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graph TD; Start([Start]) -->|<math>u_{t_{i-1}}, p_{t_{i-1}}</math>| Momentum[Momentum equation]; Momentum -->|<math>u^*_{t_i}</math>| Surrogate[Surrogate]; Surrogate -->|<math>p_{t_i, SM}</math>| Pressure[Pressure equation]; Pressure -->|<math>p_{t_i}</math>| Correct[Correct velocity]; Correct -->|<math>u_{t_i}</math>| Transport[transport turbulence]; Transport --> End([End]); Correct -->|pressure loop| Pressure;
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The flowchart illustrates the iterative process of solving for velocity and pressure in a numerical simulation. It begins with a 'Start' node, which leads to the 'Momentum equation' block. This block receives input from the previous time step, $u_{t_{i-1}}, p_{t_{i-1}}$, and the time step size, Δt . The output of the momentum equation is the intermediate velocity, $u^*_{t_i}$, which is then passed to the 'Surrogate' block. The 'Surrogate' block outputs the semi-discrete pressure, $p_{t_i, SM}$, to the 'Pressure equation' block. The 'Pressure equation' block outputs the corrected pressure, p_{t_i} , to the 'Correct velocity' block. The 'Correct velocity' block outputs the corrected velocity, u_{t_i} , to the 'transport turbulence' block. A feedback loop labeled 'pressure loop' connects the 'Correct velocity' block back to the 'Pressure equation' block, indicating that the pressure correction is an iterative process.

Diagram illustrating the surrogate model for predicting the pressure field in a porous medium.

The input consists of three cross-sectional views of the porous medium, showing the velocity increments $\Delta u_{i,x}$, $\Delta u_{i,y}$, and $\Delta u_{i,z}$. A coordinate system (x, y, z) is shown.

These inputs are fed into the **Surrogate** model.

The surrogate model predicts the pressure field Δp_i .

The final pressure field p_{t_i} is obtained by adding the predicted pressure field Δp_i to the previous time step's pressure field $p_{t_{i-1}}$.

[illegible]