

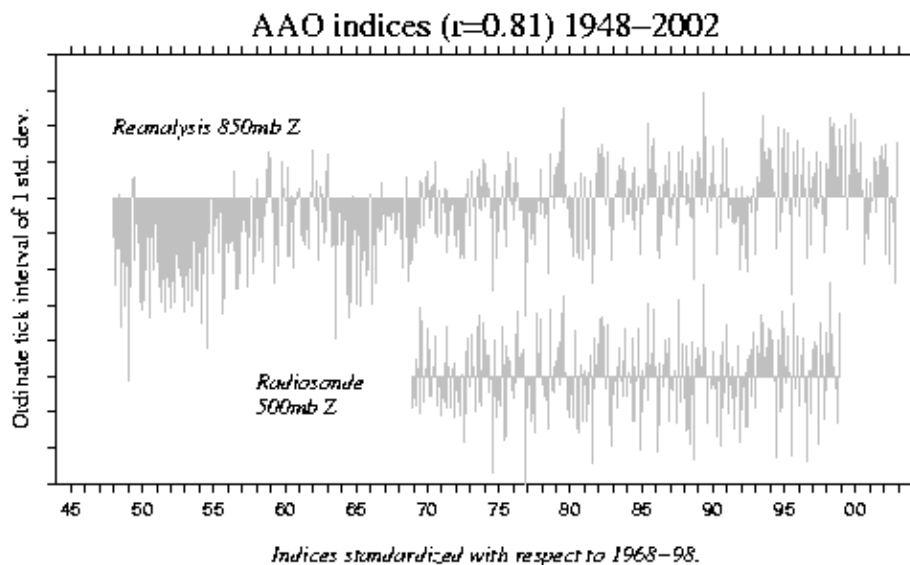
[JISAO data](#)

# Antarctic Oscillation (AAO) time series, 1948 - 2002

[Definition and analyses](#) | [Data](#)

The Antarctic Oscillation (AAO) is the dominant pattern of non-seasonal tropospheric circulation variations south of 20S, and it is characterized by pressure anomalies of one sign centered in the Antarctic and anomalies of the opposite sign centered about 40-50S. The AAO is also referred to as the Southern Annular Mode (SAM). There is a Northern Hemisphere analog to the AAO, and it is called the [Arctic Oscillation \(or Northern Annular Mode\)](#). [More information is available on annular modes through this link.](#)

The AAO is defined as the leading principal component (PC) of 850 hPa geopotential height anomalies south of 20S (Thompson and Wallace 2000). ([An AAO index calculated from SLP anomalies is available through this link.](#)) I have calculated the PC (time series) of this pattern from the NCEP / NCAR reanalysis, and all calendar months are used. There are concerns about the usefulness of the reanalysis in the Antarctic (see articles in J. Climate). The AAO time series for 1968-98 can be compared with the index calculated by [Thompson and Solomon \(2002\) from 500 hPa geopotential height from radiosondes.](#)

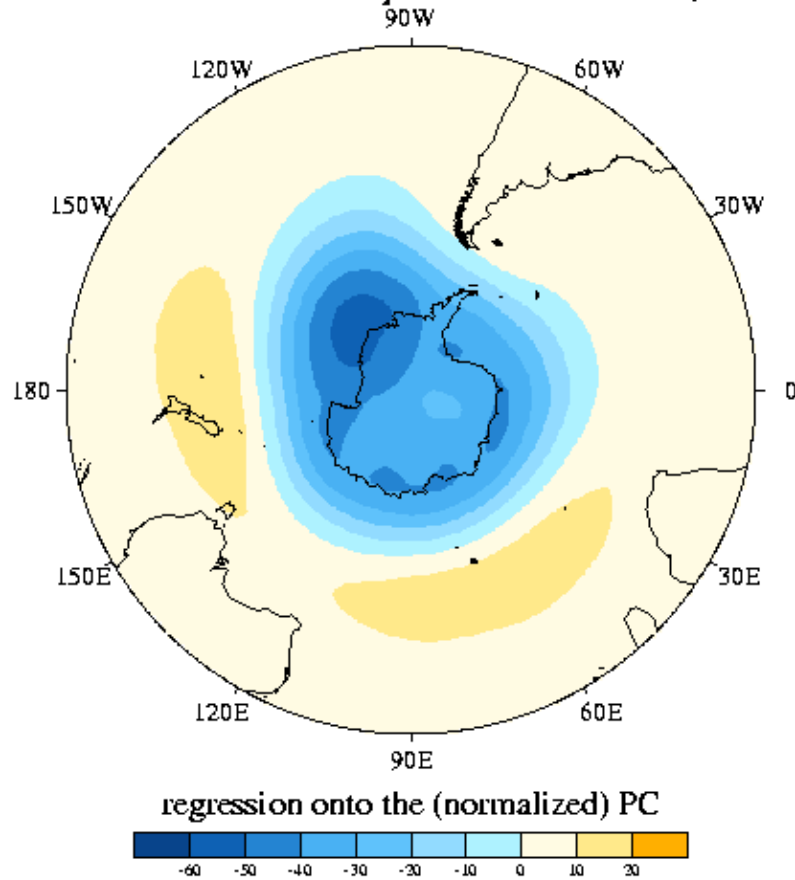


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Plots of PC1 of 850 hPa Z and a 500 hPa index. Both series are standardized with respect to

1968-98, and are correlated at 0.81 . The trend in the reanalysis-based index (the 850 hPa time series) is primarily before 1970. Qualitatively, the 500 radiosonde-based index exhibits less of a trend than the reanalysis-based index.

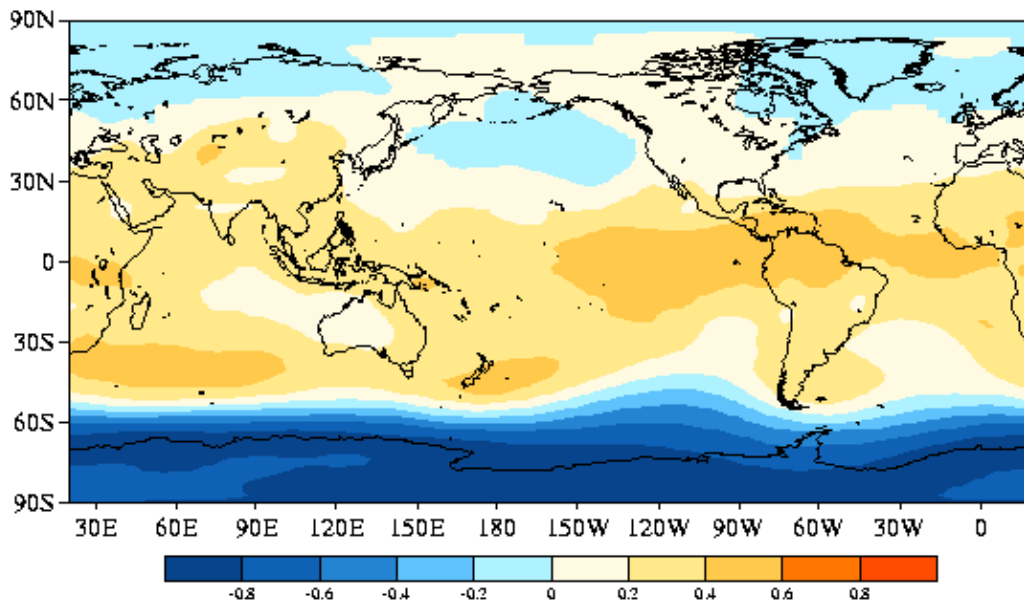
### EOF 1 of SH extratropical 850 hPa Z (meters)



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850 hPa geopotential height anomalies regressed onto the (normalized) AAO time series. Typical fluctuations in the AAO are associated with anomalies in excess of 30m over the pole and height anomalies of opposite sign and 5-10 m in magnitude at the latitude of New Zealand.

## EOF 1 of SH extratropical 850 hPa Z (plotted as correlations)

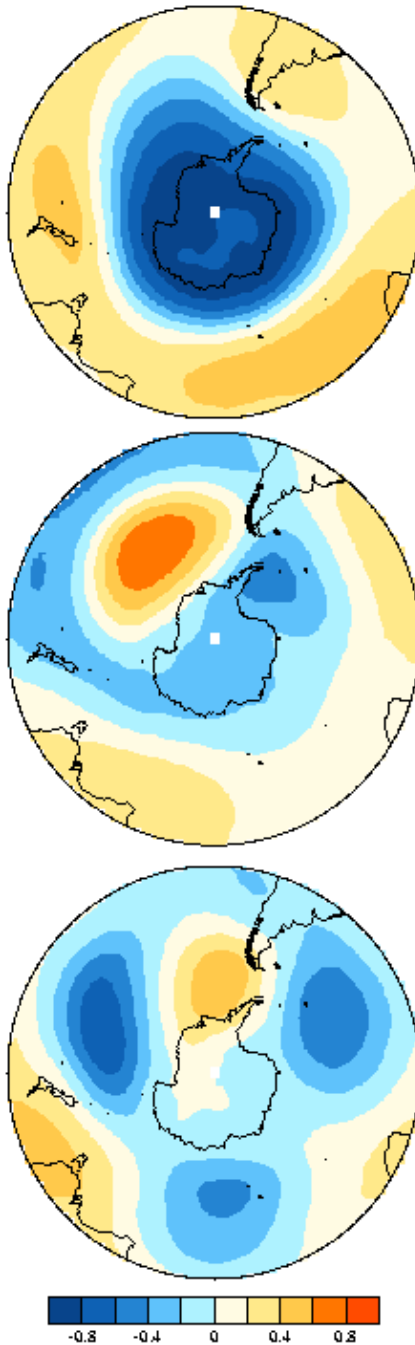


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EOF1 plotted as a correlation map. Fluctuations in the AAO explain several percent of tropical variability.

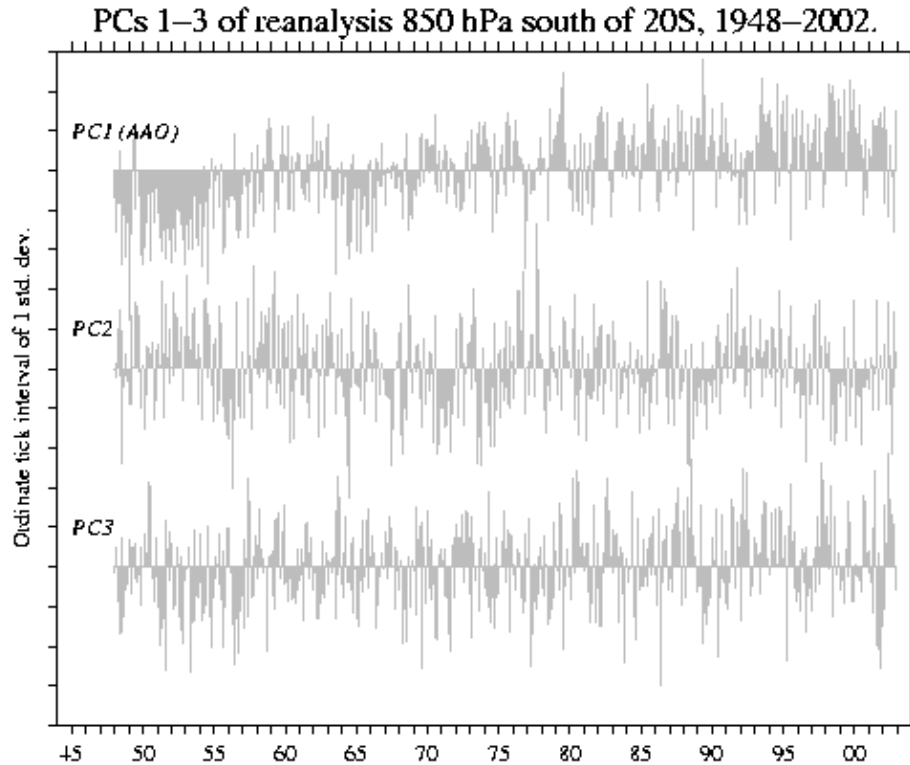
The AAO is calculated with PC analysis, and this analysis yields a large set of modes, of which the first 3 explain 33, 11, and 9% of the variance, respectively. The spatial patterns and time series of each of these modes are shown in the next figure. The spatial maps are plotted as correlation maps, with the value at each grid point given as the correlation coefficient of the time series at that grid point with the PC for that mode.

## EOFs 1-3 of SH extratropical 850 hPa Z (plotted as correlations)



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The second EOF is characterized by height anomalies of one sign centered at 50S,120W and weaker anomalies of opposite sign centered over the pole. The third EOF is characterized by zonal wave number 3 with centers of action over each of the oceans at 50S. [A netcdf file is provided of the digital values for the above figure.](#) (There are 6 maps: EOF1 correlation, EOF1 regression, ... read the history variable).



[PostScript](#) | [JPEG](#) | [PNG](#)

The above plots are of the first 3 principal components. Only the AAO exhibits a strong trend.

### References:

- Thompson, D. W. J., and J. M. Wallace, 2000: [Annular modes in the extratropical circulation. Part I: Month-to-month variability](#). *J. Climate*, 13, 1000-1016.
- Thompson, D. W. J., and S. Solomon, 2002: [Interpretation of Recent Southern Hemisphere Climate Change](#). *Science*, **296**, 895-899.

**Data:** All of the time series are standardized with respect to 1948-2002.

- [The PC 1-3 time series as a 5-column table](#): year, calendar month, pc1 (AAO), pc2, and pc3.
- [PC1 \(AAO\) as a one-column table](#).
- [PC1 \(AAO\) as a table in year-month form](#).

Digital values

jan feb mar apr may jun jul aug sep oct nov dec

1948	-70	-155	-157	-81	47	-84	-231	-237	-110	-198	-216	-130
1949	-271	-378	-163	2	79	79	-97	0	-63	-41	-75	-212
1950	-236	-162	-193	-129	-48	-58	-229	-165	-53	-60	-132	-31
1951	-43	-108	-104	-169	-203	-153	-124	-171	-223	-148	-105	-176
1952	-232	-106	-148	-204	-137	-99	-87	-103	-137	-84	-174	-236
1953	-207	-139	-116	-197	-121	-97	-200	-42	-62	-172	-91	-187
1954	-34	-84	-242	-140	10	-79	-81	-286	-20	-46	28	-145
1955	-67	-25	11	-12	-71	-94	14	-207	-98	-193	-155	-76
1956	-91	-85	-63	-63	-42	92	-75	-152	-171	-94	-66	-149
1957	-58	-12	4	-42	-60	-172	-22	-32	43	-139	-108	-107
1958	64	-4	-24	-84	-53	32	-102	15	102	26	66	133
1959	109	6	25	-94	-156	-76	-84	-97	38	-30	112	27
1960	40	35	113	-98	-98	35	-8	-104	-52	22	45	25
1961	42	-44	-14	-15	-62	-74	-28	40	-77	16	42	134
1962	114	21	14	73	26	-109	71	3	48	-67	-44	85
1963	119	80	12	-76	-35	-76	-78	-263	-70	6	-4	22
1964	-89	-59	-10	-14	-13	-190	-225	-182	17	38	-75	-46
1965	-15	-204	-45	-88	-208	-23	-96	-62	-78	-142	17	-139
1966	26	-54	-202	-70	-156	32	-24	22	-41	71	-42	-11
1967	-88	-39	6	-6	-6	-19	13	23	-43	9	-44	13
1968	-14	-53	-24	-16	-121	32	94	-33	-151	-114	-98	-7
1969	-122	-51	-1	-66	-22	-39	85	92	41	-30	78	24
1970	79	58	-5	8	62	63	-33	143	16	-55	50	-56
1971	-37	27	63	3	-86	50	-41	28	32	21	18	-57
1972	-95	-25	-30	-104	-13	-100	-53	-79	4	46	74	-37
1973	-43	42	103	15	-106	15	93	124	16	63	0	112
1974	-2	120	78	42	58	-14	34	-154	91	5	-105	-85
1975	-58	24	38	63	-37	5	-63	121	144	113	24	12
1976	-32	73	37	126	72	33	15	30	16	-34	-135	-245
1977	-128	7	17	-57	-56	-48	-20	-50	6	28	22	-13
1978	85	28	-2	28	-1	6	-129	157	109	41	6	77
1979	90	79	120	130	143	208	250	47	68	45	6	-43
1980	24	-51	-72	-100	42	65	-77	4	-102	92	-113	3
1981	67	61	-51	-82	10	70	-34	-138	-93	24	89	138
1982	24	80	144	158	79	122	32	101	144	-27	-5	-117
1983	-54	-24	51	73	43	36	120	121	-16	129	74	86
1984	-21	3	65	51	-12	87	115	-17	11	44	57	-103
1985	-20	63	39	66	38	18	219	122	155	78	166	154
1986	77	-81	-27	60	-102	-55	76	22	110	75	54	130
1987	-25	-7	27	43	67	7	-62	165	-29	95	149	73
1988	21	95	27	65	26	-13	135	12	-16	-152	92	131
1989	93	132	87	21	279	228	188	23	7	60	89	18
1990	39	158	72	-95	-91	37	-20	89	172	63	43	36
1991	132	-4	66	20	37	-25	-12	78	-16	-4	-2	-136
1992	44	-67	-18	29	-101	-137	50	48	43	1	46	49
1993	-110	90	12	69	160	165	234	171	143	123	94	141
1994	121	151	108	80	51	-84	46	218	-38	5	-1	141
1995	176	98	37	93	188	-8	-174	17	142	17	82	158
1996	62	-2	84	87	151	35	68	-39	-98	117	-76	48
1997	67	21	101	10	142	21	129	109	44	0	-93	-36
1998	96	107	106	220	98	193	215	174	38	83	143	182

1999	134	88	46	146	205	-39	100	91	52	226	152	203
2000	160	106	46	91	165	84	62	30	-114	78	-51	-70
2001	53	6	35	129	53	112	15	111	133	128	121	145
2002	107	162	-85	104	-116	1	37	62	-15	-158	-26	151

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