Appendix B

Relations among ray parameters in field coordinates and ray parameters in midpoint-offset coordinates

Beam stacks decompose the prestack data according to the midpoint ray parameter p_y and the offset ray parameter p_h. The ray tracing that I use for modeling the beam-stacked data needs the shot ray parameter p_s and the receiver ray parameter p_r as initial conditions for the rays. In this appendix I derive the equations for evaluating p_s and p_r when p_y and p_h are given, and vice versa.

Using the definitions of y and h, given the shot position x_s, and the receiver position x_r,

$$y \equiv \frac{x_r + x_s}{2} \qquad\qquad h \equiv \frac{x_r - x_s}{2} \tag{B.1}$$

the relations among the ray parameters are

$$p_y \equiv \frac{dt}{dy} = \frac{dt}{dx_r}\frac{dx_r}{dy} + \frac{dt}{dx_s}\frac{dx_s}{dy} = p_r + p_s \tag{B.2}$$

and

$$p_h \equiv \frac{dt}{dh} = \frac{dt}{dx_r}\frac{dx_r}{dh} + \frac{dt}{dx_s}\frac{dx_s}{dh} = p_r - p_s. \tag{B.3}$$