## Supplement

**Table S1: Significant ($p < 0.05$) local maxima of average wavelet power of RDI03 and Q, NAO, SCAND, MO, and WeMO**

| Variable | Period (years) | Average power | Pv |
|---|---|---|---|
| East-RDI03 | 0.7-1.2 (1.0) | 15.21 | <0.01 |
| East-Q | 0.7-3.0 (1.0) | 5 | <0.01 |
| | 3.0-6.0 (3.0) | 0.68 | 0.03 |
| | 6.0-9.0 (8.4) | 0.6 | <0.01 |
| | 9.0-15.0 (9.3) | 0.51 | 0.02 |
| West-RDI03 | 0.7-1.2 (1.0) | 16.87 | <0.01 |
| West-Q | 0.7-3 (1.0) | 6.17 | <0.01 |
| | 3.0-6.0 (4.3) | 1.06 | <0.01 |
| | 12.0-14.0 (14.0) | 0.36 | 0.01 |
| NAO | 0.5-2.0 (0.5) | 2.52 | 0.01 |
| | 2.0-3.0 (2.4) | 0.83 | 0.01 |
| | 11.0-16.0 (13.6) | 0.21 | 0.01 |
| SCAND | 0.5-1.7 (0.7) | 2.09 | 0.02 |
| | 0.8-10.0 (8.7) | 0.27 | <0.01 |
| MO | 0.4-1.2 (1) | 5.87 | <0.01 |
| WeMO | 0.9-1.3 (1) | 1.64 | 0.01 |
| | 10.0-20.0 (18) | 0.39 | 0.02 |

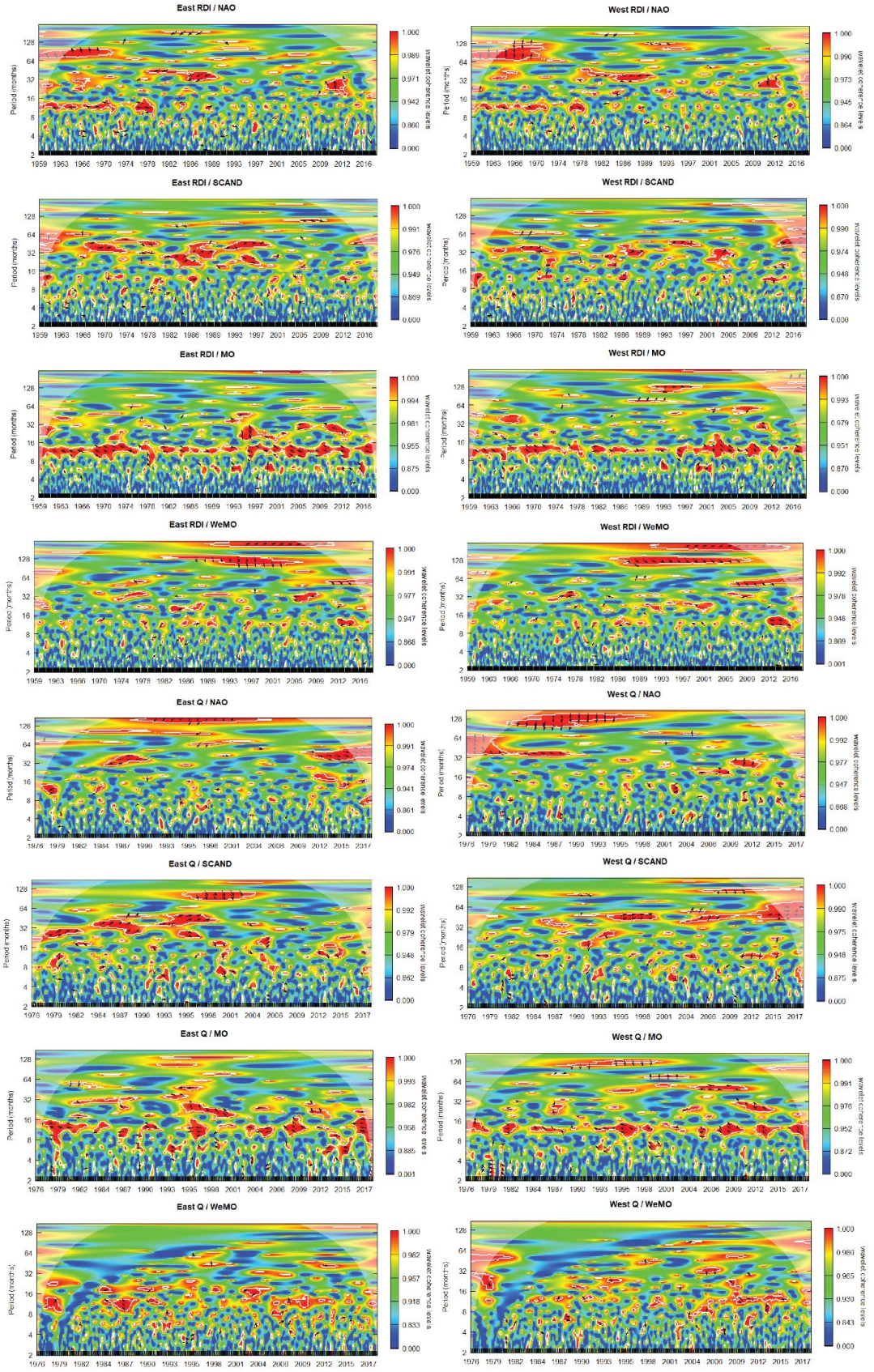


**Figure S1: Cross wavelet coherence of RDI03 and Q for each cluster and NAO, Scand, MO, and WeMO. White lines indicate the 5% significance level. Parallel black arrows indicate coherence; arrows pointing exactly to the right indicate that the two series are in phase at the respective period, arrows pointing to the left indicate an opposite in phase behaviour**

**Table S2: Significant ($p < 0.05$) local maxima of average cross wavelet coherence of RDI03 and Q, NAO, SCAND, MO, and WeMO**

| Cluster | Variable | Period (months) | Average power | Pv |
|---|---|---|---|---|
| East | NAO-Q | 6 | 0.92 | 0.04 |
| | SCAND-Q | 6.0-9.0 (8.6) | 0.95 | 0.02 |
| | | 11.5-13.5 (13) | 0.96 | <0.01 |
| | | 20.0-21.2 (21) | 0.97 | 0.01 |
| | MO-Q | 2.5-6.5 (6) | 0.95 | <0.01 |
| | | 10.5-14.0 (12) | 0.99 | <0.01 |
| | | 19 | 0.96 | 0.02 |
| | | 35.5 | 0.97 | 0.03 |
| | WeMO-Q | 11.0-12.5(12) | 0.96 | <0.01 |
| | NAO-RDI03 | 2 | 0.87 | 0.03 |
| | | 5.5-6.5 (6) | 0.93 | <0.01 |
| | | 10.0-14.0 (13) | 0.96 | 0.01 |
| | | 31 | 0.96 | 0.02 |
| | | 66.0-68.5(68.5) | 0.98 | 0.02 |
| | | 71 | 0.98 | 0.03 |
| | SCAND-RDI03 | 2.0-2.5(2) | 0.89 | <0.01 |
| | | 5.5-6.5(6) | 0.93 | <0.01 |
| | | 11.0-13.5(13) | 0.97 | <0.01 |
| | | 20.0-22.0(21) | 0.96 | 0.02 |
| | | 31.0-34.0(32) | 0.97 | 0.01 |
| | | 49 | 0.97 | 0.04 |
| | | 100 | 0.98 | 0.04 |
| | MO-RDI03 | 2 | 0.89 | 0.01 |
| | | 5.0-6.7(6) | 0.96 | <0.01 |
| | | 9.5-14.5(12) | 1 | <0.01 |
| | | 31.0-33.0(32) | 0.98 | <0.01 |
| | WeMO-RDI03 | 2 | 0.88 | <0.01 |
| | | 5.0-6.5(6) | 0.86 | <0.01 |
| | | 9.5-14.5(12) | 0.99 | <0.01 |
| | | 32 | 0.96 | 0.01 |
| | | 128 | 0.98 | 0.03 |
| | | | | |
| West | NAO-Q | 5.8-6.3 (6.0) | 0.92 | 0.03 |
| | | 10.0-11.0 (10.6) | 0.94 | 0.03 |
| | | 73.0-76.2 (73.5) | 0.98 | 0.04 |
| | SCAND-Q | 6.5 | 0.92 | 0.05 |
| | | 11.0-13.5 (13) | 0.97 | 0.01 |
| | | 21 | 0.95 | 0.05 |
| | | 42.0-44.0 (44) | 0.98 | 0.02 |
| | | 104.0-108.0 (108) | 0.99 | 0.04 |
| | MO-Q | 5.5-6.3 (6) | 0.94 | <0.01 |
| | | 10.0-14.0 (12) | 1 | <0.01 |
| | | 76 | 0.98 | 0.05 |
| | WeMO-Q | 6 | 0.91 | 0.04 |
| | | 11.0-13.0 (12) | 0.96 | <0.01 |
| | | 18 | 0.95 | 0.02 |
| | NAO-RDI03 | 6 | 0.91 | 0.03 |
| | | 10.0-14.0(13) | 0.96 | 0.01 |
| | | 21.0-23.0(22) | 0.96 | 0.02 |
| | | 35.5-38.0(38) | 0.97 | 0.03 |
| | | 128 | 0.98 | 0.05 |
| | SCAND-RDI03 | 2.0-2.5(2) | 0.89 | <0.01 |
| | | 6.0-6.5(6.0) | 0.93 | <0.01 |
| | | 11.0-13.5(13) | 0.97 | <0.01 |

| | | | | |
|---|---|---|---|---|
| | | 31.0-32.0(32) | 0.97 | 0.03 |
| | MO-RDI03 | 2.0-2.5(2) | 0.88 | 0.02 |
| | | 4.0-6.5(6) | 0.96 | <0.01 |
| | | 9.5-14.5(12) | 1 | <0.01 |
| | | 32.0-33.0(32) | 0.96 | 0.04 |
| | WeMO-RDI03 | 2.0-2.5(2) | 0.88 | <0.01 |
| | | 5.0-6.5(6) | 0.96 | <0.01 |
| | | 9.5-14.5(12) | 1 | <0.01 |
| | | 32 | 0.96 | 0.04 |
| | | 128 | 0.98 | 0.03 |

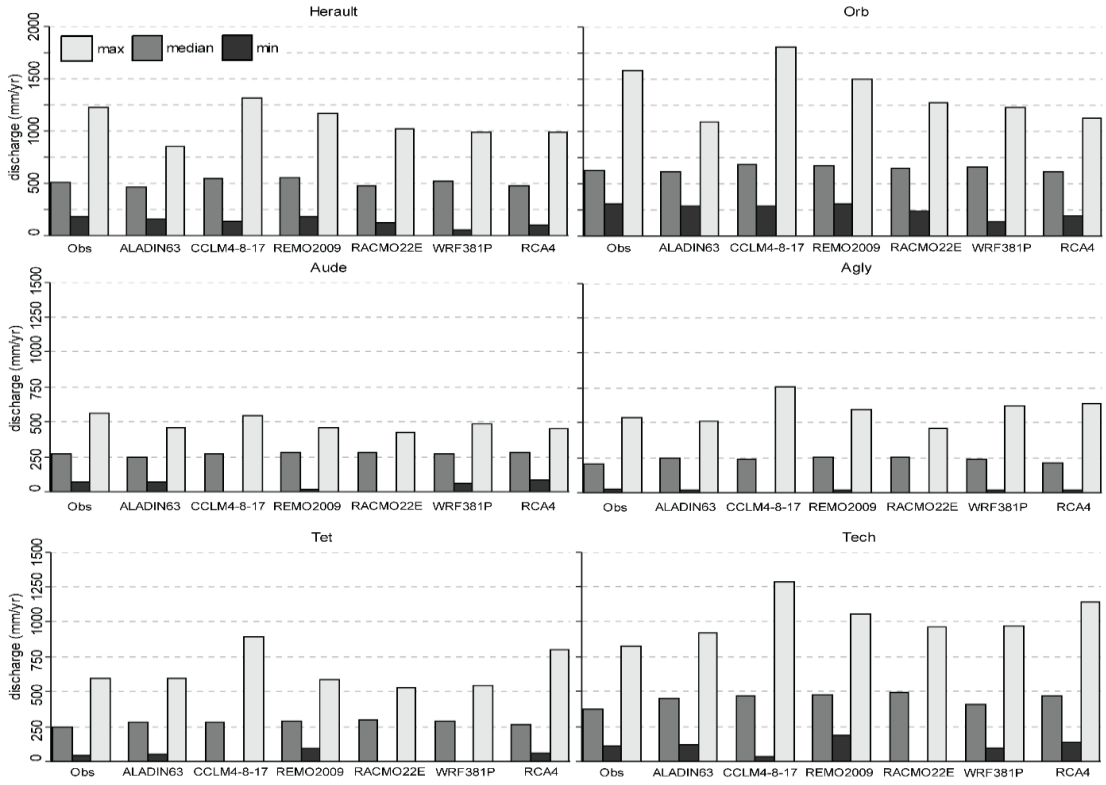


**Figure S2: Comparison of the statistical characteristics of the simulated water discharge series for the period 1959-2005 obtained from RCMs and from Safran's variables (Obs). Light, mid, and dark grey bars are the maximum (max), median, and minimum (min), respectively, obtanied throughout the series**

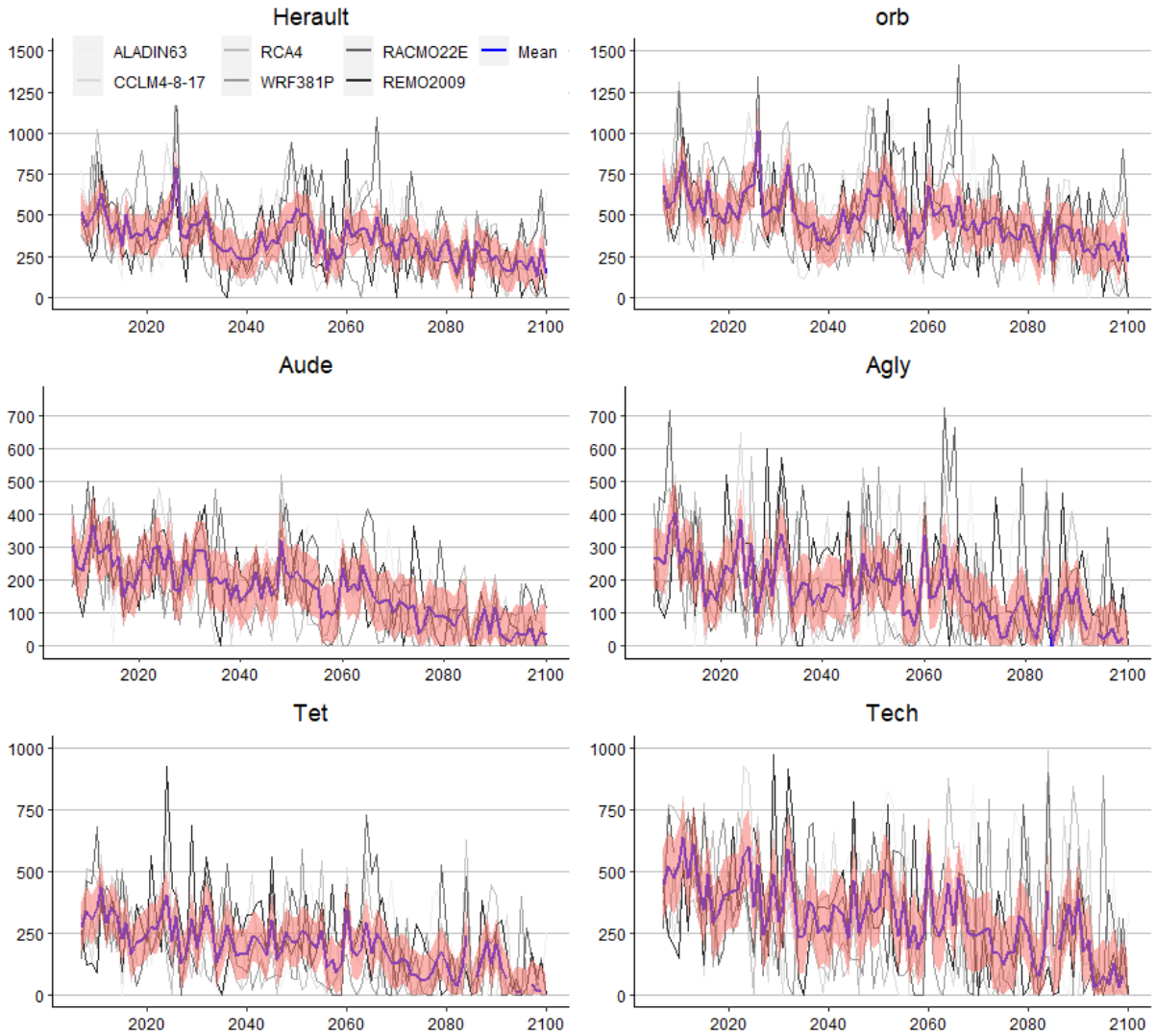


**Figure S3: Annual Qmod on the period 2006-2100 for each RCMs. Blue line shows the ensemble mean series (Mean), and pink shade is the associated standard deviation error**