## **Role of Aggregation In the Settling of Cohesive Flocs**

Ashish J. Mehta

Nutech Consultants, Inc., Gainesville, FL 32606, USA

William H. McAnally

Dynamic Solutions LLC, Knoxville, TN 37919, USA Farzin Samsami

Hariot-Watt University, Edingurgh EH14 4AS, UK

**Andrew J. Manning** 

HR Wallingford, Wallingford, Oxon OX10 8BA, UK

Floc growth (aggregation by collisions)

Floc breakup (disaggregation by collisions and flow shearing)

Shear rate G

Volume fraction φ (or mass concentration *C*)

Diameter  $d_f$ 

Density  $\rho_f$ 

Settling velocity w<sub>s</sub>

 $w_s = f(G, \Phi)$ 



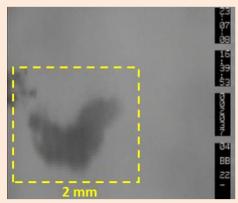
## Manning and Dyer (2002)

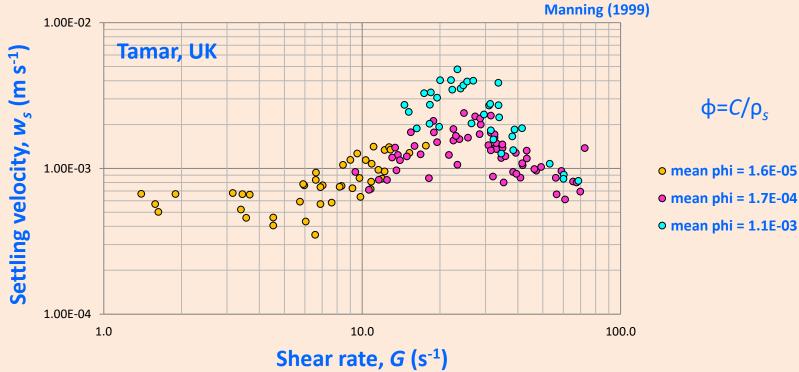


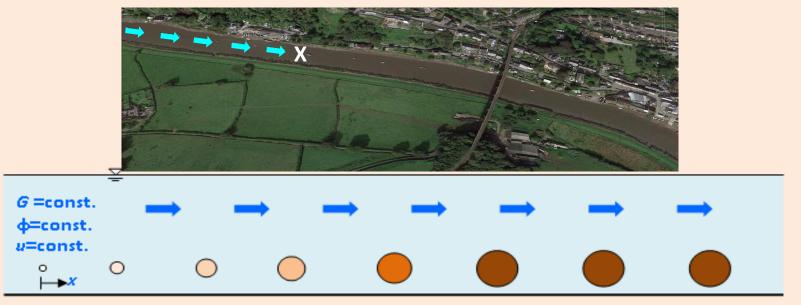


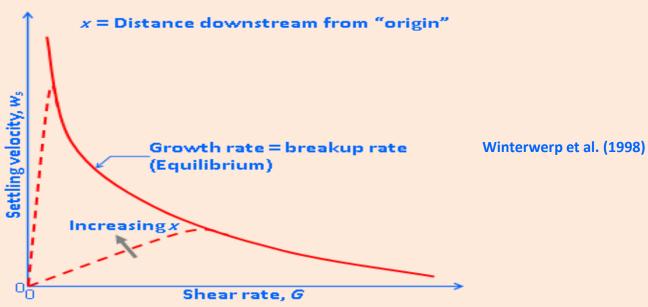


## Manning (1999)



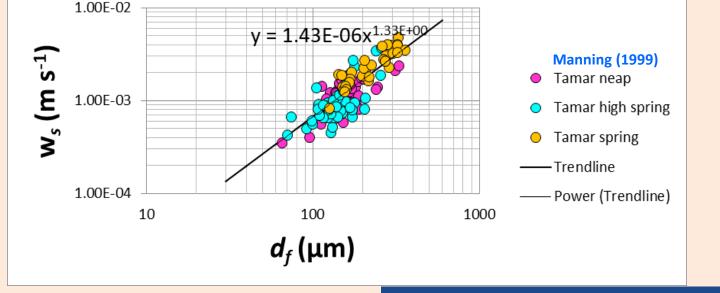


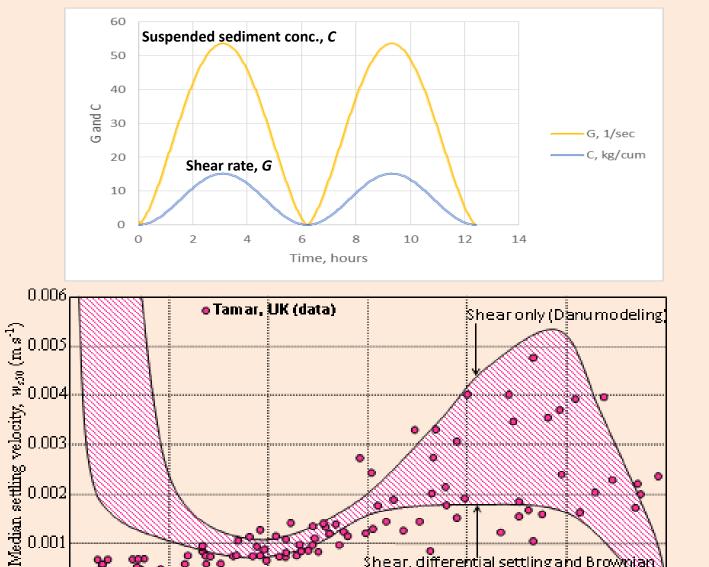




## Model DANU for aggregation dynamics (McAnally 1999)

n = number of particles per unit volume m = particle massIncrease in  $n_k$  due to aggregation by collisions Increase in  $n_k$  by disaggregation due to collisions Decrease in  $n_k$  due to disaggregation by collisions Decrease in  $n_k$  by aggregation due to collisions  $\Delta n_k$ Decrease in  $n_k$  due to disaggregation of by flow shear  $m_{k-2}$  $m_{k-1}$  $m_k$  $m_{k+1}$  $m_{k+2}$  $m_{k+3}$  $\rightarrow m_k$ 1.00E-02  $y = 1.43E-06x^{1.33E+00}$ **Manning (1999)** Tamar neap





15

Shear rate,  $G(s^{-1})$ 

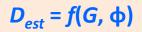
10

25

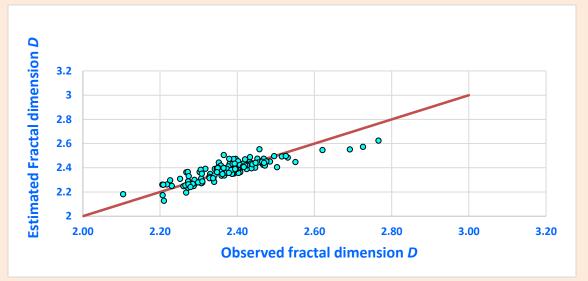
Shear, differential settling and Brownian

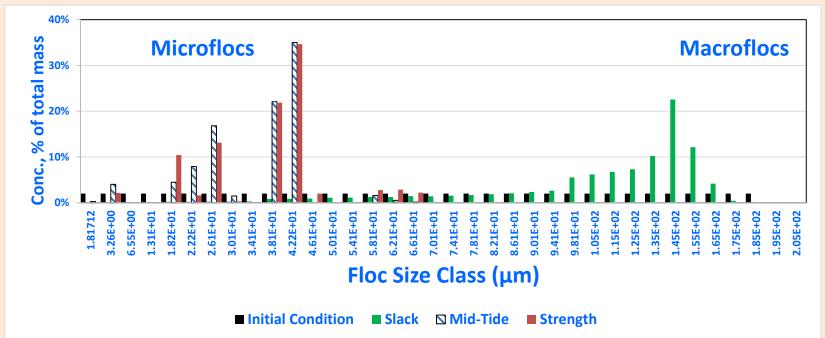
motion (Danumodeling)

20



Maggi (2007)





See also Lee et al. (2011)

