**Supplementary material**

**Table S1** | Source data

| **No.** | ***Kx (*m2/s*)*** | ***B (*m*)*** | ***H (*m*)*** | ***U (*m/s*)*** | ***U\* (*m/s*)*** | **River** |
| --- | --- | --- | --- | --- | --- | --- |
| 1a | 8.08 | 36 | 0.58 | 0.3 | 0.049 | Clinch River, VA |
| 2b | 177.7 | 160.3 | 1.74 | 0.47 | 0.036 | Sabine River, LA |
| 3c | 13.5 | 10 | 0.63 | 0.55 | 0.3 | Stony |
| 4d | 20.5 | 25 | 1.38 | 0.77 | 0.091 | Tarawera |
| 5b | 143.8 | 248.11 | 4.82 | 0.31 | 0.065235 | Red River |
| 6b | 308.9 | 12.2 | 2.32 | 1.06 | 0.054 | Sabine River, TX |
| 7b | 40.8 | 42.21 | 0.69 | 0.23 | 0.064 | Conococheague Creek |
| 8d | 11.5 | 20 | 1.92 | 0.62 | 0.123 | Tarawera |
| 9b | 1.9 | 11.58 | 0.4 | 0.22 | 0.087475 | Difficult Run |
| 10e | 6.5 | 20 | 0.4 | 0.19 | 0.18 | Green and Duwamish |
| 11d | 52 | 85 | 2.6 | 0.69 | 0.06 | Tarawera |
| 12b | 69 | 6.1 | 0.49 | 0.25 | 0.057591 | Comite River |
| 13f | 181 | 106.1 | 6.1 | 0.79 | 0.088201 | Colorado River |
| 14a | 36.93 | 55.78 | 2.26 | 0.69 | 0.098768 | Clinch River |
| 15b | 5.8 | 17.5 | 0.45 | 0.32 | 0.024 | Bayou Anacoco |
| 16d | 1.4 | 35 | 2.5 | 0.107 | 0.0063 | Bocholt-Dessel |
| 17b | 143.8 | 152.4 | 1.62 | 0.61 | 0.032 | Red River |
| 18g | 65 | 34.1 | 2.5 | 0.82 | 0.18 | John Day River |
| 19b | 32.5 | 25.9 | 0.9 | 0.34 | 0.07 | Bayou Anacoco |
| 20d | 0.5 | 7.6 | 3.45 | 0.68 | 0.047 | Yuma Mesa A |
| 21b | 315.87 | 103.6 | 2.04 | 0.56 | 0.054 | Sabine River |
| 22c | 8 | 11.4 | 0.75 | 0.41 | 0.061 | Waiotapu |
| 23b | 45.1 | 31.4 | 0.81 | 0.48 | 0.072 | Tangipahoa River |
| 24b | 53.3 | 59.44 | 0.76 | 0.68 | 0.072242 | Conococheague Creek |
| 25d | 0.2 | 35 | 2.5 | 0.037 | 0.0022 | Dessel-Herentals |
| 26c | 12.4 | 10 | 0.35 | 0.53 | 0.17 | Kapuni |
| 27b | 37.8 | 48.7 | 0.55 | 0.26 | 0.05 | Monocacy River |
| 28b | 44 | 29.9 | 0.4 | 0.34 | 0.02 | Tangipahoa River |
| 29b | 17.5 | 12.8 | 0.3 | 0.42 | 0.057 | Antietam Creek |
| 30a | 40.5 | 57.9 | 2.5 | 0.75 | 0.1 | Clinch River |
| 31b | 40.8 | 43.28 | 0.69 | 0.22 | 0.063729 | Conococheague Creek |
| 32b | 6.97 | 12.5 | 0.26 | 0.31 | 0.043 | Comite River |
| 33b | 69 | 15.7 | 0.2 | 0.36 | 0.04 | Comite River |
| 34b | 12.8 | 21.3 | 0.5 | 0.13 | 0.037 | Sabine River, TX |
| 35c | 9.6 | 1.4 | 0.19 | 0.38 | 0.11 | Irrigation |
| 36a | 15.5 | 36.8 | 0.9 | 0.13 | 0.05 | Powell River |
| 37d | 5.5 | 9.9 | 0.83 | 0.46 | 0.09 | Upper Tame |
| 38b | 44 | 161.5 | 0.4 | 0.34 | 0.02 | Tangipahoa River |
| 39h | 34.8 | 64 | 0.8 | 0.67 | 0.27 | Nooksack River |
| 40a | 19.52 | 15.9 | 0.49 | 0.21 | 0.079 | Copper Creek, VA (below gauge) |
| 41a | 9.85 | 18.6 | 0.39 | 0.14 | 0.116 | Copper Creek, VA (above gauge) |
| 42a | 0.5 | 29.61 | 1.08 | 0.36 | 0.048279 | Green and Duwamish |
| 43a | 14.8 | 48.5 | 1.2 | 0.21 | 0.07 | Clinch River |
| 44a | 21.4 | 18.3 | 0.84 | 0.52 | 0.1 | Copper Creek, VA (below gauge) |
| 45g | 13.94 | 25 | 0.56 | 1.01 | 0.137 | John Day River |
| 46a | 53.88 | 59.4 | 2.13 | 0.86 | 0.104 | Clinch River, TN (below gauge) |
| 47d | 0.2 | 100 | 4.4 | 0.029 | 0.0016 | Albert |
| 48b | 7.1 | 15.9 | 0.2 | 0.39 | 0.053 | Little Pincy Creek |
| 49b | 119.8 | 97.54 | 1.15 | 0.32 | 0.058 | Monocacy River |
| 50b | 29.6 | 49.99 | 0.95 | 0.32 | 0.074778 | Monocacy River |
| 51g | 23.23 | 36.6 | 0.81 | 0.29 | 0.068 | Amita River |
| 52b | 25.9 | 21.03 | 0.48 | 0.52 | 0.069 | Antietam Creek |
| 53b | 30.19 | 67.1 | 0.55 | 0.35 | 0.044 | Amita River |
| 54b | 101.5 | 24.08 | 0.98 | 0.59 | 0.098 | Amita River |
| 55b | 66.5 | 33.53 | 0.58 | 0.16 | 0.041315 | Monocacy River |
| 56b | 25.55 | 24.4 | 0.71 | 0.52 | 0.081 | Antietam Creek |
| 57a | 20.8 | 19.6 | 0.8 | 0.49 | 0.1 | Copper Creek |
| 58a | 46.45 | 53.3 | 2.09 | 0.79 | 0.107 | Clinch River, TN (below gauge) |
| 59c | 8.4 | 9 | 0.3 | 0.37 | 0.15 | Kapuni |
| 60b | 29.3 | 49.68 | 0.41 | 0.15 | 0.081 | Conococheague Creek |
| 61b | 1.9 | 14.5 | 0.31 | 0.25 | 0.062 | Difficult Run |
| 62b | 45.1 | 253.6 | 0.81 | 0.48 | 0.072 | Tangipahoa River |
| 63b | 25.9 | 24.99 | 0.45 | 0.41 | 0.081374 | Antietam Creek |
| 64d | 2.7 | 11 | 0.29 | 0.35 | 0.058 | Miljacka |
| 65b | 227.6 | 116.4 | 3.66 | 0.45 | 0.057 | Sabine River, LA |
| 66g | 30.19 | 42.4 | 0.8 | 0.42 | 0.068 | Amita River |
| 67b | 13.94 | 15.8 | 0.41 | 0.37 | 0.055 | Comite River |
| 68d | 27 | 25 | 1.21 | 0.73 | 0.084 | Tarawera |
| 69c | 32 | 59 | 0.72 | 0.37 | 0.07 | Manawatu |
| 70b | 9.29 | 32.6 | 0.3 | 0.43 | 0.046 | Antietam Creek |
| 71b | 131.3 | 14.2 | 1.65 | 0.58 | 0.054 | Sabine River, TX |
| 72d | 1.7 | 34 | 2.5 | 0.13 | 0.0079 | Villemsvaart |
| 73c | 7.2 | 5 | 0.28 | 0.26 | 0.21 | Puneha |
| 74c | 47 | 60 | 0.95 | 0.46 | 0.092 | Manawatu |
| 75g | 9.5 | 33.8 | 0.85 | 0.16 | 0.055 | Powell River, TN |
| 76g | 32.52 | 19.5 | 1.2 | 0.45 | 0.093 | Chattahoochee River |
| 77a | 36.9 | 53.2 | 2.4 | 0.66 | 0.11 | Clinch River |
| 78i | 836.13 | 201.2 | 3.56 | 1.27 | 0.082 | Missouri River |
| 79a | 24.6 | 16.8 | 0.5 | 0.24 | 0.08 | Copper Creek |
| 80d | 5.1 | 9.9 | 0.92 | 0.52 | 0.1 | Upper Tame |
| 81b | 39.5 | 36.6 | 0.9 | 0.4 | 0.07 | Bayou Anacoco |
| 82g | 153.29 | 86 | 2.94 | 1.2 | 0.514 | Nooksack River |
| 83b | 44 | 31.7 | 0.76 | 0.36 | 0.053227 | Tangipahoa River |
| 84c | 22 | 63 | 1 | 0.32 | 0.094 | Manawatu |
| 85b | 162.6 | 68.6 | 2.2 | 1.55 | 0.17 | Wind/Bighom Rivers |
| 86i | 891.87 | 196.6 | 3.11 | 1.53 | 0.077 | Missouri River |
| 87b | 29.6 | 51.21 | 0.65 | 0.62 | 0.04 | Monocacy River |
| 88b | 52.2 | 32 | 0.5 | 0.24 | 0.038 | Salt Creek |
| 89b | 4.65 | 35.1 | 0.32 | 0.21 | 0.04 | Monocacy River |
| 90b | 10.3 | 41.45 | 1.04 | 0.07 | 0.090343 | Tickfau River |
| 91a | 16.8 | 16.7 | 0.5 | 0.2 | 0.08 | Copper Creek |
| 92b | 29.3 | 63.7 | 0.46 | 0.1 | 0.056203 | Conococheague Creek |
| 93a | 10.7 | 28.7 | 0.6 | 0.35 | 0.07 | Clinch River |
| 94b | 1.9 | 1.5 | 0.14 | 0.33 | 0.1 | Difficult Run |
| 95b | 66.5 | 40.54 | 0.41 | 0.23 | 0.04 | Monocacy River |
| 96h | 67 | 120 | 2 | 0.64 | 0.05 | Waikato |
| 97b | 39.48 | 35.1 | 0.98 | 0.21 | 0.041 | Sabine River, TX |
| 98b | 14.7 | 17.37 | 1.23 | 0.04 | 0.050338 | Sabine River, TX |
| 99a | 5.92 | 24.99 | 1.54 | 0.66 | 0.037 | Coachell Canal, CA |
| 100e | 6.5 | 21.77 | 1.58 | 0.31 | 0.058395 | Green and Duwamish |
| 101b | 668.9 | 127.4 | 4.75 | 0.64 | 0.081 | Sabine River |
| 102a | 13.93 | 46.9 | 0.86 | 0.28 | 0.067 | Clinch River, TN (below gauge) |
| 103b | 37.16 | 47.5 | 0.87 | 0.44 | 0.07 | Monocacy River |
| 104b | 41.81 | 67.1 | 0.98 | 0.88 | 0.11 | Wind/Bighom Rivers |
| 105d | 18 | 25 | 1.57 | 0.83 | 0.096 | Tarawera |
| 106b | 184.6 | 44.2 | 1.4 | 0.99 | 0.14 | Wind/Bighom Rivers |
| 107b | 54.7 | 33.4 | 1.4 | 0.2 | 0.03 | Bayou Bartholomew |
| 108g | 32.52 | 65.5 | 1.13 | 0.39 | 0.075 | Chattahoochee River |
| 109b | 166.9 | 91.9 | 2.44 | 0.52 | 0.094 | Chattahoochee River |
| 110b | 45.1 | 42.98 | 1.28 | 0.26 | 0.068162 | Tangipahoa River |
| 111b | 24.2 | 31.39 | 1.43 | 0.13 | 0.041029 | Sabine River, TX |
| 112b | 27.6 | 25.9 | 0.94 | 0.34 | 0.067 | Bayou Anacoco |
| 113b | 10.3 | 14.9 | 0.59 | 0.27 | 0.08 | Tickfau River |
| 114a | 10.7 | 33.53 | 0.78 | 0.19 | 0.049483 | Clinch River |
| 115b | 17.5 | 10.97 | 0.52 | 0.21 | 0.074909 | Antietam Creek |
| 116a | 9.5 | 16.2 | 0.49 | 0.25 | 0.079 | Copper Creek, VA (below gauge) |
| 117b | 101.5 | 23.47 | 0.7 | 0.52 | 0.101491 | Antietam Creek |
| 118i | 464.52 | 182.9 | 2.23 | 0.93 | 0.065 | Missouri River |
| 119a | 5.9 | 24.7 | 1.6 | 0.66 | 0.04 | Conchelaa Canal |
| 120b | 40.2 | 36.6 | 0.91 | 0.4 | 0.067 | Bayou Anacoco |
| 121b | 130.5 | 155.1 | 3.96 | 0.29 | 0.06 | Red River |
| 122g | 111.5 | 70.1 | 2.4 | 0.43 | 0.1 | Yadkin River |
| 123b | 20.9 | 11.89 | 0.66 | 0.43 | 0.085 | Antietam Creek |
| 124d | 20.9 | 50.9 | 0.42 | 0.46 | 0.046 | Elkhom River |
| 125a | 15.5 | 25 | 1.4 | 0.78 | 0.091 | Powell River |
| 126a | 166.9 | 99.97 | 2.5 | 0.3 | 0.105054 | Chattahoochee River |
| 127b | 2.9 | 13.7 | 0.85 | 1.29 | 0.553 | Bear Creek |
| 128b | 53.3 | 42.98 | 1.13 | 0.63 | 0.081 | Conococheague Creek |
| 129b | 13.94 | 36.6 | 0.45 | 0.32 | 0.05 | Monocacy River |
| 130g | 260.1 | 71.6 | 3.8 | 0.76 | 0.13 | Yadkin River |
| 131b | 54.7 | 37.49 | 2.07 | 0.1 | 0.040306 | Bayou Bartholomew |
| 132d | 3 | 49 | 8.07 | 0.27 | 0.019 | Chicago Ship Canal |
| 133g | 13.94 | 13.4 | 0.81 | 0.37 | 0.077 | Muddy Creek |
| 134a | 5.96 | 23.77 | 1.6 | 0.67 | 0.04 | Coachell Canal, CA |
| 135b | 9.29 | 15.8 | 0.39 | 0.32 | 0.06 | Antietam Creek |
| 136b | 88.9 | 75.6 | 1.95 | 0.74 | 0.138 | Chattahoochee River |
| 137f | 243 | 71.6 | 8.2 | 1.2 | 0.336784 | Colorado River |
| 138b | 13.94 | 19.8 | 0.41 | 0.29 | 0.044 | Bayou Anacoco |
| 139b | 16.26 | 19.8 | 0.52 | 0.43 | 0.069 | Antietam Creek |
| 140c | 6.8 | 13 | 0.6 | 0.48 | 0.24 | Waiongana |
| 141b | 41.4 | 92.96 | 0.71 | 0.16 | 0.05 | Monocacy River |
| 142a | 20.7 | 18.3 | 0.4 | 0.15 | 0.12 | Copper Creek |
| 143i | 1486.5 | 180.6 | 3.3 | 1.62 | 0.08 | Missouri River |
| 144b | 501.4 | 21.3 | 0.5 | 0.54 | 0.027 | Amite River |
| 145b | 464.6 | 85.3 | 2.4 | 1.73 | 0.15 | Wind/Bighom Rivers |
| 146b | 501.4 | 46.02 | 0.53 | 0.41 | 0.042659 | Amite River |
| 147b | 41.8 | 59.4 | 1.1 | 0.88 | 0.12 | Wind/Bighom Rivers |
| 148b | 12.8 | 21.64 | 0.61 | 0.08 | 0.04237 | Sabine River, TX |
| 149g | 92.9 | 202.7 | 1.35 | 0.39 | 0.065 | Susquehanna River |

a Godfrey & Frederick (1970); b Nordin & Sabol (1974); c Sahin (2014); d Toprak & Cigizoglu (2008); e Fischer (1968); f Graf (1995); g Tayfur & Singh (2005); h [Deng](http://ascelibrary.org/author/Deng%2C%2BZ-Q) *et al*. (2001); i Yotsukura *et al*. (1970).

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