

# Supplementary Information

## Evaluation of trends and analysis of air temperature and wind on the Antarctic Peninsula using Extreme Value Theory

### Author information

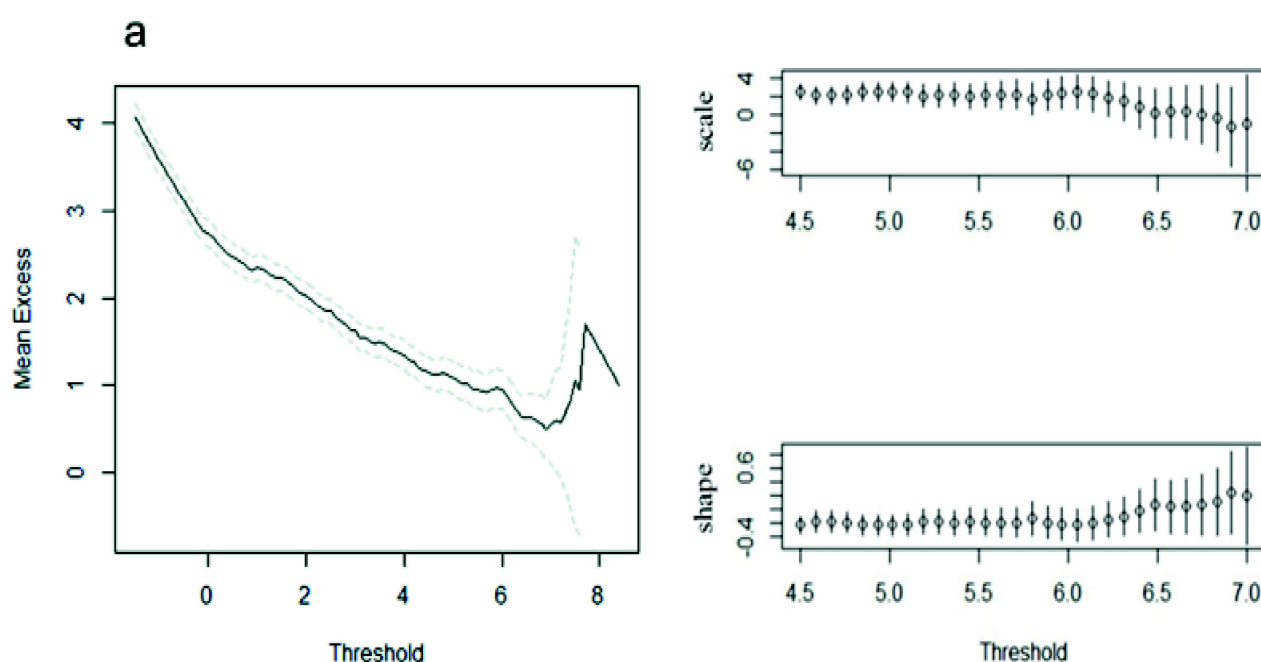
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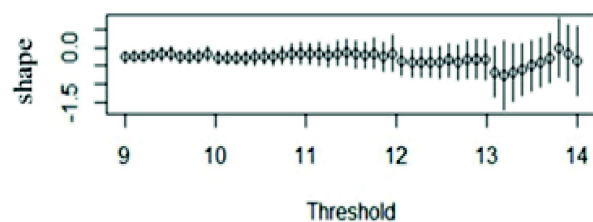
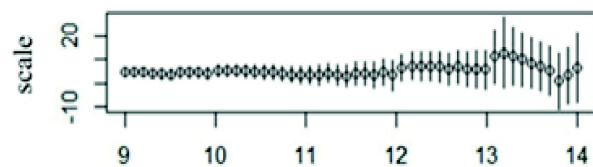
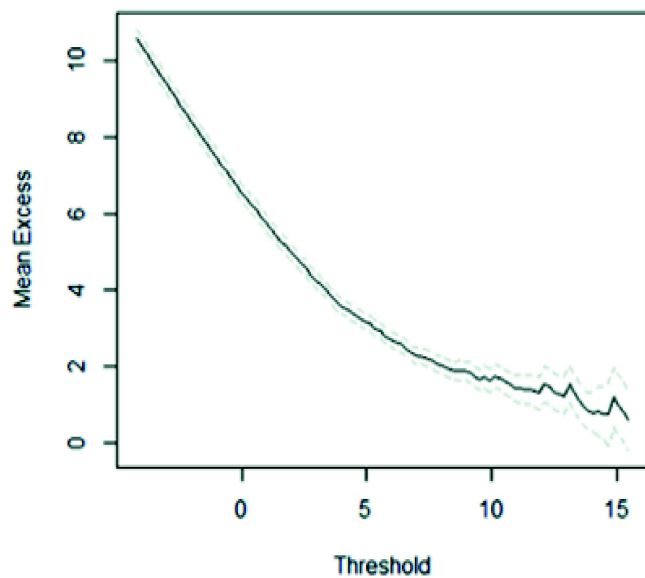
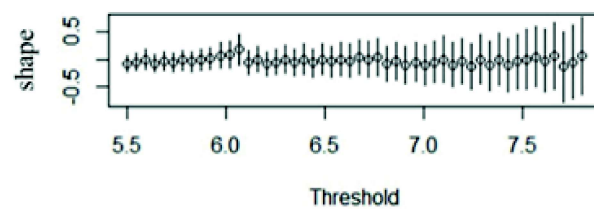
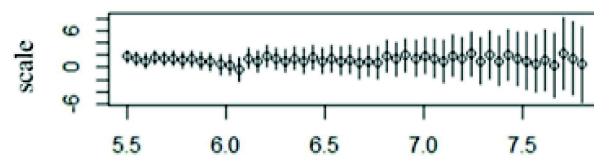
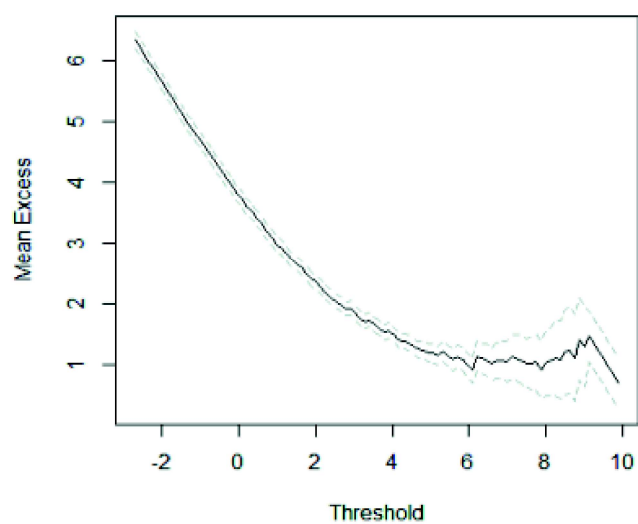
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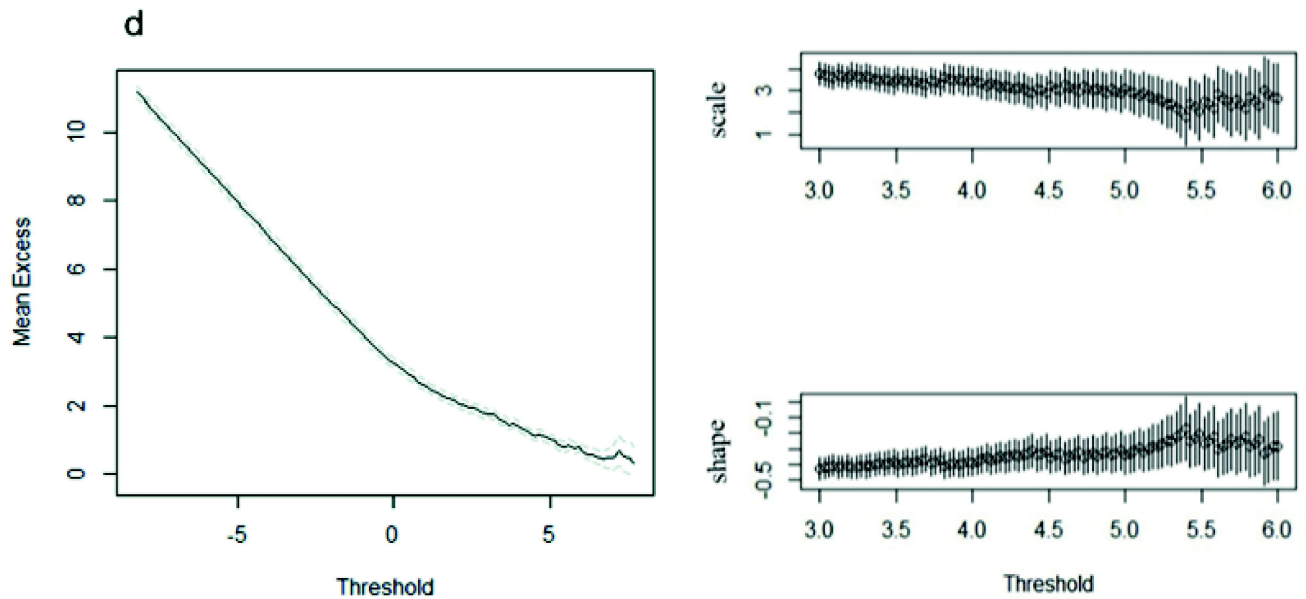
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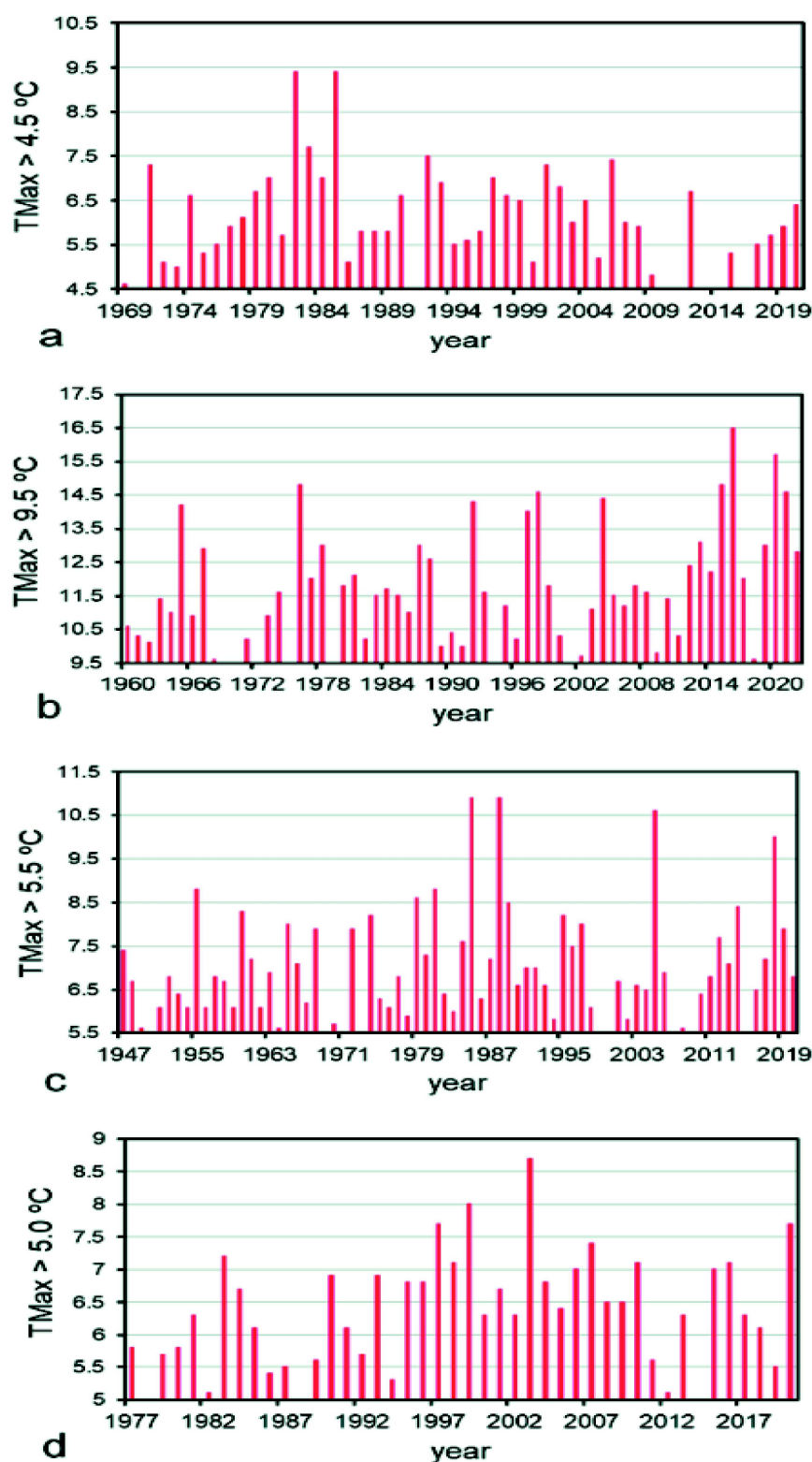
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**Figure S1** Graphs obtained with the in2extRemes software referring to the mean residual plot of excesses (left) and the POT model of thresholds (right) with the parameters scale and shape for the choice of  $u$  for each surface station. The 30-threshold range is most suitable for threshold selection in the Bellinghausen data (**a**) and 50-threshold range for (**b**) Esperanza, (**c**) Vernadsky and (**d**) Rothera.



**Figure S2** The graphs show the excesses of the monthly maximum temperature above the respective thresholds **u** for each surface station. Each peak above **u** refers to the sequence in time of warmest days recorded during the period of each series: **a** Bellingshausen (over the AP) at 62°15'S/58°54'W, **b** Esperanza (over the AP) at 63°14'/56°59', **c** Vernadsky (western) at 65°15'S/64°16'W, and **d** Rothera (western) at 67°34'S/68°07'W.

**Table S1** Extremal index ( $\Theta$ ) with 95 % CI (in parentheses), threshold (u), percentiles (k-th perc), excess number ( $N_e$ ), run, cluster number ( $N_c$ ) and cluster-size at (a) Bellingshausen (62°15'S/58°54'W), (b) Esperanza (63°14'S/56°59'W), (c) Vernadsky (65°15'S/64°16'W) and (d) Rothera (67°34'S/68°07'W). Threshold values tested with the best fits for the GP and PP distribution are highlighted in bold.

| <b>(a) Bellingshausen</b> | u (°C)                      | k-th per (%) | $N_e$        |
|---------------------------|-----------------------------|--------------|--------------|
|                           | <b>4.5</b>                  | <b>82</b>    | <b>110</b>   |
|                           | 4.8                         | 85           | 84           |
|                           | 5.0                         | 88           | 73           |
|                           | 5.3                         | 90           | 58           |
|                           | 5.7                         | 93           | 42           |
| run = 1                   | $\Theta$ (95% CI)           | $N_c$        | cluster-size |
|                           | <b>0.554 (0.479, 0.661)</b> | <b>46</b>    | <b>2.4</b>   |
|                           | 0.554 (0.474, 0.666)        | 46           | 1.8          |
|                           | 0.597 (0.509, 0.704)        | 43           | 1.7          |
|                           | 0.666 (0.567, 0.791)        | 38           | 1.5          |
|                           | 0.756 (0.632, 0.885)        | 31           | 1.4          |
| run = 2                   | $\Theta$ (95% CI)           | $N_c$        | cluster-size |
|                           | <b>0.394 (0.358, 0.443)</b> | <b>43</b>    | <b>2.6</b>   |
|                           | 0.493 (0.427, 0.493)        | 41           | 2.0          |
|                           | 0.527 (0.457, 0.527)        | 38           | 1.9          |
|                           | 0.596 (0.500, 0.723)        | 34           | 1.7          |
|                           | 0.658 (0.551, 0.794)        | 27           | 1.6          |
| run = 3                   | $\Theta$ (95% CI)           | $N_c$        | cluster-size |
|                           | <b>0.394 (0.352, 0.443)</b> | <b>43</b>    | <b>2.6</b>   |
|                           | 0.481 (0.421, 0.563)        | 40           | 2.1          |
|                           | 0.527 (0.455, 0.633)        | 38           | 1.9          |
|                           | 0.596 (0.500, 0.693)        | 34           | 1.7          |
|                           | 0.658 (0.545, 0.818)        | 27           | 1.6          |
| <b>(b) Esperanza</b>      | u (°C)                      | k-th per (%) | $N_e$        |
|                           | 8.5                         | 77           | 188          |
|                           | 9.0                         | 80           | 140          |
|                           | <b>9.5</b>                  | <b>85</b>    | <b>123</b>   |
|                           | 10.0                        | 87           | 86           |
|                           | 10.5                        | 90           | 71           |
| run = 1                   | $\Theta$ (95% CI)           | $N_c$        | cluster-size |
|                           | 0.625 (0.552, 0.708)        | 112          | 1.8          |
|                           | 0.696 (0.614, 0.796)        | 94           | 1.5          |
|                           | <b>0.728 (0.641, 0.826)</b> | <b>86</b>    | <b>1.4</b>   |
|                           | 0.756 (0.652, 0.873)        | 62           | 1.6          |
|                           | 0.746 (0.625, 0.847)        | 50           | 1.4          |
| run = 2                   | $\Theta$ (95% CI)           | $N_c$        | cluster-size |
|                           | 0.480 (0.421, 0.547)        | 86           | 2.2          |
|                           | 0.540 (0.460, 0.629)        | 73           | 1.9          |
|                           | <b>0.576 (0.489, 0.693)</b> | <b>68</b>    | <b>1.8</b>   |
|                           | 0.670 (0.572, 0.791)        | 55           | 1.6          |
|                           | 0.644 (0.558, 0.754)        | 43           | 1.7          |
| run = 3                   | $\Theta$ (95% CI)           | $N_c$        | cluster-size |
|                           | 0.407 (0.359, 0.474)        | 73           | 2.6          |
|                           | 0.466 (0.397, 0.545)        | 63           | 2.2          |
|                           | <b>0.491 (0.411, 0.582)</b> | <b>58</b>    | <b>2.1</b>   |
|                           | 0.634 (0.541, 0.764)        | 52           | 1.7          |
|                           | 0.612 (0.518, 0.719)        | 41           | 1.7          |

| (c) Vernadsky | u (°C)                      | k-th per (%)   | N <sub>e</sub> |
|---------------|-----------------------------|----------------|----------------|
|               | 5.3                         | 80             | 159            |
|               | 5.5                         | 83             | 143            |
|               | <b>5.6</b>                  | <b>85</b>      | <b>128</b>     |
|               | 6.1                         | 88             | 84             |
|               | 6.3                         | 92             | 68             |
| run = 1       | $\Theta$ (95% CI)           | N <sub>c</sub> | cluster-size   |
|               | 0.629 (0.561, 0.714)        | 100            | 1.6            |
|               | 0.685 (0.608, 0.771)        | 98             | 1.5            |
|               | <b>0.703 (0.631, 0.782)</b> | <b>90</b>      | <b>1.4</b>     |
|               | 0.773 (0.691, 0.872)        | 65             | 1.3            |
|               | 0.838 (0.750, 0.919)        | 57             | 1.2            |
| run = 2       | $\Theta$ (95% CI)           | N <sub>c</sub> | cluster-size   |
|               | 0.496 (0.436, 0.576)        | 79             | 2.0            |
|               | 0.531 (0.469, 0.608)        | 76             | 1.9            |
|               | <b>0.562 (0.498, 0.654)</b> | <b>72</b>      | <b>1.8</b>     |
|               | 0.702 (0.621, 0.808)        | 59             | 1.4            |
|               | 0.794 (0.697, 0.885)        | 54             | 1.3            |
| run = 3       | $\Theta$ (95% CI)           | N <sub>c</sub> | cluster-size   |
|               | 0.433 (0.381, 0.489)        | 69             | 2.3            |
|               | 0.468 (0.420, 0.538)        | 67             | 2.1            |
|               | <b>0.515 (0.452, 0.594)</b> | <b>66</b>      | <b>1.9</b>     |
|               | 0.666 (0.589, 0.761)        | 56             | 1.5            |
|               | 0.750 (0.675, 0.864)        | 51             | 1.3            |
| (d) Rothera   | u (°C)                      | k-th per (%)   | N <sub>e</sub> |
|               | 4.5                         | 75             | 131            |
|               | 5.0                         | 81             | 96             |
|               | <b>5.3</b>                  | <b>84</b>      | <b>86</b>      |
|               | 5.5                         | 88             | 68             |
|               | 5.8                         | 90             | 49             |
| run = 1       | $\Theta$ (95% CI)           | N <sub>c</sub> | cluster-size   |
|               | 0.374 (0.327, 0.429)        | 49             | 2.7            |
|               | 0.572 (0.489, 0.666)        | <b>55</b>      | 1.7            |
|               | <b>0.604 (0.520, 0.712)</b> | <b>52</b>      | <b>1.7</b>     |
|               | 0.661 (0.562, 0.775)        | 45             | 1.5            |
|               | 0.775 (0.678, 0.883)        | 38             | 1.3            |
| run = 2       | $\Theta$ (95% CI)           | N <sub>c</sub> | cluster-size   |
|               | 0.335 (0.300, 0.384)        | 44             | 3.0            |
|               | 0.447 (0.390, 0.518)        | 43             | 2.2            |
|               | <b>0.488 (0.420, 0.575)</b> | <b>42</b>      | <b>2.0</b>     |
|               | 0.558 (0.475, 0.666)        | 38             | 1.8            |
|               | 0.653 (0.561, 0.780)        | 32             | 1.5            |
| run = 3       | $\Theta$ (95% CI)           | N <sub>c</sub> | cluster-size   |
|               | 0.328 (0.294, 0.365)        | 43             | 3.0            |
|               | 0.416 (0.366, 0.481)        | 40             | 2.4            |
|               | <b>0.465 (0.392, 0.547)</b> | <b>40</b>      | <b>2.2</b>     |
|               | 0.500 (0.409, 0.596)        | 34             | 2.0            |
|               | 0.591 (0.508, 0.707)        | 29             | 1.7            |