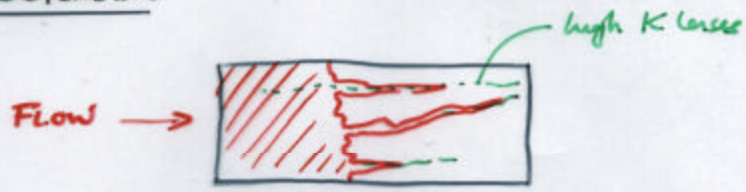
5.7.4 SCALE EFFECTS OF DISPERSION



Macrodispersion – variability in conductivity field → variability in velocity field.
– Gives enhanced dispersion – at all scales.

Hence scale effect:
Larger scale → larger variation in conductivity distribution → increasing dispersivity

Some controversy over upper limit (of scale)
scale of 10,000 m?
new sources of heterogeneity – regional geology.

Stochastic methods may be applied
– Treat heterogeneity as the defining parameter
– define heterogeneity → define dispersion characteristics

Approx magnitudes:

$$\alpha_L = \frac{1}{10} X$$

$$\alpha_T = \frac{1}{10}\alpha_L \text{ to } \frac{1}{3}\alpha_L$$

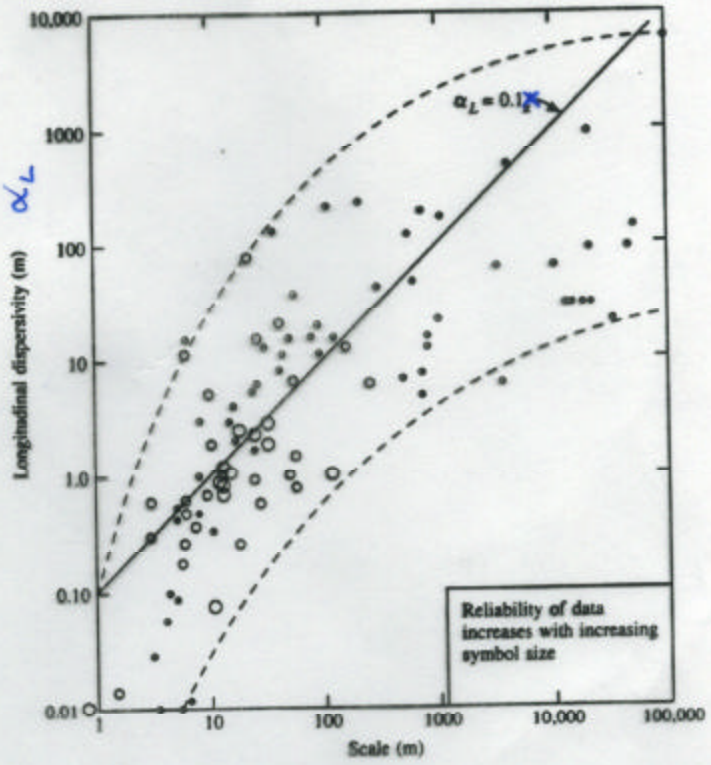


FIGURE 2.18 Field-measured values of longitudinal dispersivity as a function of the scale of measurement. The largest circles represent the most reliable data. *Source:* L. W. Gelhar, *Water Resources Research* 22, no. 9 (1986):135S–145S. Copyright by the American Geophysical Union.

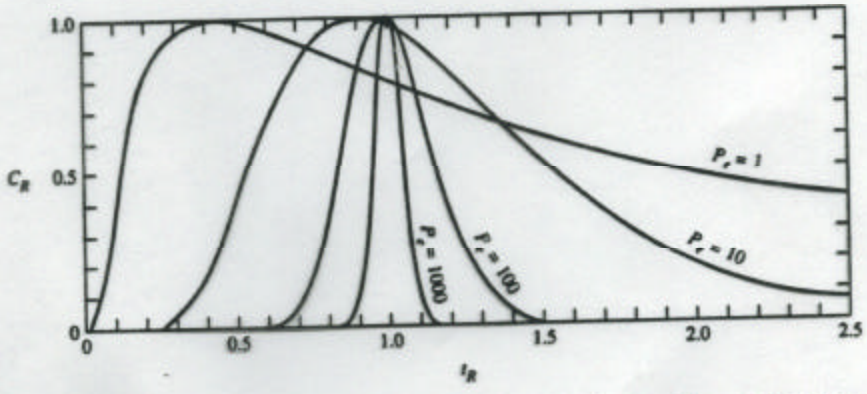


FIGURE 2.10 Dimensionless-type curve for the injection of a slug of a tracer into a one-dimensional flow field. *Source:* J. P. Sauty, *Water Resources Research* 16, no. 1 (1980):145–58. Copyright by the American Geophysical Union.