Revised notation for seismic coherence paper - Menke Dec '90

1. let the seismic velocity wave field be $v(x,t)$.

2. Suppose the wave field is measured at receiver points, x_i

3. The coherence condition is that the wavefield at two neighboring receiver points, x_i and x_{i+1} are stretched versions of one another

$$v(x_i, t=t') \approx v[x_{i+1}, t=T(x_i, x_{i+1}, t')]$$

4. The mapping function, $T(x_i, x_{i+1}, t)$ has the interpretation of travel time, in the sense that $T(0, x, t)$ is the travel time of a wave at x, where the wave is named by its travel time, t, at zero offset.

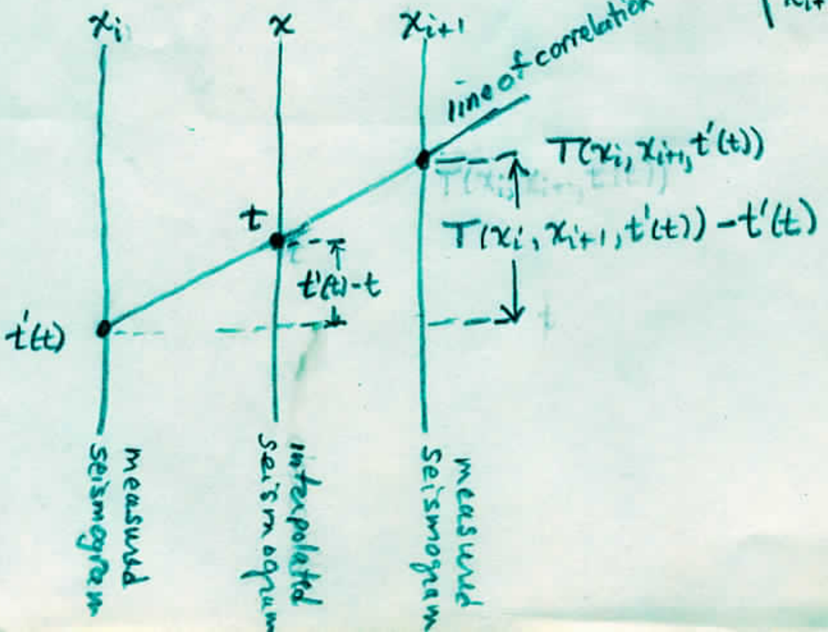
5. The interpolant for $v(x,t)$, $x_i \le x \le x_{i+1}$ is

$$v(x,t) = \left(\frac{x_{i+1}-x}{x_{i+1}-x_i}\right) v(x, t'(t)) + \left(\frac{x-x_i}{x_{i+1}-x_i}\right) v(x, T(x_i, x_{i+1}, t'(t)))$$

where $t'(t)$ solves the implicit eqn

$$t'(t) - t = \left(\frac{x-x_i}{x_{i+1}-x_i}\right)\left[T(x_i, x_{i+1}, t'(t)) - t'(t)\right]$$

(see diagram)



6. The slowness $p = \dfrac{d(\text{Travel time})}{d(\text{distance})}$

is estimated at x, $x_i \le x \le x_{i+1}$ as

$$p(\bar{x},t) = \frac{T(x_i, x_{i+1}, t'(t)) - t'(t)}{x_{i+1} - x_i}$$

where $t'(t)$ solves the implicit equation given in (5).

7. tau is estimated at x, $x_i \le x \le x_{i+1}$ as

$\tau(x,t) = t - p(x,t)\,\bar{x}$, where $p(\bar{x},t)$ is as given in (6)

8. These results can easily be used to produce a τ-p stack of the data.