# Supplementary Material

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## Supplementary Material

Supplementary Tables S1a and S1b provide the glacier attributes and final attribute-based response-group classification. Glacier-median SI is the median of the four seasonal endpoint SI values. For Big Ben, the endpoint corresponds to the 2025 glacier extent. Persistent cloud cover prevented reliable remapping of the Laurens Peninsula after 2017; consequently, the 2017 Laurens Peninsula outlines were retained in the nominal 2019 and 2025 inventory fields. Signed area and estimated-volume changes therefore extend from 1947 to 2025 for Big Ben and from 1947 to the most recent mapped extent in 2017 for the Laurens Peninsula, with negative values representing loss. Groups A–C were assigned using SI class, median elevation, and long-term glacier change; geographic location and glacier–climate correlations were not used in group assignment. Relative score weights are softmax transformations of the rule scores and are provided only to indicate the relative strength of the three classification scores. They are not statistical membership probabilities.

**Glacier nomenclature.** Three glaciers were assigned provisional names during the preparation of this study: Shearwater (AU1141), Basalt (AU1191), and Foehn (AU1121). These names have not yet received formal approval through the Australian Antarctic place-naming process. The provisional names are recorded here solely to document their association with the glacier identifiers and should not be interpreted as officially recognised geographic names.

Table S1a: Glacier location, topographic attributes, historical changes, and environmental correlations.

| Glacier | Region | Longitude | Latitude | Glacier-median SI | SI class | Median elevation (m) | Area change 1947–endpoint (%) | Estimated-volume change 1947–endpoint (%) | Max. $\|r\|$ SST | Max. $\|r\|$ wind-stress magnitude |
|---|---|---|---|---|---|---|---|---|---|---|
| Abbotsmith | Big Ben | 73.4456 | -53.1056 | 0.3887 | Relatively exposed | 648 | -8.82 | -9.38 | 0.56 | 0.26 |
| Allison | Big Ben | 73.4306 | -53.0763 | 0.4034 | Relatively exposed | 507 | -7.64 | -9.65 | 0.84 | 0.49 |
| AU1041 | Big Ben | 73.4944 | -53.0441 | 0.4152 | Relatively exposed | 642 | -37.78 | -25.66 | 0.32 | 0.54 |
| AU1211 | Big Ben | 73.4763 | -53.1390 | 0.4466 | Relatively exposed | 485 | -10.77 | -12.50 | 0.46 | 0.65 |
| AU2032 | Laurens Peninsula | 73.3465 | -53.0075 | 0.6494 | Relatively sheltered | 298 | -97.87 | -97.45 | 0.42 | 0.50 |
| AU2042 | Laurens Peninsula | 73.3483 | -53.0142 | 0.6204 | Relatively sheltered | 269 | -92.68 | -96.89 | 0.54 | 0.40 |
| AU2061 | Laurens Peninsula | 73.3012 | -52.9997 | 0.5327 | Intermediate | 437 | -56.59 | -63.41 | 0.66 | 0.40 |
| AU2071 | Laurens Peninsula | 73.2893 | -52.9969 | 0.4893 | Intermediate | 582 | -78.00 | -77.00 | 0.39 | 0.51 |
| AU2081 | Laurens Peninsula | 73.2993 | -52.9946 | 0.5922 | Relatively sheltered | 505 | -81.42 | -78.87 | 0.46 | 0.53 |
| Basalt | Big Ben | 73.5078 | -53.1601 | 0.3486 | Relatively exposed | 782 | -49.37 | -52.75 | 0.64 | 0.39 |
| Baudissin | Big Ben | 73.4481 | -53.0543 | 0.4304 | Relatively exposed | 536 | -7.24 | -7.25 | 0.80 | 0.35 |
| Brown | Big Ben | 73.6212 | -53.0854 | 0.5525 | Relatively sheltered | 661 | -42.48 | -47.63 | 0.54 | 0.29 |
| Challenger | Big Ben | 73.4859 | -53.0518 | 0.4516 | Relatively exposed | 747 | 0.27 | -0.59 | 0.87 | 0.39 |
| Compton | Big Ben | 73.5891 | -53.0795 | 0.5779 | Relatively sheltered | 852 | -43.25 | -61.89 | 0.73 | 0.49 |
| Deacock | Big Ben | 73.5234 | -53.1676 | 0.5312 | Intermediate | 789 | -42.30 | -39.15 | 0.91 | 0.27 |
| Downes | Big Ben | 73.5228 | -53.0488 | 0.5093 | Intermediate | 651 | -6.90 | -4.74 | 0.51 | 0.72 |
| Ealey | Big Ben | 73.5561 | -53.0545 | 0.5225 | Intermediate | 669 | -12.52 | -10.73 | 0.90 | 0.35 |
| Fiftyone | Big Ben | 73.5603 | -53.1556 | 0.5393 | Intermediate | 698 | -12.37 | -13.40 | 0.90 | 0.24 |
| Foehn | Big Ben | 73.6264 | -53.0931 | 0.5657 | Relatively sheltered | 736 | -61.57 | -63.82 | 0.88 | 0.46 |
| Gotely | Big Ben | 73.5109 | -53.1315 | 0.4562 | Relatively exposed | 1236 | -2.43 | -2.57 | 0.85 | 0.47 |
| Jacka | Big Ben | 73.3213 | -52.9982 | 0.5542 | Relatively sheltered | 493 | -62.13 | -61.41 | 0.10 | 0.29 |
| Lied | Big Ben | 73.4606 | -53.1282 | 0.4116 | Relatively exposed | 647 | -4.76 | -5.52 | 0.92 | 0.32 |
| Mary_Powell | Big Ben | 73.5027 | -53.0425 | 0.4877 | Intermediate | 557 | -43.64 | -63.08 | 0.45 | 0.62 |
| Nares | Big Ben | 73.4666 | -53.0422 | 0.4587 | Intermediate | 508 | -35.40 | -27.60 | 0.51 | 0.11 |
| Shearwater | Big Ben | 73.6276 | -53.1184 | 0.5912 | Relatively sheltered | 609 | -49.82 | -61.61 | 0.40 | 0.34 |
| Stephenson | Big Ben | 73.6112 | -53.1037 | 0.6080 | Relatively sheltered | 865 | -63.81 | -82.02 | 0.64 | 0.57 |
| Unnamed | Big Ben | 73.3215 | -52.9922 | 0.5267 | Intermediate | 432 | -88.89 | -87.50 | 0.34 | 0.69 |
| Winston | Big Ben | 73.6001 | -53.1288 | 0.6149 | Relatively sheltered | 891 | -28.75 | -46.94 | 0.56 | 0.30 |

Table S1b: Glacier scoring matrix, relative score weights, and primary response-group assignments.

| Glacier | Region | Longitude | Latitude | Score A | Score B | Score C | Relative score weight A (%) | Relative score weight B (%) | Relative score weight C (%) | Primary response group |
|---|---|---|---|---|---|---|---|---|---|---|
| Abbotsmith | Big Ben | 73.4456 | -53.1056 | 2 | 0 | 0 | 79 | 11 | 11 | A |
| Allison | Big Ben | 73.4306 | -53.0763 | 2 | 0 | 0 | 79 | 11 | 11 | A |
| AU1041 | Big Ben | 73.4944 | -53.0441 | 2 | 0 | 0 | 79 | 11 | 11 | A |
| AU1211 | Big Ben | 73.4763 | -53.1390 | 2 | 0 | 0 | 79 | 11 | 11 | A |
| AU2032 | Laurens Peninsula | 73.3465 | -53.0075 | 0 | 2 | 5 | 1 | 5 | 95 | C |
| AU2042 | Laurens Peninsula | 73.3483 | -53.0142 | 0 | 2 | 5 | 1 | 5 | 95 | C |
| AU2061 | Laurens Peninsula | 73.3012 | -52.9997 | 0 | 2 | 5 | 1 | 5 | 95 | C |
| AU2071 | Laurens Peninsula | 73.2893 | -52.9969 | 0 | 2 | 3 | 4 | 26 | 71 | C |
| AU2081 | Laurens Peninsula | 73.2993 | -52.9946 | 0 | 2 | 3 | 4 | 26 | 71 | C |
| Basalt | Big Ben | 73.5078 | -53.1601 | 3 | 0 | 0 | 91 | 5 | 5 | A |
| Baudissin | Big Ben | 73.4481 | -53.0543 | 2 | 0 | 0 | 79 | 11 | 11 | A |
| Brown | Big Ben | 73.6212 | -53.0854 | 1 | 2 | 0 | 24 | 67 | 9 | B |
| Challenger | Big Ben | 73.4859 | -53.0518 | 3 | 0 | 0 | 91 | 5 | 5 | A |
| Compton | Big Ben | 73.5891 | -53.0795 | 1 | 2 | 3 | 9 | 24 | 67 | C |
| Deacock | Big Ben | 73.5234 | -53.1676 | 1 | 2 | 0 | 24 | 67 | 9 | B |
| Downes | Big Ben | 73.5228 | -53.0488 | 1 | 2 | 0 | 24 | 67 | 9 | B |
| Ealey | Big Ben | 73.5561 | -53.0545 | 1 | 2 | 0 | 24 | 67 | 9 | B |
| Fiftyone | Big Ben | 73.5603 | -53.1556 | 1 | 2 | 0 | 24 | 67 | 9 | B |
| Foehn | Big Ben | 73.6264 | -53.0931 | 1 | 2 | 3 | 9 | 24 | 67 | C |
| Gotely | Big Ben | 73.5109 | -53.1315 | 3 | 0 | 0 | 91 | 5 | 5 | A |
| Jacka | Big Ben | 73.3213 | -52.9982 | 0 | 2 | 3 | 4 | 26 | 71 | C |
| Lied | Big Ben | 73.4606 | -53.1282 | 2 | 0 | 0 | 79 | 11 | 11 | A |
| Mary_Powell | Big Ben | 73.5027 | -53.0425 | 0 | 2 | 3 | 4 | 26 | 71 | C |
| Nares | Big Ben | 73.4666 | -53.0422 | 0 | 2 | 0 | 11 | 79 | 11 | B |
| Shearwater | Big Ben | 73.6276 | -53.1184 | 0 | 2 | 3 | 4 | 26 | 71 | C |
| Stephenson | Big Ben | 73.6112 | -53.1037 | 1 | 2 | 3 | 9 | 24 | 67 | C |
| Unnamed | Big Ben | 73.3215 | -52.9922 | 0 | 2 | 5 | 1 | 5 | 95 | C |
| Winston | Big Ben | 73.6001 | -53.1288 | 1 | 2 | 0 | 24 | 67 | 9 | B |