Keeve\_Lab6

install.packages('palaeoSig', repos="http:\\cran.us.r-project.org")

## Installing package into 'C:/Users/chris/Documents/R/win-library/3.5'  
## (as 'lib' is unspecified)

## Warning: unable to access index for repository http:\cran.us.r-project.org/src/contrib:  
## scheme not supported in URL 'http:\cran.us.r-project.org/src/contrib/PACKAGES'

## Warning: package 'palaeoSig' is not available (for R version 3.5.1)

## Warning: unable to access index for repository http:\cran.us.r-project.org/bin/windows/contrib/3.5:  
## scheme not supported in URL 'http:\cran.us.r-project.org/bin/windows/contrib/3.5/PACKAGES'

library(palaeoSig)

## Loading required package: vegan

## Loading required package: permute

## Loading required package: lattice

## This is vegan 2.5-2

data("arctic.env")

Making subset from arctic.env

* *Warmest month: ‘tmax’*
* *Coldest month: ‘tmin’*
* *Precipitation in July: ‘pjul’*
* *Precipitation in January: ‘pjan’*
* *Annual precipitation: ‘annp’*

arctic\_new <- arctic.env[,c("tmax","tmin","tave","pjul","pjan","annp")]

library(vegan)  
arctic\_rda <- rda(arctic\_new)

arctic\_princomp <- princomp(arctic\_new)

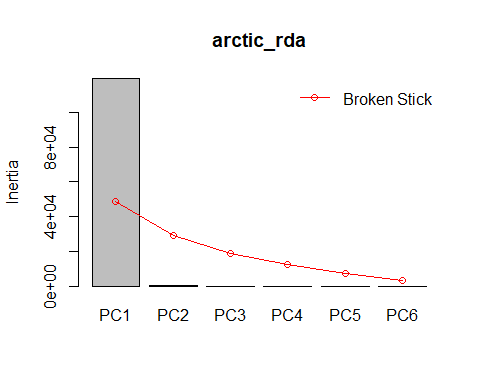
summary(arctic\_rda)

##   
## Call:  
## rda(X = arctic\_new)   
##   
## Partitioning of variance:  
## Inertia Proportion  
## Total 119778 1  
## Unconstrained 119778 1  
##   
## Eigenvalues, and their contribution to the variance   
##   
## Importance of components:  
## PC1 PC2 PC3 PC4 PC5  
## Eigenvalue 1.195e+05 2.317e+02 4.226e+01 1.718e+01 1.592e+01  
## Proportion Explained 9.974e-01 1.934e-03 3.528e-04 1.434e-04 1.329e-04  
## Cumulative Proportion 9.974e-01 9.994e-01 9.997e-01 9.998e-01 1.000e+00  
## PC6  
## Eigenvalue 2.1434956  
## Proportion Explained 0.0000179  
## Cumulative Proportion 1.0000000  
##   
## Scaling 2 for species and site scores  
## \* Species are scaled proportional to eigenvalues  
## \* Sites are unscaled: weighted dispersion equal on all dimensions  
## \* General scaling constant of scores: 99.76325   
##   
##   
## Species scores  
##   
## PC1 PC2 PC3 PC4 PC5 PC6  
## tmax 0.2342 -0.81825 0.66892 -0.80630 0.09996 -0.2583719  
## tmin 1.2465 0.80853 -0.82117 0.18834 0.89727 -0.1581003  
## tave 1.0227 -0.46370 0.01847 -0.63816 0.54209 0.2927494  
## pjul 7.2490 -3.64365 0.50157 0.48343 0.30359 0.0003316  
## pjan 9.0654 2.10494 1.45315 0.31241 0.34151 0.0254487  
## annp 98.9426 0.07063 -0.16132 -0.05791 -0.07068 -0.0027787  
##   
##   
## Site scores (weighted sums of species scores)  
##   
## PC1 PC2 PC3 PC4 PC5 PC6  
## 1 -1.12202 -1.344537 -3.24879 2.664356 2.544686 0.790411  
## 2 -0.27150 -0.769707 -1.61536 4.383501 0.169707 0.008378  
## 3 0.46440 -1.058688 -1.88830 6.564113 -4.133294 4.799533  
## 4 -0.37479 -1.220153 -2.95202 4.110809 -0.128365 0.551558  
## 5 -0.79811 -0.880962 -2.21667 3.388994 0.811162 -1.030992  
## 6 -0.78626 1.977659 -2.28610 -0.569387 -4.866489 4.934673  
## 7 0.22705 -2.771500 -6.51349 2.783664 1.233672 -2.025273  
## 8 -0.59586 2.201578 -2.99342 -0.916432 -5.003520 4.370988  
## 9 0.60127 -1.825582 -5.00810 5.665149 -3.429813 2.739766  
## 10 -0.27084 -1.173015 -2.11715 5.418227 1.085437 -2.500632  
## 11 0.74489 -0.947937 -2.86917 7.515996 -6.103927 5.784414  
## 12 -1.09033 2.433346 -3.58555 -1.412078 -1.819972 1.337818  
## 13 -1.39310 2.160875 -3.33573 -0.727177 -2.659149 2.433240  
## 14 -0.81415 -1.175899 -5.68882 3.499122 -0.082010 2.208109  
## 15 0.40052 -0.597757 -3.38590 6.938183 -5.078805 4.451110  
## 16 -0.87780 2.633121 -2.97475 -0.816701 -3.161857 2.811300  
## 17 -0.99852 2.506955 -2.84470 0.250301 -3.708573 3.767220  
## 18 -0.02010 0.991548 -6.12453 0.361418 -0.487539 1.861307  
## 19 0.05778 -0.353600 -3.20906 6.632843 -3.649953 2.234388  
## 20 -0.37468 0.522713 -6.55914 1.581378 -2.167741 2.860856  
## 21 -1.34861 -0.435854 -4.97798 3.313221 0.920909 1.027334  
## 22 0.12052 1.787157 -5.82518 0.575993 -1.719354 0.646131  
## 23 -0.80989 0.698084 -6.84086 1.384698 -2.068837 3.381782  
## 24 0.04916 1.352088 -5.94390 2.035057 -4.073852 3.928498  
## 25 0.61588 2.838032 -4.58216 1.124962 -3.864898 2.699481  
## 26 -1.07411 -0.434996 -4.00895 5.537148 -0.884821 1.949081  
## 27 -0.65801 0.803625 -6.51043 2.158139 -2.910869 2.075331  
## 28 -0.01259 1.431015 -6.14111 2.663921 -5.622332 4.420807  
## 29 -1.51117 -0.015539 -5.14774 2.851987 0.981917 -0.588797  
## 30 -1.52420 0.455616 -6.04703 1.764155 0.283586 -0.135275  
## 31 -1.18445 1.016223 -6.96875 1.397562 -2.291170 2.738549  
## 32 -1.18444 1.014537 -6.96838 1.366269 -2.262482 2.853605  
## 33 -0.72069 1.539811 -6.80565 0.920089 -3.293477 0.703070  
## 34 -1.68236 0.005967 -4.88442 3.291617 0.897913 0.013357  
## 35 -0.53783 1.234267 -6.02871 2.871027 -5.840356 5.289241  
## 36 -0.20568 2.020109 -6.28988 1.580308 -5.141609 0.531074  
## 37 -2.11525 -0.142692 -4.23430 3.578944 1.328285 2.205852  
## 38 -0.68020 1.392654 -6.84314 1.543517 -3.660319 -2.139811  
## 39 -1.56315 3.817288 -7.08139 -2.249207 -3.050461 6.641692  
## 40 -1.56315 3.817288 -7.08139 -2.249207 -3.050461 6.641692  
## 41 -1.15236 1.087597 -6.05949 3.284368 -3.414949 3.991332  
## 42 0.92834 6.224600 -2.67922 0.309732 -5.468660 5.687611  
## 43 -0.58134 5.177663 -5.48177 -1.788472 -3.660295 5.691140  
## 44 -1.67452 3.098663 -7.34601 -0.464266 -4.831586 4.968491  
## 45 -2.00444 2.285284 -6.98095 0.368560 -2.055901 3.569034  
## 46 -2.23717 3.449867 -6.32703 -0.497869 -1.983919 1.772338  
## 47 -2.20931 1.630155 -4.19821 3.190847 -0.939860 0.803535  
## 48 -2.19562 3.644677 -5.42246 -0.330393 -2.398641 1.303747  
## 49 -2.08637 1.311329 -3.12144 5.801397 -3.761937 6.311012  
## 50 -2.41972 1.144939 -3.91388 3.982539 -0.175942 1.097520  
## 51 -2.45992 1.682388 -2.70139 5.247390 -3.378245 7.762075  
## 52 -2.01955 3.650215 -3.44061 0.929999 -1.934099 -0.273073  
## 53 -2.05712 2.026275 -3.63488 3.460992 -1.178913 -0.564155  
## 54 -1.64082 1.205950 -3.22916 5.524358 -1.860956 -2.467347  
## 55 -1.82269 1.398110 -3.01888 5.475518 -2.070667 -1.463967  
## 56 -2.20705 1.387922 -3.50457 4.587710 -0.681654 -0.890746  
## 57 -2.35936 2.064017 -3.36736 3.339474 -0.346450 0.436214  
## 58 -2.52932 1.739100 -2.78552 5.286960 -0.955563 -0.399298  
## 59 -2.56089 2.038087 -2.54078 4.517410 -2.381269 0.721733  
## 60 -2.64229 2.074810 -2.66385 4.179217 -2.549134 0.816448  
## 61 -3.06704 2.786569 -2.29552 2.788623 -2.025355 3.673149  
## 62 -2.70126 1.922329 -2.55103 5.157971 -1.422209 0.854779  
## 63 -3.15660 3.077347 -1.67960 3.349261 -1.600803 3.067414  
## 64 -2.43784 2.009193 -2.41157 5.655814 -1.103225 -0.637712  
## 65 -1.69990 1.626249 -2.16964 7.079643 -2.926507 -2.891318  
## 66 -3.11584 3.228630 -1.53666 3.737429 -1.612018 2.553719  
## 67 -2.17564 1.948053 -2.34991 6.251013 -2.558432 -1.693104  
## 68 -2.22641 1.843851 -2.60223 6.519041 -2.605767 -2.530091  
## 69 -2.03496 1.675883 -2.67957 7.615617 -4.220916 -4.910653  
## 70 -3.07574 2.641214 -1.11548 3.418494 -3.215809 -1.051078  
## 71 -3.07574 2.640732 -1.11538 3.409553 -3.207613 -1.018205  
## 72 -3.06577 2.645365 -1.16153 3.386867 -3.277437 -1.099552  
## 73 -3.04584 2.653667 -1.25362 3.323614 -3.400693 -1.196500  
## 74 -3.02592 2.662451 -1.34582 3.269302 -3.532145 -1.326322  
## 75 -3.20776 2.896037 -1.32508 3.618240 -3.565680 -0.182797  
## 76 -3.21774 2.883917 -1.23670 3.589131 -3.572526 -0.223494  
## 77 -2.99536 2.545063 -1.57157 4.347350 -3.721637 -0.304396  
## 78 -3.01533 2.536225 -1.45254 4.507756 -3.803081 -0.131400  
## 79 -3.73113 3.679225 -0.03026 2.266260 -1.414843 -4.022999  
## 80 -3.73113 3.678743 -0.03016 2.257319 -1.406647 -3.990126  
## 81 -3.02529 2.539130 -1.44428 4.625527 -3.731977 0.305820  
## 82 -3.09670 2.591691 -1.67900 4.320696 -3.816966 0.385339  
## 83 -3.10666 2.579727 -1.60878 4.272072 -3.761698 0.769126  
## 84 -2.96476 2.386014 -1.63889 4.873764 -3.794920 0.316817  
## 85 -3.05592 2.719483 -1.46787 4.424821 -3.771870 0.643753  
## 86 -3.13658 2.577787 -1.49105 4.539668 -3.690926 0.632263  
## 87 -2.93482 2.406782 -1.84191 4.781286 -3.777924 0.434784  
## 88 -3.08682 2.595492 -1.67134 4.496788 -4.300287 0.439651  
## 89 -3.12669 2.588112 -1.52541 4.749673 -4.081184 0.874365  
## 90 -3.09685 2.596963 -1.64103 4.799715 -4.577452 2.161073  
## 91 -3.30844 3.044542 -0.83802 4.336877 -4.623467 0.961044  
## 92 -3.35995 3.116813 -1.21300 4.198000 -4.980575 1.945083  
## 93 -3.16746 2.751255 -1.38923 4.956030 -5.000472 3.931110  
## 94 -3.17746 2.824322 -1.67681 5.955178 -5.002593 5.632839  
## 95 -3.17702 3.128456 -1.50338 5.152871 -3.661325 1.562066  
## 96 -3.30854 3.112858 -1.08418 5.355859 -5.018405 2.193129  
## 97 -3.36997 3.134171 -1.20790 4.584000 -5.155367 1.396114  
## 98 -3.25882 2.852718 -1.75673 5.402603 -4.999481 4.278582  
## 99 -3.17744 2.798406 -1.53487 5.568726 -4.930696 3.445831  
## 100 -3.26869 3.129944 -1.26847 5.238294 -5.273113 1.966360  
## 101 -3.19824 2.938554 -1.26936 5.063437 -5.676613 0.314332  
## 102 -3.38995 3.154107 -1.21258 5.059315 -5.188746 1.741722  
## 103 -3.25804 2.938945 -1.09356 5.568323 -5.338910 0.817244  
## 104 -2.93388 2.970821 -1.63765 6.818048 -3.901769 -2.968398  
## 105 -3.51012 3.972696 -0.35484 6.101065 -5.447405 -2.864075  
## 106 -3.23900 3.225614 -1.50958 6.324156 -6.157817 -4.213005  
## 107 -3.17756 3.170347 -1.22913 6.687437 -6.035791 -4.342669  
## 108 -3.25893 3.217312 -1.41749 6.387410 -6.034562 -4.116057  
## 109 -3.70366 3.928081 -0.94054 5.218168 -5.576686 -2.096423  
## 110 -3.71376 3.640229 -1.25428 5.429901 -5.314993 -2.178712  
## 111 -3.39005 3.573857 -1.12966 6.691828 -6.171285 -5.234750  
## 112 -3.60254 3.645797 -1.32081 6.097475 -5.561088 -4.059228  
## 113 -3.33929 3.723219 -1.03579 6.893317 -6.066280 -5.619837  
## 114 -3.64225 3.946386 -0.91027 6.361613 -5.397759 -4.358346  
## 115 0.23527 -1.979239 -0.59512 3.905000 -1.020715 1.005698  
## 116 -0.21878 -1.956145 -1.01925 3.683231 1.271287 -0.159432  
## 117 -0.41980 -2.203501 -1.19880 4.194490 2.585139 -0.336230  
## 118 -0.49945 -2.220200 -0.92825 4.452517 3.428989 -0.520893  
## 119 11.51239 8.925657 -1.85581 -1.905714 0.387958 0.235588  
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## 121 14.78457 12.508157 0.78190 -2.807755 -4.728816 -0.092279  
## 122 16.00620 13.957772 2.26433 -3.470442 -8.014581 1.833194  
## 123 15.99626 13.950164 2.29301 -3.525387 -7.829366 2.552700  
## 124 11.69405 9.213453 -0.79037 -1.844802 -2.357849 4.865257  
## 125 11.66253 9.280125 -1.22685 -2.344830 -2.582155 5.356164  
## 126 11.69405 9.213453 -0.79037 -1.844802 -2.357849 4.865257  
## 127 11.66253 9.280125 -1.22685 -2.344830 -2.582155 5.356164  
## 128 16.57274 15.530613 -0.87197 -2.812176 1.482706 -11.456344  
## 129 12.06788 9.450067 -0.67577 -1.232291 -3.020395 4.131874  
## 131 11.96843 8.657042 -0.60398 0.334449 -2.892394 1.512224  
## 132 11.76455 9.120662 -1.25059 -1.063809 -2.343341 3.922123  
## 133 11.78538 9.237914 -0.91064 -0.893165 -2.266431 3.560010  
## 134 16.59079 15.110016 3.29494 -5.551092 -9.829635 3.689783  
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## 136 11.38068 8.852908 -1.12334 -1.836838 -1.956669 2.669067  
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## 138 11.89597 9.572634 -0.16997 -2.131113 -3.436143 3.671073  
## 139 10.86564 8.655595 -1.16248 -2.324321 -1.067419 2.268820  
## 140 10.86564 8.655595 -1.16248 -2.324321 -1.067419 2.268820  
## 141 4.04353 -1.772394 -6.53704 2.997507 10.730012 -1.106298  
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## 143 4.31680 -1.707598 -6.27628 3.472774 10.383859 -2.005747  
## 144 4.04353 -1.772394 -6.53704 2.997507 10.730012 -1.106298  
## 145 5.89777 2.845947 -4.44783 2.093622 3.392451 7.595120  
## 146 5.61457 2.781115 -4.70403 1.639190 3.934277 8.895198  
## 147 4.06140 -0.922451 -6.65512 1.641672 9.682459 -1.035748  
## 148 4.91587 0.806115 -6.27861 0.117245 5.240876 1.374542  
## 149 5.00274 1.818353 -6.71628 -2.156139 3.183377 6.509290  
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## 151 3.18977 0.739356 -6.75219 1.454654 8.070232 5.005076  
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## 153 3.22039 0.560207 -6.72886 1.677713 8.089634 4.584960  
## 154 2.85579 0.542200 -7.16470 1.005363 8.486005 6.595745  
## 155 5.12773 1.446544 -5.30030 0.067162 3.034571 4.470273  
## 156 4.76619 1.000783 -4.94034 0.965897 4.292161 3.780992  
## 157 4.00126 -0.470817 -4.99003 2.103880 6.458364 4.132111  
## 158 2.92218 -2.410186 -9.04856 1.467343 3.492365 3.110573  
## 159 2.43010 -0.696126 -6.62441 3.500927 2.213864 8.282618  
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## 161 2.38934 -0.825689 -6.85328 3.341523 2.263668 8.580179  
## 162 2.64193 -0.571296 -6.64949 3.659033 1.739110 6.950273  
## 163 2.75043 -2.190096 -9.03229 1.207931 4.034658 1.771170  
## 164 2.06726 -0.508111 -6.12615 3.270201 2.794770 9.980061  
## 165 1.65197 -0.968699 -7.06574 1.891581 4.342532 10.047367  
## 166 2.61960 -2.954168 -9.38006 1.659358 4.430997 2.690615  
## 167 1.97546 0.068378 -6.23289 2.588101 3.294151 2.762868  
## 168 1.97500 -2.869229 -8.59986 2.367700 5.247857 3.897947  
## 169 -2.13696 3.227220 -4.67425 -0.451398 6.607108 10.026005  
## 170 -1.19475 9.004068 -5.75206 4.290321 14.750442 -5.596554  
## 171 -0.11456 8.436948 -3.87725 0.913775 10.778698 -2.126212  
## 172 -1.81396 8.065589 -2.57292 1.137655 4.849999 7.569865  
## 173 -0.58765 8.832609 -6.18058 2.531274 18.181283 -11.181117  
## 174 -2.35038 7.495046 1.46790 4.306643 5.679886 4.365227  
## 175 -2.92841 4.233627 -4.43395 1.469354 1.190953 8.329957  
## 176 -2.92841 4.233627 -4.43395 1.469354 1.190953 8.329957  
## 177 -4.56226 6.476520 -1.92528 2.666301 1.786597 3.122859  
## 178 -3.09446 1.605375 5.34751 -1.117834 1.112948 -5.088797  
## 179 -2.15677 1.938332 -2.81995 -0.754596 2.214932 1.881959  
## 180 -2.23694 0.183852 1.34435 2.926734 3.275335 -3.768126  
## 181 -2.31511 1.154262 -1.75308 0.472315 2.752231 0.653462  
## 182 -2.72984 1.031616 -1.39530 -0.296204 1.933059 1.351360  
## 183 -2.76812 0.908729 -0.47688 0.185095 2.383682 0.046699  
## 184 -2.77970 1.010550 -1.12875 -0.099042 2.116971 0.744763  
## 185 -2.89817 1.768607 1.73534 -1.236633 1.243161 -0.425189  
## 186 -2.83034 1.168827 -0.94489 -0.168348 1.738215 1.130379  
## 187 -3.25177 2.536247 2.07478 -0.643423 0.923364 0.371526  
## 188 -3.07896 2.742457 2.79519 -0.171601 0.628523 -3.329578  
## 189 -2.87945 0.949690 -0.50169 0.206745 2.246246 0.018123  
## 190 -2.71697 1.878230 0.86113 -0.422087 1.673595 -0.602357  
## 191 -2.78834 1.929210 0.60429 -0.821017 1.754799 -0.217129  
## 192 -2.72701 1.891834 0.87575 -0.021035 1.413593 -0.420684  
## 193 -3.20178 2.572863 1.67945 -1.002838 1.394958 0.194409  
## 194 -2.80827 1.927517 0.67247 -0.699865 1.904907 -0.373311  
## 195 -3.04004 2.055153 1.36174 -0.922281 1.598213 -0.175834  
## 196 -3.07961 2.988034 2.36969 -0.095469 0.879309 -3.414867  
## 197 -3.27317 2.658158 1.29769 -0.984038 1.429967 0.374210  
## 198 -3.29306 2.912796 1.93024 -1.157498 0.899923 -1.185590  
## 199 -2.95090 1.005277 -0.71460 0.022835 1.970475 -0.306687  
## 200 -2.97084 0.997301 -0.60446 0.114544 2.023421 -0.667095  
## 201 -3.05059 1.316141 -0.07752 1.336513 1.642334 0.685800  
## 202 -2.89903 1.877521 0.37576 0.782342 1.601952 -0.389602  
## 203 -3.00000 2.222510 0.43212 0.202564 2.395070 0.301327  
## 204 -3.13207 2.381730 0.65874 -0.562699 1.715517 0.454130  
## 205 -3.03081 2.129486 0.03271 0.393499 2.369837 0.476479  
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## 553 -1.81280 -0.418940 2.60180 0.128436 1.463685 -0.250417  
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## 565 -2.74867 0.543823 2.93799 -5.800009 -1.863287 -1.932339  
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## 614 2.30615 1.566356 4.22200 3.370630 4.742979 -0.491644  
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## 668 -1.78080 0.545381 -2.73537 -1.673230 4.193447 2.357560  
## 669 -1.76159 0.756386 -3.03195 -1.935570 3.881102 2.410802  
## 670 -1.86671 -0.712409 0.94136 -1.874933 1.867859 0.030241  
## 671 -1.86578 -0.597193 1.34088 -1.674188 2.249758 -0.939277  
## 672 -1.93916 -0.273265 -1.50293 -0.781730 4.577323 0.719352  
## 673 -2.00131 -0.033467 -1.89764 -1.611688 4.326106 -0.173615  
## 674 -1.97800 -0.586945 0.52335 -1.007127 2.044909 0.841647  
## 675 -2.00941 -0.466193 -0.19965 -1.175889 2.413178 1.163226  
## 676 -1.97199 0.521459 -2.14135 -1.463462 3.863608 1.080507  
## 677 -2.01788 -0.438761 1.69346 -2.044938 1.202736 -0.688223  
## 678 -1.44592 -0.300731 5.55968 -0.029230 -0.627049 -4.562266  
## 679 -2.06263 0.369761 -2.08096 -1.380780 3.976213 0.646563  
## 680 -2.09405 0.781432 -2.38343 -1.296765 3.444895 1.159818  
## 681 -2.17236 0.344641 -1.58401 -0.547011 4.145806 0.925084  
## 682 -1.84038 -0.302898 3.52646 2.489889 1.524928 -4.046465  
## 683 -1.79190 0.077731 2.99215 1.242937 1.214928 -2.819859  
## 684 -1.97234 -0.002708 3.01701 3.173147 1.439381 0.687862  
## 685 -1.54167 0.052886 4.41736 -0.973164 -3.890382 3.019818  
## 686 -2.12672 -0.163248 1.84489 1.115961 1.825410 -1.214683  
## 687 -2.13830 -0.280634 0.45383 1.424442 2.497977 0.648249  
## 688 -2.12616 1.361681 -2.76985 -1.868385 2.841976 1.778426  
## 689 -2.15393 0.784985 -2.16338 -0.603683 3.450214 1.051311  
## 690 -2.20237 0.352247 -1.45533 0.024803 3.830572 0.848687  
## 691 -2.06295 -0.075067 2.70779 4.070909 1.815031 1.248411  
## 692 -1.87865 -0.150268 4.92314 3.005339 1.143716 -5.413839  
## 694 -2.17391 0.788211 -2.08758 -0.306542 3.367574 1.034057  
## 695 -3.06997 1.413863 3.93276 -3.456504 -2.302496 0.176234  
## 696 -2.92343 1.244457 4.92067 -1.850902 1.155992 -3.365600  
## 697 -2.25160 0.156471 -1.04986 0.978028 3.762751 0.634000  
## 698 -2.10350 0.006331 3.19530 2.617744 1.979756 -3.248381  
## 699 -2.30100 0.056150 0.66616 0.491407 1.676927 1.803882  
## 700 -1.64255 0.217951 3.63394 -0.973668 -1.494533 -1.403458  
## 701 -2.30029 -0.140993 0.89263 0.711415 1.865506 -0.307676  
## 702 -3.22797 1.807794 6.31842 -1.841718 -3.611933 3.286456  
## 703 -3.21815 1.778496 6.47247 -1.849024 -4.442408 4.649597  
## 704 -2.27806 -0.074469 1.77635 2.380261 1.307653 1.397461  
## 705 -3.09446 1.605375 5.34751 -1.117834 1.112948 -5.088797  
## 706 -2.02831 0.599624 1.15713 0.386722 1.047369 -1.412130  
## 707 -1.91283 0.259408 5.17704 0.340297 -2.480964 0.442487  
## 708 -3.19794 1.657277 5.19616 -1.179570 -2.038956 0.588158  
## 709 -3.18490 1.780544 5.55096 -0.892281 1.385873 -5.410066  
## 710 -2.30531 0.232271 4.98879 0.151730 0.592718 -3.568639  
## 711 -2.01841 0.940431 1.25268 1.457009 -0.261831 5.142505  
## 712 -2.38135 0.813618 1.58499 0.801077 0.793309 1.950952  
## 713 -2.70112 1.011678 4.11394 0.358226 0.746664 0.430352  
## 714 -2.43210 0.686442 1.41452 0.774699 0.803268 1.178452  
## 715 -2.25011 0.998993 2.23829 0.226393 -0.280438 2.617052  
## 716 -2.62180 0.958755 4.24779 0.287659 -1.896448 5.245550  
## 717 -3.16429 1.685853 5.24797 0.496539 1.338860 -4.035563  
## 718 -2.24002 1.009796 2.11978 -0.065409 0.270540 1.086689  
## 719 -2.22080 1.206327 1.86695 -0.509187 0.000374 1.494545  
## 720 -2.35279 1.407975 1.88643 -1.027478 -0.221929 0.769992  
## 721 -2.41343 1.283829 1.66113 -1.085680 0.200354 1.256941  
## 722 -2.83531 1.612947 2.74653 0.031786 0.768981 1.697265  
## 723 -2.38346 1.395829 1.07288 -0.269423 0.501656 0.846089  
## 724 -2.65499 1.492533 1.95020 -0.778266 0.918624 0.830977  
## 725 -3.25573 1.756728 6.35985 2.174081 -3.436667 2.677210  
## 726 -3.26621 2.008284 5.88470 2.021446 -2.431519 1.119049  
## 727 -3.23647 2.120200 4.10135 2.046273 1.114194 -4.079373  
## 728 -2.70501 1.256139 1.61660 0.367396 1.298881 -1.209381  
## 729 -2.61666 1.630122 0.96624 -1.285634 0.794581 0.579003  
## 730 -2.68643 1.624039 1.20672 -0.769842 1.168683 0.853834  
## 731 -2.54364 1.556829 1.55989 0.262013 1.315562 -0.665757  
## 732 -2.54364 1.556829 1.55989 0.262013 1.315562 -0.665757  
## 733 -2.63653 1.625422 1.03582 -1.367303 1.229221 -0.756180  
## 734 -2.72723 1.564329 0.75095 -0.153334 1.199356 -0.924971  
## 735 -2.80788 1.442425 0.64227 0.154513 1.351676 -1.021104  
## 736 0.79299 0.261264 -5.50222 -4.568367 7.801607 0.730065  
## 737 1.96618 0.632311 -5.48983 -2.812750 7.776109 1.741645  
## 738 0.89254 0.476934 -5.03465 -5.648209 5.664739 1.955772  
## 739 0.66241 -0.181322 -5.69125 -4.240898 8.692960 0.072801  
## 740 0.74112 0.484478 -4.68824 -5.104673 4.637616 3.307168  
## 741 1.48850 -0.553756 -6.11805 -4.926231 6.056883 1.240934  
## 742 0.62225 -1.423218 -5.32831 -3.748239 6.537003 1.376409  
## 743 0.56068 0.454397 -4.83166 -2.693176 4.980361 4.763554  
## 744 0.44961 -0.787307 -4.71950 -4.361760 5.085595 2.522332  
## 745 0.52128 -0.073108 -4.62202 -2.166438 4.993010 4.528208  
## 746 0.17439 0.313285 -4.77698 -5.827984 4.238224 2.886310  
## 747 0.46104 -0.860260 -4.12034 -3.377366 4.673014 3.018548  
## 748 -0.06767 -0.105474 -4.85300 -5.261326 4.214539 3.566898  
## 749 1.08785 -3.221732 -5.59177 -2.592074 5.368150 0.816741  
## 750 -0.04750 0.184986 -4.62482 -5.767472 4.354878 2.954669  
## 751 0.02334 0.661871 -4.45223 -5.374151 4.179842 4.530691  
## 752 -0.35039 -0.379289 -4.71490 -5.030476 3.788895 4.037248  
## 753 -0.45087 -0.312947 -3.97793 -5.734814 3.595001 3.509646  
## 754 -0.23929 0.453042 -4.72883 -5.018789 4.542114 4.043128  
## 755 -0.56142 -0.401096 -4.15283 -4.825593 4.017236 4.045099  
## 756 -0.62228 -0.571534 -4.04402 -4.898635 3.361300 4.011494  
## 757 -0.44043 0.209034 -4.83735 -4.208769 5.306587 3.281649  
## 758 -0.35935 0.792815 -5.28192 -3.432070 6.580589 3.455904  
## 759 -0.74237 -0.273859 -4.40309 -3.679817 5.160502 3.567265  
## 760 -0.47130 1.102623 -5.84096 -3.141506 6.845442 3.217939  
## 761 -0.60061 0.431524 -4.64429 -2.956895 6.194806 3.626026  
## 762 -0.78210 -0.951302 -3.37718 -4.005670 3.390130 3.633219  
## 763 -0.80231 -0.327413 -3.91834 -3.438921 4.764027 4.032415  
## 764 -0.85350 -0.889085 -3.65460 -4.218471 3.344928 3.686853  
## 765 -0.76286 0.258611 -4.40677 -3.467345 5.119402 4.270234  
## 766 -1.00173 -1.310148 -2.62963 -2.338812 3.731174 4.532483  
## 767 -2.11175 1.677042 1.80096 -2.038821 -0.994316 -1.098035  
## 768 -2.26287 1.724000 1.82493 -1.817388 -0.508545 -1.050680  
## 769 -2.52548 1.528751 1.46854 -1.341968 -0.043733 -0.961706  
## 770 -1.98178 2.032969 1.34362 -3.148014 -0.595648 -3.159135  
## 771 -2.25511 0.346495 0.89888 -1.032653 -3.772307 0.693041  
## 772 -2.29413 2.124910 1.49004 -2.271924 -0.260508 -1.701290  
## 773 -2.09241 1.893925 1.42773 -2.618038 -0.606369 -2.711203  
## 774 -2.29504 0.344997 1.05222 -0.585897 -3.802344 1.200938  
## 775 -2.37472 2.011701 1.30770 -2.039313 0.236278 -2.034566  
## 776 -2.59665 1.933567 1.26334 -1.314201 0.221610 -1.275368  
## 777 -2.16279 2.112272 1.31547 -2.371336 0.193808 -3.056324  
## 778 -2.67723 1.824318 1.05766 -1.072868 0.790328 -1.680973  
## 779 -2.70788 2.004566 1.05656 -1.210769 0.612930 -1.533694  
## 780 -2.85821 1.937509 0.87787 0.006505 1.754681 -1.793891  
## 781 -2.43751 2.513581 0.42083 -2.638742 0.298385 -3.308275  
## 782 -2.48736 2.506627 0.61181 -2.269291 0.501249 -3.137380  
## 783 -2.49885 2.609109 -0.06629 -2.795286 0.670493 -3.908039  
## 784 -2.61919 2.770189 0.28000 -2.462856 1.081598 -3.735001  
## 785 -2.61920 2.771152 0.27979 -2.444974 1.065205 -3.800747  
## 786 -2.61922 2.771926 0.28397 -2.388272 0.977519 -3.616227  
## 787 -2.71050 2.839353 0.02394 -2.523648 1.318073 -4.031517  
## 788 -2.71050 2.839353 0.02394 -2.523648 1.318073 -4.031517  
## 789 -2.76980 2.020647 1.19198 -0.799324 -1.890950 0.714587  
## 790 -2.73003 2.026248 1.09064 -0.808719 -2.591728 1.389857  
## 791 -2.62942 2.217240 0.83664 -0.554691 -2.686946 1.711245  
## 792 -2.88178 2.572721 -0.08025 -2.070960 1.658686 -3.731928  
## 793 -2.64002 2.667600 -0.10809 -2.490879 1.033801 -3.977768  
## 794 -2.77983 2.010846 1.29289 -0.658329 -2.160854 1.227450  
## 795 -2.61945 2.230324 0.74805 -0.507699 -2.696494 1.686196  
## 796 -2.63928 2.245245 0.69592 -0.444338 -2.058055 1.148212  
## 797 -2.61865 2.086294 0.65559 0.170186 -2.077267 1.962963  
## 798 -2.62934 2.245487 0.67754 -0.441398 -2.267006 1.405896  
## 799 -2.59885 2.060650 0.77313 0.059718 -2.876603 2.401923  
## 800 -2.61963 1.961403 0.33937 -0.035799 -2.702668 2.326791  
## 801 -2.59893 2.059301 0.81328 0.268859 -3.291083 3.245205  
## 802 -2.61967 1.958698 0.36677 0.021120 -2.870483 2.550767  
## 803 -2.69984 2.666150 0.08623 -1.997772 1.338079 -3.784284  
## 804 -2.62945 2.224914 0.82119 -0.392331 -2.827270 1.860027  
## 805 -2.79045 2.239813 0.97488 -0.672262 -1.905260 0.972837  
## 806 -2.77055 2.248457 0.89140 -0.644464 -2.183397 1.327111  
## 807 -2.73066 2.533817 -0.12846 -2.207671 1.175177 -4.131034  
## 808 -2.88315 2.979956 -0.52948 -2.669333 1.686791 -4.307703  
## 809 -2.95311 2.665352 -0.51725 -2.130234 1.996539 -4.131571  
## 810 -2.78115 2.741738 -0.23885 -2.112761 1.613547 -4.086548  
## 811 -2.76122 2.749077 -0.33073 -2.193896 1.506684 -4.117751  
## 812 -2.96383 2.852457 -0.61013 -2.358212 1.720475 -3.982622  
## 813 -2.80183 2.929133 -0.30912 -2.291448 1.462847 -3.994327  
## 814 -2.77123 2.729761 -0.19584 -2.227041 1.343679 -4.063098  
## 815 -2.86234 3.109288 -0.24218 -2.299360 1.677934 -3.951487  
## 816 -2.80114 2.729181 -0.09654 -1.956607 1.456073 -3.857659  
## 817 -3.02357 2.869599 -0.53221 -1.843842 2.404906 -4.068602  
## 818 -3.01438 3.037486 -0.58940 -2.384339 1.861639 -4.037565  
## 819 -2.81202 2.625339 -0.50703 -2.051804 1.299305 -3.977953  
## 820 -3.17452 2.552490 0.65271 -1.763089 0.114140 -1.271679  
## 821 -2.81200 2.638954 -0.57306 -1.951051 1.411024 -4.076167  
## 822 -2.86251 2.826445 -0.57969 -2.038567 1.724101 -4.338650  
## 823 -2.86183 2.620848 -0.34341 -1.743742 1.674082 -4.014598  
## 824 -2.89246 2.823402 -0.45303 -1.706744 1.664582 -3.925671  
## 825 -2.91330 2.705754 -0.77478 -1.862343 1.529656 -3.971606  
## 826 -3.02190 1.927304 1.42405 0.694430 -3.050879 3.625950  
## 827 -3.23579 2.644202 0.14904 -2.159850 0.849286 -2.560213  
## 828 -3.28564 2.635802 0.34033 -1.817221 1.076740 -2.290700  
## 829 -3.20563 2.796004 -0.71754 -1.381970 2.144922 -3.313050  
## 830 -3.18565 2.819180 -0.90275 -1.428213 2.325790 -3.633570  
## 831 -3.37771 2.926252 -0.17430 -1.757068 0.927705 -2.162482

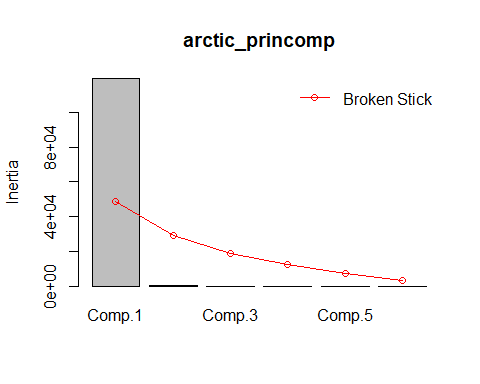
summary(arctic\_princomp)

## Importance of components:  
## Comp.1 Comp.2 Comp.3 Comp.4  
## Standard deviation 345.4337335 15.211532287 6.496717451 4.1423038805  
## Proportion of Variance 0.9974188 0.001934167 0.000352806 0.0001434273  
## Cumulative Proportion 0.9974188 0.999352968 0.999705775 0.9998492019  
## Comp.5 Comp.6  
## Standard deviation 3.9874258069 1.463184e+00  
## Proportion of Variance 0.0001329025 1.789558e-05  
## Cumulative Proportion 0.9999821044 1.000000e+00

screeplot(arctic\_rda,bstick=TRUE)



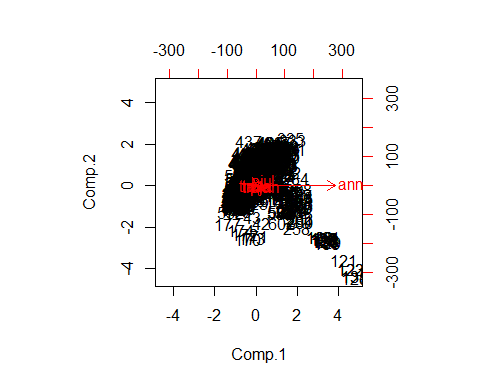
screeplot(arctic\_princomp, bstick=TRUE)



The two methods analyze the importance of components differently. In particular, rda focuses on eigenvalues, while princomp focuses on standards of deviation.

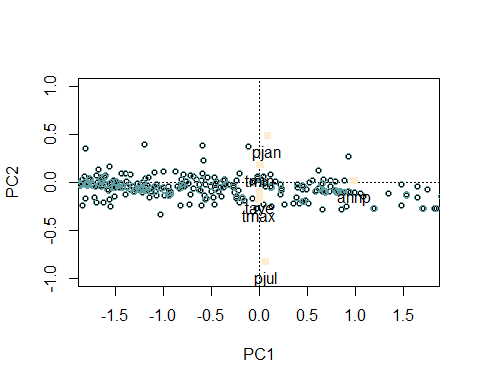
## Plotting princomp

biplot(arctic\_princomp,pc.biplot = TRUE)



## Plotting rda…

plot(arctic\_rda,scaling=1,display="sites",xlim=c(-1,1),ylim=c(-1,1))   
points(arctic\_rda,display="sites",scaling=1,col="cadetblue")  
points(arctic\_rda,display="species",scaling=0,pch = 15,col="blanchedalmond")   
text(arctic\_rda,display="species",scaling=0,pos=1)



Annual precipitation appears to be the determining factor.

Subsetting arctic biome and running rda

arctic\_arctic <- subset(arctic.env,BIOME=="arctic",select = c("tmax","tmin","tave","pjul","pjan","annp"))

arctic\_arctic\_rda <- rda(arctic\_arctic)

Subsetting boreal biome and running rda

arctic\_boreal <- subset(arctic.env,BIOME=="boreal",select = c("tmax","tmin","tave","pjul","pjan","annp"))

boreal\_rda <- rda(arctic\_boreal)

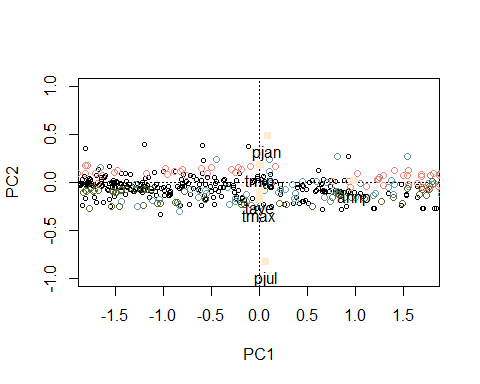
Subsetting subarctic biome and running rda

arctic\_sub <- subset(arctic.env,BIOME=="subarctic",select = c("tmax","tmin","tave","pjul","pjan","annp"))

subarctic\_rda <- rda(arctic\_sub)

Generating biplot

plot(arctic\_rda,scaling=1,display="sites",xlim=c(-1,1),ylim=c(-1,1))   
points(arctic\_arctic\_rda,display="sites",scaling=1,col="cadetblue")  
points(boreal\_rda,display="sites",scaling=1,col="darkolivegreen")  
points(subarctic\_rda,display="sites",scaling=1,col="salmon")  
points(arctic\_rda,display="species",scaling=0,pch = 15,col="blanchedalmond")   
text(arctic\_rda,display="species",scaling=0,pos=1)



PC1 discriminates between the biomes. The arctic and boreal biomes have heavy loading.

Access dataset for Northeast Shark River Slough on Neotoma

library(neotoma)  
ne\_shark\_river <- get\_dataset(6505,ageold=9000,ageyoung=0)

## The API call was successful, you have returned 1 record.

ne\_shark\_river\_pollen <- get\_download(ne\_shark\_river)

## API call was successful. Returned record for Northeast Shark RiverSlough

## Warning:   
## There were multiple entries for Microsphere suspension   
## get\_download has mapped aliases for the taxa in the taxon.list.

Convert to percentages

ne\_shark\_river\_pollen\_pct <- analogue::tran(x=ne\_shark\_river\_pollen[["10967"]][["counts"]],method='percent')

Drop rare taxa (>2%)

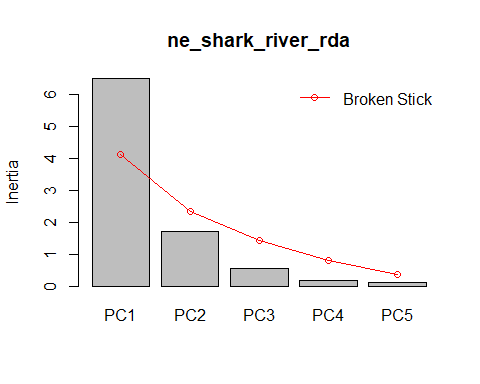
ne\_shark\_river\_pollen\_common <- ne\_shark\_river\_pollen\_pct[, colMeans(ne\_shark\_river\_pollen\_pct, na.rm = TRUE) > 2]

Square root transform

ne\_shark\_river\_pollen\_sqrt <- sqrt(ne\_shark\_river\_pollen\_common)

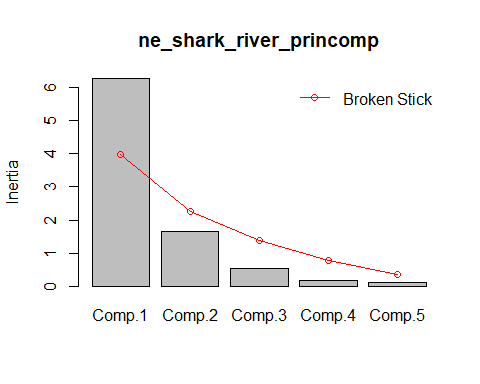
rda on Shark River

ne\_shark\_river\_rda <- rda(ne\_shark\_river\_pollen\_sqrt)  
screeplot(ne\_shark\_river\_rda,bstick=TRUE)



princomp on Shark River

ne\_shark\_river\_princomp <- princomp(ne\_shark\_river\_pollen\_sqrt)  
screeplot(ne\_shark\_river\_princomp,bstick=TRUE)

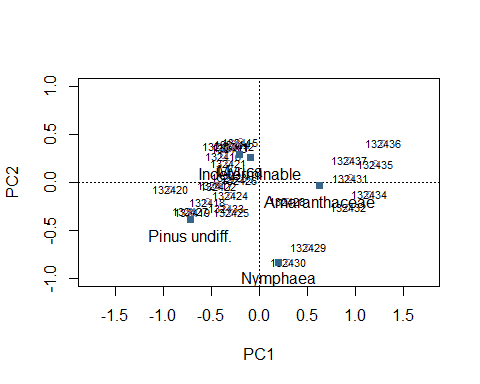
 There is one significant axis

Plotting PC1 and making biplot

scores(ne\_shark\_river\_rda)

## $species  
## PC1 PC2  
## Amaranthaceae 2.1291124 -0.06947434  
## Indeterminable -0.2915880 0.43508783  
## Myrica -0.6598895 0.49180417  
## Pinus undiff. -2.3853652 -0.67057636  
## Nymphaea 0.6971082 -1.43485342  
##   
## $sites  
## PC1 PC2  
## 132410 -0.4799022 0.86263326  
## 132411 -0.3413918 0.84995987  
## 132412 -0.2817075 0.86219601  
## 132413 -0.3622301 0.81808626  
## 132414 -0.3237066 0.92663687  
## 132415 -0.2244135 0.97774618  
## 132416 -0.4375360 0.63443076  
## 132417 -0.5413266 -0.07247328  
## 132418 -0.6321047 -0.46034125  
## 132419 -0.8201641 -0.71283863  
## 132420 -1.0922788 -0.16425101  
## 132421 -0.3813647 0.46342160  
## 132422 -0.4978978 -0.08312333  
## 132423 -0.3593462 0.12565267  
## 132424 -0.3504269 -0.30997867  
## 132425 -0.3360484 -0.71109225  
## 132426 -0.2405481 0.06599238  
## 132427 -0.8395937 -0.69561298  
## 132428 0.3427879 -0.44959994  
## 132429 0.6026299 -1.55555637  
## 132430 0.3608528 -1.91242445  
## 132431 1.1284979 0.11376180  
## 132432 1.0925434 -0.59968831  
## 132433 -0.4012532 -0.60734859  
## 132434 1.3534686 -0.28915916  
## 132435 1.4274363 0.45047821  
## 132436 1.5247319 0.93865225  
## 132437 1.1102924 0.53384010  
##   
## attr(,"const")  
## [1] 3.955929

plot(ne\_shark\_river\_rda,scaling=1,display="sites",xlim=c(-1,1),ylim=c(-1,1))   
points(ne\_shark\_river\_rda,display="sites",scaling=1,col="plum4")  
points(ne\_shark\_river\_rda,display="species",scaling=0,pch = 15,col="steelblue4")   
text(ne\_shark\_river\_rda,display="species",scaling=0,pos=1)



Taxa with similar patterns in the pollen diagram are closer together on the PCA biplot, but neither is immediately legible.