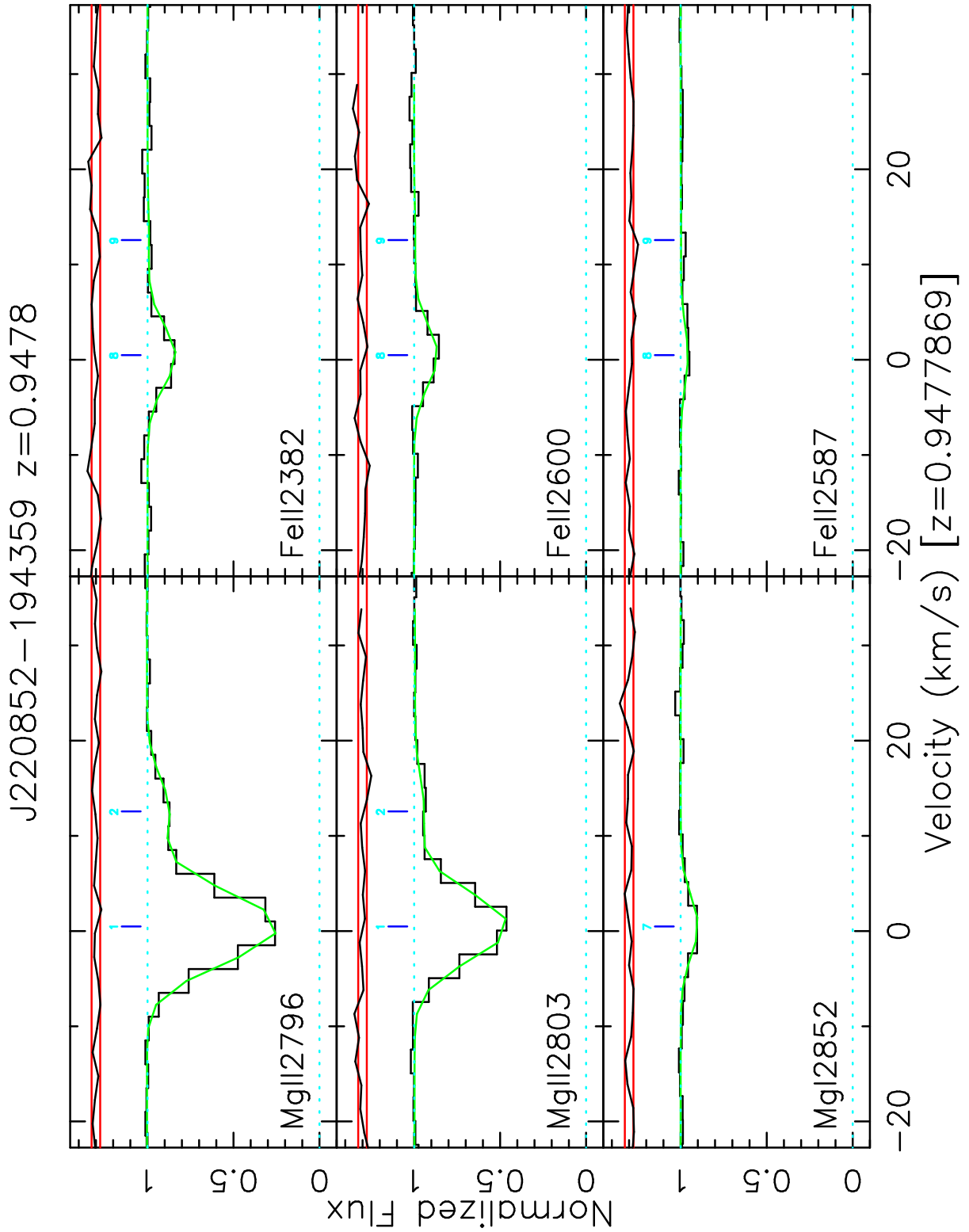
Figure 132. Many-multiplet fit for the  $z = 2.253$  absorber toward J214225–442018.



**Figure 133.** Many-multiplet fit for the  $z = 2.380$  absorber toward J214225–442018.



**Figure 134.** Many-multiplet fit for the  $z = 1.627$  absorber toward J220734–403655.



**Figure 135.** Many-multiplet fit for the  $z = 0.9478$  absorber toward J220852-194359.



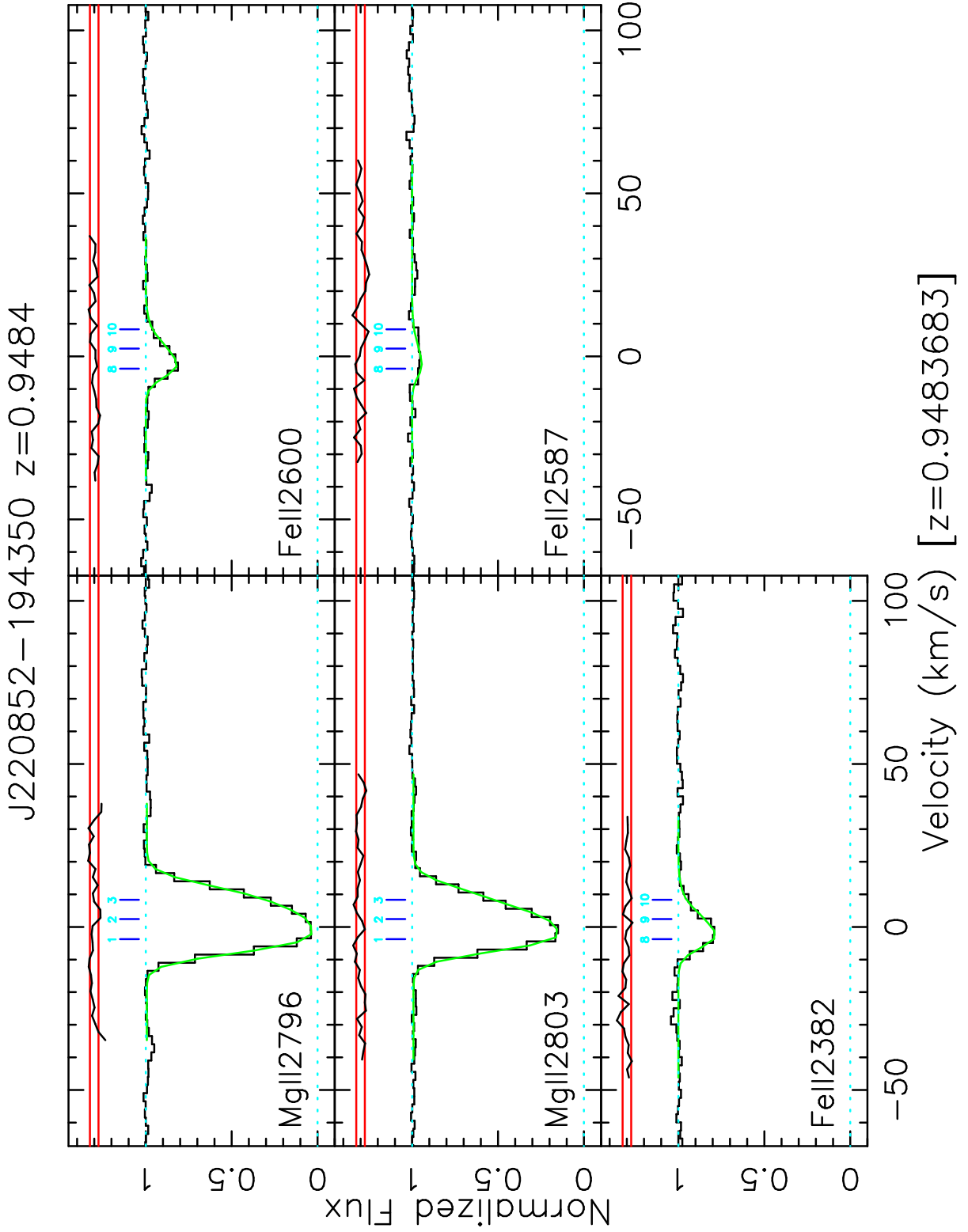
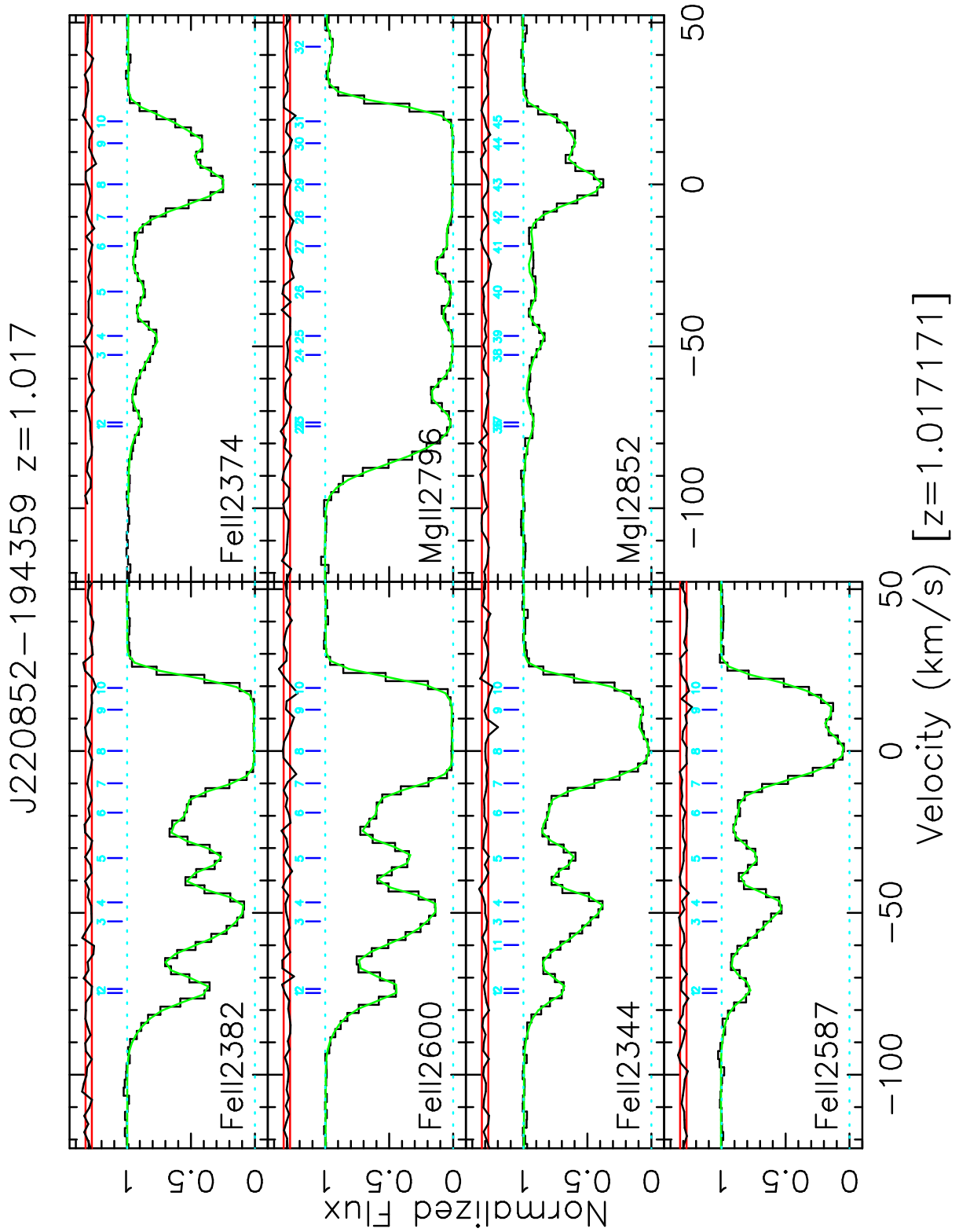


Figure 136. Many-multiplet fit for the  $z = 0.9484$  absorber toward J220852–194359.



**Figure 137.** Many-multiplet fit for the  $z = 1.017$  absorber toward J220852–194359.

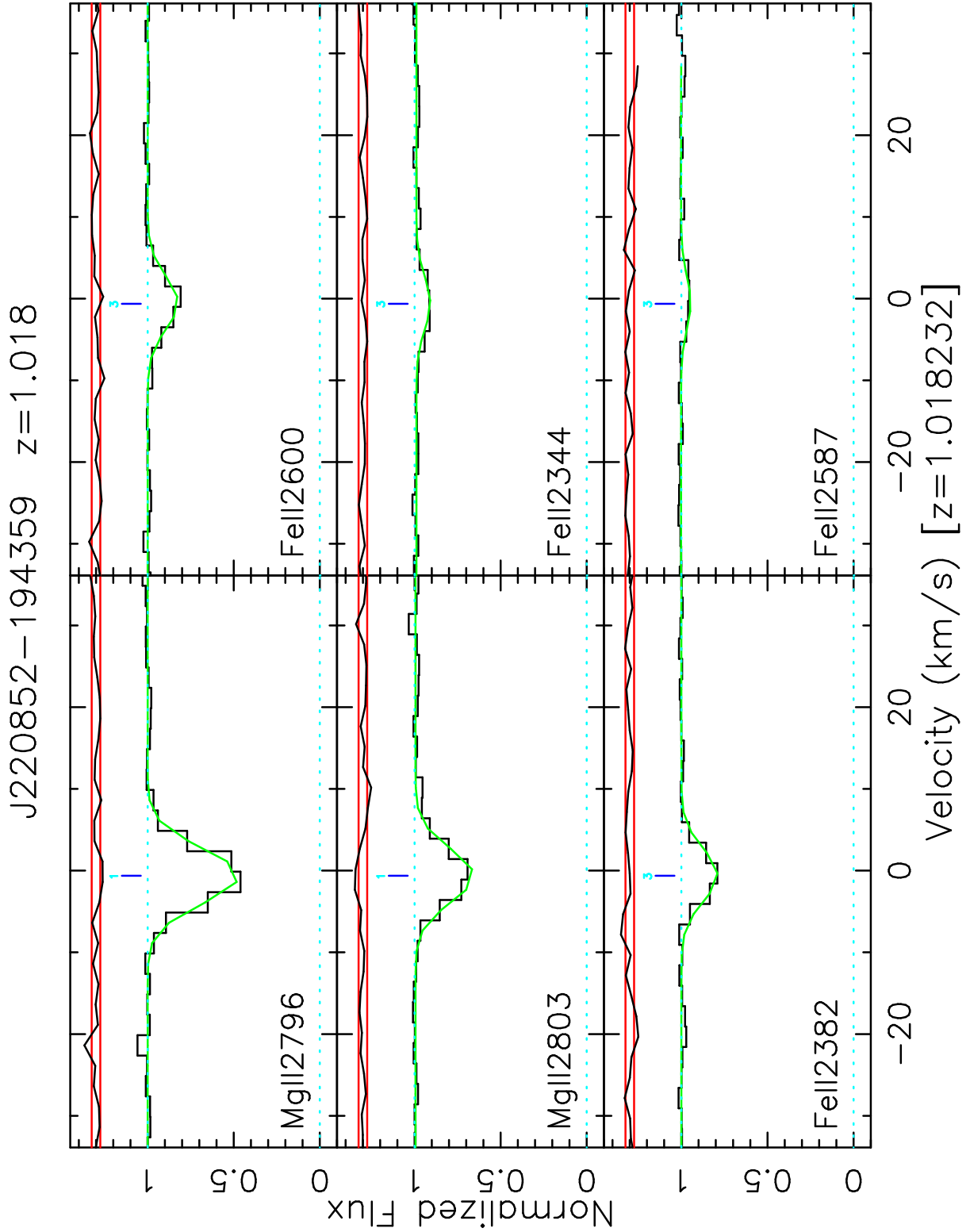
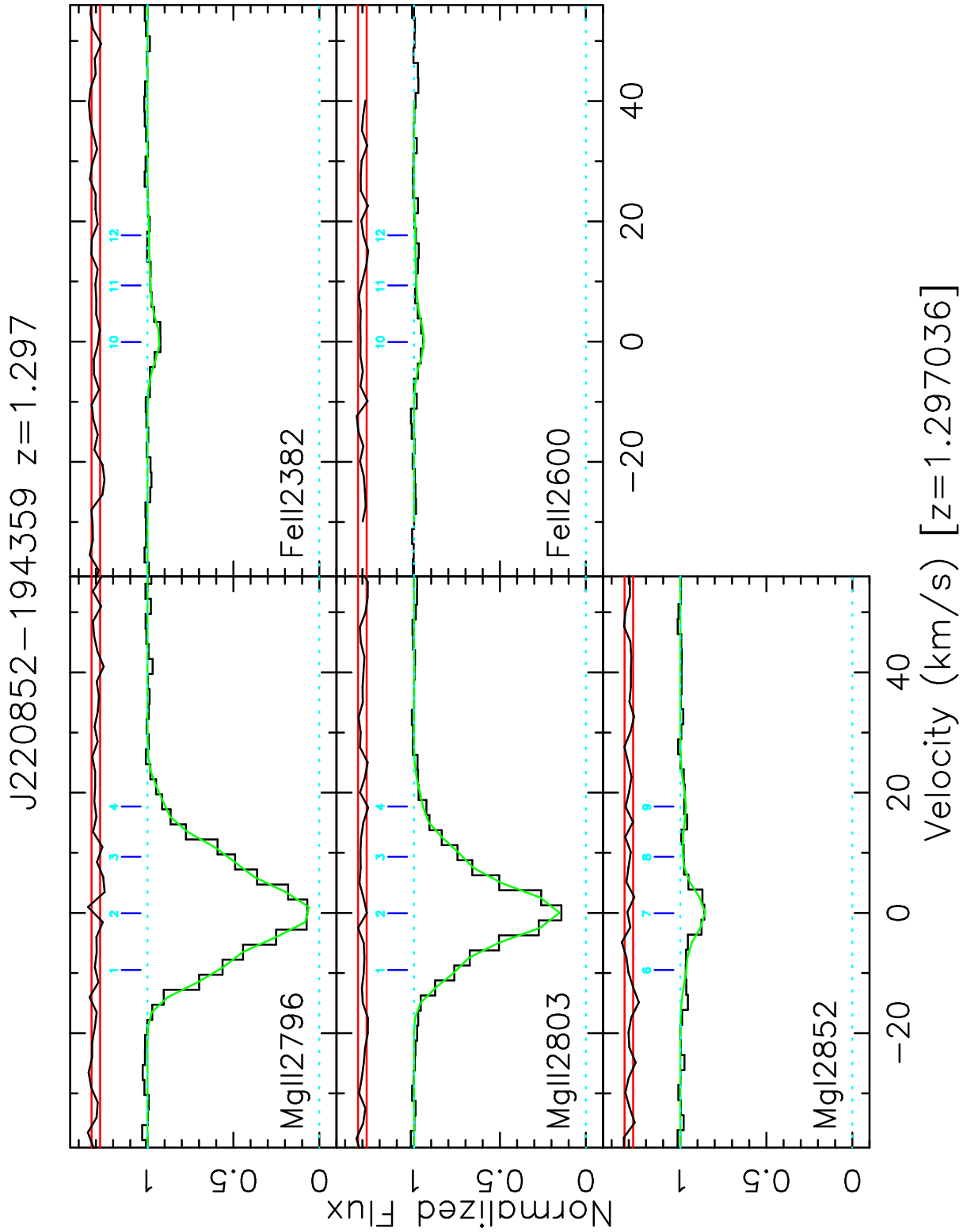


Figure 138. Many-multiplet fit for the  $z = 1.018$  absorber toward J220852-194359.



**Figure 139.** Many-multiplet fit for the  $z = 1.297$  absorber toward J220852–194359.

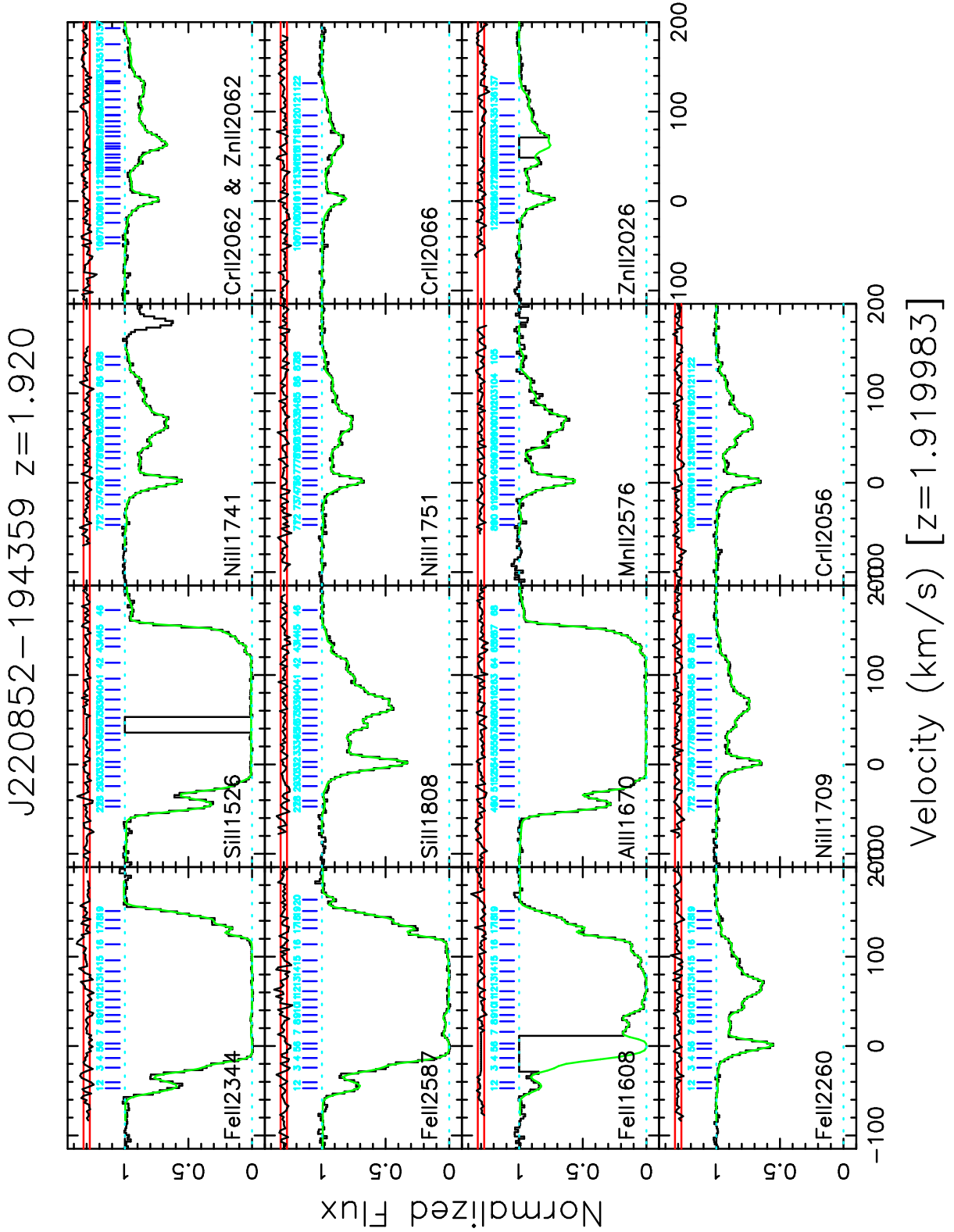
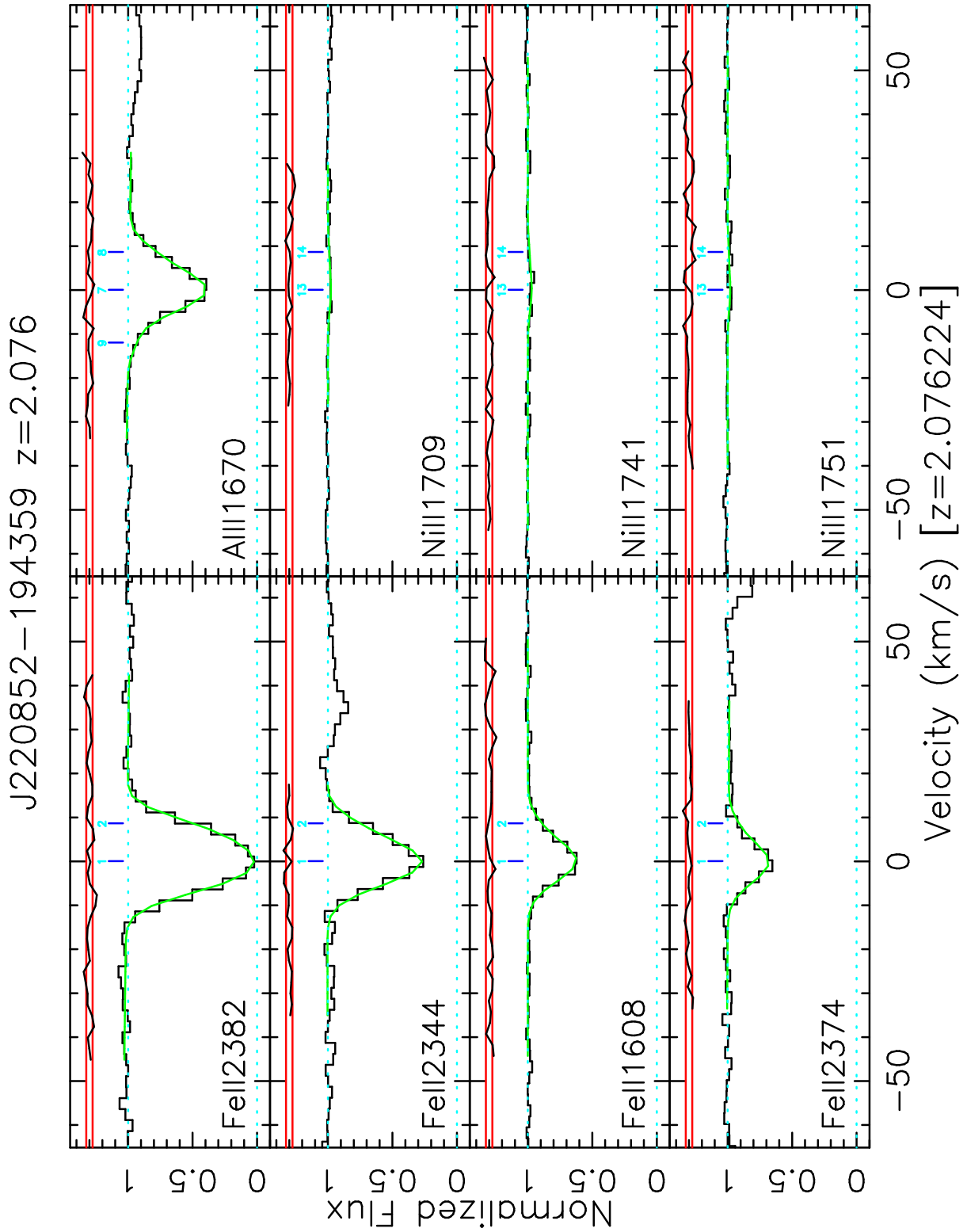


Figure 140. Many-multiplet fit for the  $z = 1.920$  absorber toward J220852–194359.



**Figure 141.** Many-multiplet fit for the  $z = 2.076$  absorber toward J220852-194359.

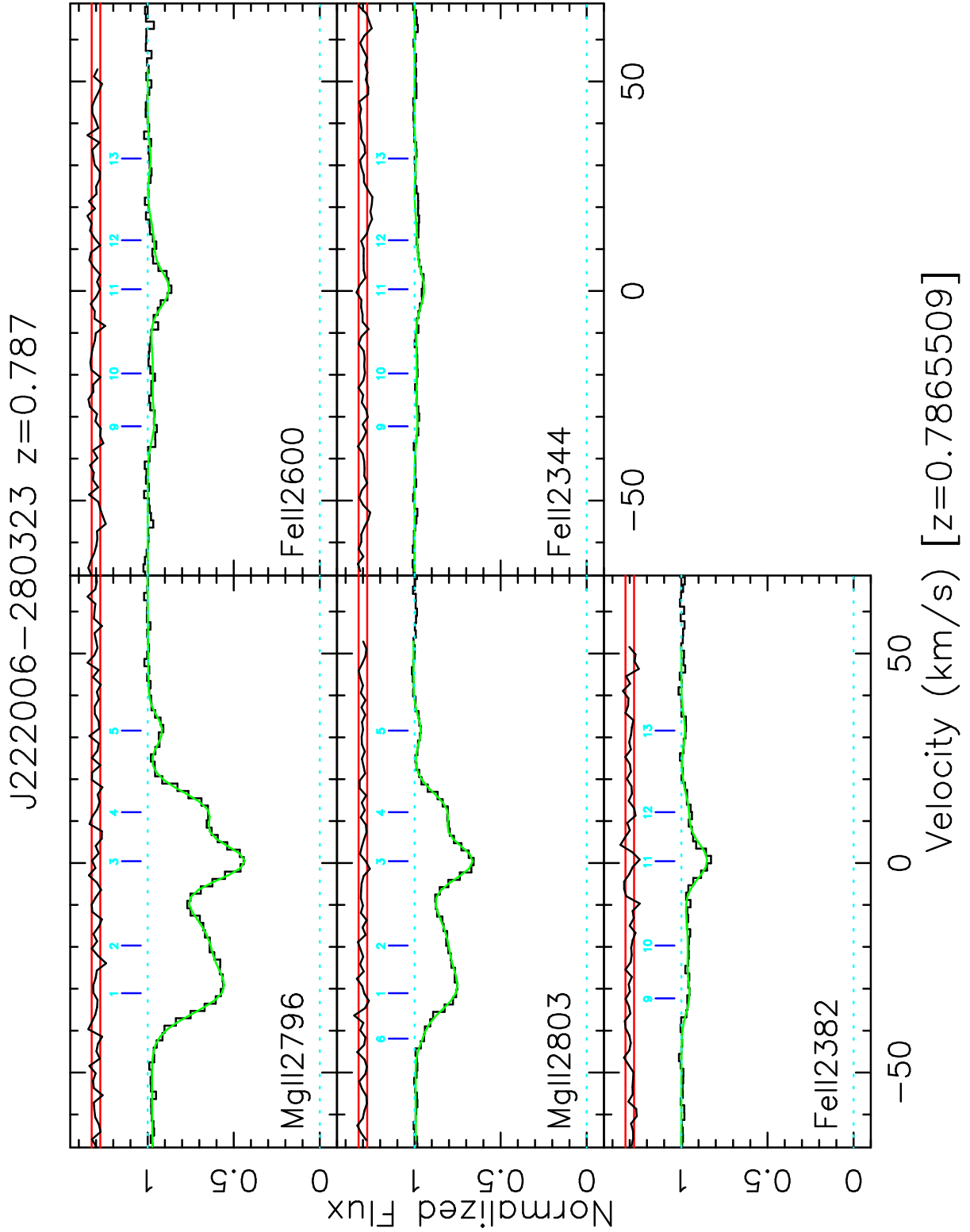
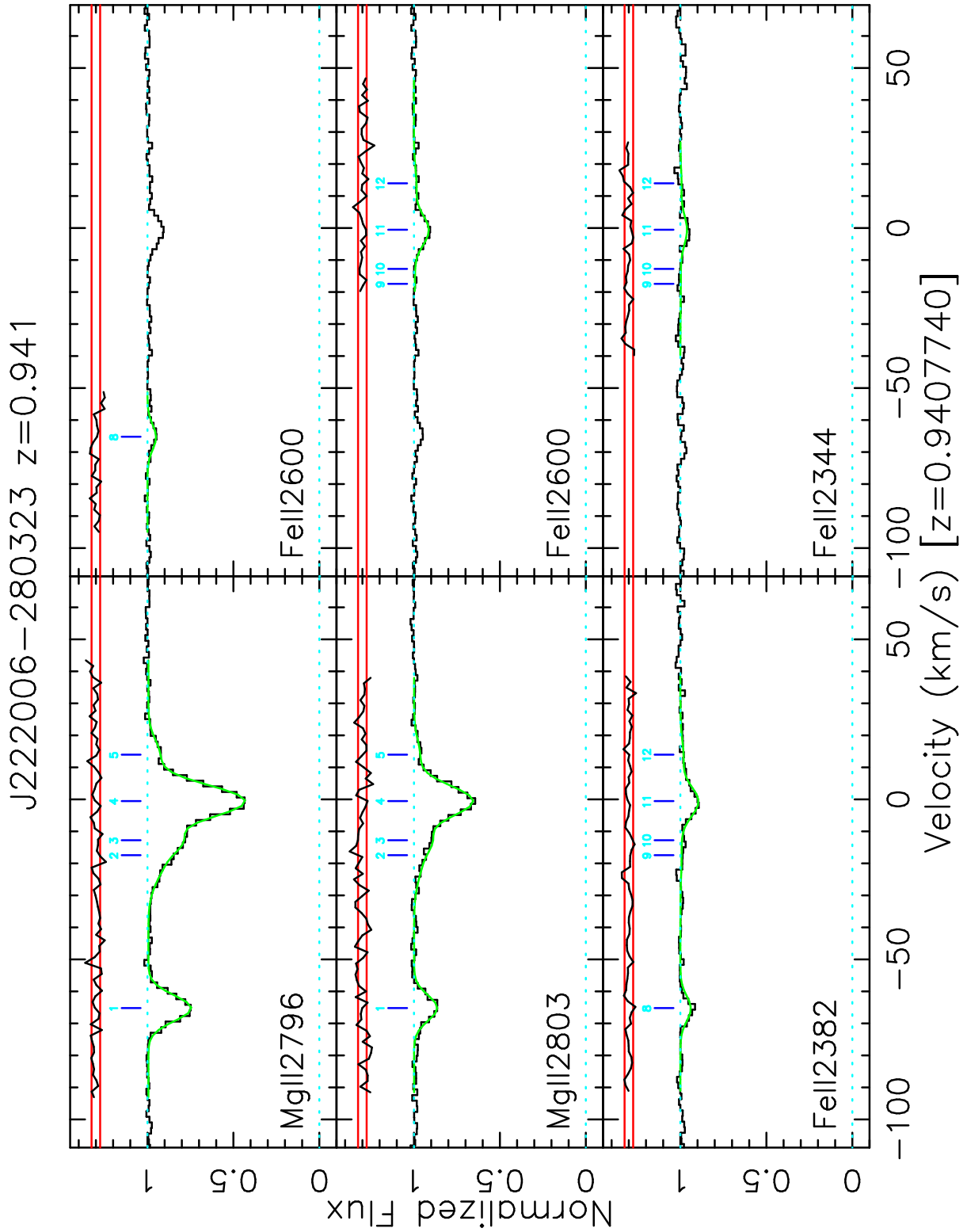


Figure 142. Many-multiplet fit for the  $z = 0.941$  absorber toward J222006–280323.



**Figure 143.** Many-multiplet fit for the  $z = 0.941$  absorber toward J222006–280323.



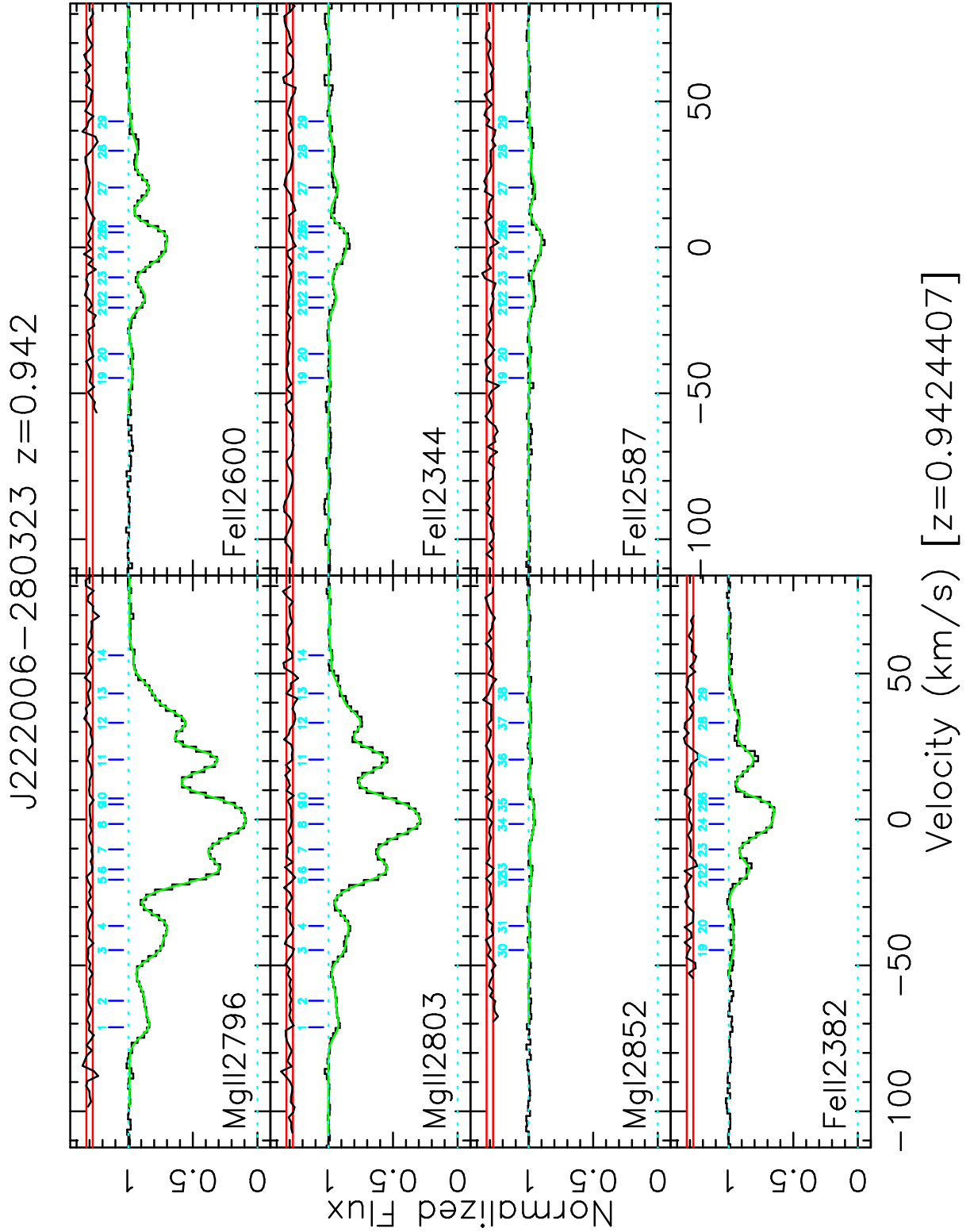
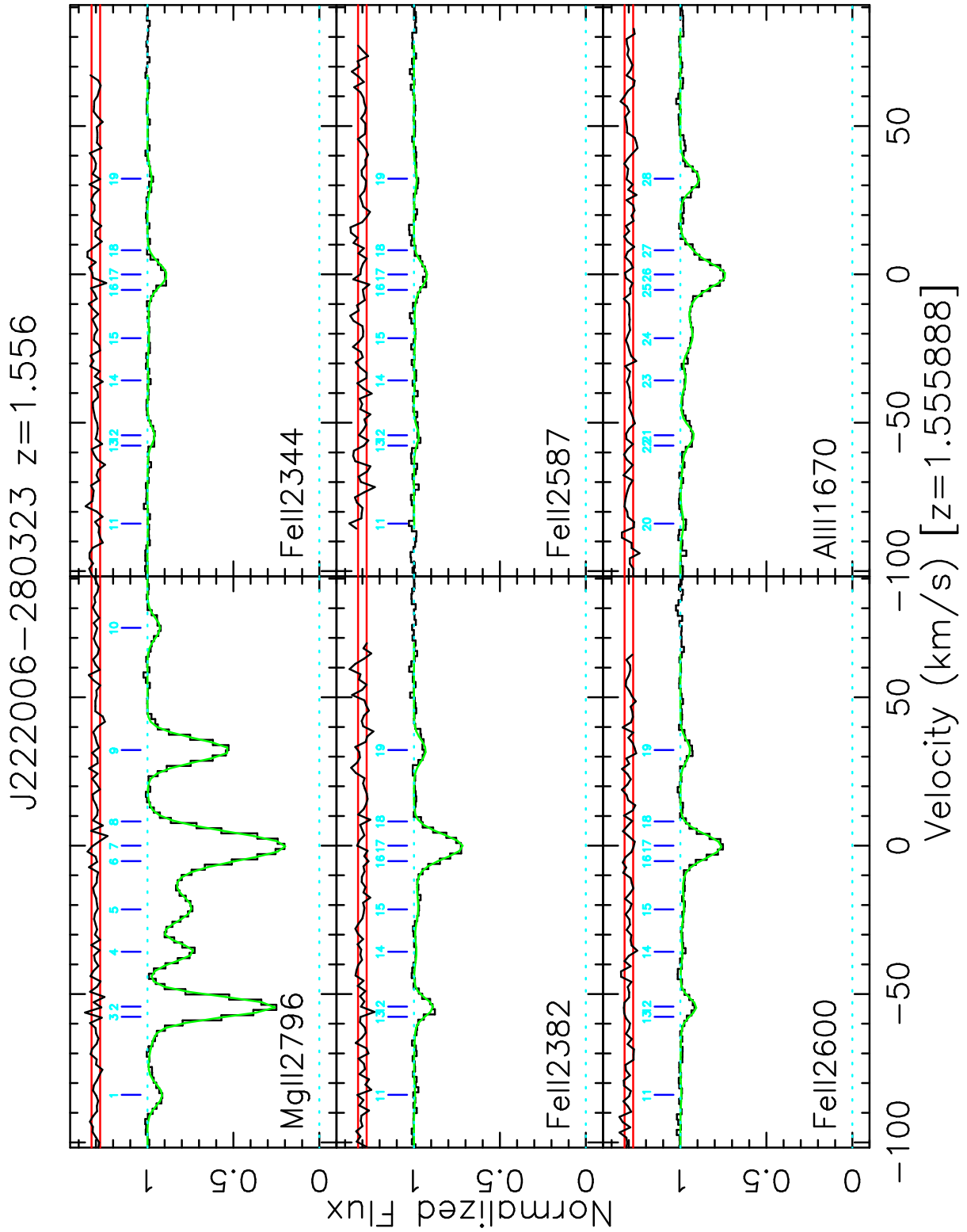
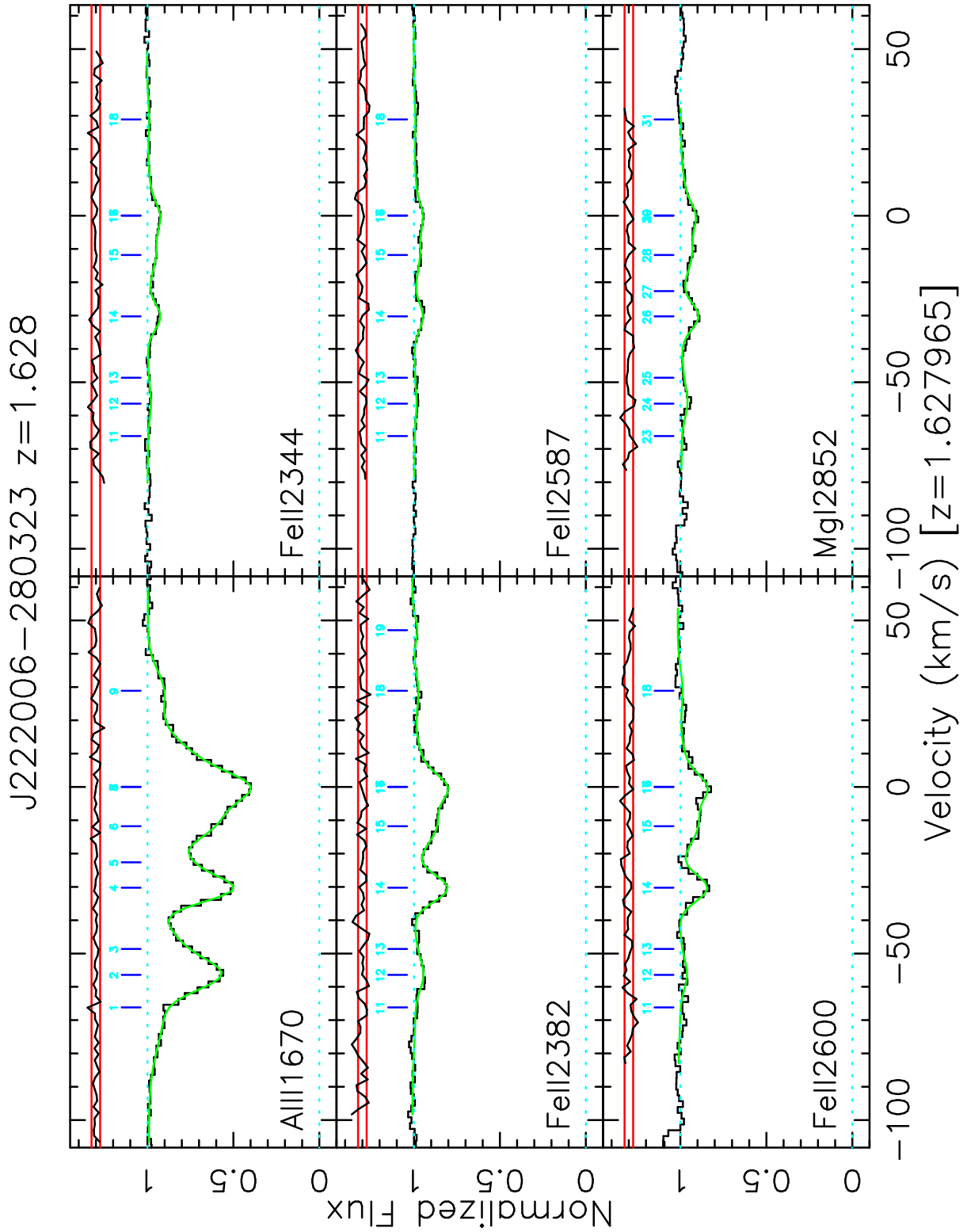


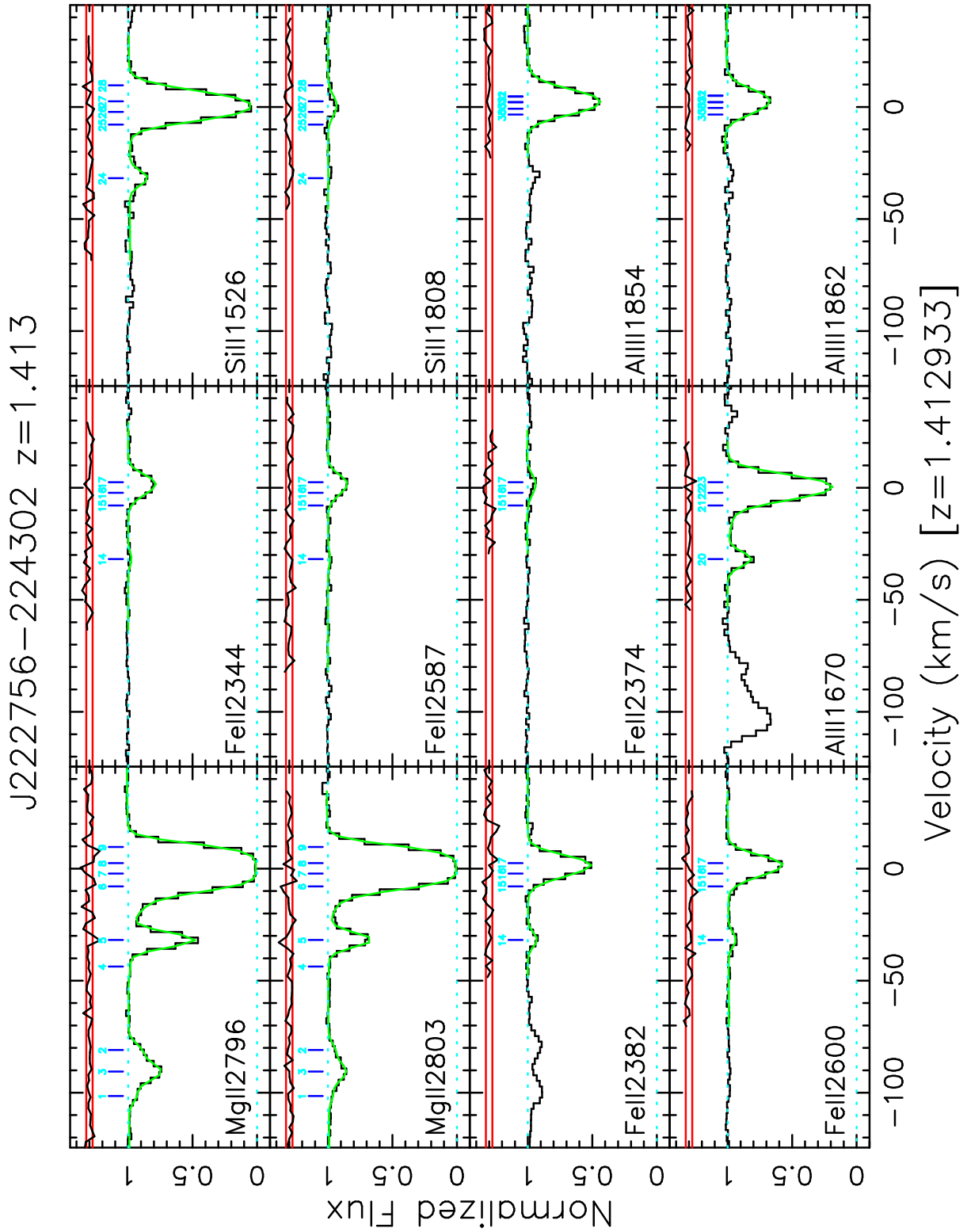
Figure 144. Many-multiplet fit for the  $z = 0.942$  absorber toward J222006–280323.



**Figure 145.** Many-multiplet fit for the  $z = 1.556$  absorber toward J222006–280323.



**Figure 146.** Many-multiplet fit for the  $z = 1.628$  absorber toward J222006–280323.



**Figure 147.** Many-multiplet fit for the  $z = 1.413$  absorber toward J222756–224302.

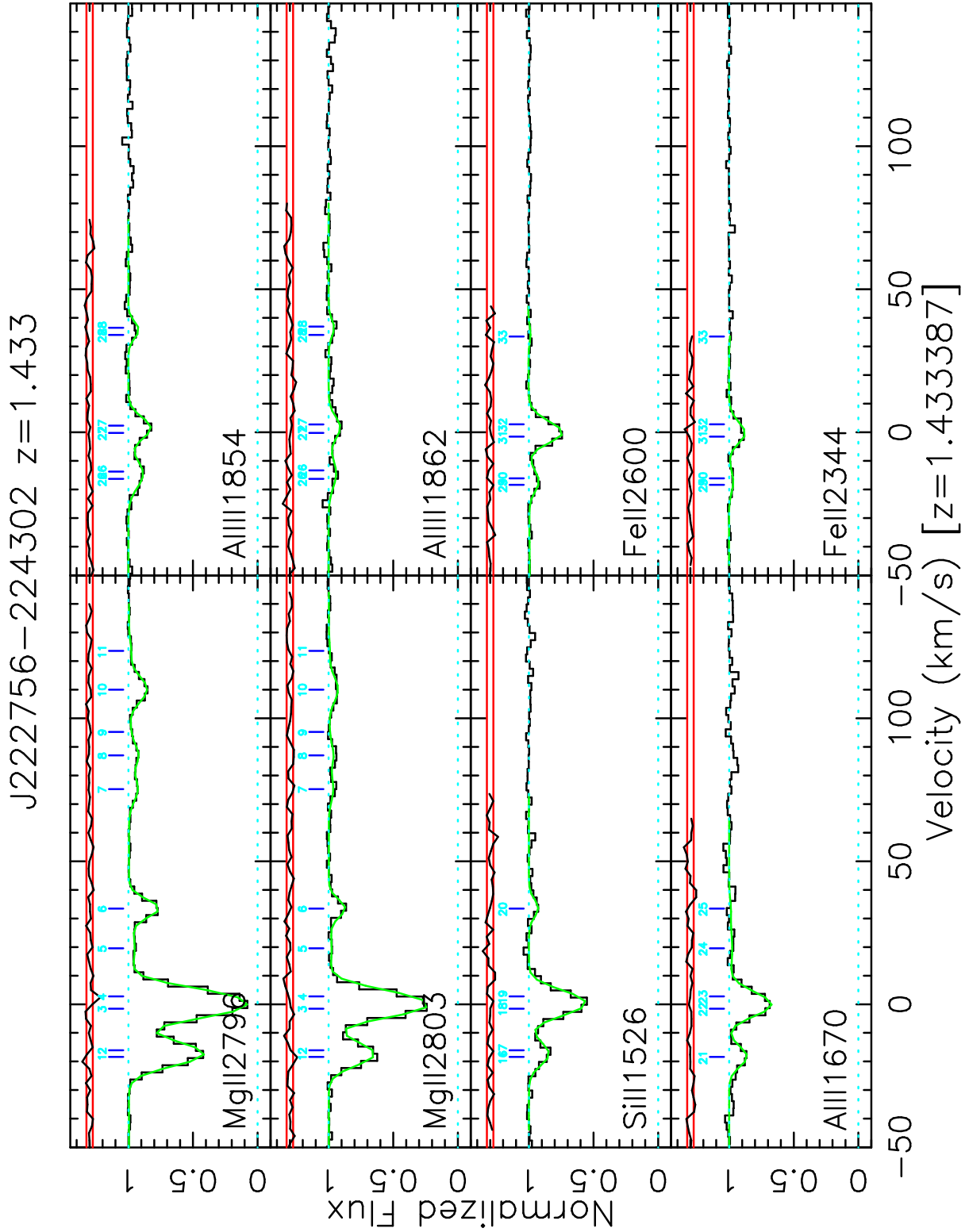
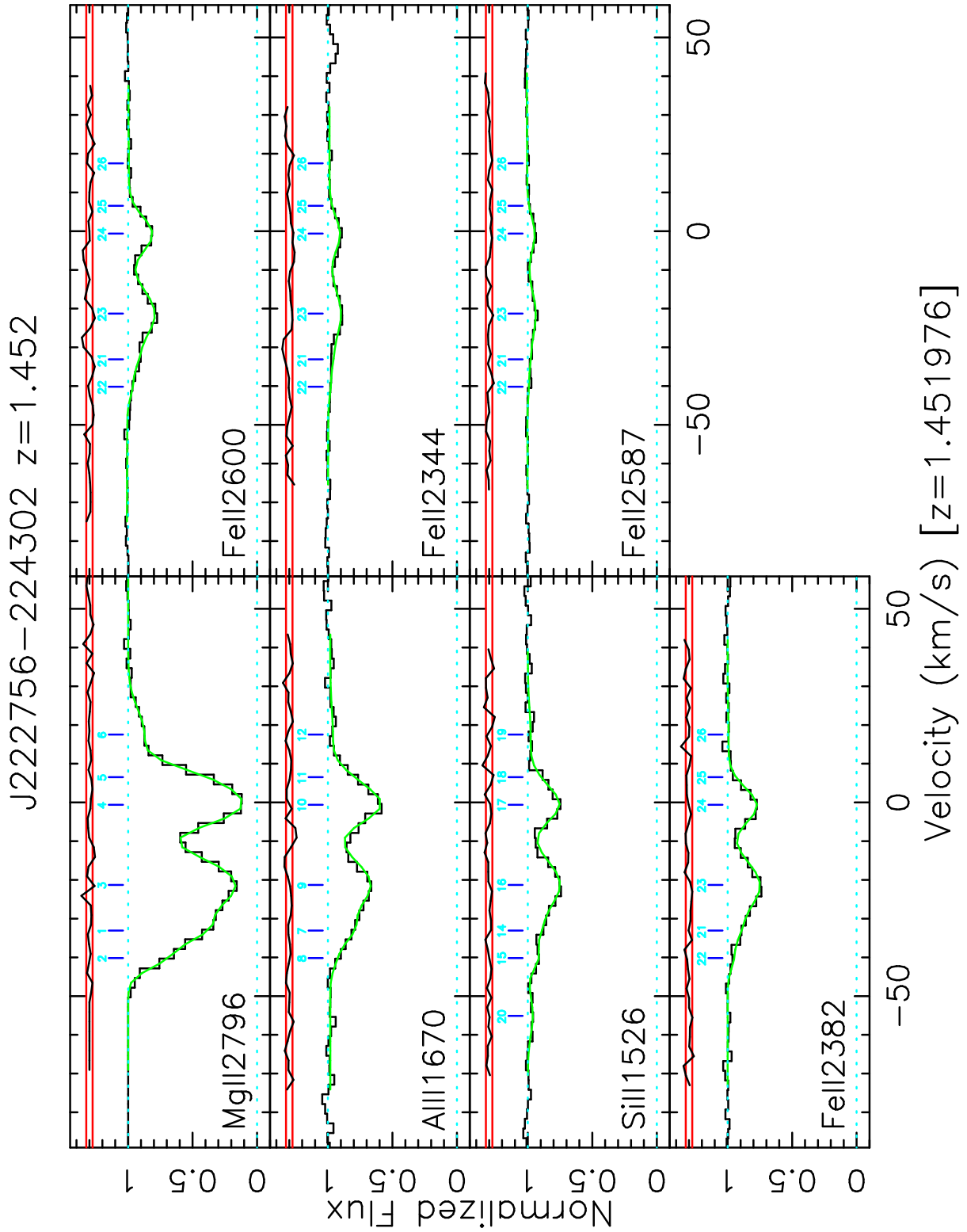


Figure 148. Many-multiplet fit for the  $z = 1.433$  absorber toward J222756–224302.



**Figure 149.** Many-multiplet fit for the  $z = 1.452$  absorber toward J222756–224302.

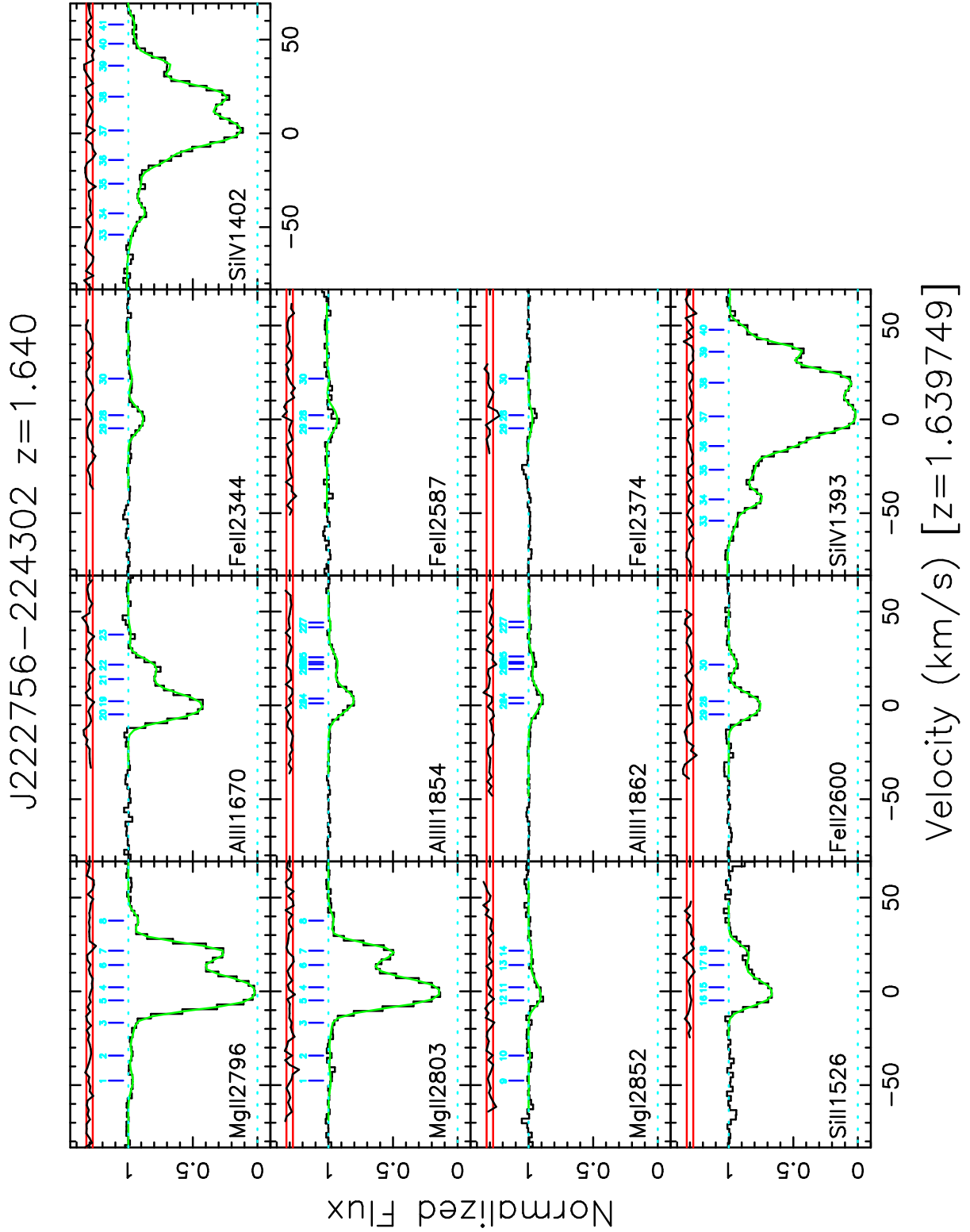


Figure 150. Many-multiplet fit for the  $z = 1.640$  absorber toward J222756–224302.

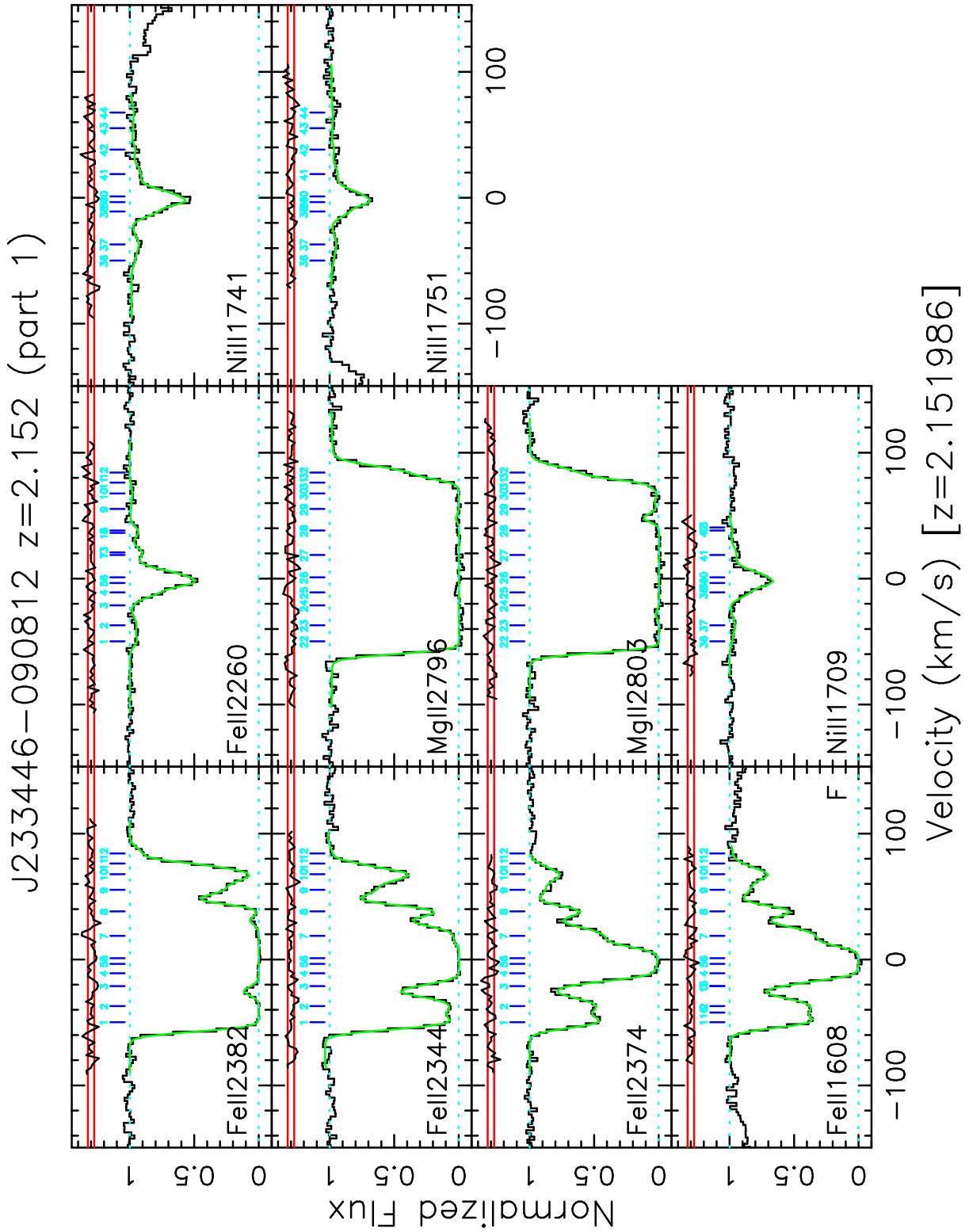


Figure 151. Many-multiplet fit for the  $z = 2.152$  absorber toward J233446–090812 (part 1).



J233446–090812  $z=2.152$  (part 2)

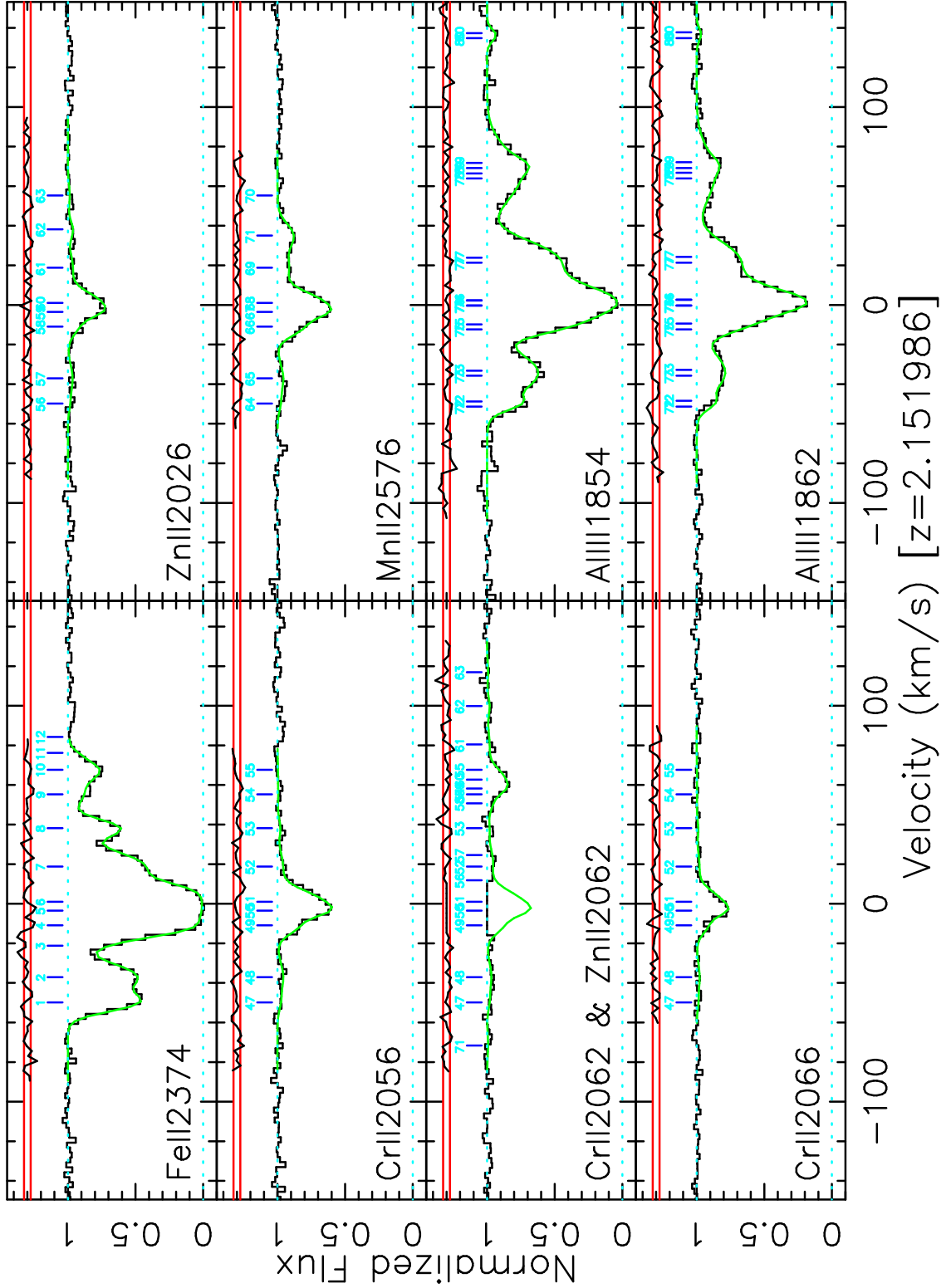
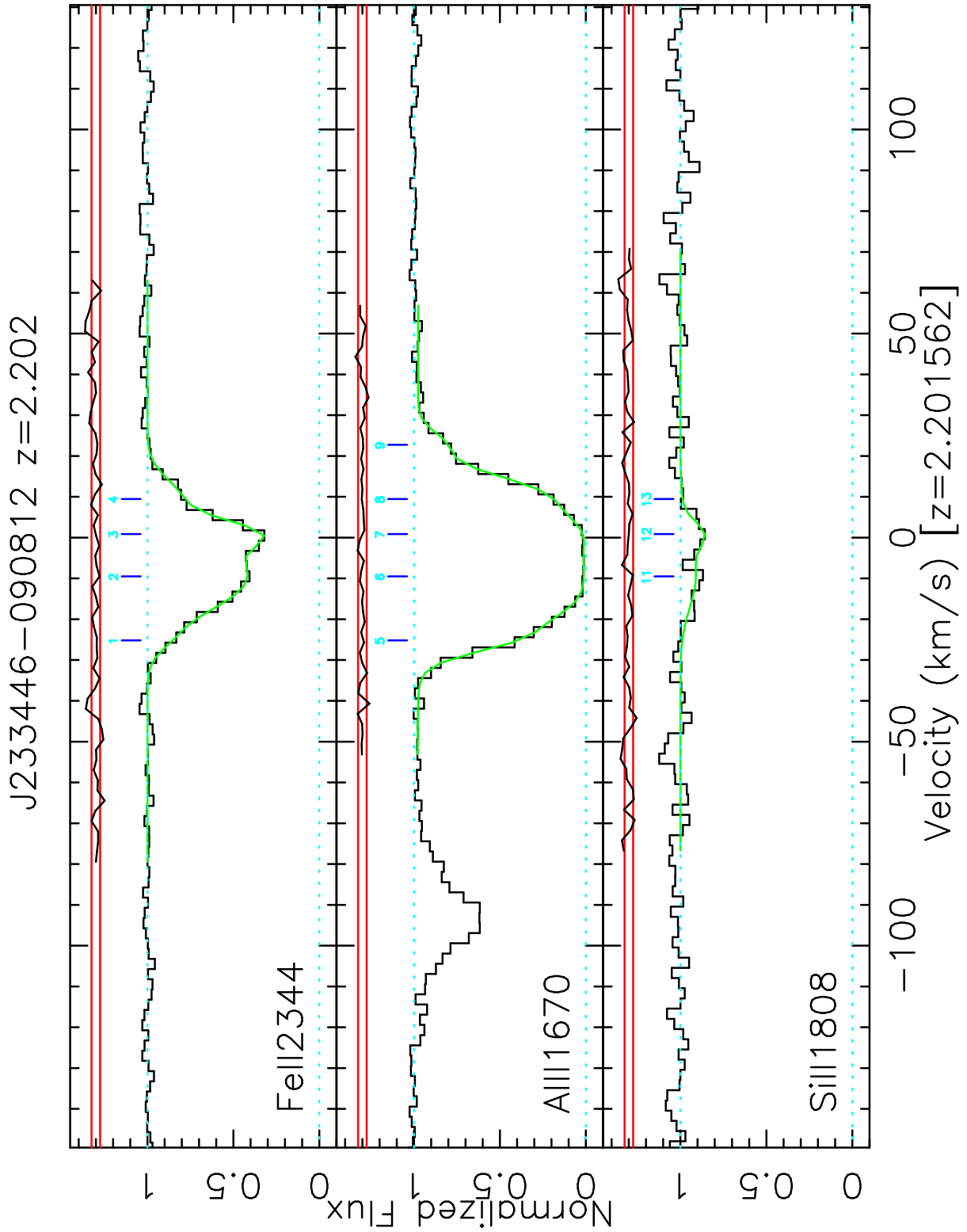


Figure 152. Many-multiplet fit for the  $z = 2.152$  absorber toward J233446–090812 (part 2).



**Figure 153.** Many-multiplet fit for the  $z = 2.202$  absorber toward J233446-090812.

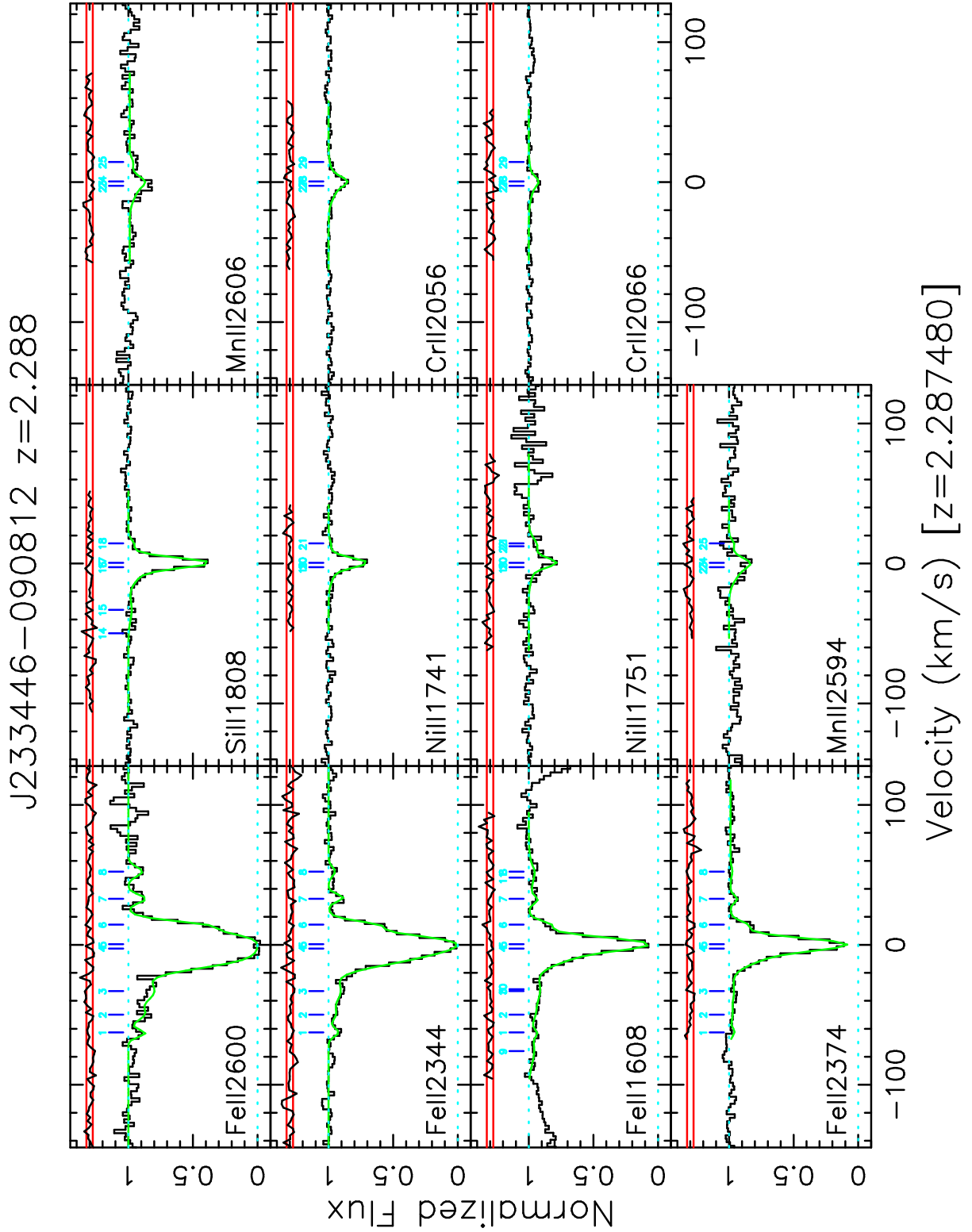
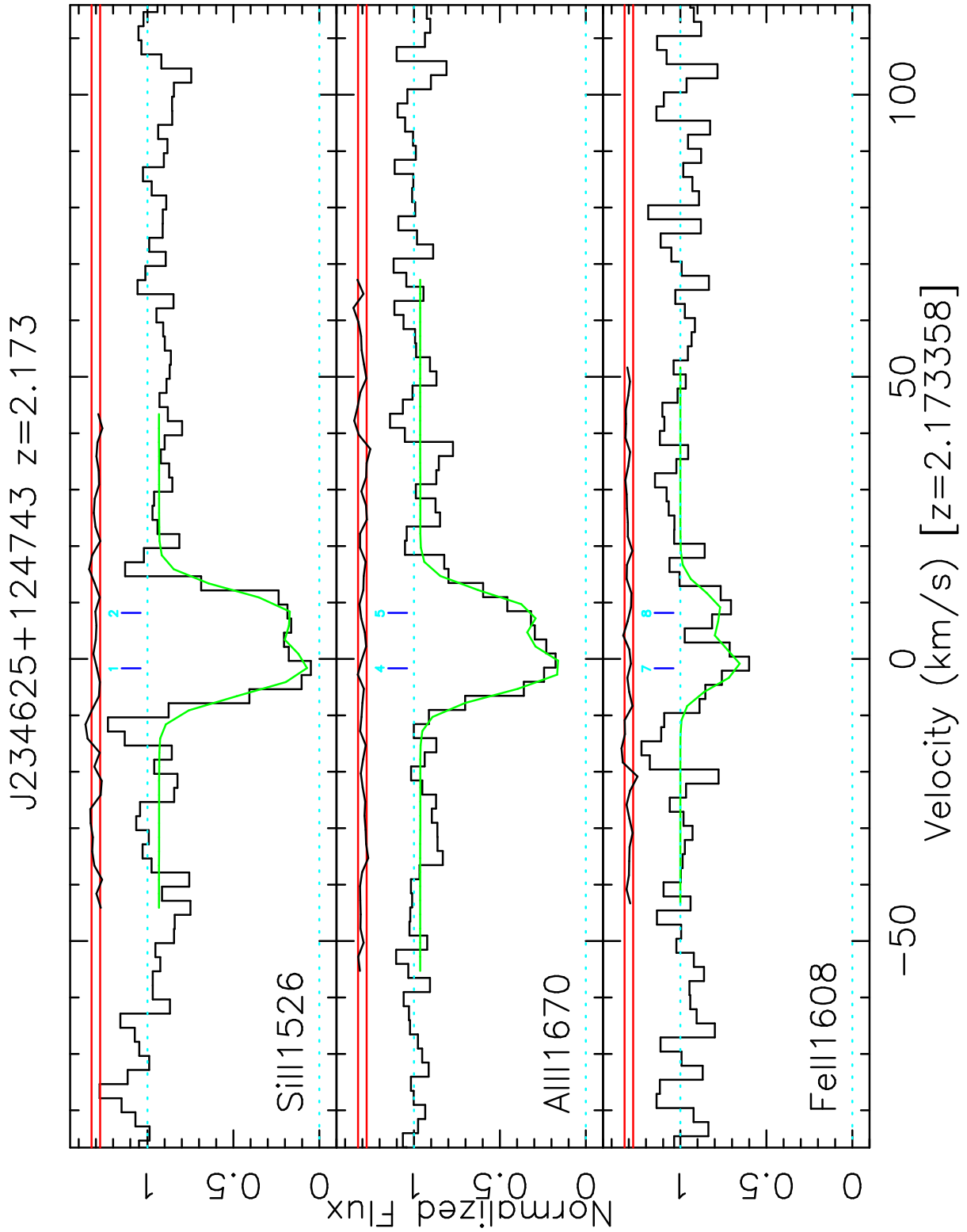
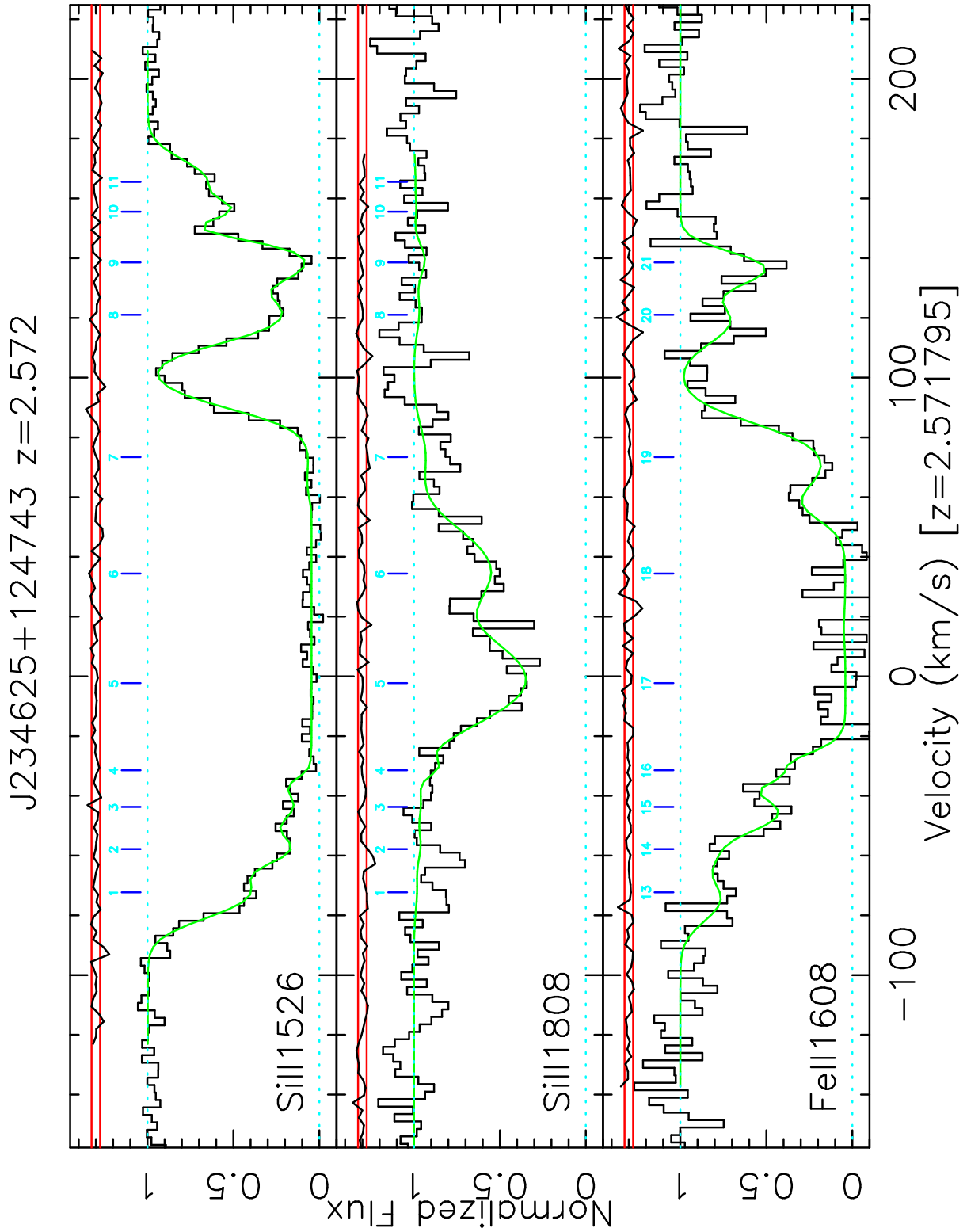


Figure 154. Many-multiplet fit for the  $z = 2.288$  absorber toward J233446–090812.



**Figure 155.** Many-multiplet fit for the  $z = 2.173$  absorber toward J234625+124743.



**Figure 156.** Many-multiplet fit for the  $z = 2.572$  absorber toward J234625+124743.

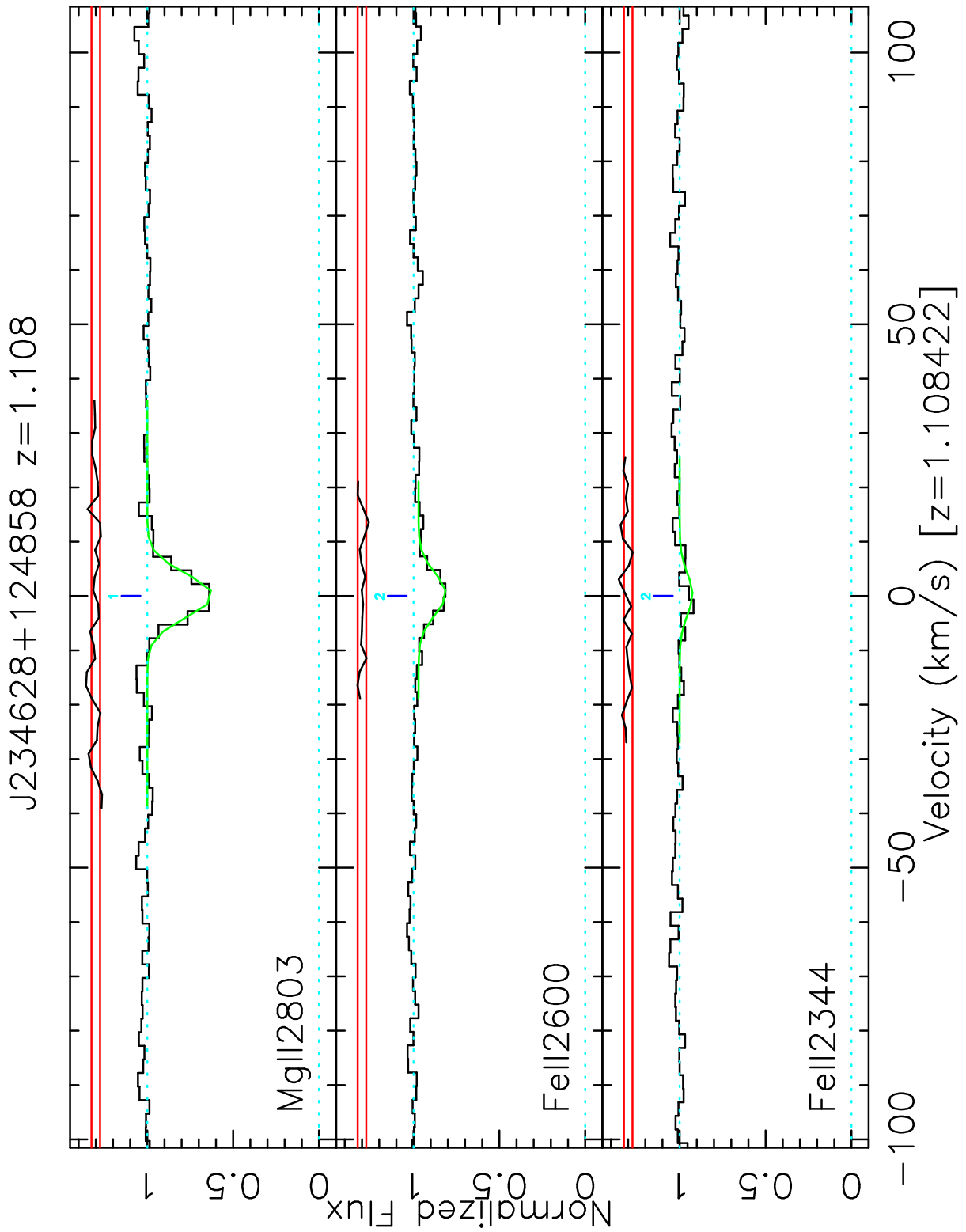


Figure 157. Many-multiplet fit for the  $z = 1.108$  absorber toward J234628+124858.

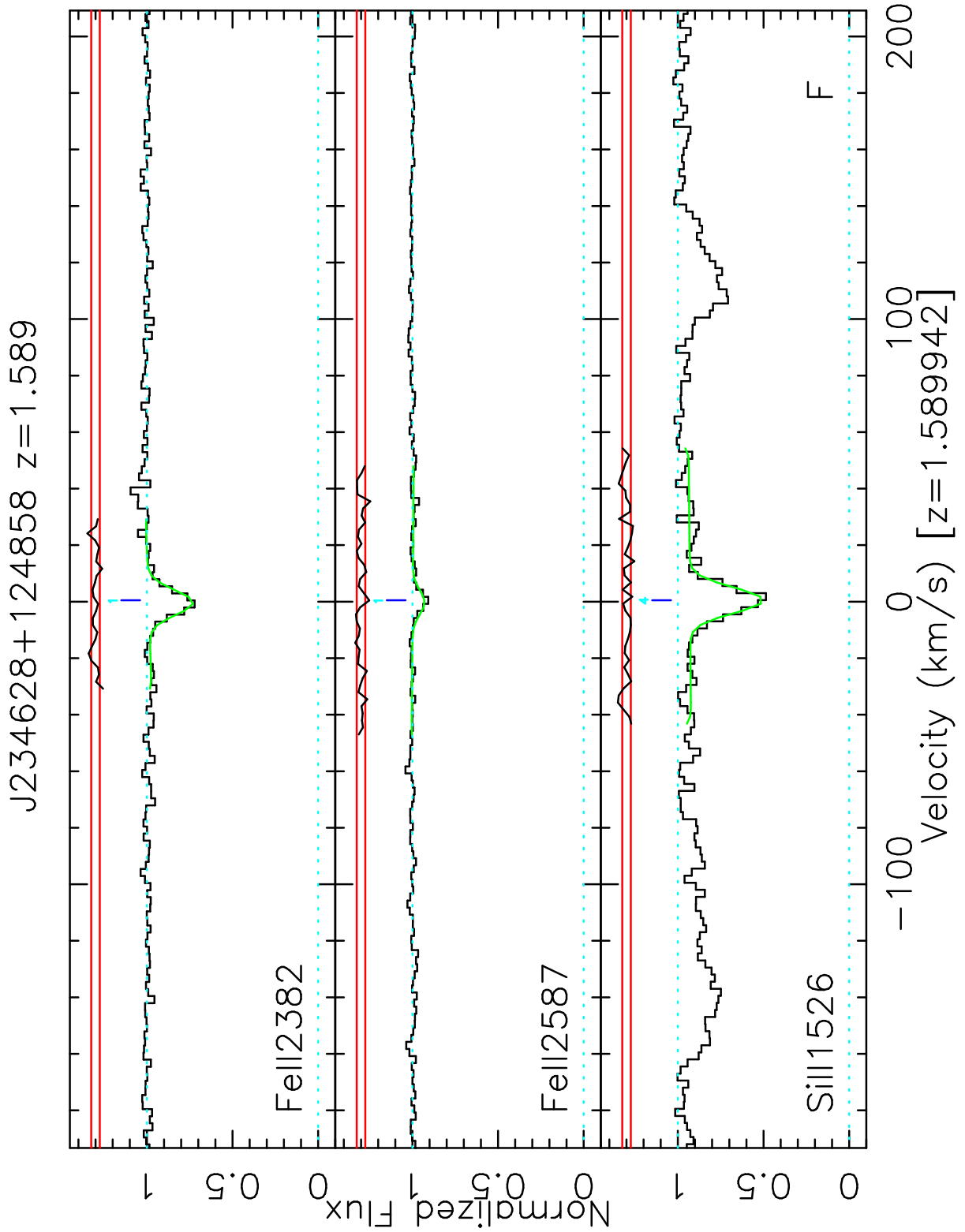
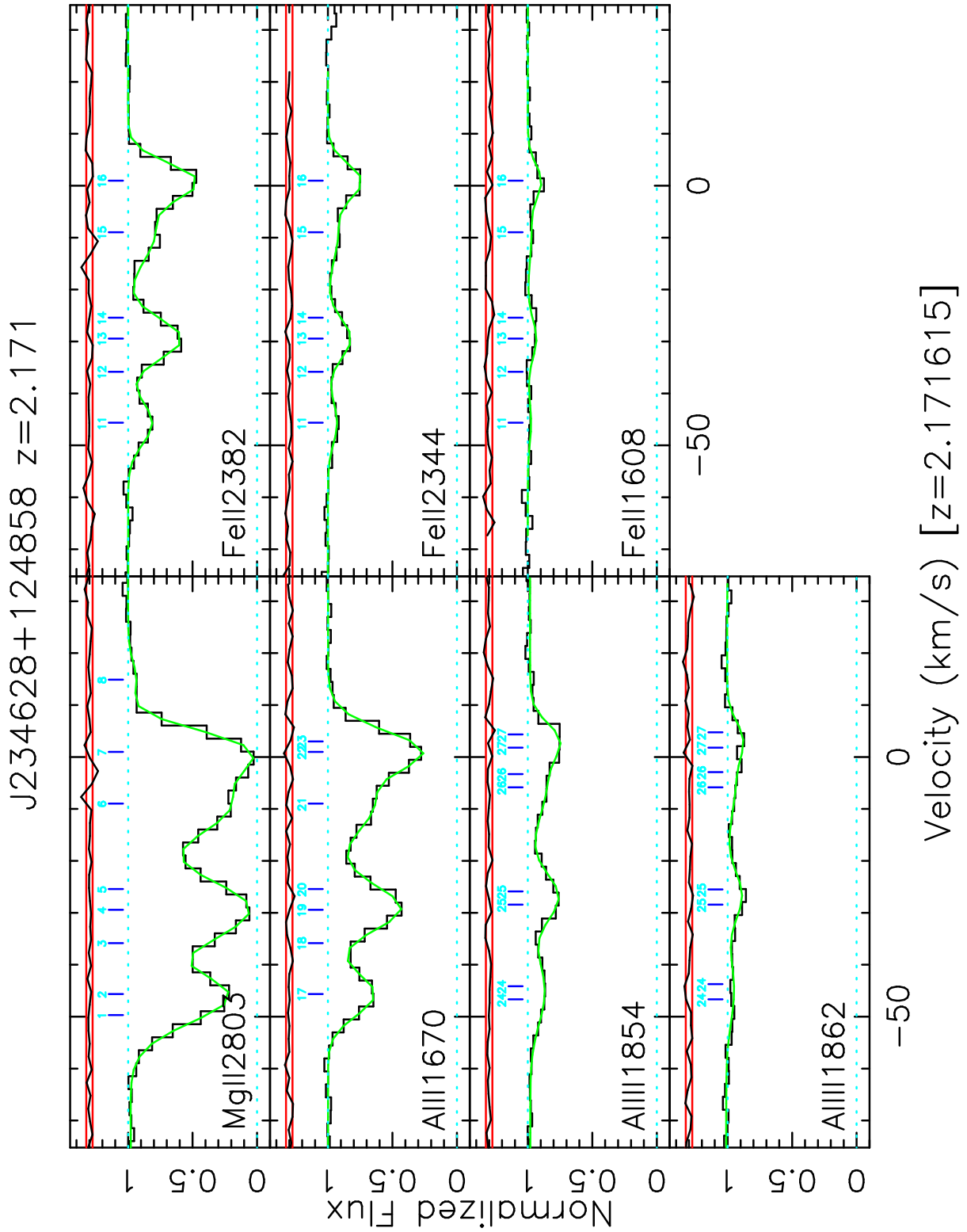


Figure 158. Many-multiplet fit for the  $z = 1.589$  absorber toward J234628+124858.



**Figure 159.** Many-multiplet fit for the  $z = 2.171$  absorber toward J234628+124858.



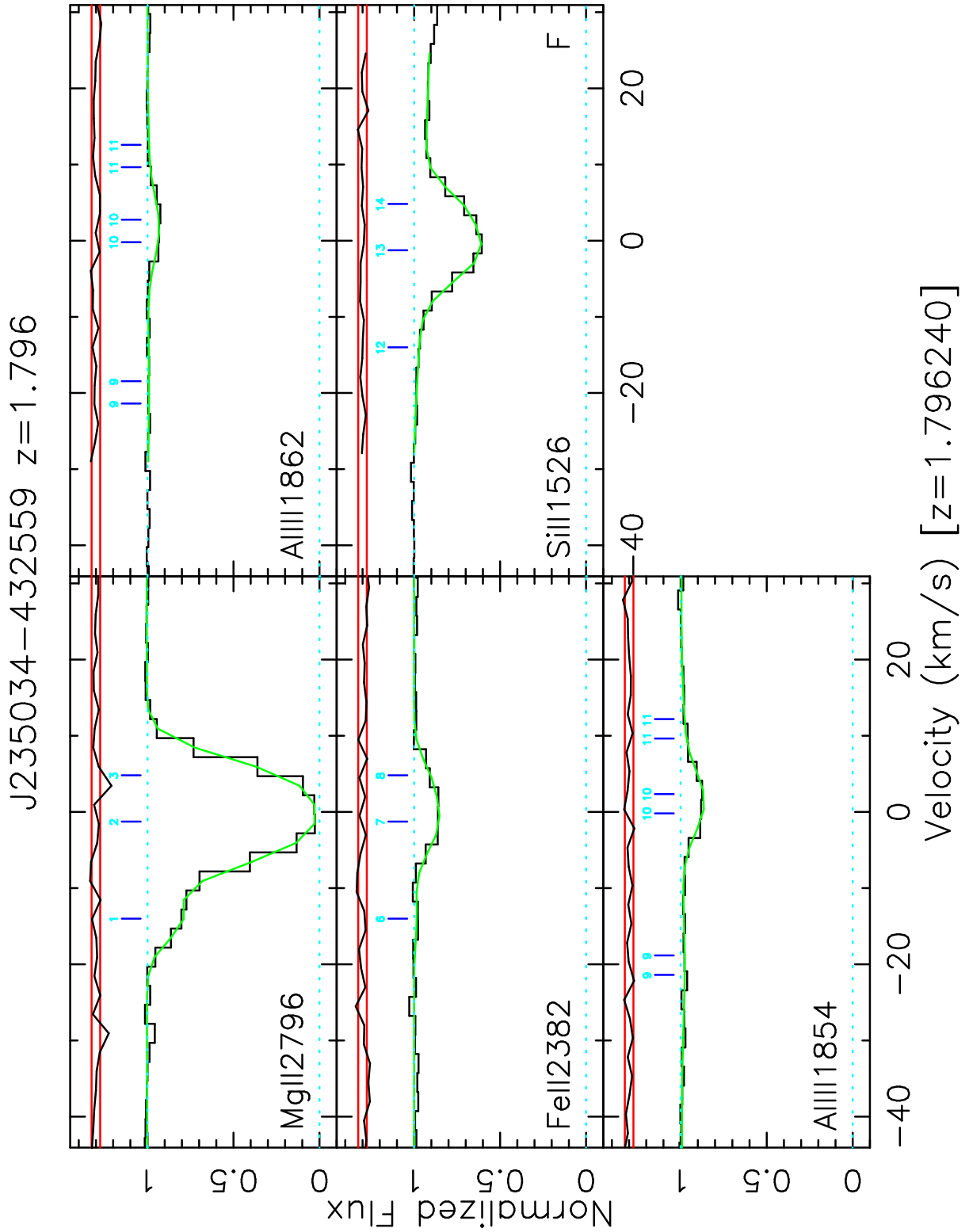


Figure 160. Many-multiplet fit for the  $z = 1.796$  absorber toward J235034+432559.