where

h is hydraulic head,

K is hydraulic conductivity, and

S_s is specific storage.

For simulating oil flow, the quantities h, K, and S_s are computed as

$$h = \frac{p}{\rho_o g} + z, \tag{8}$$

$$K = \frac{\rho_o g k}{\mu}, \tag{9}$$

$$S_s = \rho_o g \phi c, \tag{10}$$

where

ρ_o is oil density,

z is vertical elevation above a given datum, and

The simulation time step is 0.2 day.

The parameter estimation program PEST version 10 (Doherty, 2004) is used to perform history matching—the adjustment of model parameters so that simulated pressures matches measured pressured. PEST implements a nonlinear least-squares regression method to estimate model parameters by minimizing the sum of squares of the differences between measured and simulated pressures:

$$\Phi = \sum_{i=1}^{N} (p_i^{meas} - p_i^{sim})^2 \tag{11}$$

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