effect of picking wrong seismic velocity on epicentre location

consider the earth as a

note biased distribution of stations.

suppose we measure arrivals, $t_i$ and station locations $x_i$, exactly

if $V$ known exactly then residuals

$$r_i = 0 = \frac{t_{obs} - t_{calc}}{v} = t_i - t_0 - \frac{x_i - x_0}{v}$$

but if $V+sV$ is used and $sV > 0$ then all
the measured residuals are positive for stations in group A
in earthquake location we seek to minimize the
error $\sum r_i^2$. Since we have a biased station
distribution we can artificially reduce the error
by moving the epicenter away from its actual
position. The residual from group A look like

$$r_i^{\text{group A}} = t_i - t_0 - \frac{(x_i - x_0)}{(V+sV)} = \text{positive}$$

we make $r_i$ smaller by:

- decreasing first term
- increasing second term

decreasing first term: make to larger earthquake
appears later than actually was
increasing second term: make $x_0$ smaller, earthquake
seems farther away from group A
than it actually is.