Supplementary figures for "Controls on the hydraulic geometry of alluvial channels: bank stability to gravitational failure, the critical-flow hypothesis, and conservation of mass and energy"

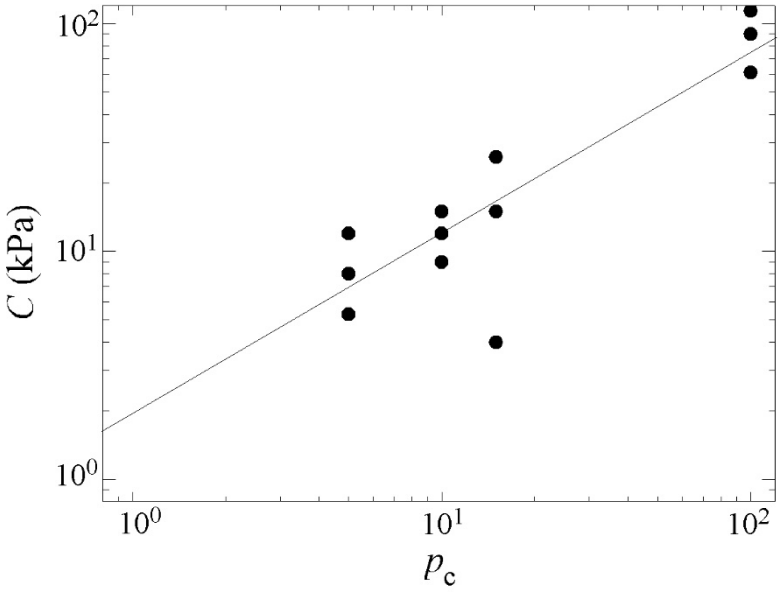

Figure S1. Plot of cohesion, C, as a function of percent clay content, p_c, from the experiments of Dafalla (2013) demonstrating the approximately linear nature of the relationship, i.e., the exponent of a power-law relationship between C and p_c (shown as a line above) determined by a least-squares linear regression to the logarithms of the data is 0.78 ± 0.12 where 0.12 is the standard error. Note that three data points from Dafalla (2013) were not included because the clay contents were zero and hence the logarithms were undefined. However, those data points were included in the linear least-squares regression of non-log-transformed data reported in the paper that resulted in the coefficient of proportionality of 900 ± 70 in Eq. (3).

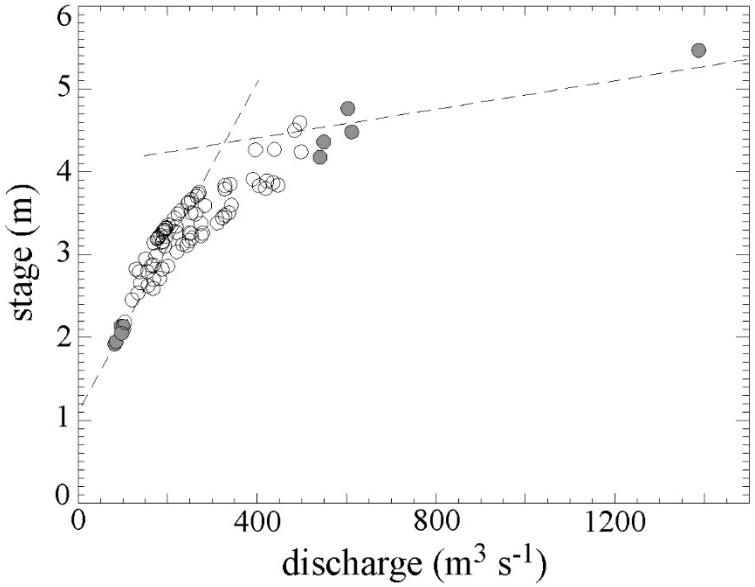

Figure S2. Example (using U.S.G.S. gaging station 3230500: Big Darby Creek at Darbyville, Ohio) of how bankfull discharge is estimated from the bend in the stage-discharge rating curve. For each station, bankfull discharge is estimated as the intersection of the linear regressions of stage and discharge for relatively low and high flows obtained by fitting data for the five smallest and five largest peak annual discharges (shown as gray circles).

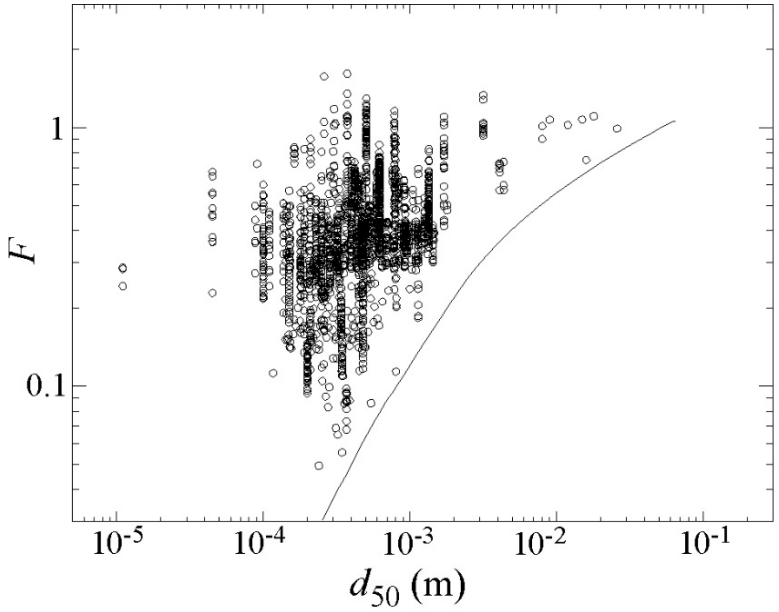

Figure S3. Plot of Froude number, F, as a function of median bed grain diameter, d_{50}, for each of the data points in Table S2 of Ohata et al. (2019) that had ripples or dunes present. The curve indicates the Froude numbers required to generate bedforms as a function of median bed grain sizes in this dataset. I removed 26 out of 3791 data points because they came from a study (Julien et al., 2002) that reported a range of d_{50} values from 0.75 to 3.8 mm but provided only a representative value of 2.5 mm.

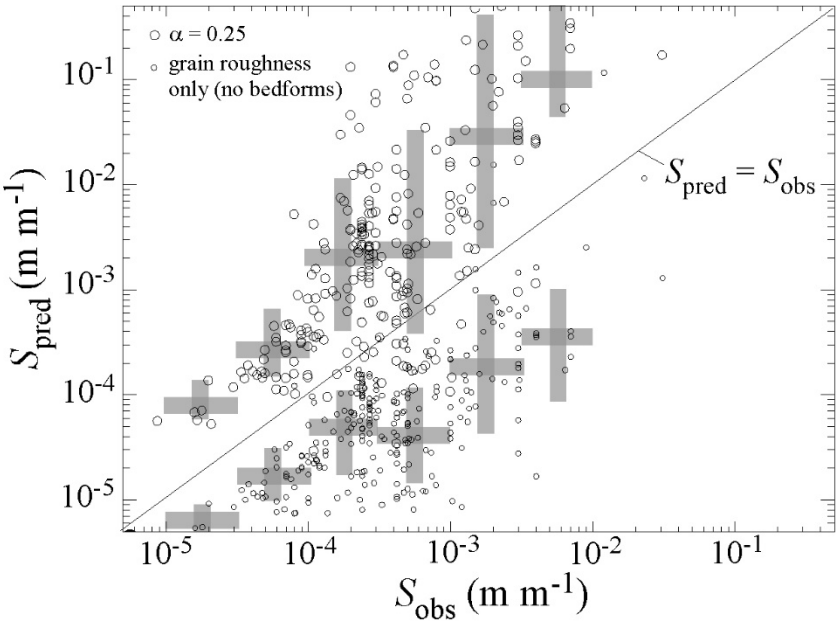

Figure S4. Plot of predicted along-channel slope, S_{pred}, using equation (16) and (20) as a function of observed along-channel slope, S_{obs}, for sand-bedded channels in the Dunne and Jerolmack (2018) global dataset. Small circles represent predictions for grain roughness only (eqn. (16)) and large circles represent predictions of equation (20) with $\tau_c/\tau_0 \approx 0$ and $\alpha = 0.25$.