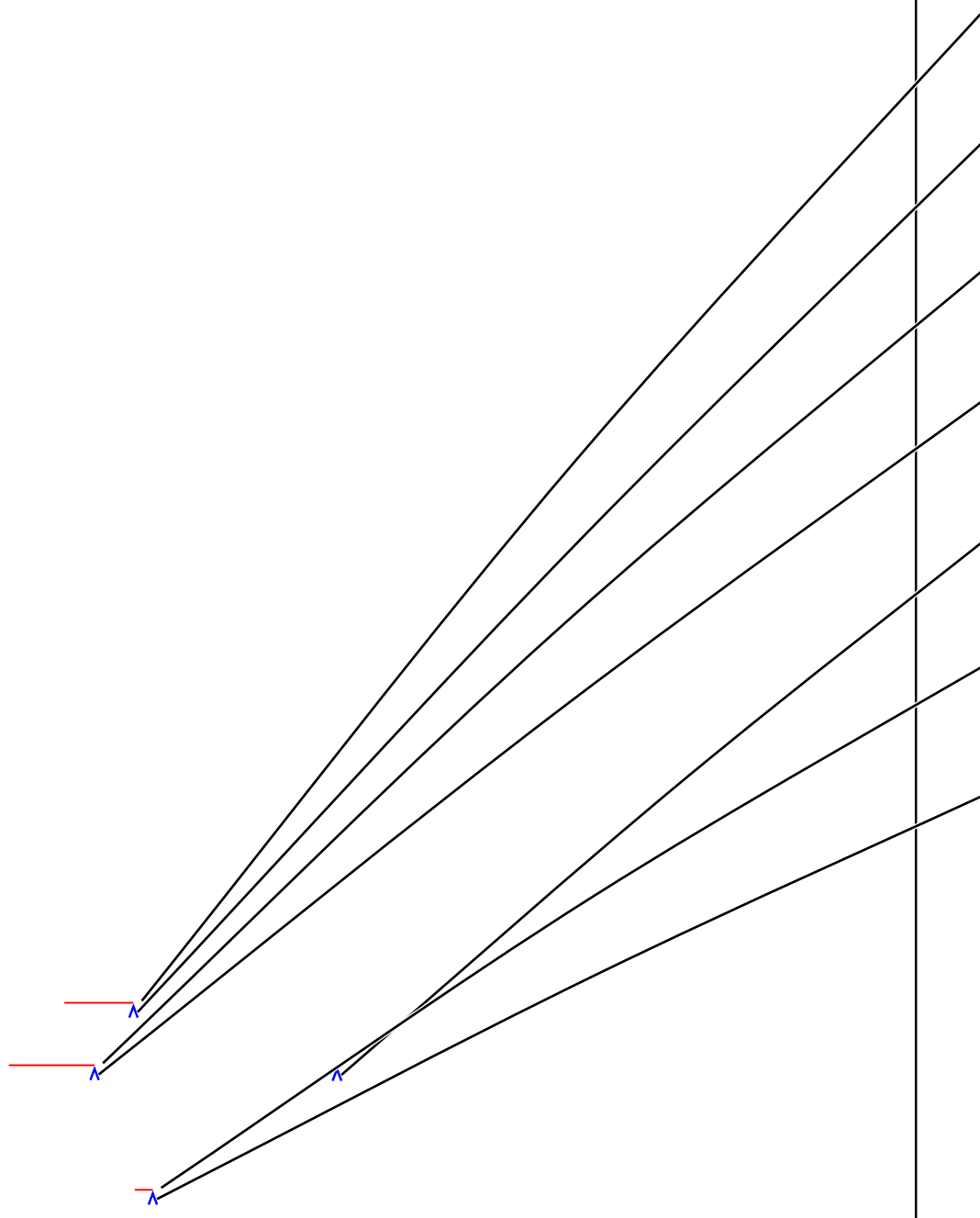

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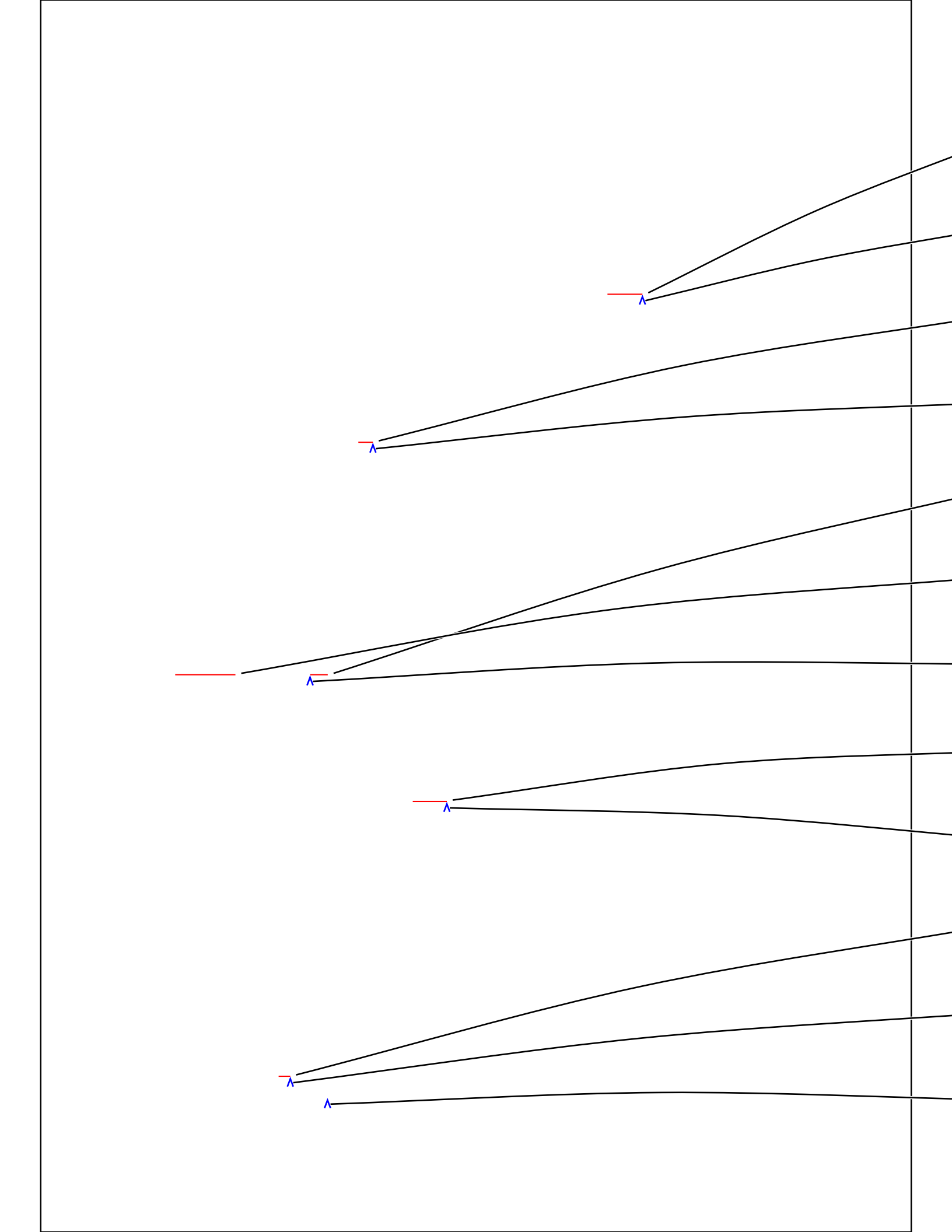

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Author: Jolene

Comments from page 2 continued on next page

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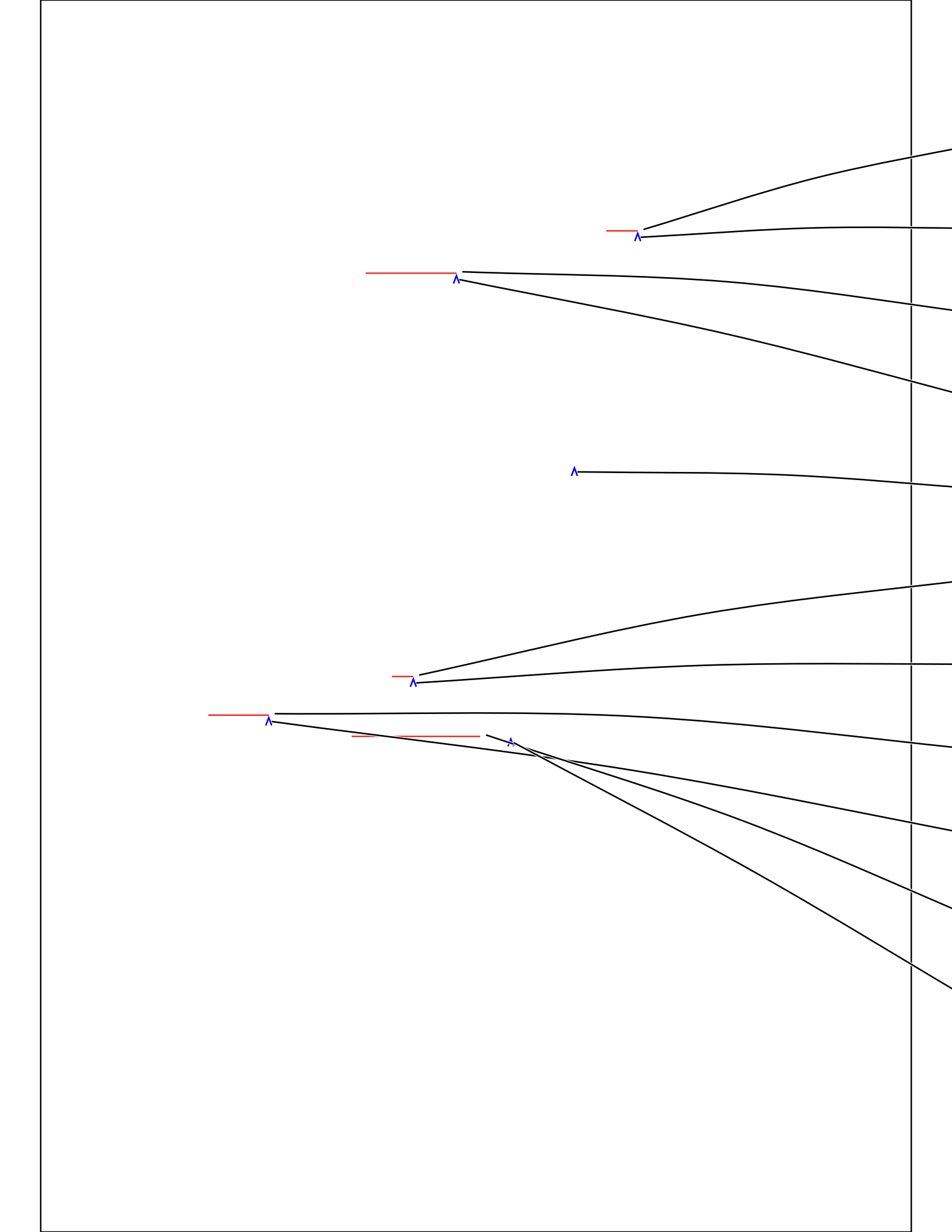

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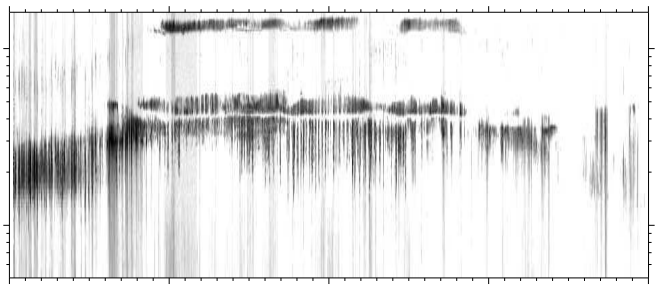

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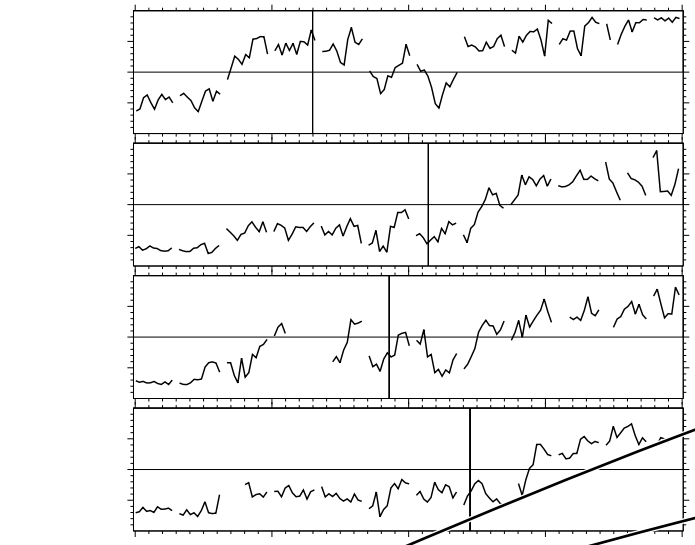

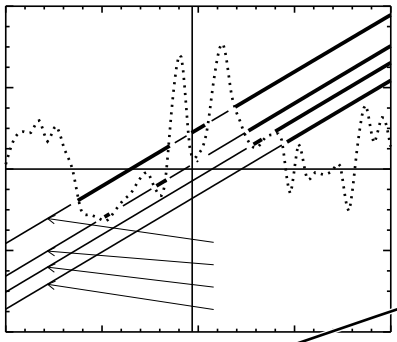

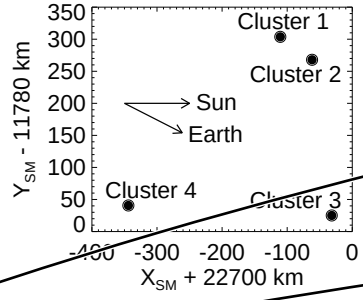

Fig. 3. (a) ~~Four~~ oblique lines represent changes of the sign of $S_{||}/\sigma S_{||}$ along the orbit of the four Cluster spacecraft ~~plotted in~~ the Z_{SM} coordinate as a function of time; the dotted line is the estimated central position of the chorus source region (see text). The horizontal solid line is the magnetic equator, the vertical solid line shows the ~~moment~~ when the center of mass of the four spacecraft crosses the equator. (b) Positions of the spacecraft in the equatorial plane. Arrows show the earthward and the sunward directions.

(dotted line in Fig. 3a) can be drawn, separating the positive and negative values of $S_{||}/\sigma S_{||}$ and hence indicating the central position of the chorus source region.

To estimate this central position at a given time we have used an ~~approximative~~ method based on linear interpolation or extrapolation of the obtained $S_{||}/\sigma S_{||}$ values. The procedure is as follows:

Page: 5

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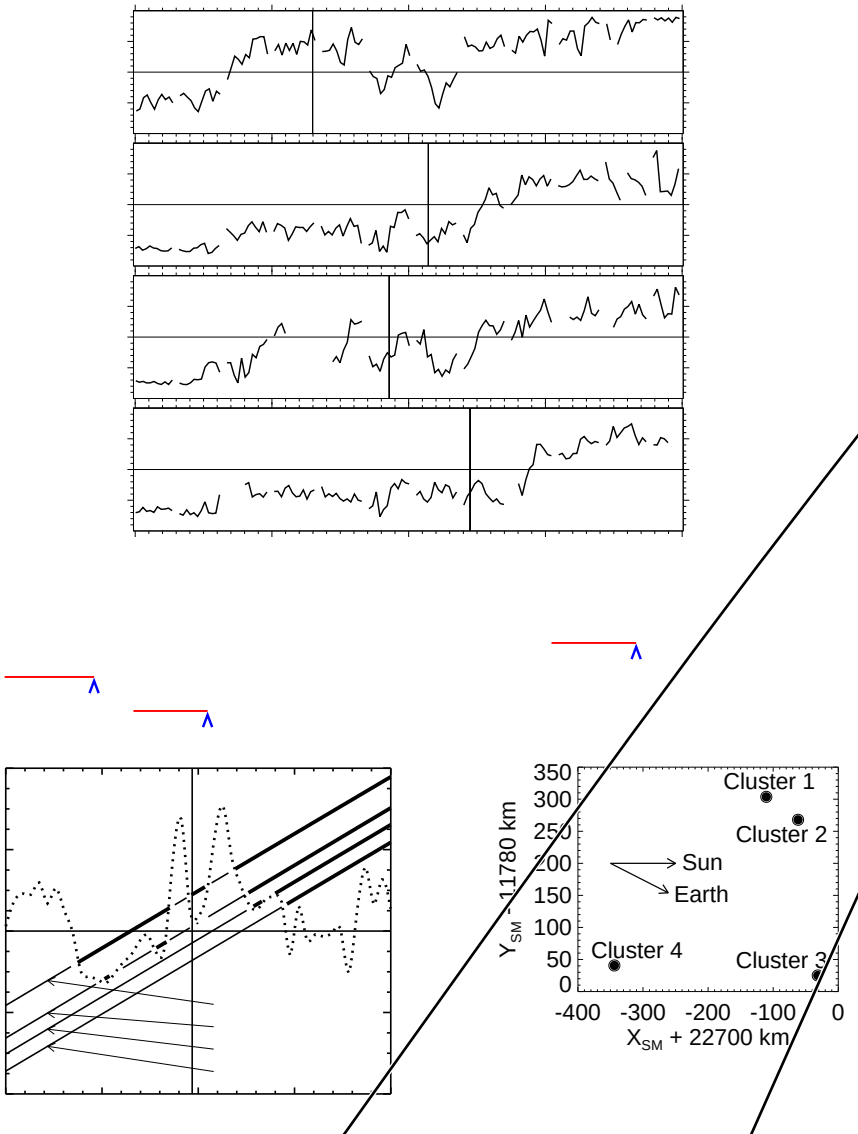

Fig. 3. (a) ~~Four~~ oblique lines represent changes of the sign of $S_{||}/\sigma S_{||}$ along the orbit of the four Cluster spacecraft ~~plotted in~~ the Z_{SM} coordinate as a function of time; the dotted line is the estimated central position of the chorus source region (see text). The horizontal solid line is the magnetic equator, the vertical solid line shows the ~~moment~~ when the center of mass of the four spacecraft crosses the equator. (b) Positions of the spacecraft in the equatorial plane. Arrows show the earthward and the sunward directions.

(dotted line in Fig. 3a) can be drawn, separating the positive and negative values of $S_{||}/\sigma S_{||}$ and hence indicating the central position of the chorus source region.

To estimate this central position at a given time we have used an ~~approximative~~ method based on linear interpolation or extrapolation of the obtained $S_{||}/\sigma S_{||}$ values. The procedure is as follows:

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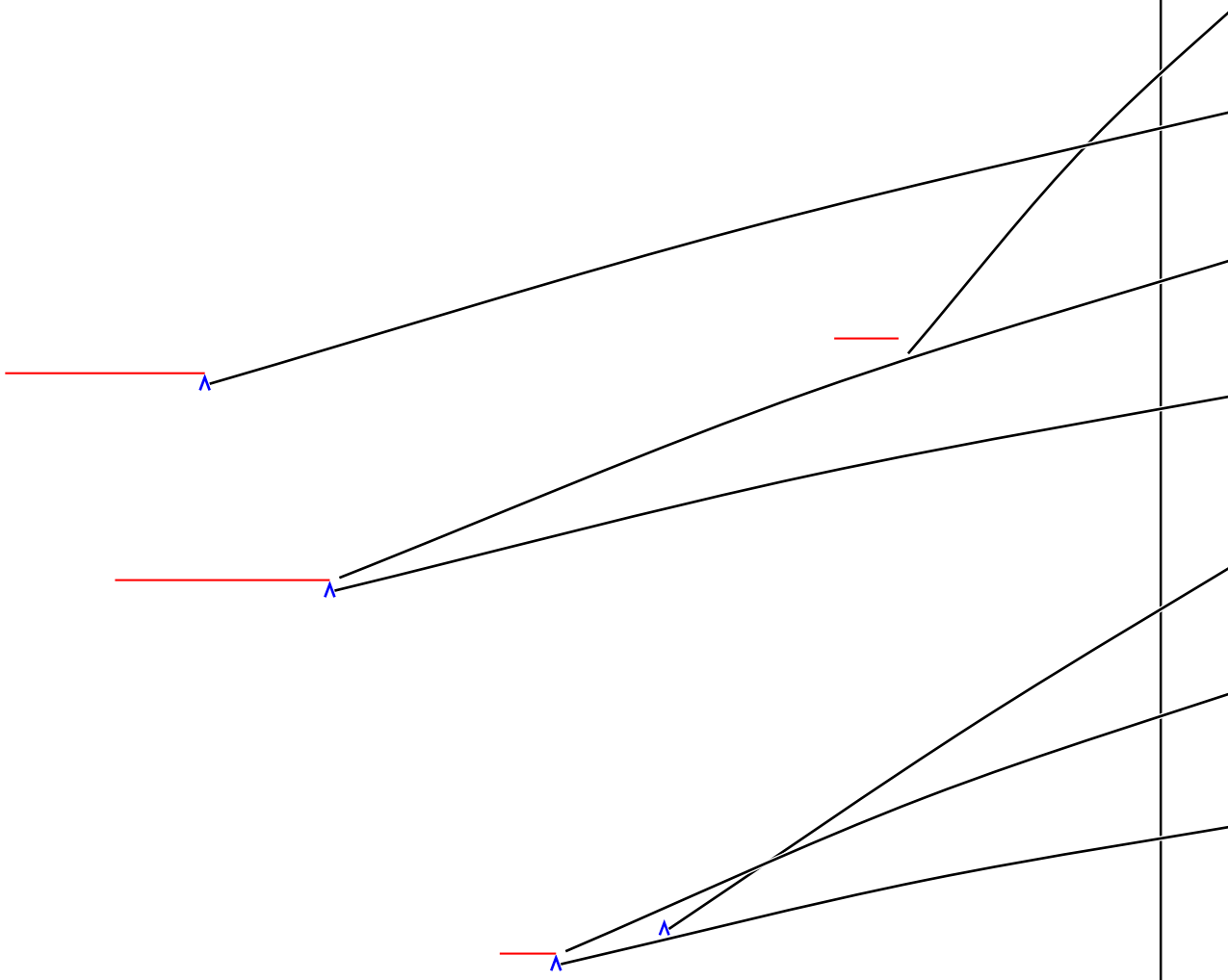
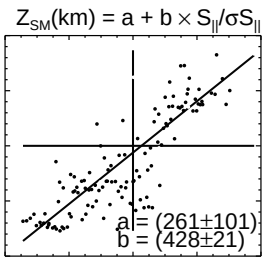
approximation





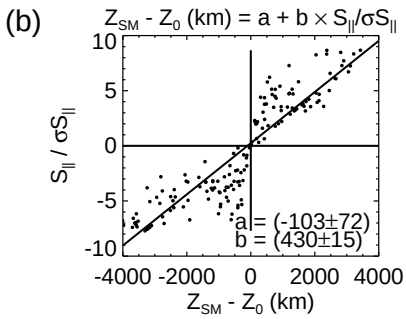


Fig. 4. (a) Linear fit to the obtained $S_{||}/\sigma S_{||}$ values as a function of the Z_{SM} coordinate. (b) The same but using the difference of the Z_{SM} coordinate and the estimated central position of the source.

Page: 6

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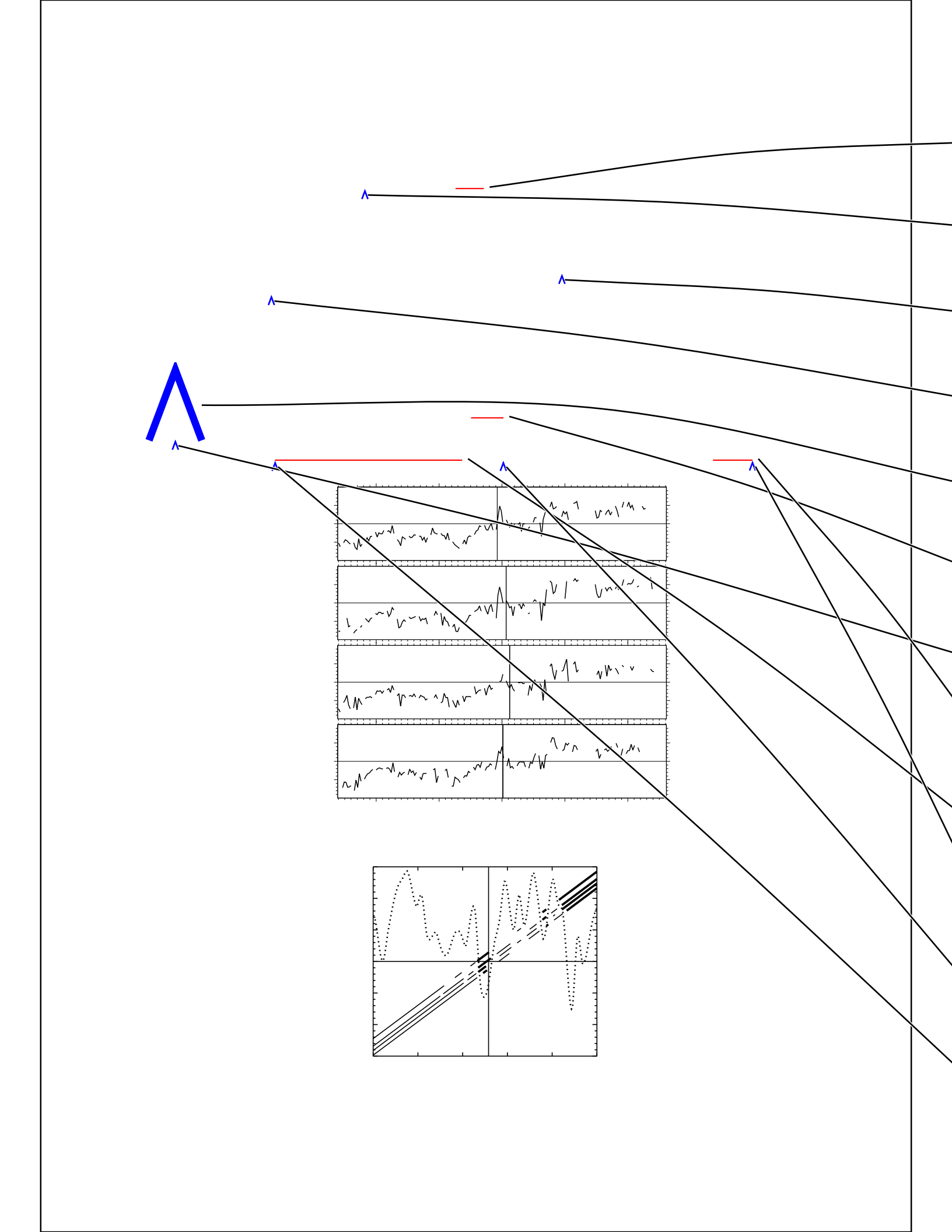

Page: 7

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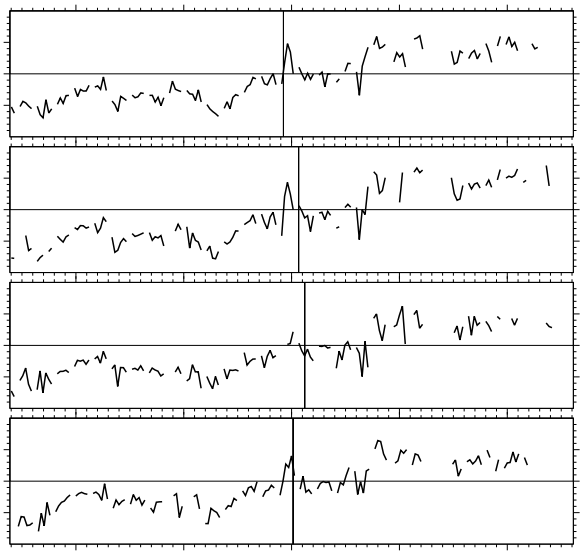

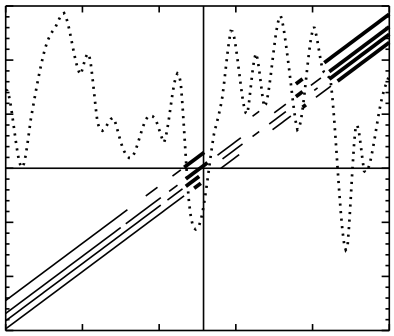

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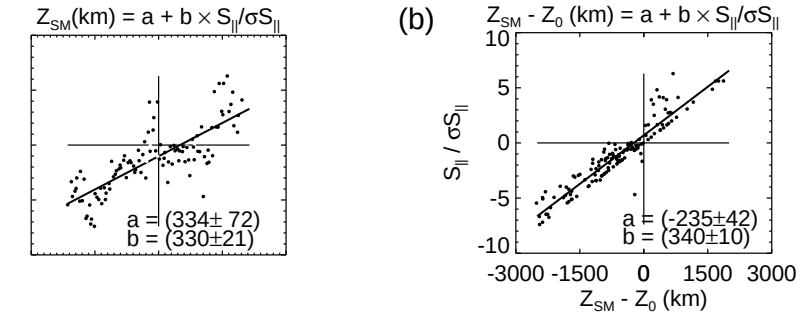

Fig. 7. The same as in Fig. 4 but for the data recorded on 18 April 2002.

4 Discussion

The analysis presented above ~~lead us to the estimation of~~ the central position of the source region of whistler-mode chorus. It has to be noted that this position is not necessarily the geometric center of the source region. ~~Its "centrality" is meant~~ as the point where the parallel component of the total Poynting flux changes its sign. We suppose that the source region has a finite dimension of a few thousands of km along the field line (*Santolík et al.*, 2003b). Inside this source region both directions of the Poynting flux are present simultaneously but on its southern end, the waves propagating to the South prevail, and similarly on its northern ~~end~~ we mainly observe the waves propagating to the North. The central position of this source region is then the point inside the source region where the parallel Poynting flux of waves propagating into the northern hemisphere equals the parallel flux of the waves propagating to the southern hemisphere.

We have observed random fluctuations of the estimated central position of the source region. There are two possible explanations. Either this is a property of the source mechanism itself, or the entire magnetic configuration is tail-like and flaps over the spacecraft, carrying the chorus source region with it. Under quiet conditions this latter possibility is not very likely to happen at the radial distance of our observations ($\sim$4 R_E). However, during storm conditions it is not unrealistic to have strong magnetic distortions at this radial distance. We have thus examined this possibility for the case of 31 March 2001. Figure 8 shows $S_{||}/\sigma S_{||}$ measured onboard Cluster 1, together with the direction of the ambient magnetic field $\boldsymbol{B}_0$ measured on the same spacecraft, and with the simulated results obtained from the dipole model calculated along the spacecraft orbit. We can see that the deviation θ_{BM} of the $\boldsymbol{B}_0$ direction from the Z_{SM} axis is larger than the dipole model pre-

Page: 8

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allows us to estimate the location

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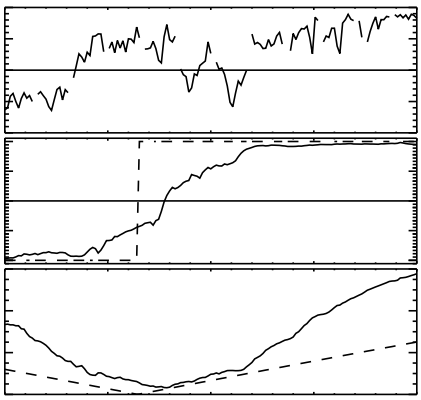

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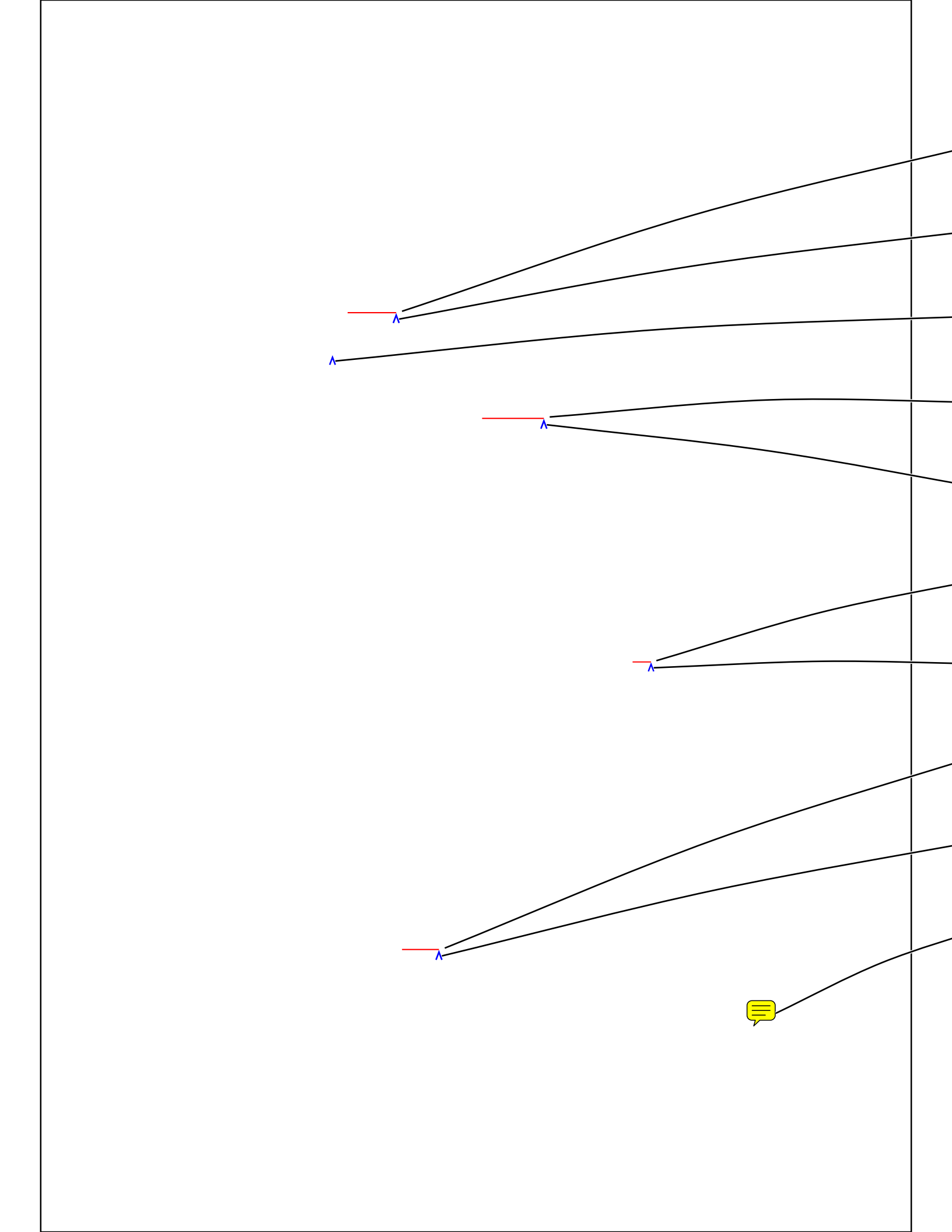

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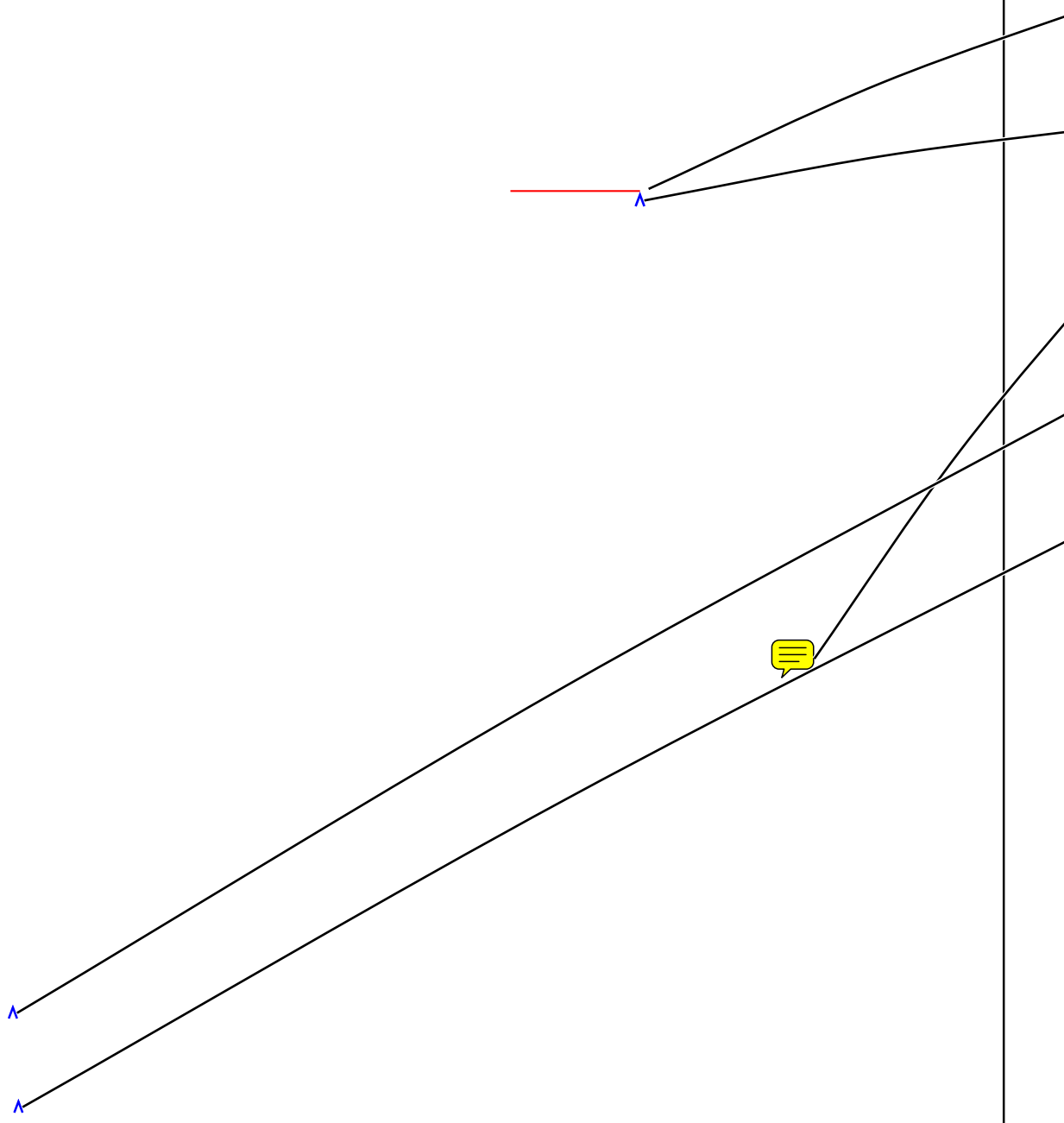
Perraut in front of their last names



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Put first initials of 2nd through 4th authors in front of their last names.

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Author: Jolene
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O.,
