Supplement

Table S1. Summary information for the selected RHBN stations in the Pacific Basin.

Station ID	Station Name	Province	Lat.	Long.	Basin area (km^2)	Sub-basin	Basin
09BC001	Pelly River At Pelly Crossing	YT	62.8	-136.6	48900	Yukon	Pacific Ocean
09AC001	Takhini River Near Whitehorse	YT	60.9	-135.7	7050	Yukon	Pacific Ocean
09AE003	Swift River Near Swift River	BC	59.9	-131.8	3390	Yukon	Pacific Ocean
09AA006	Atlin River Near Atlin	BC	59.6	-133.8	6860	Yukon	Pacific Ocean
08CD001	Tuya River Near Telegraph Creek	BC	58.1	-130.8	3550	Seaboard	Pacific Ocean
08CG001	Iskut River Below Johnson River	BC	56.7	-131.7	9500	Seaboard	Pacific Ocean
08FB006	Atnarko River Near The Mouth	BC	52.4	-126.0	2550	Seaboard	Pacific Ocean
08OA002	Yakoun River Near Port Clements	BC	53.6	-132.2	480	Seaboard	Pacific Ocean
08HB008	Sproat River Near Alberni	BC	49.3	-124.9	351	Seaboard	Pacific Ocean
08GA010	Capilano River Above Intake	BC	49.4	-123.1	173	Seaboard	Pacific Ocean
08HA001	Chemainus River Near Westholme	BC	48.9	-123.7	355	Seaboard	Pacific Ocean
08HA003	Koksilah River At Cowichan Station	BC	48.7	-123.7	209	Seaboard	Pacific Ocean
08JE001	Stuart River Near Fort St. James	BC	54.4	-124.3	14200	Fraser	Pacific Ocean
08JB002	Stellako River At Glenannan	BC	54.0	-125.0	3600	Fraser	Pacific Ocean
08LA001	Clearwater River Near Clearwater Station	BC	51.6	-120.1	10300	Fraser	Pacific Ocean
08LD001	Adams River Near Squilax	BC	50.9	-119.7	3210	Fraser	Pacific Ocean
08MA002	Chilko River At Outlet Of Chilko Lake	BC	51.6	-124.1	2130	Fraser	Pacific Ocean
08MG005	Lillooet River Near Pemberton	BC	50.3	-122.8	2100	Fraser	Pacific Ocean
08MH006	North Alouette River At 232nd Street Maple Ridge	BC	49.2	-122.6	37.3	Fraser	Pacific Ocean
08MH016	Chilliwack River At Outlet Of Chilliwack Lake	BC	49.1	-121.5	335	Fraser	Pacific Ocean
08NB005	Columbia River At Donald	BC	51.5	-117.2	9700	Columbia	Pacific Ocean
08NF001	Kootenay River At Kootenay Crossing	BC	50.9	-116.0	416	Columbia	Pacific Ocean
08ND013	Illecillewaet River At Greeley	BC	51.0	-118.1	1150	Columbia	Pacific Ocean
08NE006	Kuskanax Creek Near Nakusp	BC	50.3	-117.7	330	Columbia	Pacific Ocean
08NE077	Barnes Creek Near Needles	BC	49.9	-118.1	204	Columbia	Pacific Ocean
08NH005	Kaslo River Below Kemp Creek	BC	49.9	-117.0	442	Columbia	Pacific Ocean
08NH084	Arrow Creek Near Erickson	BC	49.2	-116.5	78.3	Columbia	Pacific Ocean
08NJ130	Anderson Creek Near Nelson	BC	49.5	-117.3	9.07	Columbia	Pacific Ocean
08NN015	West Kettle River Near Mcculloch	BC	49.7	-119.1	233	Columbia	Pacific Ocean
08NL007	Similkameen River At Princeton	BC	49.5	-120.5	1810	Columbia	Pacific Ocean

Table S2. Summary information for the selected RHBN stations in the Atlantic Basin.

Station ID	Station Name	Province	Lat	Long	Basin area (km^2)	Sub-basin	Basin
02YC001	Torrent River At Bristols Pool	NL	50.6	-57.2	624	Seaboard	Atlantic Ocean
02YL001	Upper Humber River Near Reidville	NL	49.2	-57.4	2110	Seaboard	Atlantic Ocean
02YQ001	Gander River At Big Chute	NL	49.0	-54.9	4450	Seaboard	Atlantic Ocean
02YR001	Middle Brook Near Gambo	NL	48.8	-54.2	275	Seaboard	Atlantic Ocean
02ZB001	Isle Aux Morts River Below Highway Bridge	NL	47.6	-59.0	205	Seaboard	Atlantic Ocean
02ZF001	Bay Du Nord River At Big Falls	NL	47.7	-55.4	1170	Seaboard	Atlantic Ocean
02ZG001	Garnish River Near Garnish	NL	47.2	-55.3	205	Seaboard	Atlantic Ocean
02ZH001	Pipers Hole River At Mothers Brook	NL	47.9	-54.3	764	Seaboard	Atlantic Ocean
02ZK001	Rocky River Near Colinet	NL	47.2	-53.6	301	Seaboard	Atlantic Ocean
02ZM006	Northeast Pond River At Northeast Pond	NL	47.6	-52.8	3.63	Seaboard	Atlantic Ocean
01FB001	Northeast Margaree River At Margaree Valley	NS	46.4	-61.0	368	Seaboard	Atlantic Ocean
01FB003	Southwest Margaree River Near Upper Margaree	NS	46.2	-61.1	357	Seaboard	Atlantic Ocean
01FA001	River Inhabitants At Glenora	NS	45.7	-61.3	193	Seaboard	Atlantic Ocean
01EO001	St. Marys River At Stillwater	NS	45.2	-62.0	1350	Seaboard	Atlantic Ocean
01DP004	Middle River Of Pictou At Rocklin	NS	45.5	-62.8	92.2	Seaboard	Atlantic Ocean
01DG003	Beaverbank River Near Kinsac	NS	44.9	-63.7	96.9	Seaboard	Atlantic Ocean
01EF001	Lahave River At West Northfield	NS	44.4	-64.6	1250	Seaboard	Atlantic Ocean
01EC001	Roseway River At Lower Ohio	NS	43.8	-65.4	495	Seaboard	Atlantic Ocean
01BV006	Point Wolfe River At Fundy National Park	NB	45.6	-65.0	130	Seaboard	Atlantic Ocean
01BU002	Petitcodiac River Near Petitcodiac	NB	45.9	-65.2	391	Seaboard	Atlantic Ocean
01BS001	Coal Branch River At Beersville	NB	46.4	-65.1	166	Seaboard	Atlantic Ocean
01CA003	Carruthers Brook Near St. Anthony	PE	46.7	-64.2	46.8	Seaboard	Atlantic Ocean
01BO001	Southwest Miramichi River At Blackville	NB	46.7	-65.8	5050	Seaboard	Atlantic Ocean
01BP001	Little Southwest Miramichi River At Lyttleton	NB	46.9	-65.9	1340	Seaboard	Atlantic Ocean
01BQ001	Northwest Miramichi River At Trout Brook	NB	47.1	-65.8	948	Seaboard	Atlantic Ocean
01BC001	Restigouche River Below Kedgwick River	NB	47.7	-67.5	3160	Seaboard	Atlantic Ocean
01BE001	Upsalquitch River At Upsalquitch	NB	47.8	-66.9	2270	Seaboard	Atlantic Ocean
01BJ003	Jacquet River Near Durham Centre	NB	47.9	-66.0	510	Seaboard	Atlantic Ocean
02VC001	Romaine (Riviere) Au Pont De La Q.I.T.	QC	50.3	-63.6	13000	St. Lawrence	Atlantic Ocean
02UC002	Moisie (Riviere) A 51 Km En Amont Du Pont Du Q.N.S.L.R.	QC	50.4	-66.2	19000	St. Lawrence	Atlantic Ocean
02RF001	Chamouchouane (Riviere) A La Tete De La Chute Aux Saumons	QC	48.7	-72.5	15300	St. Lawrence	Atlantic Ocean
02QA002	Rimouski (Riviere) A 3 7 Km En Amont Du Pont-Route 132	QC	48.4	-68.6	1610	St. Lawrence	Atlantic Ocean
02PB006	Sainte-Anne (Riviere) (Bras Du Nord De La) En Amont	QC	47.0	-71.9	642	St. Lawrence	Atlantic Ocean
02OE027	Eaton (Riviere) Pres De La Riviere Saint-Francois-3	QC	45.5	-71.7	642	St. Lawrence	Atlantic Ocean
02NF003	Matawin (Riviere) A Saint-Michel-Des-Saints	QC	46.7	-73.9	1390	St. Lawrence	Atlantic Ocean
02LB007	South Nation River At Spencerville	ON	44.8	-75.5	246	St. Lawrence	Atlantic Ocean
02KB001	Petawawa River Near Petawawa	ON	45.9	-77.3	4122.32	St. Lawrence	Atlantic Ocean
02HL004	Skootamatta River Near Actinolite	ON	44.5	-77.3	677.65	St. Lawrence	Atlantic Ocean
02EA005	North Magnetawan River Near Burks Falls	ON	45.7	-79.4	328.84	St. Lawrence	Atlantic Ocean
02EC002	Black River Near Washago	ON	44.7	-79.3	1510.27	St. Lawrence	Atlantic Ocean
02FB007	Sydenham River Near Owen Sound	ON	44.5	-80.9	182.97	St. Lawrence	Atlantic Ocean
02FC001	Saugeen River Near Port Elgin	ON	44.5	-81.3	3953.52	St. Lawrence	Atlantic Ocean
02GA010	Nith River Near Canning	ON	43.2	-80.5	1034.28	St. Lawrence	Atlantic Ocean
02AB008	Neebing River Near Thunder Bay	ON	48.4	-89.3	187	St. Lawrence	Atlantic Ocean
01AQ001	Lepreau River At Lepreau	NB	45.2	-66.5	239	Saint John- St. Croix	Atlantic Ocean
01AP004	Kennebecasis River At Apohaqui	NB	45.7	-65.6	1100	Saint John- St. Croix	Atlantic Ocean
01AP002	Canaan River At East Canaan	NB	46.1	-65.4	668	Saint John- St. Croix	Atlantic Ocean
01AK001	Shogomoc Stream Near Trans-Canada Highway	NB	45.9	-67.3	234	Saint John- St. Croix	Atlantic Ocean
01AD002	Saint John River At Fort Kent	ME	47.3	-68.6	14700	Saint John- St. Croix	Atlantic Ocean
01AD003	St. Francis River At Outlet Of Glasier Lake	NB	47.2	-69.0	1350	Saint John- St. Croix	Atlantic Ocean

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Table S3. Summary information for the selected RHBN stations in the Arctic Basin.

Station ID	Station Name	Province	Lat.	Long.	Basin area (km^2)	Sub-basin	Basin
10PB001	Coppermine River At Outlet Of Point Lake	NT	65.4	-114.0	19200	Seaboard	Arctic Ocean
10RC001	Back River Above Hermann River	NU	66.1	-96.5	93900	Seaboard	Arctic Ocean
10CB001	Sikanni Chief River Near Fort Nelson	BC	57.2	-122.7	2180	Lower Mackenzie	Arctic Ocean
10BE004	Toad River Above Nonda Creek	BC	58.9	-125.4	2540	Lower Mackenzie	Arctic Ocean
10CD001	Muskwa River Near Fort Nelson	BC	58.8	-122.7	20300	Lower Mackenzie	Arctic Ocean
07LE002	Fond Du Lac River At Outlet Of Black Lake	SK	59.2	-105.5	50700	Lower Mackenzie	Arctic Ocean
07OB001	Hay River Near Hay River	NT	60.7	-115.9	51700	Lower Mackenzie	Arctic Ocean
10EB001	South Nahanni River Above Virginia Falls	NT	61.6	-125.8	14500	Lower Mackenzie	Arctic Ocean
07RD001	Lockhart River At Outlet Of Artillery Lake	NT	62.9	-108.5	26600	Lower Mackenzie	Arctic Ocean
07FB001	Pine River At East Pine	BC	55.7	-121.2	12100	Peace Athabasca	Arctic Ocean
07CD001	Clearwater River At Draper	AB	56.7	-111.3	30799.4	Peace Athabasca	Arctic Ocean
07FC003	Blueberry River Below Aitken Creek	BC	56.7	-121.2	1770	Peace Athabasca	Arctic Ocean

Table S4. Summary information for the selected RHBN stations in the Hudson Bay Basin.

Station ID	Station Name	Province	Lat.	Long.	Basin area (km^2)	Sub-basin	Basin
04NA001	Harricana (Riviere) 3 1 Km En Aval Du Pont-Route 111 A Amos	QC	48.6	-78.1	3680	Western & Northern HB	Hudson Bay
04LJ001	Missinaibi River At Mattice	ON	49.6	-83.3	8574.38	Western & Northern HB	Hudson Bay
04JC002	Nagagami River At Highway No. 11	ON	49.8	-84.5	2178.36	Western & Northern HB	Hudson Bay
06CD002	Churchill River Above Otter Rapids	SK	55.6	-104.7	119000	Northern Quebec & Ontario	Hudson Bay
06GD001	Seal River Below Great Island	MB	58.9	-96.3	48100	Northern Quebec & Ontario	Hudson Bay
06LC001	Kazan River Above Kazan Falls	NU	63.7	-95.9	70000	Northern Quebec & Ontario	Hudson Bay
05PB014	Turtle River Near Mine Centre	ON	48.9	-92.7	4767.74	Nelson	Hudson Bay
05TD001	Grass River Above Standing Stone Falls	MB	55.7	-97.0	15400	Nelson	Hudson Bay
05LH005	Waterhen River Near Waterhen	MB	51.8	-99.5	55100	Nelson	Hudson Bay
05AD005	Belly River Near Mountain View	AB	49.1	-113.7	319.2	Nelson	Hudson Bay
05AD003	Waterton River Near Waterton Park	AB	49.1	-113.8	612.7	Nelson	Hudson Bay
05AA008	Crowsnest River At Frank	AB	49.6	-114.4	402.7	Nelson	Hudson Bay
05BB001	Bow River At Banff	AB	51.2	-115.6	2209.6	Nelson	Hudson Bay
05DA007	Mistaya River Near Saskatchewan Crossing	AB	51.9	-116.7	248	Nelson	Hudson Bay

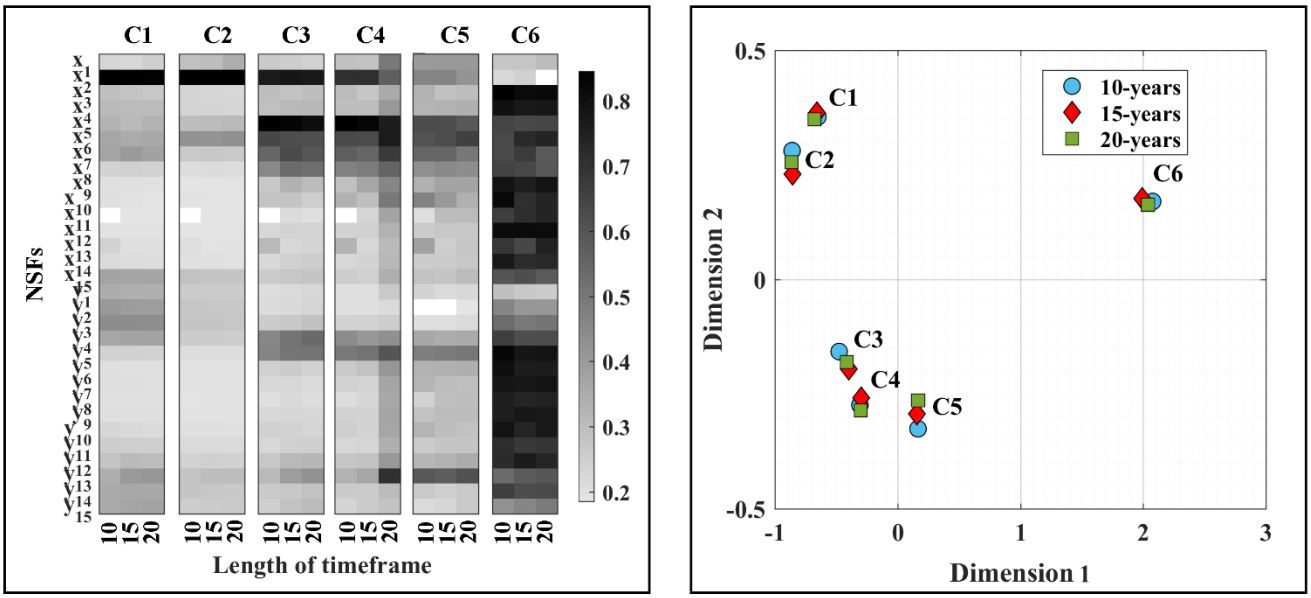

Fig. S1. Cluster centers for 10-, 15- and 20-year timeframes. The left panel shows the variation in cluster centers, i.e. 30 Normalized Streamflow Features (NSFs) with respect to the length of the clustering timeframe. In each sub-panel, columns from left to right correspond to 10-, 15- and 20-year timeframes, respectively. The right panel shows the two dimensional scaling of the cluster centers, which represent the relative distance of cluster centers from one another considering 10-, 15- and 20-year timeframes.

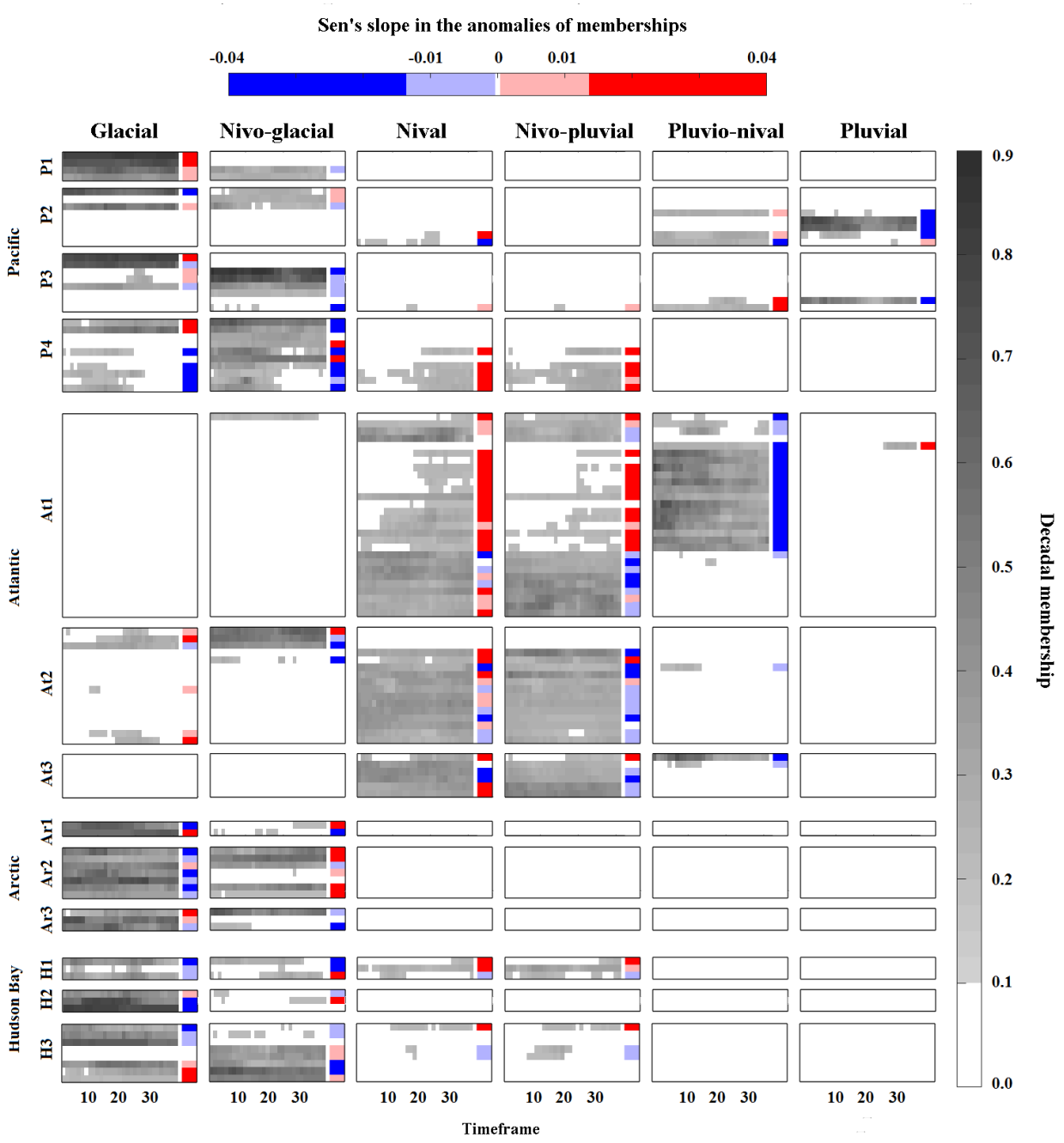

Fig. S2. The evolution in the degrees of membership to each regime type in 106 considered RHBN streams along with the corresponding Sen's slope. For each stream, the shades of grey show decadal memberships over the period of 1966 to 2010 considering a 15-year moving window. The color bar shows the direction and significance of the Sen's slope of the trend in the anomalies of memberships. Positive and negative trends are shown with red and blue colors, respectively. Sharper colors show significant cases.

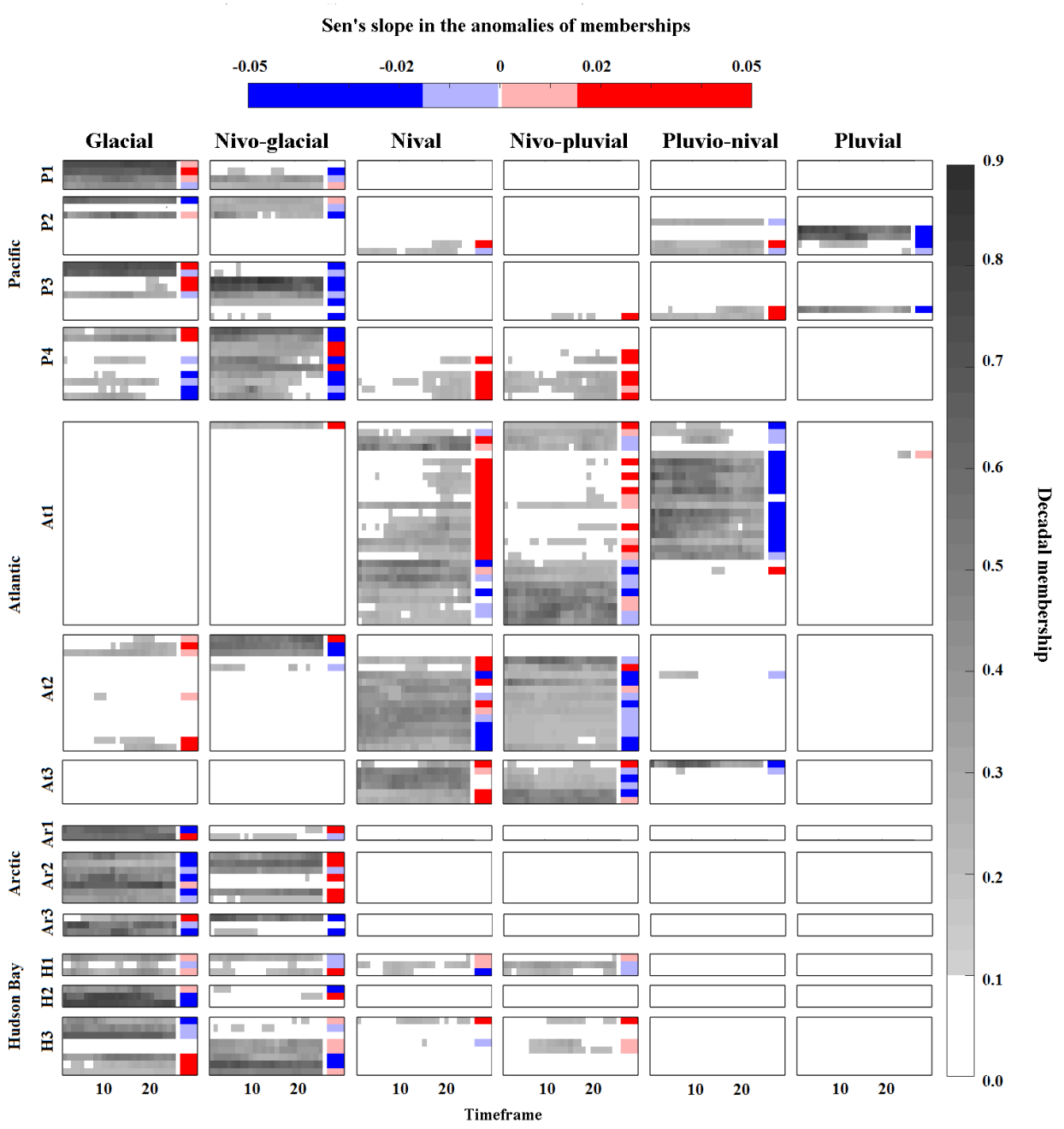

Fig. S3. The evolution in the degrees of membership to each regime type in 106 considered RHBN streams along with the corresponding Sen's slope. For each stream, the shades of grey show decadal memberships over the period of 1966 to 2010 considering a 20-year moving window. The color bar shows the direction and significance of the Sen's slope of the trend in the anomalies of memberships. Positive and negative trends are shown with red and blue colors, respectively. Sharper colors show significant cases.

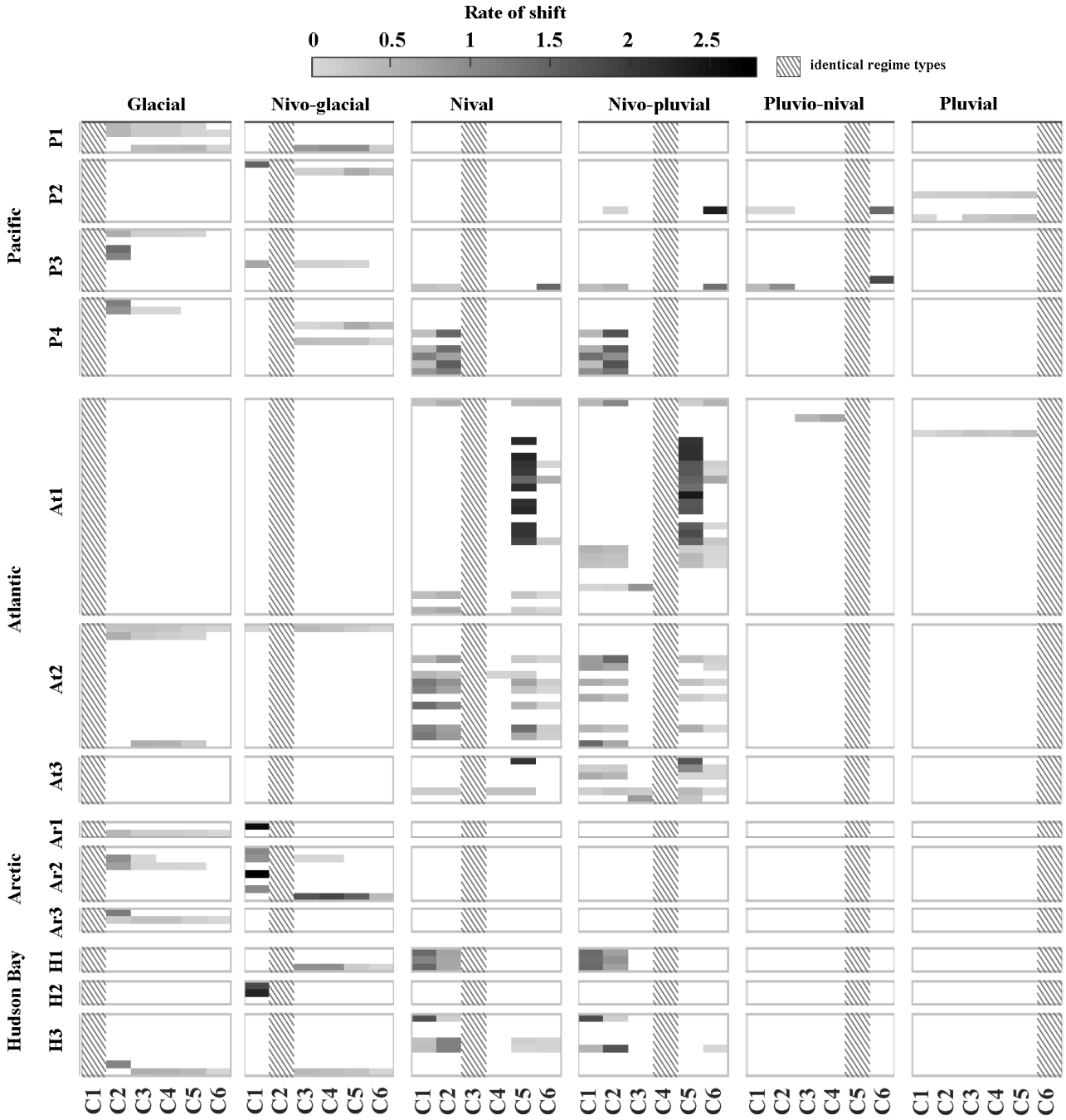

Fig. S4. Mapping shifts in natural streamflow throughout Canada during 1966 to 2010 considering 15-year timeframes. Rates of shift among various regime types in each stream are shown by shades of grey that quantifies how much decline in the giver regimes shown in the x-axes in each panel can result into incline in the receiver regime type corresponding with the column in which the panel is located. Columns filled with diagonal lines show the identical regime types with the receiving regimes identified in the column where the panel is located.

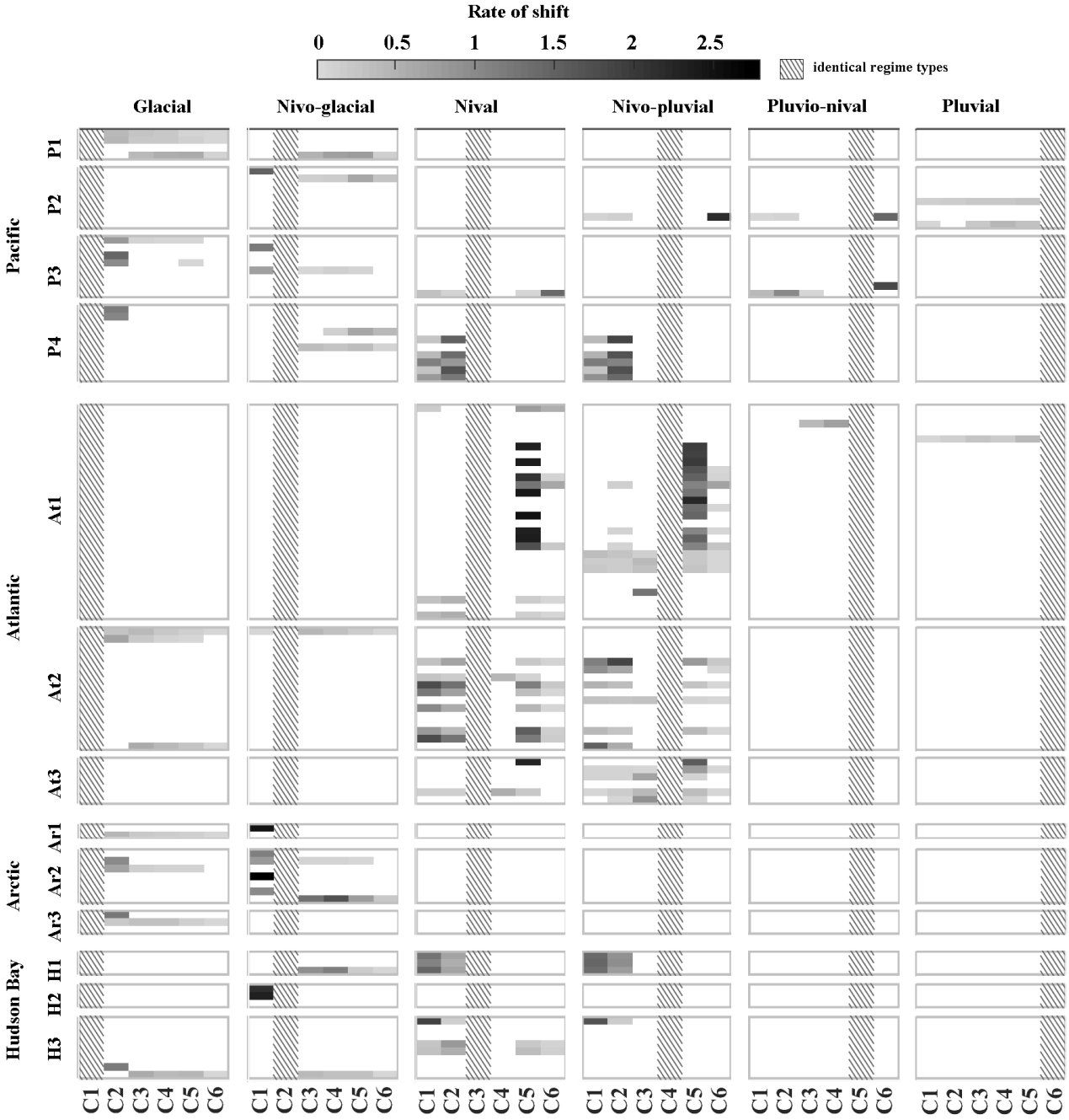

Fig. S5. Mapping shifts in natural streamflow throughout Canada during 1966 to 2010 considering 20-year timeframes. Rates of shift among various regime types in each stream are shown by shades of grey that quantifies how much decline in the giver regimes shown in the x-axes in each panel can result into incline in the receiver regime type corresponding with the column in which the panel is located. Columns filled with diagonal lines show the identical regime types with the receiving regimes identified in the column where the panel is located.

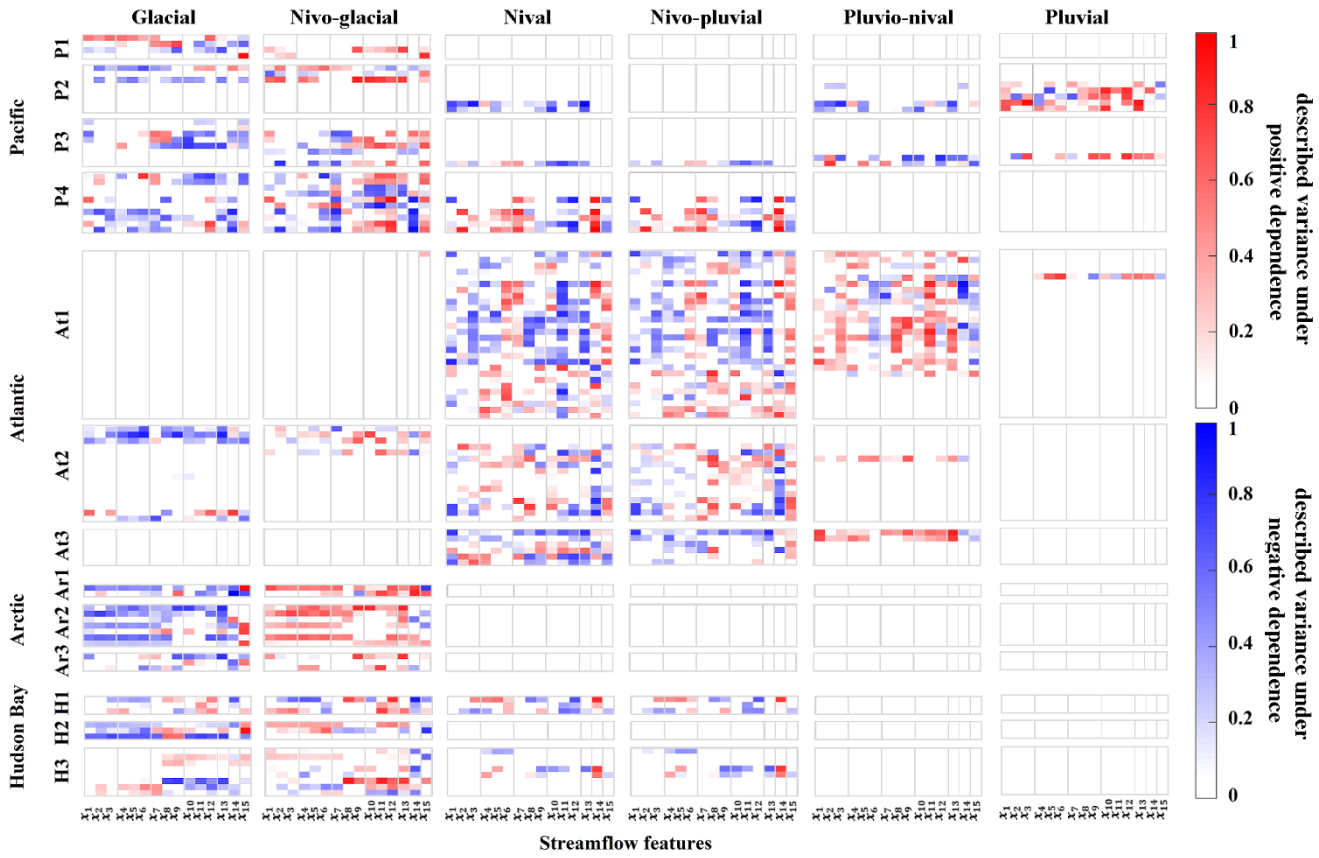

Fig. S6. The alterations in regime types for 106 RHBN streams attributed to the first moments of the 15 IHA considered. Shades of red and blue show the positive and negative dependencies between changes in streamflow features and the degrees of membership, respectively. Color saturation shows the coefficient of determination between changes in the streamflow features and the degrees of membership representing the percentage of described variance in changes of streamflow regime by changes in streamflow features. The analysis is related to 15-year timeframes.

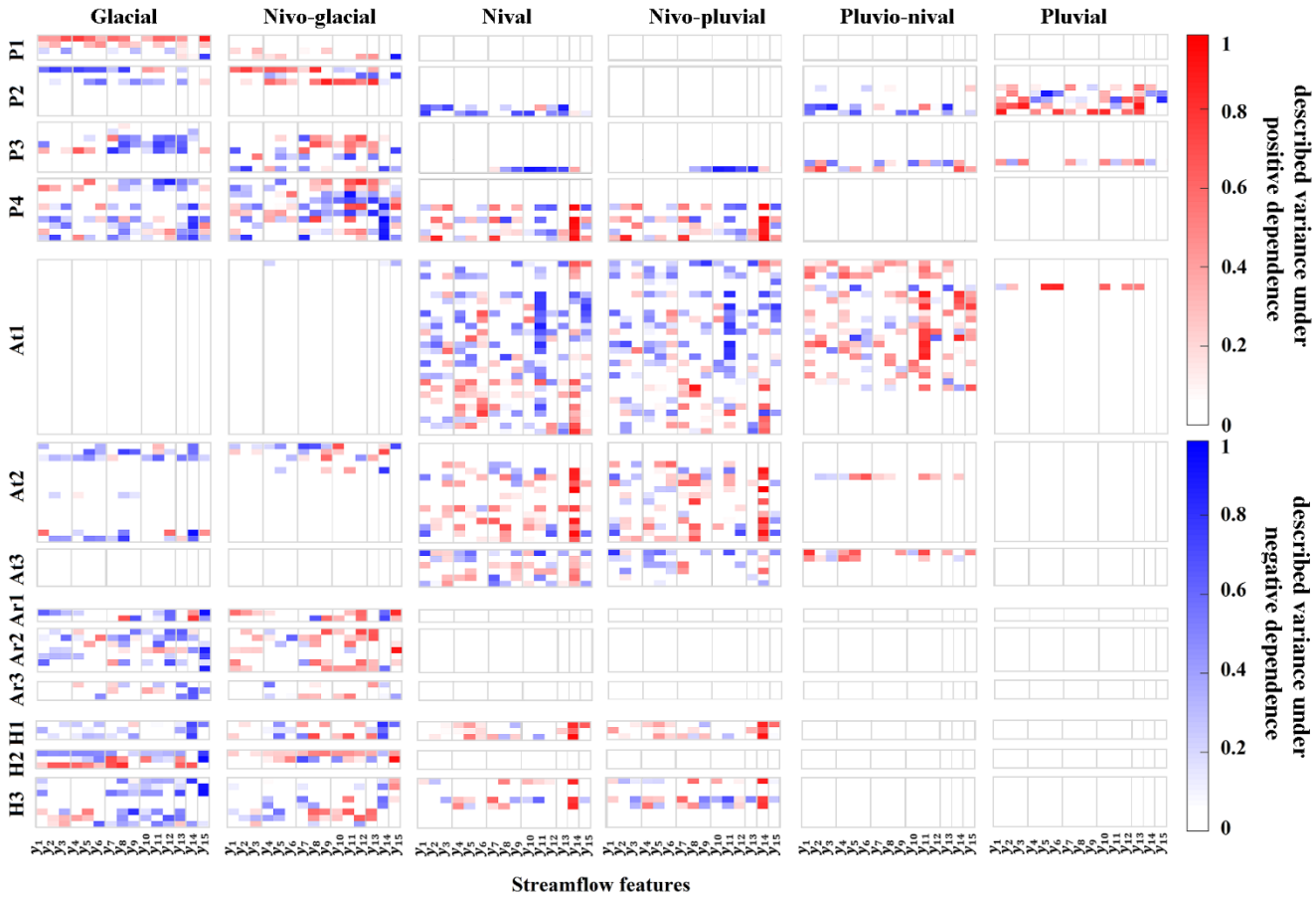

Fig. S7. The alterations in regime types for 106 RHBN streams attributed to the second moments of the 15 IHA considered. Shades of red and blue show the positive and negative dependencies between changes in streamflow features and the degrees of membership, respectively. Color saturation shows the coefficient of determination between changes in the streamflow features and the degrees of membership representing the percentage of described variance in changes of streamflow regime by changes in streamflow features. The analysis is related to 15-year timeframes.

Fig. S8. The alterations in regime types for 106 RHBN streams attributed to the first moments of the 15 IHA considered. Shades of red and blue show the positive and negative dependencies between changes in streamflow features and the degrees of membership, respectively. Color saturation shows the coefficient of determination between changes in the streamflow features and the degrees of membership representing the percentage of described variance in changes of streamflow regime by changes in streamflow features. The analysis is related to 20-year timeframes.

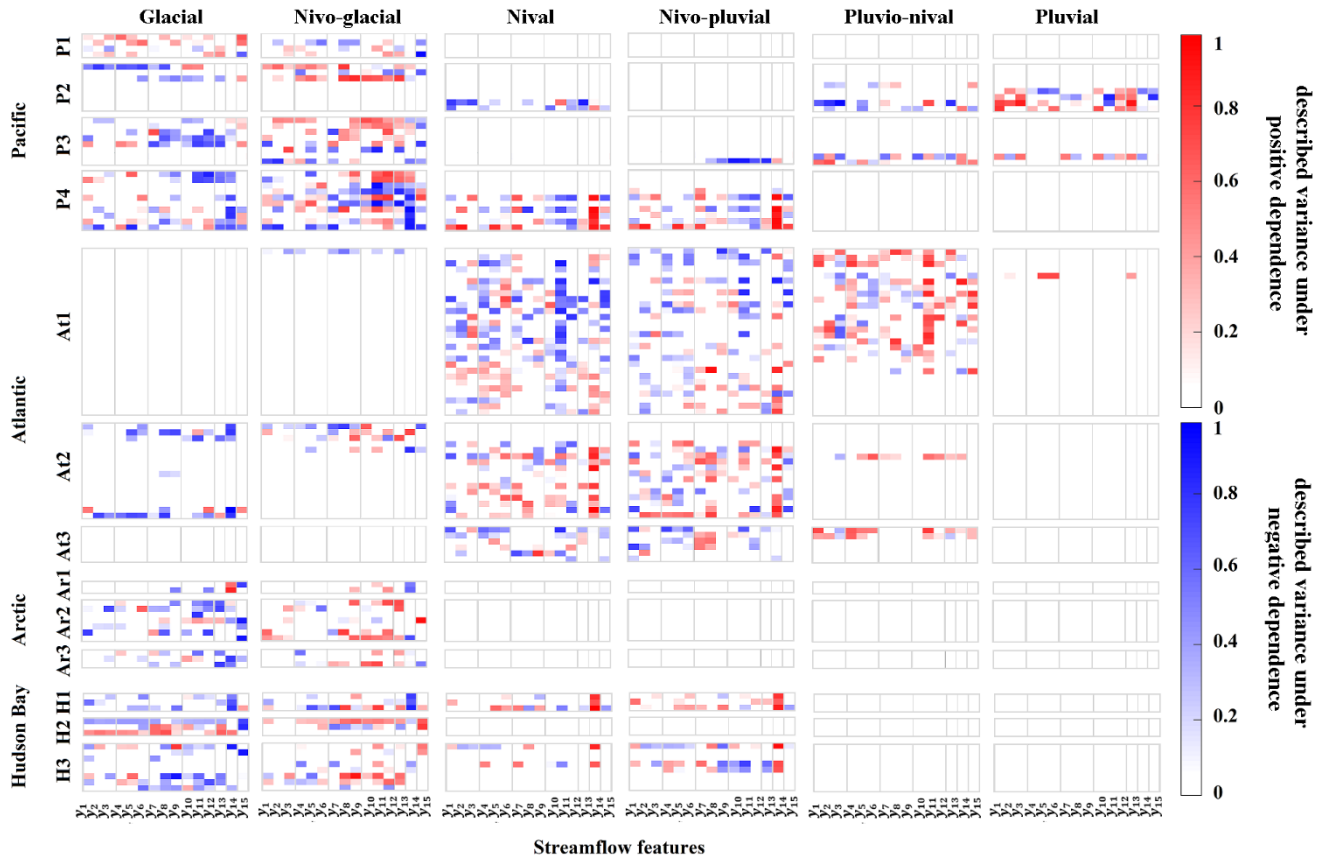

Fig. S9. The alterations in regime types for 106 RHBN streams attributed to the second moments of the 15 IHA considered. Shades of red and blue show the positive and negative dependencies between changes in streamflow features and the degrees of membership, respectively. Color saturation shows the coefficient of determination between changes in the streamflow features and the degrees of membership representing the percentage of described variance in changes of streamflow regime by changes in streamflow features. The analysis is related to 20-year timeframes.