*Earth Surface Dynamics*

Supporting Information for

**Influence of alluvial slope on avulsion in river deltas**

O. A. Prasojo1,2\*, T. B. Hoey3, A. Owen1 and R. D. Williams1

1School of Geographical and Earth Sciences, University of Glasgow, University Avenue, Glasgow, G12 8QQ, United Kingdom, 2Geoscience Study Program, Faculty of Mathematics and Natural Sciences (FMIPA), Universitas Indonesia, Depok 16424, Indonesia, 3Department of Civil and Environmental Engineering, Brunel University London, Uxbridge, UB8 3PH, United Kingdom, Trevor.Hoey@brunel.ac.uk

**Contents of this file**

Figures S1 to S6

Table S1 to S2

Video S1

**Figure S1.** Run f reaching the model’s boundary.

A diagram of a sea level

Description automatically generated

**Figure S2.** Boxplots showing distribution of avulsion timescale (*Ta* empirical) observed in the model.

A graph of a number of boxes

Description automatically generated with medium confidence

**Figure S3.** Time series plot of topset slope (a), delta lobe width (b) and avulsion length (c) observed in our model

**A diagram of a graph

Description automatically generated with medium confidence**

**Figure S4.** Boxplots showing distribution of sediment load (*Qs*) observed in the model.

A graph of a running graph

Description automatically generated

**Figure S5.** Correlation between avulsion timescale produced by our model (*Ta empirical*), analytical model (*Ta H\* = 1.4*, *Ta H\* = 0.5*, *Ta H\* = 0.2*), natural deltas (*Ta natural*) and relative sea-level rise (*RSLR*) plotted on semi-log plot.

A graph of different sea levels

Description automatically generated

**Figure S6.** Log-log plot between avulsion length (*La*) and backwater length produced from our model scenarios (*Lb*) along with linear regression line for each scenario.

A diagram of a number of different colored dots

Description automatically generated with medium confidence

**Table S1.** Measured morphometric variables and avulsion timescales from our model (attached as Excel file).

**Table S2**. River delta avulsion timescales from natural and laboratory experiment collected from the literature.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ID | *hc* | *Bc* | *Qs* | *Hb* | *La* | 𝝈1 | *B* | *N* | *va* | *H* | *Stopset* | *Ta* | Source |
| [m] | [m] | [km3/y] | [m] | [km] | [mm/y] | [km] | [-] | [m/yr] | [m] | [-] | [year] |  |
| Parana | 11.8 | 1270 | 0.03 | 40 | 210 | 3 | 50.8 | 4 | 0.005 |  | 0.000053 | 1633 | Chadwick et al., 2020; Prasojo et al., 2022 |
| Danube | 6.3 | 1250 | 0.025 | 50 | 95 | 0.2 | 50 | 4 | 0.0025 |  | 0.0000119 | 1991 | Chadwick et al., 2020; Prasojo et al., 2022 |
| Nile | 16.2 | 240 | 0.045 | 120 | 210 | 4.5 | 9.6 | 4 |  |  | 0.0000686 |  | Chadwick et al., 2020; Prasojo et al., 2022 |
| Mississippi | 21 | 650 | 0.15 | 80 | 490 | 2.3 | 26 | 4 | 0.01 |  | 0.0000602 | 1250 | Chadwick et al., 2020; Prasojo et al., 2022 |
| Assiniboine | 4.2 | 100 | 0.00036 | 7 | 12 |  | 4 | 4 | 0.0014 | 4.2 | 0.0005 | 1000 | Chadwick et al., 2020; Jerolmack & Mohrig, 2007; Prasojo et al., 2022 |
| Rhine-Meuse | 5 | 700 | 0.0012 | 18 | 51 | 1.6 | 28 | 4 | 0.0016 |  | 0.00011 | 1450 | Chadwick et al., 2020; Prasojo et al., 2022 |
| Magdalena | 6 | 1100 | 0.083 | 200 | 67 | 2.9 | 44 | 4 | 0.0038 | 6 | 0.0000512 | 394.7 | Chadwick et al., 2020; Jerolmack & Mohrig, 2007; Prasojo et al., 2022 |
| Orinoco | 8 | 2000 | 0.057 | 110 | 78 | 2.7 | 80 | 4 | 0.0021 |  | 0.0000413 | 1000 | Chadwick et al., 2020; Prasojo et al., 2022 |
| Mid-Amazon | 12 | 3000 | 0.45 | 50 | 404 | 2.9 | 120 | 4 | 0.005 | 12 | 0.00003 | 600 | Chadwick et al., 2020; Jerolmack & Mohrig, 2007; Prasojo et al., 2022 |
| Upper-Rhone | 5.4 | 377 | 0.012 | 70 |  | 2.9 | 15.08 | 4 | 0.002 | 5.9 | 0.000382 | 1450 | Chadwick et al., 2020; Prasojo et al., 2022 |
| Yellow | 3.5 | 500 | 0.42 | 30 | 31 | 1.7 | 20 | 4 | 0.1 |  | 0.0000965 | 7 | Chadwick et al., 2020; Prasojo et al., 2022 |
| Brahmaputra | 7 | 3300 | 0.2 | 80 |  | 11.4 | 132 | 4 | 0.02 | 7 | 0.0001 | 500 | Chadwick et al., 2020; Prasojo et al., 2022 |
| Goose | 2 | 100 | 0.00013 | 10 |  | -3 | 4 | 4 | 0.00198 |  |  | 333 | Chadwick et al., 2020; Prasojo et al., 2022 |
| Mitchell | 7 | 100 | 0.0011 | 15 |  | -0.25 | 4 | 4 |  |  |  | 63 | Chadwick et al., 2020; Prasojo et al., 2022 |
| Trinity | 5 | 200 | 0.0023 | 8 |  | 4.2 | 8 | 4 | 0.0011 |  |  |  | Chadwick et al., 2020; Prasojo et al., 2022 |
| Okavango |  |  |  |  |  |  |  |  |  |  | 0.00019 | 100 | Jerolmack & Mohrig, 2007; Prasojo et al., 2022 |
| Gilbert |  |  |  |  |  |  |  | 7 | 0.0007 | 6 | 0.00006 | 1224.4898 | Jerolmack & Mohrig, 2007; Prasojo et al., 2022 |
| Suwanee |  |  |  |  |  |  |  | 3 | 0.001 | 3 | 0.00007 | 1000 | Jerolmack & Mohrig, 2007; Prasojo et al., 2022 |
| McArthur |  |  |  |  |  |  |  | 2 | 0.0005 | 5 | 0.00006 | 5000 | Jerolmack & Mohrig, 2007; Prasojo et al., 2022 |
| Emerald Lake Fan |  |  |  |  |  |  |  | 1 | 3.65 | 0.3 | 0.035 | 0.08 | Jerolmack & Mohrig, 2007; Prasojo et al., 2022 |
| Rolling Stone Fan |  |  |  |  |  |  |  | 1 | 0.63 | 0.1 | 0.0064 | 0.16 | Jerolmack & Mohrig, 2007; Prasojo et al., 2022 |
| XES 1999 Lab Fan Run 1, Stage 3 |  |  |  |  |  |  |  | 9 | 17.52 | 0 | 0.06 | 0.00005 | Jerolmack & Mohrig, 2007; Prasojo et al., 2022 |

1relative sea-level rise rate as the sum of the coastal subsidence rate and eustatic sea level rise rate. Please refer to the main text for the abbreviations on the header.

**Video S1.** Timelapse of bed level change, sediment concentration of cohesive and non-cohesive grain size throughout the simulation.