Equations of motion of the fluid phase

- statistically stationary, incompressible and isothermal fluid flow
- constant physical properties of the fluid flow; Newtonian fluid
- standard k–ε turbulence model
- 2-dimensional, time–averaged form of transport equations :

$$\begin{aligned}\frac{\partial}{\partial x}(\rho_F\, u_F\, \Phi) \;+\; \frac{\partial}{\partial y}(\rho_F\, v_F \Phi) &= \\ &= \frac{\partial}{\partial x}\left(\Gamma\,\frac{\partial \Phi}{\partial x}\right) + \frac{\partial}{\partial y}\left(\Gamma\,\frac{\partial \Phi}{\partial y}\right) + S_\Phi + S_\Phi^P\end{aligned}$$

where : $\Phi - u_F, v_F, k, \varepsilon$

Φ	S_Φ	S_Φ^P	Γ
1	0	0	0
u_F	$\frac{\partial}{\partial x}\left(\Gamma\,\frac{\partial u_F}{\partial x}\right) + \frac{\partial}{\partial y}\left(\Gamma\,\frac{\partial v_F}{\partial x}\right) - \frac{\partial p}{\partial x}$	$S_{u_F}^P$	μ_{eff}
v_F	$\frac{\partial}{\partial x}\left(\Gamma\,\frac{\partial u_F}{\partial y}\right) + \frac{\partial}{\partial y}\left(\Gamma\,\frac{\partial v_F}{\partial y}\right) - \frac{\partial p}{\partial y}$	$S_{v_F}^P$	μ_{eff}
k	$P_k - \rho_F\, \varepsilon$	0	$\frac{\mu_t}{\sigma_k}$
ε	$\frac{\varepsilon}{k}(C_{\varepsilon_1}\, P_k - C_{\varepsilon_2}\, \rho_F\, \varepsilon)$	0	$\frac{\mu_t}{\sigma_\varepsilon}$
$P_k = \mu_t \left\{ 2\cdot\left[\left(\frac{\partial u_F}{\partial x}\right)^2 + \left(\frac{\partial v_F}{\partial y}\right)^2\right] + \left(\frac{\partial u_F}{\partial y} + \frac{\partial v_F}{\partial x}\right)^2 \right\}$			
$S_{u_i}^P = -\frac{1}{V_{ij}} \sum m_P \dot{N}_P \left[u_{Pi,out} - u_{Pi,in}\right.$ $\left. -g_i\,\left(\frac{\rho_P-\rho_F}{\rho_P+1/2\rho_F}\right)(t_{out}-t_{in})\right]$			

- finite volume discretization on block–structured grid with control volumes of arbitrary, convex, quadrangular shape
- pressure–velocity coupling algorithm of SIMPLE kind with colocated arrangement of variables on numerical grid (FAN2D – Perić/Lilek, 1993)