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## A simple method for calculating in-situ settling velocities of cohesive sediment without fractal dimensions

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### KEYWORDS:

DREDGE; SEDIMENT SETTLING; POROSITY; IN-SITU MEASUREMENT;  
DENSITY FUNCTION

# Deduction of settling velocity

Balance of forces



Expressions of forces based on porosity



Relationship between porosity and fractal dimension



$$F_g - F_b = F_v + F_i$$



$$\begin{aligned} F_g &= V_f \rho_f g = a d_f^2 \rho_f g \\ F_b &= V_f \rho_w g = a d_f^2 \rho_w g \\ F_v &= 4P_f \mu \omega = c (b d_f^2)^{\left(\frac{9}{16D} + \frac{7}{16}\right)} \mu \omega \\ F_i &= A_f \rho_f \omega^2 = b d_f^2 \rho_f \omega^2 \end{aligned}$$

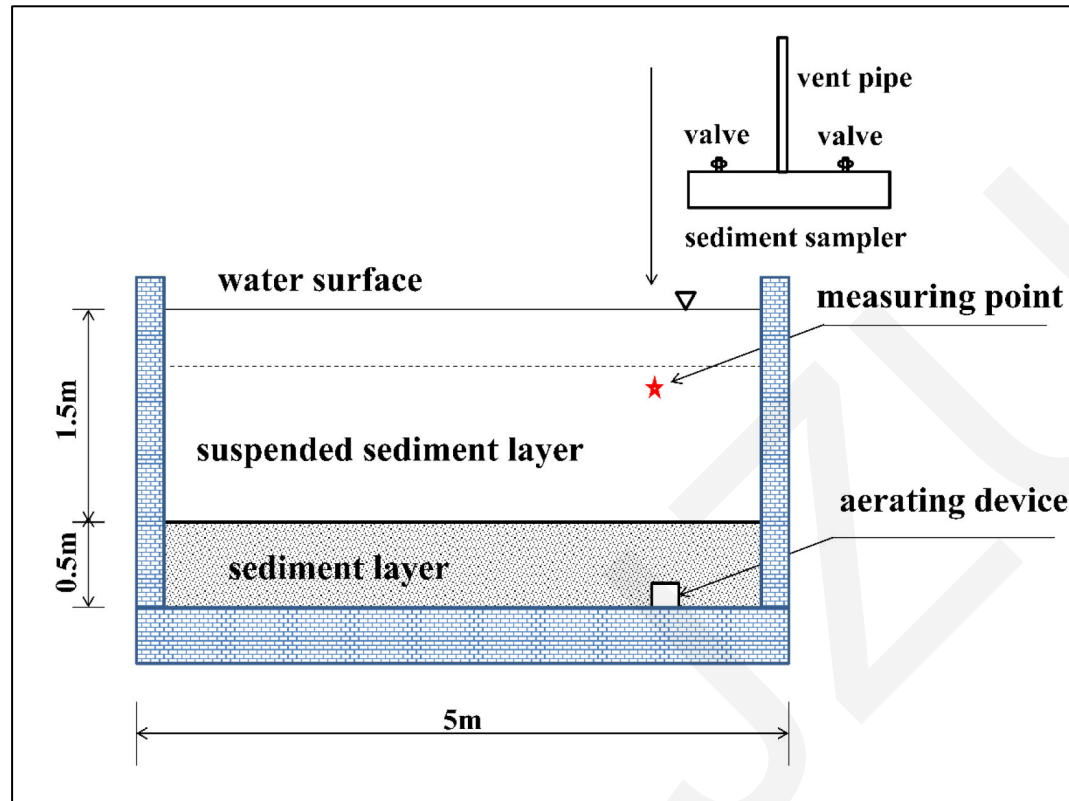


$$D = \log_l(1 - e) + 3$$

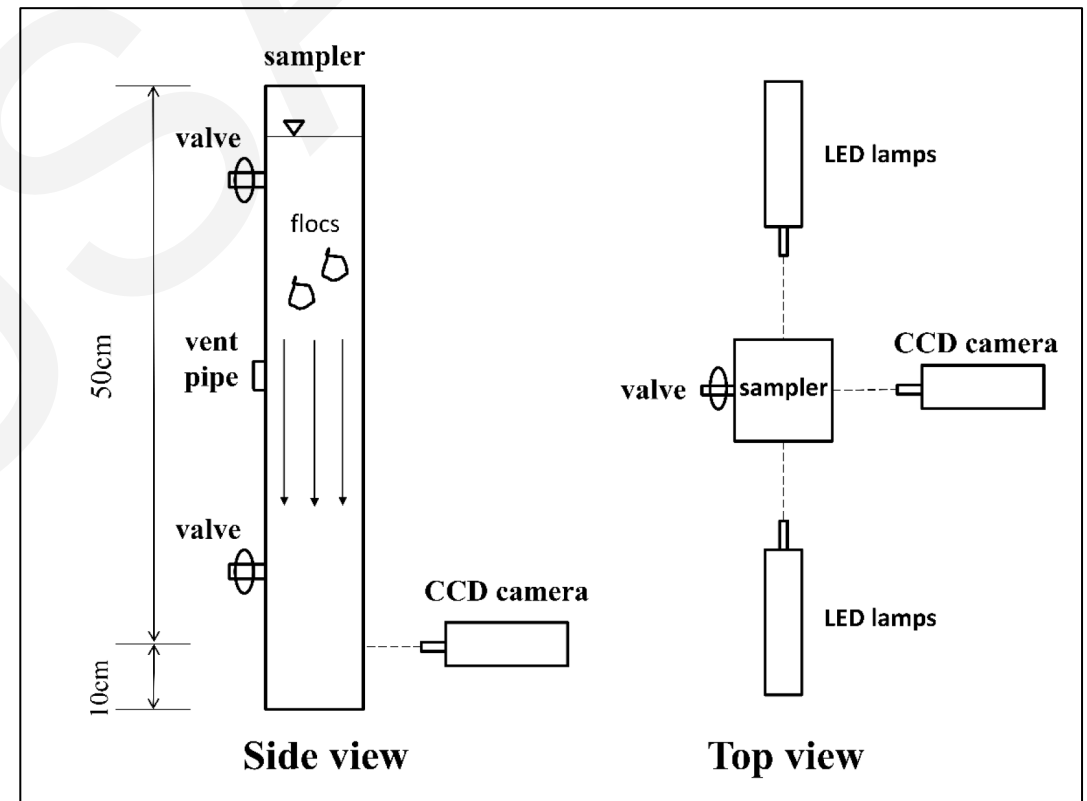


$$\omega = \frac{-3\mu c (b d_f^2)^{\frac{E}{2}} \pm \sqrt{9\mu^4 c^2 (b d_f^2)^E + 4ab\rho_f g (\rho_f - \rho_w) d_f^5}}{2\rho_f b d_f^2}$$

# Experiments on the settling of sediment flocs

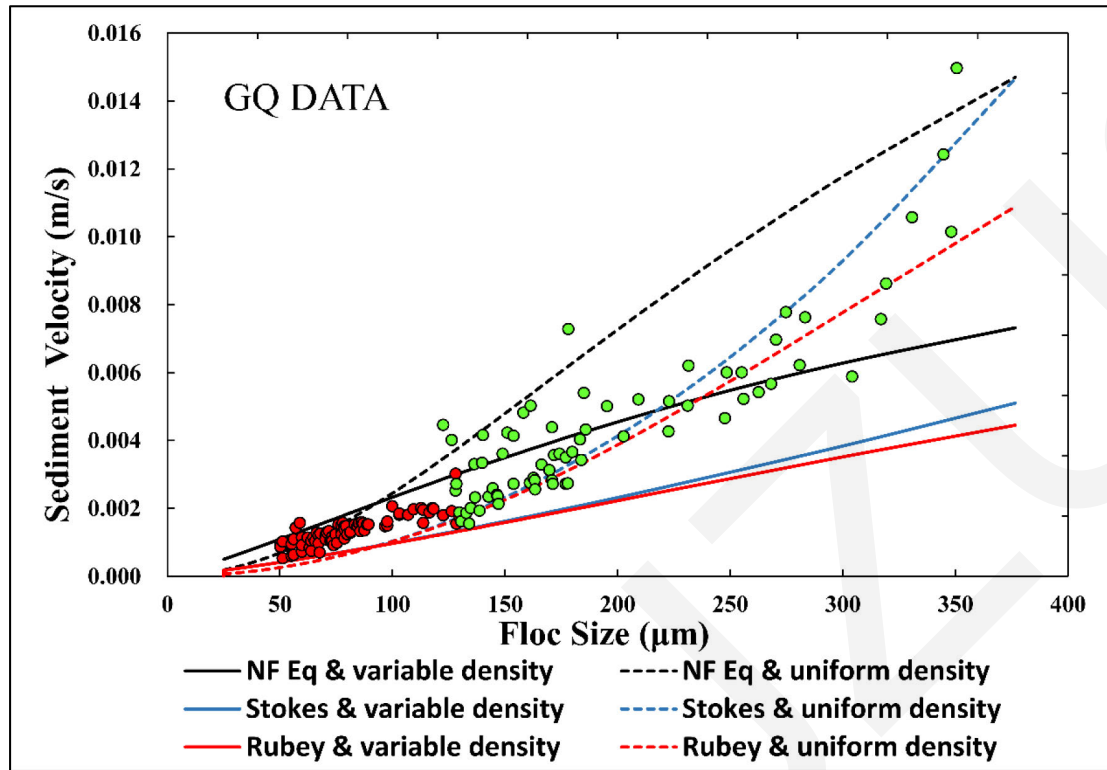


Experiment site

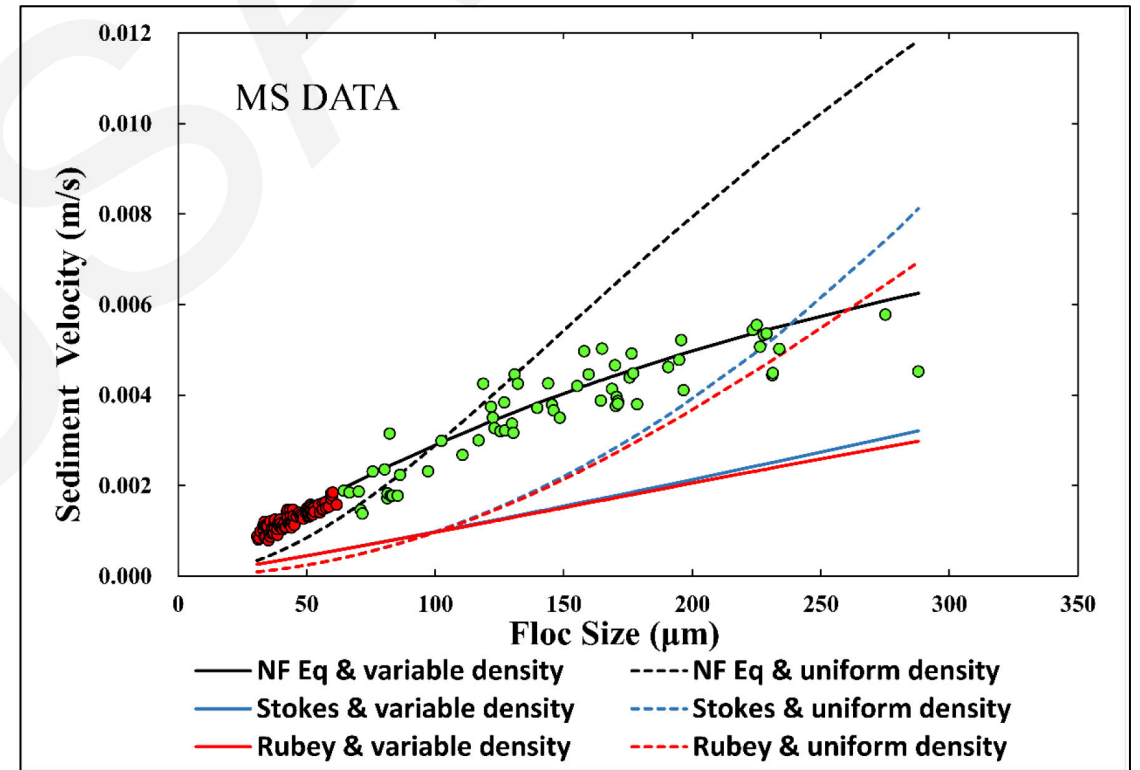


Settling volumes

# Results of settling velocity



**Guanqiao lake**



**Moshui lake**

# Conclusions

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- ◆ The variable density function performed better than the uniform density function and was, therefore, recommended for calculating the settling velocities for both micro and macro flocs.
- ◆ The method presented in this paper, which is simpler in determining in-situ settling velocities than traditional methods, also allows for direct inter-comparisons between results derived from various studies.