

Table S1. List of model input parameters

Parameter	Value	Units	Description
L	860	km	Modelled reach length
B_{bf}	500	m	Reach-representative bankfull channel width
Ω	1.3	-	Channel sinuosity
λ_p	0.3	-	Bed porosity
Cz	30	-	Dimensionless Chezy resistance coefficient
ζ	4	-	Coefficient in dune height relation (Eq. (21))
α_{al}	2	-	Ratio of active layer thickness to dune height
α_{trans}	0.5	-	Partitioning coefficient for active layer-substrate interface GSD
L_S	1	m	Thickness of the substrate storage layer
S_I	0.00005	-	Initial channel slope
Λ	1	-	Ratio of wash load deposition to bed material deposition
Q_{bf}	4500	m^3s^{-1}	Representative bankfull flow discharge
$Q_{Tfeed,pre}$	385	Mt yr^{-1}	Bed material feed rate of “pre-Xiaolangdi” condition
$Q_{Tfeed,post}$	38.5	Mt yr^{-1}	Bed material feed rate of “post-Xiaolangdi” condition
$B_{f,pre}$	13000	m	Active floodplain width of “pre-Xiaolangdi” condition
$B_{f,post}$	2500	m	Active floodplain width of “post-Xiaolangdi” condition

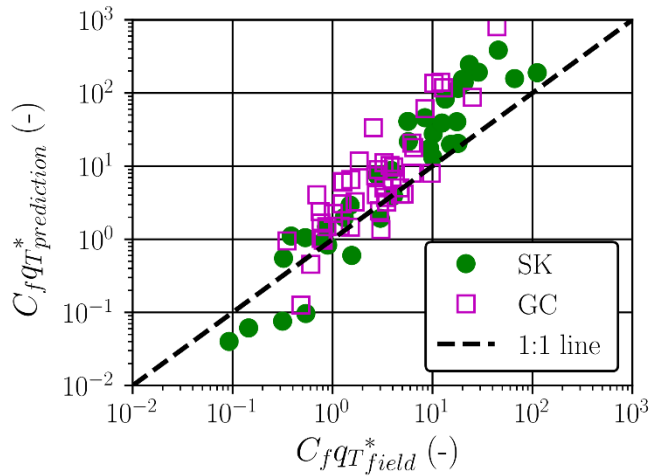


Figure S1 Comparison of the proposed relation ($C_{fqT}^*_{prediction}$) against the observed data ($C_{fqT}^*_{field}$) at Gaocun (GC) and Sunkou (SK) stations.

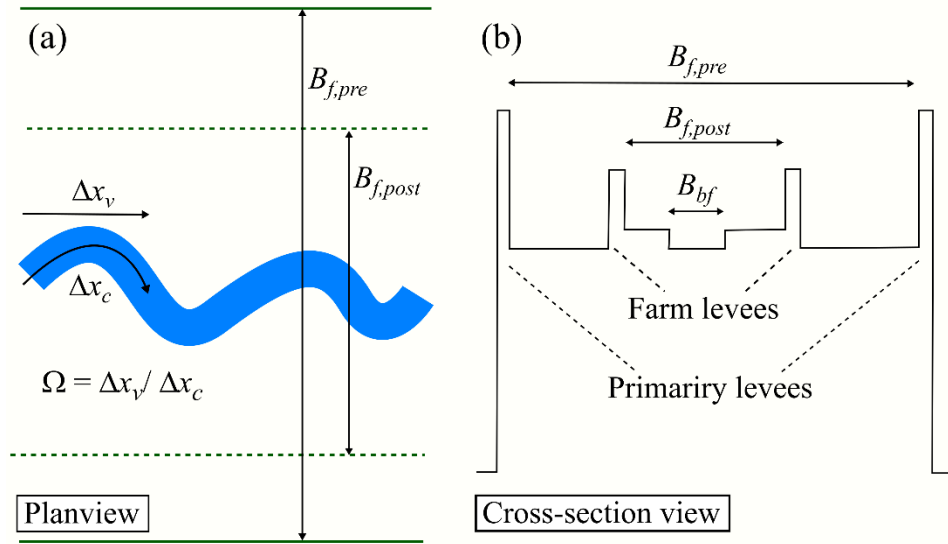


Figure S2 Illustration of (a) planform view and (b) cross-sectional view of the modelled reach.

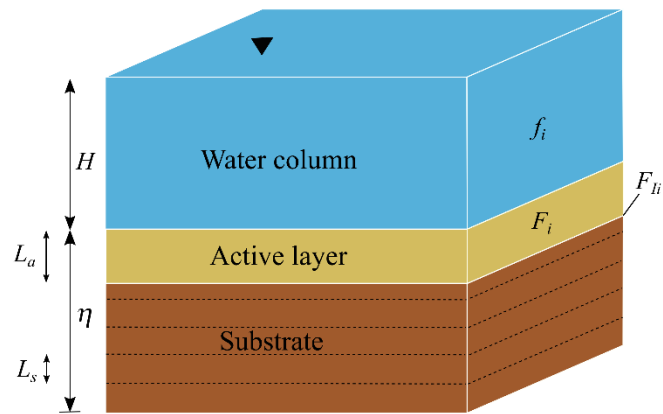


Figure S3 Illustration of the modelled water column, active layer and substrate.

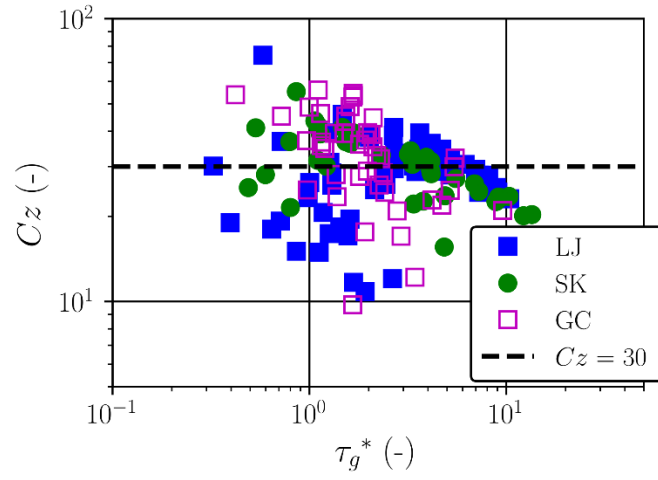


Figure S4 Plot of the dimensionless Chezy friction coefficient (Cz) and the Shields number (τ_g^*) for Lijin (LJ), Sunkou (SK) and Gaocun (GC) stations. Characteristic value is found to be approximately $Cz = 30$.