Two-Point Closures:

As discussed previously, the most difficult term to model in the Reynolds transport equations is the pressure-strain term. For homogeneous turbulence subject to rapid distortion, this term takes the form:

$$\mathcal{R}_{ij} = 2 \frac{\partial \bar{u}_k}{\partial x_l} \left(M_{iljk} + M_{jlik} \right)$$

where:

$$M_{iljk} = -\frac{1}{4\pi} \iiint_{-\infty}^{\infty} \frac{1}{|\vec{r}|} \frac{\partial^2 R_{il}(\vec{r})}{\partial r_j \, \partial r_k} d\vec{r}$$

($R_{il}(\vec{r})$: Two-Point Correlation Tensor)

This suggests that one may want to solve for the two-point correlation. In two-point closure models, that is exactly what is done. The advantages of such models are that the pressure can be treated more naturally, and the resulting two-point correlation provides information about the spatial structure of the turbulence. However, two-point closures are significantly more complicated to use in modeling situations, and this has almost exclusively limited their use to homogeneous turbulence. There are two notable two-point closure models: the direct interaction approximation (DIA) by Kraichnan (1964) and the eddy-damped quasi-normal Markovian model (EDQNM) by Lesieur (1990). The EDQNM model has also been used to develop large eddy simulation models.