**Supplementary Material II**

**Table S1.** Statistical metrics used to validate the annual data of satellite rainfall products with data from the surface weather station.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Satellites** | **ID** | **r** | **R²** | **MAE** | **RMSE** | **Index (d)** | **Pbias** |
| CHIRPS | **1** | 0.01 | 0.00 | 668.83 | 805.92 | 0.43 | 23.60 |
| TRMM | **1** | 0.31 | 0.10 | 1390.53 | 1458.31 | 0.34 | -67.80 |
| PERSIANN-CDR | **1** | 0.04 | 0.00 | 536.07 | 680.57 | 0.46 | -21.80 |
| MERRA | **1** | 0.10 | 0.00 | 522.25 | 601.00 | 0.43 | -12.30 |
| CHIRPS | **2** | 0.72 | 0.51 | 510.99 | 552.17 | 0.59 | 38.60 |
| TRMM | **2** | 0.76 | 0.58 | 725.88 | 776.92 | 0.46 | -56.90 |
| PERSIANN-CDR | **2** | 0.64 | 0.42 | 372.85 | 431.83 | 0.65 | 25.90 |
| MERRA | **2** | 0.60 | 0.42 | 346.64 | 430.32 | 0.65 | 24.10 |
| CHIRPS | **3** | 0.78 | 0.61 | 301.17 | 406.92 | 0.82 | -2.60 |
| TRMM | **3** | 0.66 | 0.44 | 1403.44 | 1504.04 | 0.41 | -73.70 |
| PERSIANN-CDR | **3** | 0.58 | 0.34 | 420.52 | 633.80 | 0.66 | -19.70 |
| MERRA | **3** | 0.50 | 0.34 | 528.73 | 717.26 | 0.61 | -24.20 |
| CHIRPS | **4** | -0.49 | 0.24 | 316.58 | 445.41 | 0.13 | 1.30 |
| TRMM | **4** | 0.12 | 0.02 | 1176.83 | 1222.15 | 0.28 | -67.80 |
| PERSIANN-CDR | **4** | -0.14 | 0.02 | 330.72 | 458.16 | 0.32 | -7.30 |
| MERRA | **4** | 0.26 | 0.02 | 317.72 | 370.68 | 0.49 | 0.40 |
| CHIRPS | **5** | -0.18 | 0.03 | 346.30 | 451.25 | 0.32 | -9.20 |
| TRMM | **5** | 0.53 | 0.28 | 1561.81 | 1587.25 | 0.25 | -73.60 |
| PERSIANN-CDR | **5** | 0.58 | 0.33 | 545.91 | 607.74 | 0.49 | -25.70 |
| MERRA | **5** | 0.69 | 0.33 | 630.11 | 676.56 | 0.51 | -29.70 |
| CHIRPS | **6** | 0.00 | 0.00 | 262.89 | 455.30 | 0.46 | -6.50 |
| TRMM | **6** | 0.25 | 0.06 | 1661.31 | 1690.73 | 0.22 | -74.60 |
| PERSIANN-CDR | **6** | 0.07 | 0.00 | 675.72 | 768.84 | 0.37 | -30.40 |
| MERRA | **6** | 0.43 | 0.18 | 558.60 | 617.17 | 0.48 | -23.50 |
| CHIRPS | **7** | 0.33 | 0.11 | 235.27 | 294.54 | 0.57 | -3.00 |
| TRMM | **7** | 0.55 | 0.30 | 1229.61 | 1253.97 | 0.29 | -68.90 |
| PERSIANN-CDR | **7** | 0.55 | 0.30 | 265.95 | 345.79 | 0.64 | -13.00 |
| MERRA | **7** | 0.56 | 0.32 | 323.31 | 418.16 | 0.62 | -17.50 |

**Table S2.** Statistical metrics (r and R²) used to validate the monthly data of satellite rainfall products with data from the surface weather station.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Months** | **Products** | **ID1** | | **ID2** | | **ID3** | | **ID4** | | **ID5** | | **ID6** | | **ID7** | |
| **r** | **R²** | **r** | **R²** | **r** | **R²** | **r** | **R²** | **r** | **R²** | **r** | **R²** | **r** | **R²** |
|  | CHIRPS | 0.33 | 0.11 | 0.88 | 0.77 | 0.65 | 0.43 | 0.18 | 0.03 | 0.30 | 0.09 | 0.23 | 0.05 | 0.56 | 0.31 |
|  | TRMM | 0.60 | 0.36 | 0.94 | 0.87 | 0.62 | 0.38 | 0.00 | 0.00 | -0.07 | 0.01 | -0.08 | 0.01 | 0.58 | 0.34 |
| Jan | PERSIANN-CDR | 0.48 | 0.23 | 0.89 | 0.79 | 0.56 | 0.32 | -0.11 | 0.01 | -0.10 | 0.01 | -0.22 | 0.05 | 0.46 | 0.21 |
|  | MERRA | 0.32 | 0.23 | 0.87 | 0.79 | 0.80 | 0.32 | 0.13 | 0.01 | 0.20 | 0.01 | 0.25 | 0.06 | 0.49 | 0.24 |
|  | CHIRPS | -0.04 | 0.00 | 0.04 | 0.00 | 0.43 | 0.18 | 0.60 | 0.36 | 0.03 | 0.00 | 0.29 | 0.09 | 0.50 | 0.25 |
|  | TRMM | 0.29 | 0.08 | 0.72 | 0.51 | 0.63 | 0.40 | 0.38 | 0.15 | -0.26 | 0.07 | 0.18 | 0.03 | 0.61 | 0.37 |
| Feb | PERSIANN-CDR | 0.36 | 0.13 | 0.77 | 0.59 | 0.51 | 0.26 | 0.31 | 0.09 | -0.18 | 0.03 | 0.01 | 0.00 | 0.51 | 0.26 |
|  | MERRA | -0.04 | 0.13 | 0.18 | 0.59 | 0.61 | 0.26 | 0.62 | 0.09 | -0.11 | 0.03 | 0.36 | 0.13 | 0.60 | 0.36 |
|  | CHIRPS | 0.25 | 0.06 | -0.11 | 0.01 | 0.44 | 0.19 | -0.43 | 0.19 | -0.59 | 0.35 | 0.85 | 0.73 | 0.10 | 0.01 |
|  | TRMM | 0.43 | 0.19 | 0.08 | 0.01 | 0.32 | 0.10 | 0.16 | 0.03 | -0.18 | 0.03 | 0.30 | 0.09 | 0.78 | 0.60 |
| Mar | PERSIANN-CDR | -0.03 | 0.00 | 0.21 | 0.04 | 0.55 | 0.30 | -0.19 | 0.04 | 0.13 | 0.02 | 0.23 | 0.05 | -0.01 | 0.00 |
|  | MERRA | 0.52 | 0.00 | 0.34 | 0.04 | 0.49 | 0.30 | 0.44 | 0.04 | 0.34 | 0.02 | 0.08 | 0.01 | 0.43 | 0.18 |
|  | CHIRPS | 0.74 | 0.55 | 0.45 | 0.20 | 0.43 | 0.19 | 0.09 | 0.01 | -0.17 | 0.03 | 0.45 | 0.21 | 0.84 | 0.70 |
|  | TRMM | 0.89 | 0.79 | 0.57 | 0.33 | 0.76 | 0.58 | 0.09 | 0.01 | 0.23 | 0.05 | 0.45 | 0.20 | 0.75 | 0.57 |
| Apr | PERSIANN-CDR | 0.45 | 0.20 | 0.39 | 0.15 | 0.49 | 0.24 | 0.01 | 0.00 | 0.11 | 0.01 | 0.19 | 0.04 | 0.68 | 0.47 |
|  | MERRA | 0.76 | 0.20 | 0.81 | 0.15 | 0.68 | 0.24 | 0.27 | 0.00 | 0.09 | 0.01 | 0.43 | 0.18 | 0.58 | 0.34 |
|  | CHIRPS | 0.54 | 0.29 | 0.49 | 0.24 | 0.35 | 0.12 | 0.14 | 0.02 | -0.30 | 0.09 | 0.12 | 0.01 | 0.45 | 0.21 |
|  | TRMM | 0.79 | 0.63 | 0.67 | 0.46 | 0.35 | 0.12 | 0.24 | 0.06 | -0.64 | 0.42 | 0.31 | 0.10 | 0.59 | 0.35 |
| May | PERSIANN-CDR | 0.48 | 0.23 | 0.42 | 0.18 | 0.34 | 0.12 | 0.19 | 0.04 | -0.44 | 0.20 | 0.17 | 0.03 | 0.44 | 0.19 |
|  | MERRA | 0.84 | 0.23 | 0.92 | 0.18 | 0.61 | 0.12 | 0.50 | 0.04 | -0.09 | 0.20 | 0.43 | 0.19 | 0.73 | 0.53 |
|  | CHIRPS | 0.85 | 0.72 | 0.63 | 0.39 | 0.55 | 0.31 | -0.53 | 0.28 | -0.35 | 0.12 | -0.17 | 0.03 | 0.81 | 0.66 |
|  | TRMM | 0.55 | 0.31 | 0.69 | 0.48 | 0.38 | 0.14 | -0.30 | 0.09 | -0.32 | 0.10 | -0.37 | 0.14 | 0.85 | 0.72 |
| Jun | PERSIANN-CDR | 0.63 | 0.40 | 0.55 | 0.30 | -0.33 | 0.11 | -0.40 | 0.16 | -0.07 | 0.00 | -0.18 | 0.03 | 0.65 | 0.42 |
|  | MERRA | 0.80 | 0.40 | 0.74 | 0.30 | 0.19 | 0.11 | -0.33 | 0.16 | -0.33 | 0.00 | -0.20 | 0.04 | 0.80 | 0.63 |
|  | CHIRPS | 0.97 | 0.94 | 0.80 | 0.65 | 0.47 | 0.22 | 0.27 | 0.08 | -0.05 | 0.00 | -0.26 | 0.07 | 0.93 | 0.86 |
|  | TRMM | 0.95 | 0.90 | 0.84 | 0.70 | 0.49 | 0.24 | 0.24 | 0.06 | -0.07 | 0.00 | -0.14 | 0.02 | 0.93 | 0.87 |
| Jul | PERSIANN-CDR | 0.92 | 0.84 | 0.83 | 0.69 | 0.49 | 0.24 | 0.27 | 0.07 | -0.09 | 0.01 | -0.14 | 0.02 | 0.86 | 0.73 |
|  | MERRA | 0.97 | 0.84 | 0.86 | 0.69 | 0.51 | 0.24 | 0.08 | 0.07 | -0.08 | 0.01 | -0.31 | 0.10 | 0.92 | 0.85 |
|  | CHIRPS | 0.76 | 0.58 | 0.09 | 0.01 | 0.04 | 0.00 | -0.45 | 0.20 | -0.61 | 0.37 | -0.62 | 0.39 | 0.25 | 0.06 |
|  | TRMM | 0.68 | 0.46 | 0.59 | 0.35 | 0.39 | 0.15 | -0.55 | 0.30 | -0.56 | 0.31 | -0.60 | 0.36 | 0.30 | 0.09 |
| Aug | PERSIANN-CDR | 0.70 | 0.49 | 0.73 | 0.53 | 0.16 | 0.03 | -0.42 | 0.18 | -0.48 | 0.23 | -0.71 | 0.50 | 0.47 | 0.22 |
|  | MERRA | 0.83 | 0.49 | 0.73 | 0.53 | 0.41 | 0.03 | -0.30 | 0.18 | -0.24 | 0.23 | -0.51 | 0.26 | 0.57 | 0.32 |
|  | CHIRPS | 0.83 | 0.69 | 0.71 | 0.50 | 0.60 | 0.36 | 0.55 | 0.30 | 0.54 | 0.30 | 0.54 | 0.29 | 0.69 | 0.47 |
|  | TRMM | 0.88 | 0.77 | 0.97 | 0.95 | 0.39 | 0.15 | 0.49 | 0.24 | 0.30 | 0.09 | 0.54 | 0.29 | 0.93 | 0.86 |
| Sep | PERSIANN-CDR | 0.90 | 0.81 | 0.91 | 0.83 | 0.48 | 0.23 | 0.60 | 0.36 | 0.52 | 0.27 | 0.57 | 0.32 | 0.88 | 0.78 |
|  | MERRA | 0.94 | 0.81 | 0.94 | 0.83 | 0.47 | 0.23 | 0.73 | 0.36 | 0.50 | 0.27 | 0.65 | 0.42 | 0.93 | 0.87 |
|  | CHIRPS | 0.39 | 0.15 | 0.48 | 0.23 | -0.04 | 0.00 | 0.22 | 0.05 | -0.31 | 0.10 | 0.21 | 0.04 | 0.13 | 0.02 |
|  | TRMM | 0.45 | 0.21 | 0.85 | 0.72 | 0.35 | 0.12 | 0.52 | 0.27 | -0.06 | 0.00 | 0.61 | 0.37 | 0.66 | 0.44 |
| Oct | PERSIANN-CDR | 0.50 | 0.25 | 0.81 | 0.66 | 0.33 | 0.11 | 0.52 | 0.27 | 0.05 | 0.00 | 0.51 | 0.26 | 0.44 | 0.20 |
|  | MERRA | 0.76 | 0.25 | 0.76 | 0.66 | 0.29 | 0.11 | 0.39 | 0.27 | -0.34 | 0.00 | 0.15 | 0.02 | 0.66 | 0.44 |
|  | CHIRPS | 0.40 | 0.16 | -0.19 | 0.04 | 0.51 | 0.26 | 0.29 | 0.08 | 0.27 | 0.07 | 0.60 | 0.36 | 0.53 | 0.28 |
|  | TRMM | 0.24 | 0.06 | 0.04 | 0.00 | 0.37 | 0.14 | 0.72 | 0.52 | 0.38 | 0.14 | 0.92 | 0.85 | 0.58 | 0.34 |
| Nov | PERSIANN-CDR | 0.48 | 0.23 | -0.15 | 0.02 | 0.56 | 0.32 | 0.56 | 0.32 | 0.30 | 0.09 | 0.83 | 0.69 | 0.61 | 0.38 |
|  | MERRA | 0.63 | 0.23 | -0.01 | 0.02 | 0.85 | 0.32 | 0.52 | 0.32 | 0.27 | 0.09 | 0.83 | 0.68 | 0.93 | 0.86 |
|  | CHIRPS | 0.45 | 0.20 | -0.14 | 0.02 | 0.18 | 0.03 | -0.21 | 0.04 | 0.15 | 0.02 | -0.05 | 0.00 | 0.28 | 0.08 |
|  | TRMM | 0.18 | 0.03 | 0.33 | 0.11 | 0.45 | 0.20 | -0.11 | 0.01 | 0.29 | 0.09 | -0.04 | 0.00 | 0.42 | 0.18 |
| Dec | PERSIANN-CDR | 0.30 | 0.09 | 0.31 | 0.09 | 0.49 | 0.24 | -0.26 | 0.07 | 0.12 | 0.01 | -0.10 | 0.01 | 0.63 | 0.39 |
|  | MERRA | 0.47 | 0.09 | 0.26 | 0.09 | 0.45 | 0.24 | 0.00 | 0.07 | 0.27 | 0.01 | -0.09 | 0.01 | 0.48 | 0.24 |

**Table S3.** Statistical metrics (MAE and RMSE) used to validate the monthly data of satellite rainfall products with data from the surface weather station.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Months** | **Products** | **ID1** | | **ID2** | | **ID3** | | **ID4** | | **ID5** | | **ID6** | | **ID7** | |
| **MAE**  **(mm)** | **RMSE**  **(mm)** | **MAE**  **(mm)** | **RMSE**  **(mm)** | **MAE**  **(mm)** | **RMSE**  **(mm)** | **MAE**  **(mm)** | **RMSE**  **(mm)** | **MAE**  **(mm)** | **RMSE**  **(mm)** | **MAE**  **(mm)** | **RMSE**  **(mm)** | **MAE**  **(mm)** | **RMSE**  **(mm)** |
|  | CHIRPS | 151.7 | 204.0 | 88.8 | 106.3 | 74.8 | 98.4 | 114.8 | 170.9 | 100.9 | 145.8 | 134.5 | 188.7 | 94.5 | 113.7 |
|  | TRMM | 218.3 | 255.7 | 115.7 | 163.4 | 210.7 | 227.6 | 158.6 | 204.7 | 111.6 | 151.6 | 153.4 | 202.8 | 222.5 | 245.4 |
| Jan | PERSIANN-CDR | 150.3 | 174.2 | 70.4 | 80.5 | 80.6 | 124.8 | 148.7 | 189.9 | 132.9 | 159.2 | 148.9 | 190.9 | 101.1 | 143.7 |
|  | MERRA | 157.2 | 174.9 | 74.7 | 98.3 | 76.9 | 98.5 | 113.7 | 154.9 | 94.7 | 113.6 | 105.0 | 135.4 | 112.7 | 140.9 |
|  | CHIRPS | 189.9 | 239.2 | 81.1 | 110.7 | 120.6 | 178.0 | 64.7 | 78.9 | 110.6 | 137.7 | 98.8 | 118.6 | 60.2 | 80.9 |
|  | TRMM | 163.2 | 198.6 | 75.3 | 93.1 | 234.5 | 277.6 | 122.2 | 151.0 | 171.9 | 211.4 | 176.9 | 194.8 | 135.0 | 155.7 |
| Feb | PERSIANN-CDR | 123.9 | 146.0 | 59.3 | 76.4 | 116.2 | 177.4 | 82.1 | 104.5 | 116.3 | 162.6 | 94.5 | 134.3 | 73.7 | 86.9 |
|  | MERRA | 132.6 | 155.3 | 85.8 | 112.5 | 134.2 | 163.1 | 64.5 | 81.4 | 124.4 | 167.4 | 73.5 | 95.0 | 74.2 | 85.1 |
|  | CHIRPS | 176.7 | 199.1 | 84.7 | 103.9 | 83.5 | 125.3 | 111.0 | 134.6 | 156.5 | 196.3 | 48.7 | 60.8 | 89.6 | 99.1 |
|  | TRMM | 242.7 | 278.4 | 128.8 | 151.6 | 185.1 | 226.9 | 183.7 | 209.9 | 206.0 | 258.8 | 269.8 | 288.8 | 158.4 | 174.9 |
| Mar | PERSIANN-CDR | 159.9 | 210.7 | 69.6 | 85.1 | 98.8 | 133.8 | 103.7 | 128.4 | 131.1 | 178.2 | 152.4 | 183.1 | 87.4 | 104.6 |
|  | MERRA | 134.4 | 170.9 | 72.0 | 85.0 | 116.7 | 152.4 | 91.4 | 101.2 | 126.2 | 187.3 | 146.0 | 172.7 | 73.5 | 105.6 |
|  | CHIRPS | 71.8 | 84.8 | 123.2 | 256.2 | 83.0 | 145.6 | 66.8 | 89.6 | 143.9 | 179.7 | 88.1 | 92.8 | 31.9 | 35.4 |
|  | TRMM | 142.7 | 155.5 | 49.8 | 56.7 | 122.7 | 142.5 | 132.0 | 151.9 | 265.3 | 278.0 | 209.3 | 214.2 | 77.6 | 87.7 |
| Apr | PERSIANN-CDR | 86.5 | 107.5 | 38.4 | 46.9 | 72.8 | 97.1 | 94.1 | 111.1 | 201.3 | 221.6 | 148.1 | 160.9 | 33.1 | 41.9 |
|  | MERRA | 70.5 | 86.2 | 26.2 | 33.3 | 74.7 | 94.8 | 71.0 | 85.8 | 208.6 | 227.7 | 126.3 | 135.2 | 36.9 | 48.3 |
|  | CHIRPS | 70.6 | 86.0 | 47.3 | 66.5 | 84.6 | 118.3 | 124.5 | 158.4 | 93.4 | 112.3 | 227.8 | 266.7 | 49.6 | 92.4 |
|  | TRMM | 97.5 | 125.7 | 54.4 | 85.5 | 110.0 | 159.9 | 165.5 | 204.9 | 137.7 | 159.2 | 298.2 | 328.0 | 95.3 | 133.9 |
| May | PERSIANN-CDR | 56.6 | 92.7 | 53.5 | 70.6 | 79.2 | 125.3 | 125.9 | 153.4 | 99.0 | 124.3 | 227.7 | 267.5 | 55.4 | 97.3 |
|  | MERRA | 44.0 | 64.0 | 27.8 | 34.0 | 73.9 | 120.7 | 117.7 | 138.6 | 96.1 | 120.4 | 223.6 | 257.2 | 57.4 | 93.2 |
|  | CHIRPS | 34.4 | 49.0 | 28.1 | 33.2 | 35.8 | 45.7 | 80.1 | 93.2 | 123.9 | 156.1 | 115.8 | 132.1 | 25.2 | 35.5 |
|  | TRMM | 69.9 | 77.7 | 36.5 | 41.0 | 90.0 | 95.6 | 93.3 | 101.9 | 142.1 | 178.3 | 137.4 | 166.1 | 62.5 | 69.4 |
| Jun | PERSIANN-CDR | 45.3 | 54.3 | 34.2 | 40.0 | 48.5 | 74.7 | 83.4 | 95.9 | 121.6 | 146.9 | 124.5 | 144.2 | 36.7 | 47.7 |
|  | MERRA | 24.1 | 27.1 | 29.2 | 35.7 | 54.6 | 63.5 | 55.6 | 73.1 | 110.7 | 151.9 | 109.0 | 126.8 | 27.5 | 34.0 |
|  | CHIRPS | 18.6 | 24.1 | 35.7 | 45.1 | 57.4 | 80.3 | 43.4 | 69.6 | 61.3 | 84.0 | 92.2 | 141.3 | 42.9 | 51.5 |
|  | TRMM | 71.9 | 89.6 | 34.4 | 44.2 | 74.4 | 92.6 | 43.8 | 55.0 | 86.8 | 97.5 | 120.8 | 153.6 | 87.5 | 106.3 |
| Jul | PERSIANN-CDR | 27.2 | 35.0 | 36.4 | 46.5 | 53.9 | 71.7 | 43.8 | 75.6 | 65.8 | 81.7 | 95.6 | 137.7 | 41.8 | 58.9 |
|  | MERRA | 18.4 | 25.9 | 30.5 | 64.4 | 67.0 | 88.4 | 59.2 | 106.2 | 74.5 | 105.7 | 112.7 | 156.9 | 35.9 | 46.0 |
|  | CHIRPS | 26.7 | 39.2 | 47.0 | 83.6 | 71.4 | 117.1 | 44.2 | 58.6 | 68.3 | 79.4 | 71.6 | 81.2 | 39.8 | 50.7 |
|  | TRMM | 46.8 | 58.7 | 37.2 | 47.6 | 67.2 | 78.8 | 48.5 | 61.1 | 67.3 | 81.4 | 86.5 | 96.0 | 52.9 | 65.8 |
| Aug | PERSIANN-CDR | 23.5 | 33.5 | 25.1 | 33.5 | 44.5 | 58.3 | 42.1 | 57.9 | 58.6 | 67.7 | 66.2 | 75.6 | 33.1 | 42.7 |
|  | MERRA | 19.0 | 25.8 | 23.7 | 29.9 | 42.9 | 55.8 | 47.5 | 62.9 | 55.7 | 69.8 | 70.5 | 78.1 | 37.2 | 41.3 |
|  | CHIRPS | 55.8 | 63.4 | 39.3 | 47.0 | 63.5 | 75.0 | 64.1 | 83.3 | 87.5 | 104.1 | 62.2 | 71.4 | 40.1 | 49.2 |
|  | TRMM | 55.6 | 70.8 | 43.7 | 56.7 | 80.0 | 99.4 | 85.3 | 120.7 | 131.2 | 168.8 | 77.0 | 103.0 | 63.8 | 78.5 |
| Sep | PERSIANN-CDR | 37.9 | 46.3 | 36.8 | 48.1 | 57.5 | 77.6 | 66.8 | 78.6 | 93.7 | 111.9 | 63.8 | 74.9 | 26.9 | 36.0 |
|  | MERRA | 20.7 | 34.0 | 21.9 | 33.9 | 54.7 | 78.2 | 51.2 | 67.4 | 92.1 | 121.0 | 53.6 | 68.4 | 23.5 | 26.1 |
|  | CHIRPS | 80.6 | 98.5 | 64.8 | 80.4 | 110.5 | 137.4 | 91.4 | 106.2 | 120.0 | 154.6 | 108.1 | 131.5 | 85.1 | 100.0 |
|  | TRMM | 81.1 | 91.9 | 58.8 | 65.7 | 112.4 | 136.3 | 72.3 | 102.1 | 69.5 | 86.0 | 54.2 | 71.1 | 119.8 | 139.8 |
| Oct | PERSIANN-CDR | 39.7 | 53.1 | 44.7 | 54.0 | 66.5 | 81.6 | 73.3 | 85.2 | 68.9 | 84.7 | 63.7 | 84.2 | 55.5 | 78.2 |
|  | MERRA | 21.2 | 37.1 | 35.4 | 41.5 | 70.0 | 89.1 | 79.5 | 90.1 | 70.9 | 82.4 | 79.8 | 95.1 | 60.2 | 79.2 |
|  | CHIRPS | 57.9 | 68.8 | 43.0 | 54.5 | 71.7 | 93.2 | 47.9 | 60.5 | 67.8 | 80.9 | 62.9 | 76.6 | 46.1 | 64.3 |
|  | TRMM | 139.3 | 153.1 | 67.2 | 75.3 | 128.5 | 161.8 | 96.0 | 107.6 | 106.4 | 128.8 | 68.2 | 85.1 | 109.8 | 130.3 |
| Nov | PERSIANN-CDR | 74.6 | 84.6 | 47.4 | 67.3 | 71.4 | 95.8 | 46.8 | 51.8 | 71.8 | 80.5 | 33.6 | 39.6 | 47.5 | 61.5 |
|  | MERRA | 52.0 | 58.7 | 50.8 | 77.4 | 53.5 | 63.9 | 51.2 | 62.5 | 83.8 | 93.0 | 48.3 | 58.8 | 22.8 | 27.9 |
|  | CHIRPS | 77.5 | 97.9 | 83.8 | 92.3 | 80.4 | 114.2 | 98.8 | 115.7 | 67.5 | 88.6 | 81.8 | 103.4 | 59.1 | 69.2 |
|  | TRMM | 128.7 | 153.9 | 73.9 | 90.7 | 143.9 | 172.2 | 78.5 | 117.3 | 92.3 | 117.1 | 130.2 | 144.7 | 101.9 | 116.1 |
| Dec | PERSIANN-CDR | 90.5 | 99.5 | 75.4 | 82.7 | 81.3 | 103.5 | 104.8 | 125.4 | 66.8 | 87.7 | 80.7 | 93.5 | 41.4 | 50.0 |
|  | MERRA | 75.5 | 84.6 | 66.9 | 81.9 | 83.0 | 105.4 | 98.6 | 117.7 | 62.5 | 82.9 | 77.5 | 95.2 | 51.2 | 60.3 |

**Table S4.** Statistical metrics used to validate the monthly data of satellite rainfall products with data from the surface weather station.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **ID1** | | **ID2** | | **ID3** | | **ID4** | | **ID5** | | **ID6** | | **ID7** | |
| **Months** | **Products** | **d** | **Pbias**  **(%)** | **d** | **Pbias**  **(%)** | **d** | **Pbias**  **(%)** | **d** | **Pbias**  **(%)** | **d** | **Pbias**  **(%)** | **d** | **Pbias**  **(%)** | **d** | **Pbias**  **(%)** |
|  | CHIRPS | 0.6 | 15.3 | 0.8 | 35.3 | 0.8 | -13.6 | 0.5 | 20.6 | 0.5 | 38.2 | 0.5 | 37.0 | 0.7 | -12.0 |
|  | TRMM | 0.5 | -65.6 | 0.5 | -54.8 | 0.4 | -70.5 | 0.4 | -59.1 | 0.4 | -54.2 | 0.4 | -60.5 | 0.4 | -70.9 |
| Jan | PERSIANN-CDR | 0.6 | -27.3 | 0.9 | 17.8 | 0.7 | -21.6 | 0.3 | 4.3 | 0.3 | 18.6 | 0.2 | 0.0 | 0.6 | -24.6 |
|  | MERRA | 0.5 | -20.6 | 0.8 | 13.6 | 0.8 | -25.6 | 0.4 | 7.1 | 0.5 | 11.2 | 0.5 | 5.6 | 0.6 | -29.3 |
|  | CHIRPS | 0.4 | 59.8 | 0.4 | 42.2 | 0.5 | -31.8 | 0.7 | 11.3 | 0.4 | -18.5 | 0.5 | 23.8 | 0.6 | -10.4 |
|  | TRMM | 0.5 | -58.6 | 0.6 | -47.5 | 0.5 | -74.7 | 0.5 | -60.9 | 0.4 | -69.1 | 0.4 | -67.1 | 0.5 | -63.8 |
| Feb | PERSIANN-CDR | 0.5 | -29.5 | 0.8 | 31.7 | 0.6 | -34.8 | 0.6 | -3.0 | 0.4 | -22.9 | 0.4 | -29.3 | 0.7 | -9.7 |
|  | MERRA | 0.4 | -12.9 | 0.5 | 44.7 | 0.6 | -31.8 | 0.8 | 15.2 | 0.4 | -23.4 | 0.6 | -12.3 | 0.8 | -10.2 |
|  | CHIRPS | 0.5 | 23.7 | 0.3 | 14.0 | 0.6 | -9.2 | 0.2 | 15.6 | 0.0 | -1.0 | 0.9 | -6.3 | 0.4 | 9.0 |
|  | TRMM | 0.4 | -74.6 | 0.5 | -64.1 | 0.5 | -72.5 | 0.4 | -72.1 | 0.4 | -73.3 | 0.4 | -78.5 | 0.5 | -69.0 |
| Mar | PERSIANN-CDR | 0.4 | -44.2 | 0.5 | -8.5 | 0.6 | -25.7 | 0.4 | -23.2 | 0.4 | -26.3 | 0.5 | -43.5 | 0.4 | -14.4 |
|  | MERRA | 0.5 | -34.3 | 0.6 | -4.0 | 0.5 | -36.4 | 0.5 | -16.1 | 0.5 | -38.9 | 0.4 | -37.8 | 0.6 | -29.0 |
|  | CHIRPS | 0.8 | 26.4 | 0.2 | 153.4 | 0.5 | 23.7 | 0.5 | -12.5 | 0.4 | -47.9 | 0.5 | -28.3 | 0.9 | 18.8 |
|  | TRMM | 0.4 | -75.6 | 0.6 | -56.6 | 0.5 | -76.8 | 0.4 | -80.6 | 0.3 | -88.3 | 0.3 | -84.9 | 0.5 | -68.8 |
| Apr | PERSIANN-CDR | 0.5 | -43.7 | 0.6 | 14.3 | 0.6 | -39.4 | 0.4 | -40.8 | 0.4 | -67.0 | 0.3 | -60.1 | 0.8 | -12.1 |
|  | MERRA | 0.6 | -36.3 | 0.8 | 27.8 | 0.6 | -42.5 | 0.5 | -26.6 | 0.4 | -69.4 | 0.4 | -51.2 | 0.7 | -18.5 |
|  | CHIRPS | 0.7 | 18.7 | 0.6 | 10.7 | 0.5 | 1.2 | 0.4 | -49.8 | 0.3 | -19.1 | 0.4 | -67.8 | 0.5 | -12.2 |
|  | TRMM | 0.4 | -69.2 | 0.4 | -61.7 | 0.4 | -76.4 | 0.4 | -83.9 | 0.4 | -81.4 | 0.4 | -89.6 | 0.4 | -75.5 |
| May | PERSIANN-CDR | 0.5 | -27.0 | 0.6 | 15.8 | 0.3 | -32.3 | 0.4 | -46.6 | 0.3 | -43.7 | 0.4 | -68.4 | 0.5 | -25.9 |
|  | MERRA | 0.8 | -22.4 | 0.9 | 10.7 | 0.4 | -40.4 | 0.6 | -44.6 | 0.4 | -52.0 | 0.4 | -67.1 | 0.6 | -36.8 |
|  | CHIRPS | 0.8 | 26.8 | 0.7 | 17.7 | 0.7 | -15.3 | 0.2 | -24.6 | 0.3 | -36.6 | 0.4 | -31.9 | 0.9 | -9.8 |
|  | TRMM | 0.4 | -62.3 | 0.5 | -53.0 | 0.4 | -75.3 | 0.3 | -70.3 | 0.4 | -79.9 | 0.4 | -77.7 | 0.6 | -63.9 |
| Jun | PERSIANN-CDR | 0.7 | -12.5 | 0.7 | 19.5 | 0.3 | -35.2 | 0.2 | -22.3 | 0.4 | -47.8 | 0.3 | -41.1 | 0.8 | -6.3 |
|  | MERRA | 0.9 | -1.9 | 0.7 | 33.3 | 0.4 | -27.1 | 0.3 | -10.3 | 0.3 | -45.3 | 0.3 | -33.1 | 0.9 | -1.9 |
|  | CHIRPS | 1.0 | 7.4 | 0.8 | 31.6 | 0.7 | 1.6 | 0.5 | 40.6 | 0.3 | -16.9 | 0.3 | -33.7 | 0.9 | -30.1 |
|  | TRMM | 0.6 | -67.7 | 0.8 | -53.3 | 0.6 | -69.3 | 0.5 | -48.7 | 0.3 | -72.4 | 0.4 | -77.4 | 0.6 | -72.7 |
| Jul | PERSIANN-CDR | 0.9 | -12.7 | 0.8 | 32.6 | 0.7 | -21.3 | 0.5 | 42.9 | 0.3 | -27.7 | 0.3 | -40.6 | 0.9 | -28.4 |
|  | MERRA | 1.0 | -3.8 | 0.8 | 38.4 | 0.7 | -14.5 | 0.3 | 64.9 | 0.2 | -22.2 | 0.2 | -30.2 | 0.9 | -23.0 |
|  | CHIRPS | 0.8 | 22.9 | 0.3 | 38.3 | 0.3 | 38.2 | 0.2 | -8.6 | 0.1 | 2.0 | 0.1 | -36.0 | 0.6 | -4.9 |
|  | TRMM | 0.5 | -67.2 | 0.5 | -61.3 | 0.5 | -72.7 | 0.3 | -67.5 | 0.4 | -73.9 | 0.3 | -79.2 | 0.4 | -68.8 |
| Aug | PERSIANN-CDR | 0.8 | 8.2 | 0.8 | 35.8 | 0.5 | -7.9 | 0.1 | 16.0 | 0.2 | -11.4 | 0.1 | -27.3 | 0.7 | 5.9 |
|  | MERRA | 0.9 | 6.9 | 0.8 | 21.1 | 0.6 | -26.9 | 0.1 | 15.3 | 0.4 | -27.6 | 0.2 | -29.0 | 0.7 | -13.5 |
|  | CHIRPS | 0.8 | 53.9 | 0.8 | 28.3 | 0.7 | 35.5 | 0.7 | -17.7 | 0.7 | -21.4 | 0.7 | 11.5 | 0.8 | 11.2 |
|  | TRMM | 0.6 | -61.2 | 0.6 | -55.3 | 0.5 | -67.0 | 0.4 | -70.5 | 0.4 | -79.3 | 0.5 | -67.1 | 0.6 | -66.0 |
| Sep | PERSIANN-CDR | 0.9 | 38.7 | 0.9 | 46.9 | 0.7 | 11.2 | 0.8 | -3.0 | 0.7 | -30.6 | 0.8 | 12.6 | 0.9 | 14.0 |
|  | MERRA | 0.9 | 17.0 | 0.9 | 25.4 | 0.7 | -4.8 | 0.9 | -8.9 | 0.6 | -40.6 | 0.8 | -2.4 | 1.0 | -2.4 |
|  | CHIRPS | 0.5 | 53.3 | 0.5 | 60.8 | 0.4 | 43.3 | 0.5 | 49.5 | 0.3 | 104.6 | 0.4 | 119.0 | 0.4 | 12.1 |
|  | TRMM | 0.5 | -60.5 | 0.5 | -57.8 | 0.5 | -73.2 | 0.5 | -59.5 | 0.4 | -58.9 | 0.5 | -48.4 | 0.5 | -74.4 |
| Oct | PERSIANN-CDR | 0.7 | 12.9 | 0.7 | 44.0 | 0.6 | -10.7 | 0.6 | 37.7 | 0.5 | 36.8 | 0.6 | 68.8 | 0.6 | -14.8 |
|  | MERRA | 0.9 | 8.9 | 0.8 | 28.6 | 0.5 | -26.6 | 0.6 | 35.0 | 0.2 | 12.5 | 0.5 | 64.8 | 0.6 | -29.9 |
|  | CHIRPS | 0.7 | -2.0 | 0.3 | 17.9 | 0.5 | -9.5 | 0.5 | -7.5 | 0.5 | 4.4 | 0.6 | 52.4 | 0.6 | -4.9 |
|  | TRMM | 0.4 | -75.4 | 0.4 | -63.0 | 0.4 | -76.4 | 0.5 | -69.6 | 0.5 | -70.7 | 0.5 | -61.7 | 0.4 | -72.4 |
| Nov | PERSIANN-CDR | 0.6 | -33.1 | 0.3 | 27.6 | 0.6 | -21.8 | 0.7 | 2.9 | 0.5 | -4.8 | 0.9 | 17.9 | 0.7 | -10.2 |
|  | MERRA | 0.8 | -14.2 | 0.4 | 38.1 | 0.9 | -13.5 | 0.7 | 18.6 | 0.5 | 6.6 | 0.8 | 43.3 | 1.0 | 0.5 |
|  | CHIRPS | 0.7 | 16.4 | 0.3 | 35.2 | 0.4 | -6.3 | 0.1 | 32.2 | 0.5 | 22.0 | 0.3 | 13.3 | 0.5 | 13.9 |
|  | TRMM | 0.4 | -64.6 | 0.5 | -55.7 | 0.5 | -70.0 | 0.4 | -56.2 | 0.4 | -61.4 | 0.4 | -68.5 | 0.4 | -63.7 |
| Dec | PERSIANN-CDR | 0.5 | -18.0 | 0.5 | 33.6 | 0.6 | -16.0 | 0.1 | 31.9 | 0.4 | 8.2 | 0.3 | -9.4 | 0.8 | 1.7 |
|  | MERRA | 0.6 | -2.6 | 0.5 | 31.2 | 0.6 | -15.1 | 0.4 | 39.0 | 0.6 | 9.4 | 0.3 | 0.8 | 0.7 | 2.9 |

**Table S5.** Results of non-parametric Mann-Kendall test (TMK) and normality tests (Pettitt, SNHT and Buishand) for CHIRPS monthly data from rainfall stations.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Months | Mann-Kendall | | | | Pettitt | | | SNHT | | | Buishand’s | | |
| Feb |
| ID | TAU | P.VA | ZMK | Sen's Slope | K | P.VA | t | T0 | P.VA | t | Q | P.VA | t |
| 1 | 0.009 | 0.946 | 0.31 | 0.165 | 148 | 0.422 | 2011 | 4.204 | 0.399 | 2011 | 5.889 | 0.272 | 2011 |
| 2 | **-0.215** | **0.049\*** | **-2.00** | **-1.982** | 94 | 0.555 | 1992 | 2.806 | 0.669 | 2021 | 3.827 | 0.767 | 2016 |
| 3 | **-0.200** | **0.067+** | **-1.82** | **-2.044** | 188 | 0.115 | 2001 | 6.441 | 0.158 | 2001 | **8.224** | **0.042\*\*** | **2001** |
| 4 | -0.132 | 0.229 | -0.80 | -1.166 | 140 | 0.519 | 2001 | 4.278 | 0.377 | 2001 | 6.702 | 0.148 | 2001 |
| 5 | **-0.200** | **0.067+** | **-1.82** | **-2.044** | 188 | 0.115 | 2001 | 6.441 | 0.158 | 2001 | **8.224** | **0.042\*\*** | **2001** |
| 6 | 0.034 | 0.762 | 0.61 | 0.585 | 96 | 0.579 | 1992 | 3.654 | 0.481 | 2021 | 4.239 | 0.660 | 1992 |
| 7 | **-0.323** | **0.003\*\*** | **-2.85** | **-3.466** | **235** | **0.0164\*** | **2001** | **9.719** | **0.027\*** | **1999** | **10.072** | **0.006\*\*** | **2000** |
| Mar | Mann-Kendall | | | | Pettitt | | | SNHT | | | Buishand’s | | |
| ID | TAU | P.VA | ZMK | Sen's Slope | K | P.VA | t | T0 | P.VA | t | Q | P.VA | t |
| 1 | -0.115 | 0.296 | -0.82 | -1.683 | 124 | 0.792 | 1996 | 2.978 | 0.593 | 2018 | 3.649 | 0.811 | 1996 |
| 2 | -0.071 | 0.522 | -0.61 | -0.608 | 148 | 0.430 | 1995 | 5.372 | 0.237 | 1983 | 6.061 | 0.254 | 1995 |
| 3 | -0.127 | 0.247 | -1.08 | -1.709 | **194** | **0.093+** | **1996** | **8.990** | **0.084+** | **1996** | **9.362** | **0.012\*** | **1996** |
| 4 | 0.012 | 0.919 | 0.00 | 0.080 | 114 | 0.994 | 2012 | 2.741 | 0.692 | 2012 | 4.609 | 0.565 | 2012 |
| 5 | -0.127 | 0.247 | -1.08 | -1.709 | **194** | **0.093+** | **1996** | **8.990** | **0.084+** | **1996** | **9.362** | **0.012\*** | **1996** |
| 6 | -0.073 | 0.508 | -0.74 | -1.147 | 120 | 0.862 | 1996 | 2.805 | 0.675 | 1986 | 4.886 | 0.482 | 1996 |
| 7 | -0.137 | 0.212 | -1.30 | -1.821 | **212** | **0.045\*** | **1996** | **10.538** | **0.014\*** | **1996** | **10.136** | **0.006\*\*** | **1996** |
| Apr | Mann-Kendall | | | | Pettitt | | | SNHT | | | Buishand’s | | |
| ID | TAU | P.VA | ZMK | Sen's Slope | K | P.VA | t | T0 | P.VA | t | Q | P.VA | t |
| 1 | **-0.196** | **0.072+** | **-1.92** | **-2.314** | **192** | **0.099** | **2012** | **8.680** | **0.031\*** | **2015** | **7.970** | **0.056+** | **2012** |
| 2 | -0.122 | 0.266 | -1.13 | -0.649 | 156 | 0.329 | 2014 | 7.143 | 0.116 | 2017 | 6.414 | 0.191 | 2014 |
| 3 | **-0.210** | **0.055+** | **-1.67** | **-1.397** | 170 | 0.220 | 2014 | 6.238 | 0.135 | 2014 | 6.416 | 0.192 | 2014 |
| 4 | -0.073 | 0.508 | -0.72 | -0.376 | 162 | 0.274 | 2014 | 6.377 | 0.119 | 2017 | 6.093 | 0.238 | 2014 |
| 5 | **-0.210** | **0.055+** | **-1.67** | **-1.397** | 170 | 0.220 | 2014 | 6.238 | 0.135 | 2014 | 6.416 | 0.192 | 2014 |
| 6 | -0.092 | 0.406 | -0.90 | -0.799 | 158 | 0.329 | 2015 | **8.005** | **0.047\*** | **2017** | 6.578 | 0.168 | 2015 |
| 7 | **-0.224** | **0.040\*** | **-2.02** | **-1.256** | 180 | 0.158 | 1996 | **7.054** | **0.083+** | **2014** | 7.000 | 0.120 | 1996 |
| Jun | Mann-Kendall | | | | Pettitt | | | SNHT | | | Buishand’s | | |
| ID | TAU | P.VA | ZMK | Sen's Slope | K | P.VA | t | T0 | P.VA | t | Q | P.VA | t |
| 1 | 0.088 | 0.425 | 0.87 | 0.479 | 150 | 0.394 | 2007 | **12.610** | **0.017\*** | **1983** | 5.380 | 0.350 | 2011 |
| 2 | -0.037 | 0.745 | -0.35 | -0.166 | 88 | 0.435 | 2011 | **12.305** | **0.017\*** | **1983** | 4.898 | 0.480 | 1983 |
| 3 | -0.118 | 0.281 | -1.16 | -0.772 | 139 | 0.559 | 1997 | **13.837** | **0.010\*** | **1983** | 5.258 | 0.392 | 1997 |
| 4 | -0.018 | 0.875 | -0.16 | -0.126 | 86 | 0.385 | 2011 | **10.923** | **0.019\*** | **1983** | 4.615 | 0.550 | 1983 |
| 5 | -0.118 | 0.281 | -1.16 | -0.772 | 139 | 0.559 | 1997 | **13.837** | **0.010\*** | **1983** | 5.258 | 0.392 | 1997 |
| 6 | 0.037 | 0.745 | 0.35 | 0.235 | 106 | 0.837 | 2011 | **11.725** | **0.019\*** | **1983** | 4.782 | 0.503 | 1983 |
| 7 | -0.146 | 0.181 | -1.30 | -0.874 | 174 | 0.199 | 1997 | **10.984** | **0.019\*** | **1983** | 6.922 | 0.136 | 1997 |

**Legend**: \*\* = 99% significance; \* = 95% significance; = +90% significance; TAU = Trend curvature magnitude; P.VA = Significance level; K = value that indicates the possibility of locating the point where the ruptures occurred in the series; t = value that indicates the position of ruptures; T0 and Q = critical values of the SNHT and Buishand tests. Results with statistical significance are highlighted in bold.

**Table S6.** Results of non-parametric Mann-Kendall test and normality tests (Pettitt, SNHT and Buishand’s) for CHIRPS monthly data from rainfall stations.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Months | Mann-Kendall | | | | Pettitt | | | SNHT | | | Buishand’s | | |
| Jul |
| ID | TAU | P.VA | ZMK | Sen's Slope | K | P.VA | t | T0 | P.VA | t | Q | P.VA | t |
| 1 | -0.102 | 0.351 | -0.98 | -0.669 | 164 | 0.252 | 2015 | 6.172 | 0.185 | 2016 | 5.855 | 0.270 | 2015 |
| 2 | -0.063 | 0.567 | -0.72 | -0.252 | 166 | 0.239 | 2015 | 4.780 | 0.286 | 2015 | 5.333 | 0.378 | 2015 |
| 3 | -0.105 | 0.340 | -1.13 | -0.619 | 158 | 0.319 | 2015 | 5.133 | 0.251 | 2015 | 5.527 | 0.329 | 2015 |
| 4 | -0.039 | 0.728 | -0.50 | -0.200 | 154 | 0.360 | 2015 | 4.709 | 0.290 | 2015 | 5.293 | 0.391 | 2015 |
| 5 | -0.105 | 0.340 | -1.13 | -0.619 | 158 | 0.319 | 2015 | 5.133 | 0.251 | 2015 | 5.527 | 0.329 | 2015 |
| 6 | -0.077 | 0.486 | -0.77 | -0.331 | 167 | 0.247 | 2015 | 5.932 | 0.198 | 2016 | 5.797 | 0.292 | 2015 |
| 7 | **-0.187** | **0.088+** | **-1.94** | **-0.870** | 192 | 0.110 | 2015 | 6.001 | 0.198 | 2015 | 5.976 | 0.238 | 2015 |
| Sep | Mann-Kendall | | | | Pettitt | | | SNHT | | | Buishand’s | | |
| ID | TAU | P.VA | ZMK | Sen's Slope | K | P.VA | t | T0 | P.VA | t | Q | P.VA | t |
| 1 | -0.171 | 0.118 | -1.11 | -1.394 | 156 | 0.345 | 2009 | 4.790 | 0.349 | 2009 | 6.602 | 0.165 | 2009 |
| 2 | -0.104 | 0.345 | -0.64 | -0.790 | 115 | 0.987 | 2009 | 3.086 | 0.626 | 2014 | 5.088 | 0.439 | 2009 |
| 3 | -0.167 | 0.127 | -1.17 | -1.287 | 145 | 0.479 | 2000 | 3.593 | 0.505 | 2014 | 5.267 | 0.388 | 2009 |
| 4 | -0.124 | 0.257 | -0.82 | -0.863 | 130 | 0.690 | 2009 | 3.743 | 0.482 | 2009 | 5.837 | 0.277 | 2009 |
| 5 | -0.167 | 0.127 | -1.17 | -1.287 | 145 | 0.479 | 2000 | 3.593 | 0.505 | 2014 | 5.267 | 0.388 | 2009 |
| 6 | -0.105 | 0.340 | -0.56 | -0.829 | 104 | 0.776 | 2009 | 3.018 | 0.619 | 2014 | 5.115 | 0.430 | 2009 |
| 7 | **-0.193** | **0.078+** | **-1.81** | **-1.448** | **198** | **0.078+** | **2000** | 6.047 | 0.138 | 2000 | **7.949** | **0.059+** | **2000** |
| Oct | Mann-Kendall | | | | Pettitt | | | SNHT | | | Buishand’s | | |
| ID | TAU | P.VA | ZMK | Sen's Slope | K | P.VA | t | T0 | P.VA | t | Q | P.VA | t |
| 1 | **0.198** | **0.071+** | **1.84** | **1.423** | 178 | 0.156 | 1994 | 6.123 | 0.179 | 1994 | **7.465** | **0.084+** | **1994** |
| 2 | **0.183** | **0.094+** | **1.71** | **1.259** | 152 | 0.377 | 1994 | 3.959 | 0.429 | 1994 | 6.002 | 0.246 | 1994 |
| 3 | 0.167 | 0.127 | 1.66 | 1.263 | 129 | 0.715 | 1994 | 3.986 | 0.419 | 2010 | 5.889 | 0.267 | 2010 |
| 4 | **0.239** | **0.029\*** | **2.06** | **1.427** | 182 | 0.146 | 1994 | 5.159 | 0.254 | 1994 | 6.991 | 0.124 | 2007 |
| 5 | 0.167 | 0.127 | 1.66 | 1.263 | 129 | 0.715 | 1994 | 3.986 | 0.419 | 2010 | 5.889 | 0.267 | 2010 |
| 6 | **0.224** | **0.040\*** | **1.99** | **1.590** | 188 | 0.121 | 1994 | 6.882 | 0.134 | 1994 | **7.914** | **0.056+** | **1994** |
| 7 | 0.173 | 0.113 | 1.47 | 1.307 | 130 | 0.698 | 1990 | 3.880 | 0.443 | 2010 | 5.810 | 0.290 | 2010 |
| Nov | Mann-Kendall | | | | Pettitt | | | SNHT | | | Buishand’s | | |
| ID | TAU | P.VA | ZMK | Sen's Slope | K | P.VA | t | T0 | P.VA | t | Q | P.VA | t |
| 1 | -0.071 | 0.522 | -0.65 | -0.621 | 138 | 0.581 | 2015 | 5.185 | 0.253 | 2015 | 5.554 | 0.344 | 2015 |
| 2 | 0.026 | 0.822 | 0.27 | 0.086 | 76 | 0.198 | 1986 | **7.973** | **0.096+** | **1982** | 3.841 | 0.763 | 1986 |
| 3 | 0.060 | 0.590 | 0.75 | 0.241 | 124 | 0.804 | 2001 | **8.946** | **0.037\*** | **1982** | 3.626 | 0.820 | 1985 |
| 4 | 0.044 | 0.694 | 0.39 | 0.160 | 110 | 0.924 | 2001 | **8.372** | **0.064+** | **1982** | 4.248 | 0.656 | 1986 |
| 5 | 0.060 | 0.590 | 0.75 | 0.241 | 124 | 0.804 | 2001 | **8.946** | **0.037\*** | **1982** | 3.626 | 0.820 | 1985 |
| 6 | -0.018 | 0.875 | -0.15 | -0.170 | 108 | 0.866 | 2015 | 6.517 | 0.169 | 1982 | 4.285 | 0.640 | 2015 |
| 7 | 0.015 | 0.902 | 0.17 | 0.187 | 98 | 0.640 | 2001 | 4.523 | 0.331 | 1982 | 2.919 | 0.949 | 2001 |

**Legend**: \*\* = 99% significance; \* = 95% significance; = 90% significance; TAU = Trend curvature magnitude; P.VA = Significance level; K = value that indicates the possibility of locating the point where the ruptures occurred in the series; t = value that indicates the position of ruptures; T0 and Q = critical values of the SNHT and Buishand’s tests. Results with statistical significance are highlighted in bold.