ERRATA SHEET

This errata sheet lists errors and their correction for the doctoral thesis of Husam Elghannay, titles "Methods Development and Validation for Large Scale Simulations of Dense Particulate Flow Systems in CFD-DEM Framework", Virginia Tech, 2018. Errors indicated in the middle column are typos in an already published work and were corrected as indicated in the last column.

Location	Error	Correction
Page 12, Eq. (2.2)	$\frac{\partial(\varepsilon\rho_g\vec{u})}{\partial t}+\vec{\nabla}.(\varepsilon\rho_g\vec{u}\vec{u}) = -\vec{\nabla}p+\vec{\nabla}.(\varepsilon\bar{\bar{\tau}})+\varepsilon\rho_g\vec{g} - \vec{f}_{Drag}$	$\frac{\partial(\varepsilon\rho_g\vec{u})}{\partial t}+\vec{\nabla}.(\varepsilon\rho_g\vec{u}\vec{u}) = -\vec{\nabla}p+\vec{\nabla}.(\varepsilon\bar{\bar{\tau}})+\rho_g\vec{g} - \vec{f}_{Drag}$
Page 13, Eq. (2.3)	$\vec{f}_{Drag}=\sum_{n=1}^{N_p}\beta\frac{V_p}{(1-\varepsilon)}(\vec{u}-\vec{v}_p)$	$\vec{f}_{Drag}=\sum_{n=1}^{N_p}\beta\frac{V_p}{\varepsilon(1-\varepsilon)}(\vec{u}-\vec{v}_p)$
Page 39, Eq. (3.26)	$g(n)=\frac{\sum_{i=1}^{n_{tot}}\frac{1}{\sqrt{n_i}}}{n_{tot}}$	$g(n_{tot})=\frac{\sum_{i=1}^{n_{tot}}\frac{1}{\sqrt{n_i}}}{n_{tot}}$
Page 57, line 3	using Eq. (3.27)	using Eq. (3.28a)
Page 70, Eq. (4.13)	$\vec{f}_{Drag}=\frac{\beta}{(1-\varepsilon)\rho_p}(\vec{u}-\vec{u}_p)$	$\vec{f}_{Drag}=\frac{\beta}{\varepsilon(1-\varepsilon)\rho_p}(\vec{u}-\vec{u}_p)$
Page 99, Eq. (5.6)	$\vec{F}_{Drag}=\frac{\beta V_p}{(1-\varepsilon)}(\vec{u}-\vec{v}_p)$	$\vec{F}_{Drag}=\frac{\beta V_p}{\varepsilon(1-\varepsilon)}(\vec{u}-\vec{v}_p)$
Page 100, Eq. (5.8)	$\vec{F}_t=\begin{cases}-k_t\vec{\delta}_t-\eta_t\vec{v}_{p,t} & for\ (\lvert\vec{F}_t\rvert<\mu_f\lvert\vec{F}_n\rvert)\\ -\mu_f\lvert\vec{F}_n\rvert & for\ (\lvert\vec{F}_t\rvert\geq\mu_f\lvert\vec{F}_n\rvert)\end{cases}$	$\vec{F}_t=\begin{cases}-k_t\vec{\delta}_t-\eta_t\vec{v}_{p,t} & for\ (\lvert\vec{F}_t\rvert<f\lvert\vec{F}_n\rvert)\\ -f\lvert\vec{F}_n\rvert & for\ (\lvert\vec{F}_t\rvert\geq f\lvert\vec{F}_n\rvert)\end{cases}$
Page 100, line 11	where; k, δ, η and μ_f above are	where; k, δ, η and f above are
Page 114, Nomenclature	μ_f-friction factor [-] (removed)	f-friction factor [-] (added)
Page 238, Eq. (A.24)	$\vec{F}_{Drag}^{RP}=\frac{\beta V^{RP}}{(1-\varepsilon)}(\vec{u}-\vec{v}^{RP})$	$\vec{F}_{Drag}^{RP}=\frac{\beta V^{RP}}{\varepsilon(1-\varepsilon)}(\vec{u}-\vec{v}^{RP})$
Page 259, Eq. (B.3)	$m_p\frac{d\vec{u}_p}{dt}=V_p(\rho_p-\rho)\vec{g}+\frac{\beta V_p}{(1-\varepsilon)}(\vec{u}-\vec{u}_p) + \sum\vec{F}_{coll}$	$m_p\frac{d\vec{u}_p}{dt}=V_p(\rho_p-\rho)\vec{g} + \frac{\beta V_p}{\varepsilon(1-\varepsilon)}(\vec{u}-\vec{u}_p) + \sum\vec{F}_{coll}$
Page 261, Eq. (B.12)	$\vec{F}_{Drag}^{RP}=\sum_{n_{pP}}\vec{F}_{Drag}=\frac{\beta V_p}{(1-\varepsilon)}\sum_{n_{pP}}(\vec{u}-\vec{u}_p) = \frac{\beta V^{RP}}{(1-\varepsilon)}(\vec{u}-\vec{u}^{RP})$	$\vec{F}_{Drag}^{RP}=\sum_{n_{pP}}\vec{F}_{Drag}=\frac{\beta V_p}{\varepsilon(1-\varepsilon)}\sum_{n_{pP}}(\vec{u}-\vec{u}_p) = \frac{\beta V^{RP}}{\varepsilon(1-\varepsilon)}(\vec{u}-\vec{u}^{RP})$