Supplementary Material

# Supplementary Data

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## Supplementary Figures

Table S. Details of each observation station analyzed.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Station ID** | Long Name | Subregion | Latitude [°] | Longitude [°] | Start Date | End Date | Days of Data |
| **2400565** | Brevoort Island | Baffin Island | 63.34 | -64.15 | 1989-04-01 | 1993-03-30 | 1427 |
| **2400570** | Broughton Island | Baffin Island | 67.54 | -63.79 | 1980-01-01 | 1991-06-30 | 4189 |
| **2400635** | Cape Dorset A | Baffin Island | 64.23 | -76.53 | 1980-01-01 | 2010-12-30 | 10460 |
| **2400654** | Cape Dyer A | Baffin Island | 66.58 | -61.62 | 1980-01-01 | 1993-03-30 | 4801 |
| **2400660** | Cape Hooper | Baffin Island | 68.47 | -66.82 | 1980-01-01 | 1991-06-30 | 4174 |
| **2400800** | Clyde A | Baffin Island | 70.49 | -68.52 | 1980-01-01 | 2002-06-30 | 7915 |
| **2401030** | Dewar Lakes | Baffin Island | 68.65 | -71.17 | 1980-01-01 | 1993-05-12 | 4754 |
| **2402590** | Iqaluit A | Baffin Island | 63.75 | -68.55 | 1980-01-01 | 2002-05-31 | 6629 |
| **2402592** | Iqaluit Climate | Baffin Island | 63.75 | -68.54 | 2005-03-01 | 2007-11-30 | 866 |
| **2402594** | Iqaluit Ua | Baffin Island | 63.75 | -68.55 | 1997-04-01 | 2016-02-15 | 5930 |
| **2402684** | Longstaff Bluff | Baffin Island | 68.90 | -75.14 | 1980-01-01 | 1991-06-28 | 4191 |
| **2402730** | Nanisivik A | Baffin Island | 72.98 | -84.62 | 1980-01-01 | 2010-12-30 | 9528 |
| **2403050** | Pangnirtung 1925 Climate | Baffin Island | 66.13 | -65.73 | 1981-02-01 | 1983-08-31 | 209 |
| **2403201** | Pond Inlet A | Baffin Island | 72.69 | -77.97 | 1980-01-01 | 2009-09-30 | 9815 |
| **2400300** | Alert | Ellesmere Island | 82.52 | -62.28 | 1980-01-01 | 1999-12-31 | 7294 |
| **2400306** | Alert Ua | Ellesmere Island | 82.50 | -62.33 | 2000-01-01 | 2014-12-31 | 5382 |
| **2401200** | Eureka A | Ellesmere Island | 79.98 | -85.93 | 1980-01-01 | 2016-02-16 | 13080 |
| **2402346** | Grise Fiord | Ellesmere Island | 76.42 | -82.90 | 1984-08-01 | 2010-06-25 | 8114 |
| **04202** | Pituffik | NW Greenland | 76.53 | -68.75 | 1982-01-01 | 2006-11-27 | 8325 |
| **04212** | Uummannaq Heli. | CW Greenland | 70.67 | -52.12 | 1980-01-03 | 1989-08-21 | 1691 |
| **04216** | Ilulissat | CW Greenland | 69.22 | -51.05 | 1980-01-01 | 1991-10-11 | 3311 |
| **04220** | Aasiaat | CW Greenland | 68.70 | -52.75 | 1980-01-01 | 2013-12-31 | 11341 |
| **04230** | Sisimiut | SW Greenland | 66.92 | -53.67 | 1980-01-01 | 2001-05-15 | 5675 |
| **04231** | Kangerlussuaq | SW Greenland | 67.00 | -50.80 | 1980-01-01 | 2013-12-31 | 12242 |
| **04235** | DYE 1 | SW Greenland | 66.63 | -52.87 | 1982-02-01 | 1989-09-18 | 2492 |
| **04240** | Maniitsoq | SW Greenland | 65.40 | -52.87 | 1980-01-02 | 1987-01-30 | 1583 |
| **04250** | Nuuk | SW Greenland | 64.17 | -51.75 | 1980-01-01 | 2006-12-05 | 9390 |
| **04260** | Mitt. Paamiut | SW Greenland | 62.02 | -49.67 | 1980-01-01 | 2003-03-31 | 7232 |
| **04270** | Mitt. Narsarsuaq | SW Greenland | 61.17 | -45.42 | 1980-01-01 | 2008-12-30 | 10364 |
| **04272** | Qaqortoq | SW Greenland | 60.72 | -46.05 | 1980-01-01 | 2013-12-31 | 12201 |
| **04283** | Nanortalik Heli. | SW Greenland | 60.13 | -45.23 | 1980-01-01 | 1985-11-02 | 1960 |
| **04465** | DYE 2 | SW Greenland | 66.48 | -46.28 | 1982-01-28 | 1988-10-06 | 1929 |
| **04310** | Station Nord | NE Greenland | 81.60 | -16.65 | 1980-01-01 | 2007-07-09 | 9192 |
| **04320** | Danmarkshavn | NE Greenland | 76.77 | -18.67 | 1980-01-01 | 2008-12-31 | 10417 |
| **04338** | Mestersvig | NE Greenland | 72.25 | -23.90 | 1980-01-01 | 1985-10-25 | 1993 |
| **04339** | Ittoqqortoormiit | NE Greenland | 70.48 | -21.95 | 1980-11-02 | 2006-01-14 | 8453 |
| **04360** | Tasiilaq | SE Greenland | 65.60 | -37.63 | 1980-01-01 | 2013-12-21 | 8737 |
| **04365** | DYE 4 | SE Greenland | 65.52 | -37.17 | 1981-02-04 | 1991-05-20 | 2587 |
| **04475** | DYE 3 | SE Greenland | 65.18 | -43.83 | 1982-07-18 | 1989-09-18 | 2335 |

Table S2. Extreme event threshold accumulation, frequency (*fe*), and number of days with at least 1 mm of accumulation for each station. Dashed lines separate the subregions. E, M, and C represent ERA-5, MERRA-2, and CFSR, respectively.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Extreme Threshold [mm] | | | |  | *fe* [events (yr)-1] | | | |  | Days with Accumulation 1 mm | | | |
| **Station ID** | Obs. | E. | M. | C. |  | Obs. | E. | M. | C. |  | Obs. | E. | M. | C. |
| **2400565** | 25.3 | 17.3 | 16.8 | 15.1 |  | 4.9 | 1.3 | 1.5 | 0.3 |  | 366 | 414 | 403 | 412 |
| **2400570** | 12.0 | 11.1 | 10.4 | 9.3 |  | 3.6 | 3.6 | 3.6 | 2.2 |  | 777 | 910 | 1030 | 971 |
| **2400635** | 13.8 | 11.6 | 11.3 | 10.5 |  | 5.8 | 3.4 | 3.7 | 3.3 |  | 3321 | 2843 | 3262 | 3761 |
| **2400654** | 26.3 | 16.6 | 14.3 | 13.6 |  | 4.8 | 1.2 | 0.3 | 0.2 |  | 1223 | 1225 | 1291 | 1544 |
| **2400660** | 11.6 | 12.1 | 10.8 | 9.8 |  | 3.9 | 5.7 | 3.4 | 2.8 |  | 900 | 1169 | 949 | 1106 |
| **2400800** | 11.7 | 10.7 | 10.4 | 9.7 |  | 3.4 | 3.1 | 3.2 | 2.7 |  | 1438 | 1637 | 1987 | 1801 |
| **2401030** | 11.8 | 10.1 | 9.8 | 9.9 |  | 3.6 | 3.4 | 3.7 | 3.3 |  | 922 | 1243 | 1503 | 1309 |
| **2402590** | 14.9 | 12.7 | 10.9 | 10.2 |  | 4.6 | 4.1 | 2.3 | 2.0 |  | 1656 | 2072 | 2281 | 2107 |
| **2402592** | 14.5 | 13.9 | 12.3 | 9.7 |  | 4.6 | 6.7 | 3.0 | 2.5 |  | 203 | 332 | 354 | 334 |
| **2402594** | 16.0 | 13.8 | 11.8 | 19.3 |  | 4.6 | 4.1 | 3.1 | 9.2 |  | 1478 | 2024 | 2180 | 2342 |
| **2402684** | 10.3 | 10.8 | 10.7 | 9.7 |  | 3.0 | 4.8 | 5.9 | 3.6 |  | 663 | 992 | 1223 | 1059 |
| **2402730** | 13.7 | 8.7 | 8.6 | 6.2 |  | 3.7 | 1.0 | 1.9 | 0.3 |  | 1891 | 1888 | 2894 | 2143 |
| **2403050** | 17.9 | 13.4 | 13.8 | 10.7 |  | 5.2 | 5.2 | 5.2 | 3.5 |  | 55 | 85 | 96 | 87 |
| **2403201** | 13.4 | 9.5 | 8.6 | 8.7 |  | 3.2 | 1.6 | 1.6 | 1.4 |  | 1683 | 2232 | 3067 | 3255 |
| **2400300** | 9.4 | 7.1 | 6.1 | 6.0 |  | 3.1 | 1.5 | 0.9 | 0.9 |  | 1183 | 1254 | 1307 | 1098 |
| **2400306** | 8.3 | 6.3 | 5.0 | 10.2 |  | 3.5 | 1.0 | 0.5 | 5.1 |  | 951 | 903 | 749 | 968 |
| **2401200** | 7.8 | 6.3 | 9.0 | 9.1 |  | 1.5 | 0.9 | 4.6 | 5.4 |  | 1041 | 1246 | 2531 | 2980 |
| **2402346** | 15.2 | 8.6 | 11.8 | 7.0 |  | 2.4 | 0.4 | 1.8 | 0.2 |  | 1035 | 1309 | 1653 | 1222 |
| **04202** | 11.2 | 12.4 | 10.0 | 10.9 |  | 1.8 | 5.0 | 2.9 | 4.5 |  | 819 | 1700 | 1785 | 2202 |
| **04212** | 12.6 | 10.0 | 10.4 | 11.4 |  | 0.9 | 1.1 | 2.8 | 4.1 |  | 68 | 358 | 425 | 446 |
| **04216** | 16.9 | 10.3 | 13.0 | 11.8 |  | 3.3 | 1.0 | 2.1 | 1.7 |  | 566 | 638 | 770 | 671 |
| **04220** | 13.7 | 11.4 | 11.2 | 12.7 |  | 4.1 | 2.2 | 2.9 | 4.6 |  | 2366 | 2249 | 2687 | 3319 |
| **04230** | 17.4 | 14.2 | 14.1 | 9.0 |  | 4.2 | 3.4 | 3.5 | 0.8 |  | 1287 | 1846 | 2127 | 2126 |
| **04231** | 10.6 | 8.2 | 11.0 | 11.5 |  | 2.3 | 1.5 | 5.1 | 3.7 |  | 1552 | 2614 | 3174 | 2169 |
| **04235** | 9.2 | 10.9 | 10.1 | 8.7 |  | 2.2 | 7.8 | 7.8 | 5.5 |  | 267 | 675 | 792 | 898 |
| **04250** | 24.0 | 18.3 | 17.0 | 16.3 |  | 6.1 | 3.0 | 2.9 | 2.5 |  | 3053 | 3617 | 4145 | 4456 |
| **04260** | 27.0 | 22.8 | 26.0 | 22.1 |  | 5.9 | 4.3 | 7.5 | 5.0 |  | 2340 | 2839 | 3335 | 3206 |
| **04270** | 28.1 | 22.1 | 25.6 | 20.5 |  | 4.2 | 4.4 | 6.4 | 3.2 |  | 2360 | 4809 | 4483 | 4027 |
| **04272** | 32.0 | 24.7 | 33.0 | 31.7 |  | 5.4 | 3.3 | 8.8 | 7.1 |  | 3413 | 4406 | 5168 | 4688 |
| **04283** | 26.4 | 22.2 | 22.7 | 21.7 |  | 4.7 | 3.6 | 5.5 | 5.7 |  | 348 | 619 | 658 | 706 |
| **04465** | 6.1 | 10.3 | 11.0 | 9.5 |  | 1.9 | 13.3 | 17.3 | 16.3 |  | 190 | 545 | 563 | 570 |
| **04310** | 13.8 | 12.4 | 10.4 | 9.4 |  | 3.2 | 3.2 | 1.9 | 1.2 |  | 1556 | 2232 | 2282 | 2257 |
| **04320** | 12.9 | 16.6 | 15.7 | 13.9 |  | 2.3 | 6.0 | 6.0 | 5.3 |  | 1311 | 1875 | 2089 | 2444 |
| **04338** | 28.3 | 23.4 | 22.4 | 21.2 |  | 2.7 | 1.3 | 1.9 | 1.1 |  | 278 | 387 | 451 | 417 |
| **04339** | 17.3 | 22.2 | 19.4 | 19.1 |  | 3.6 | 11.0 | 8.4 | 8.7 |  | 1645 | 2593 | 2720 | 2934 |
| **04360** | 27.9 | 25.5 | 29.8 | 29.5 |  | 6.0 | 5.4 | 9.6 | 9.5 |  | 2820 | 3371 | 3831 | 3764 |
| **04365** | 9.9 | 26.2 | 26.9 | 26.1 |  | 4.0 | 44.6 | 51.3 | 47.7 |  | 551 | 1027 | 1132 | 1119 |
| **04475** | 8.7 | 11.8 | 8.5 | 13.2 |  | 0.9 | 15.2 | 6.0 | 21.3 |  | 111 | 884 | 915 | 982 |

Table S3. 95% Confidence interval (CI) for each subregion corresponding to the correlations provided in Table 4. Regions whose correlation is not statistically significant (p 0.05) are italicized.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Overall Correlation (95% CI)** | | |  | **Extreme Event Correlation (95% CI)** | | |
| **Subregion** | ERA-5 | MERRA-2 | CFSR |  | ERA-5 | MERRA-2 | CFSR |
| **Baffin Island** | 0.47-0.50 | 0.42-0.44 | 0.35-0.37 |  | 0.17-0.30 | 0.08-0.21 | 0.07-0.20 |
| **Ellesmere Island** | 0.34-0.39 | 0.26-0.31 | 0.16-0.22 |  | *-0.12-0.15* | *-0.14-0.13* | *-0.24-0.03* |
| **NW Greenland** | 0.20-0.33 | 0.20-0.32 | 0.22-0.35 |  | *-0.33-0.28* | *-0.35-0.26* | *-0.33-0.28* |
| **CW Greenland** | 0.43-0.48 | 0.34-0.40 | 0.37-0.43 |  | 0.03-0.34 | *0.00-0.31* | *-0.05-0.26* |
| **SW Greenland** | 0.59-0.61 | 0.52-0.55 | 0.47-0.50 |  | 0.41-0.52 | 0.35-0.47 | 0.27-0.40 |
| **NE Greenland** | 0.40-0.44 | 0.35-0.40 | 0.35-0.39 |  | 0.11-0.35 | 0.11-0.35 | 0.08-0.32 |
| **SE Greenland** | 0.47-0.52 | 0.44-0.49 | 0.47-52 |  | 0.17-0.44 | 0.12-0.40 | 0.08-0.35 |

Table S. 3-by-3 cell group used for spatial offsetting analysis.

|  |  |  |
| --- | --- | --- |
| 1 | 2 | 3 |
| 4 | ★ | 6 |
| 7 | 8 | 9 |



Figure S. Taylor diagrams comparing accumulations for extreme events between products in each subregion. The reanalysis accumulations are retrieved from the cell surrounding the station that produces the highest correlation with the station record to account for potential spatial offsets. CFSR is not visible in f) as it is overlain by ERA-5 and MERRA-2.



Figure S. Histograms showing the cell with the highest correlation between the reanalyses and observations in each subregion. The cell numbers are as shown in Table S4.

Figure S. Taylor diagrams comparing three-day accumulations for extreme events between products in each subregion to account for potential temporal offsets in the reanalyses. CFSR is not visible in c) due to the correlation falling below 0, and f) as it is overlain by MERRA-2.