$$
\begin{aligned}
\text{average volume transport} &= \overline{\int_{-h}^{\eta} u \, \mathrm{d}z}\,, \\
&= \int_{-h}^{0} \bar{u} \, \mathrm{d}z + \overline{\int_{0}^{\eta} u \, \mathrm{d}z}\,, \\
&= \int_{-h}^{0} \bar{u}_2 \, \mathrm{d}z + \overline{\eta' u'_{\mathrm{s}}} + \mathcal{O}(\epsilon)^3\,, \\
&\approx \underbrace{\int_{-h}^{0} \bar{u}_2 \, \mathrm{d}z}_{\text{Eulerian transport}} + \underbrace{\tfrac{1}{2} a^2 k c}_{\text{Stokes transport, } S}
\end{aligned}
$$