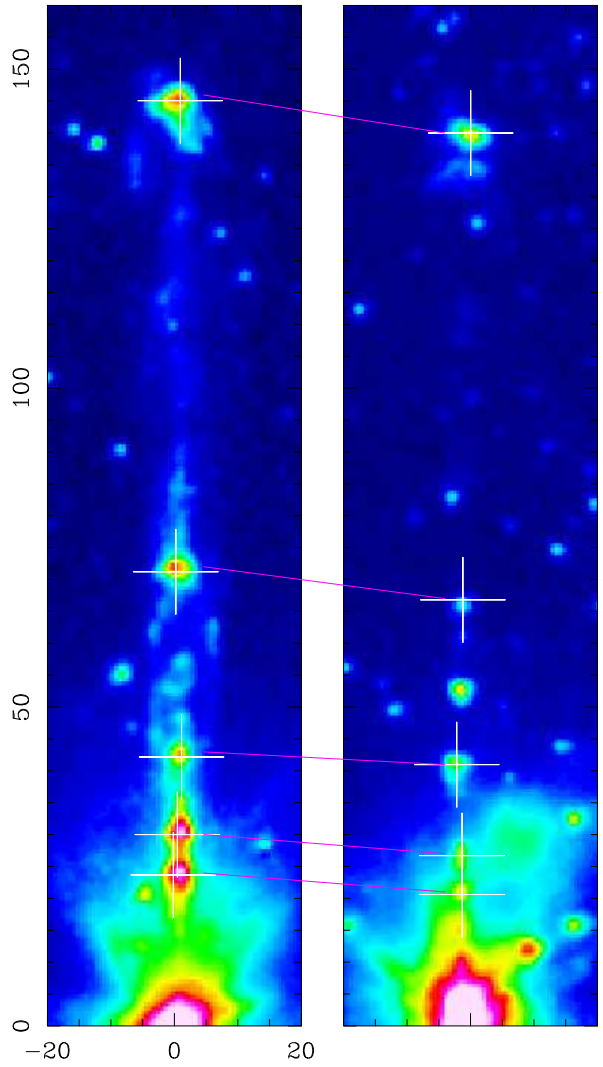

Fig. 2. The HH 111 *Spitzer* IRAC I2 band image of Noriega-Crespo et al. (2011), displayed in two frames. The left frame shows the E lobe, and the right frame the W lobe of HH 111. In both cases, the outflow axis has been rotated so that the outflow is parallel to the ordinate. In both frames, the source is placed at the origin of the reference system. The arrows indicate the chosen jet/counterjet knot pairs, and the crosses show the positions determined from parabolic fits to the emission peaks of the knots. The axes are labeled in arcseconds. The color figure can be viewed online.

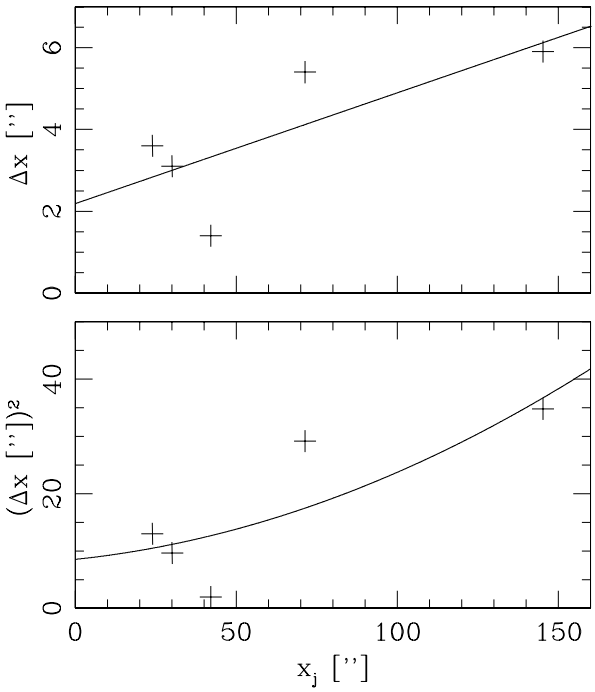

Fig. 3. Model fit to the HH 111 jet/counterjet knot pairs. We take the positions of the knot pairs shown in Figure 2 and plot Δx (top graph) and $(\Delta x)^2$ (bottom graph) as a function of x_j. The straight line in the top graph and the curve in the bottom graph show the model fits, which result in the parameters given in Table 1.

3.5. *Discussion*

From Table 1, we see that the ejection asymmetries deduced for the HH 34 and HH 111 outflows differ from each other in a significant way. If we look at the average values τ_0 and v_0 of the ejection time and velocity offsets (respectively), we find that:

- the knot structure of HH 34 implies ejection asymmetries with average time [$\tau_0 = (-3.0 \pm 9.5)$ yr] and velocity [$v_0 = (2.0 \pm 5.9)$ km s^{-1}] offsets which are not significantly different from zero,

- the positions of the knots of HH 111 imply non-zero average time [$\tau_0 = (18.2 \pm 7.1)$ yr] and velocity [$v_0 = (6.5 \pm 2.6)$ km s^{-1}] offsets.

As it is explained after equation (4), the non-zero value of τ_0 determined for HH 111 could be due to an error in the estimated position for the outflow source. For HH 111 the required offset would be $\Delta x_s = \tau_0 v_j \approx 2''.2$. Given the fact that we have located the source of HH 111 with an accuracy of better than one pixel ($\approx 0''.6$), it is clear that the average time offset that we find for the HH 111 ejections is not dominated by a possible error in the position of the outflow source. The $v_0 = (6.5 \pm 2.6)$ km s^{-1} average velocity offset also is undoubtedly a real effect.

For the widths of the ejection time and velocity offset distributions (see Table 1) we obtain that: