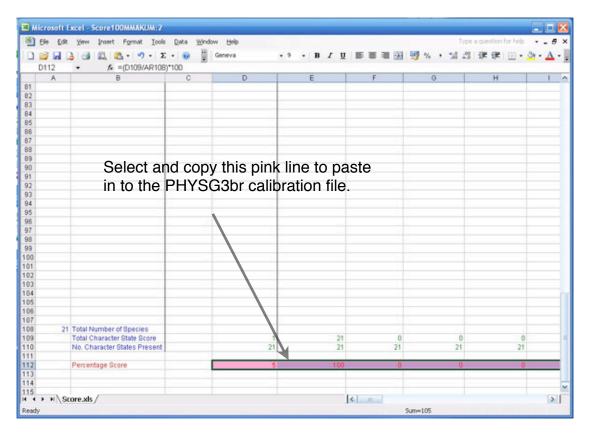
How to do a CLAMP Analysis

After scoring your fossil leaf assemblage, using the rules outlined in the downloads from the CLAMP website, you will have completed a **scoresheet** and will be ready to add your summary data from that scoresheet into the **PHYSG3br Calibration File**.

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3	RAS/RC	Kukrail Forest		26°54'46.1"	80°59'27.4"	128 m	12.03.08	1			
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5		Morphotypes	Unlobed	Lobed	No Teeth			Teeth Round	Tooth Acuto	Tth Compound	Nanonhull
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	5	Taxon 7	1	1	1						
2	6	Taxon 8	1			0.5		1		0.5	
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ŧ		Taxon 11 and 31 comb	1	11 S	1					2	
5	9	Taxon 13 and 4 comb Amblica	1		1					1	0.3
6		Taxon 14	1		1						
7		Taxon 15	1		0.5				1		
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3		Taxon 24	1		1	0.5	0.5	0.5	0.5	0.5	
1		Taxon 25	1	1.1	1			1			
5		Taxon 26	1	1	1						
8		Taxon 27	1		1						0.
7		Taxon 28	0.5	0.5		0.5	0.5	0.5	0.5	0.5	
3		Taxon 29 Taxon 30	1		1		0.5	0.5	0.5	0.5	
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2		Taxon 41 Bauhaina Green (no Taxon 43 Polymorphism	0.5	0.5		0.5	0.5	0.5	0.5	0.5	
5		Taxon 43 Polymorphism Taxon 44	0.5	0.5	1	0.5	0.5	0.5	0.5	0.5	
		Score.xls /					<				>

To do this, you highlight the whole of the **pink percentage score summary** in your fossil flora **scoresheet** and select '**copy**' from the edit menu.



You then open the **PHYSG3br file** and '**paste**' your copied line at the bottom of the PHYSG3br list of modern sites.

Ele Edit Yew Insert Format	Icols D	ata <u>Wi</u> ndov	w <u>H</u> elp							Type a quest	tion for help	8
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26 Sierraville, California	27	32	58	56	37	32	20	0	8	26	27	22
27 Toya-ko, Hokkaido	14	16	66	59	26	59	41	0	0	2	8	28
28 Satus Pass 2 SSW, Washington	30	18	50	49	40	42	38	0	2	9	20	37
29 Mt. Pocono, Pennsylvania	20	17	72	62	24	59	41	0	3	10	33	31
30 Cheesman Resvr., Colorado	26	17	57	57	52	32	28	0	10	22	36	23
31 River Falls, Wisconsin	30	16	52	52	27	55	39	0	0	6	17	33
32 Namarikawa, Hokkaido	10	16	61	55	34	50	39	0	0	3	6	22
33 Rimrock Lake, Washington	18	18	66	66	34	48	56	0	1	11	28	38
34 Chuzenji-ko, Honshu	17	14	84	66	22	64	54	0	0	2	8	30
35 Dannemora, New York	12	13	70	70	30	57	52	0	1	8	20	35
36 Akagawa Spa, Honshu	11	19	64	56	25	56	39	0	0	5	16	23
37 Republic, Washington	30	20	62	64	39	41	45	0	0	10	25	40
38 Wanakena, New York	15	23	67	65	20	57	50	0	1	12	26	44
39 Hanawa-Obono, Honshu	13	19	60	56	31	50	29	0	0	0	5	30
40 Teshio, Hokkaido	12	15	65	58	31	54	40	0	0	0	2	25
41 Kogawa, Hokkaido	14	19	64	61	22	59	44	0	0	2	6	30
42 Tadenoumi, Honshu	18	7	82	73	20	73	61	0	0	0	9	31
43 Lake Placid, New York	23	10	71	68	25	65	58	0	7	10	25	29
44 Suganuma, Honshu	12	0	94	91	18	82	71	0	0	0	12	39
45 Nukabira, Hokkaido	21	9	78	69	26	66	48	0	1	2	2	18
46 Kukrail	3.448276	55.17241	24.13793	20.68966	29.31034	18.96552	13.7931	2.689655	5.37931	7.206897	14.65517	23.48276
47 Makum	4.761905	100	0	0	0	0	0	0	0	4.761905	0	4.761905
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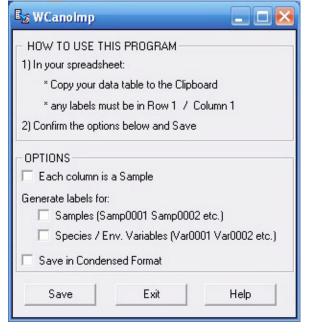
(*NB* To avoid transferring any embedded equations, etc. use the 'paste special' option and select 'values' and 'OK' before pasting. You then have to type in the name of your fossil flora alongside the pasted data in the sample names column of the PHYSG3br file.)

If you have other fossil floras you can similarly add these, up to 20 floras, to the PHYSG3br file.

You then have to **prepare the PHYSG3br file** with your added fossil data so that it can be read by the **CANOCO programme**.

To do this you **select** all of the data, including your added fossil data in the PHYSG3br file and '**copy**' it in to your computer's memory. You then launch the **WCanoImp1.0 programme** which is part of the CANOCO package.

When launched this programme will automatically recognise that you have copied data from your PHYSG3br Excel file and all you have to do is press '**save**' in the WCanoImp dialogue box. WCanoImp will then ask you to **name this new file**. I suggest you name it retaining the PHYSG3br identifier with



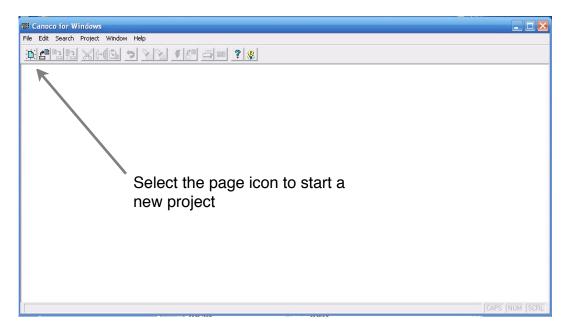
some additional characters that are meaningful to you to identify your data. You should also add the **.dta** extension to this file which tells CANOCO it is a data file it can read.

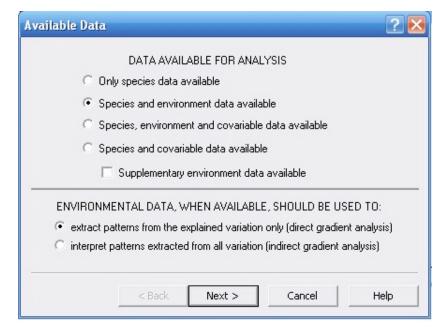
The next step in the process is to **convert the Meteorological data file MET3BR** from its existing Excel form into a **.dta** file. This is done in the same way as you did with the PHYSG3br file, that is select all of the data in the MET3BR file, copy it, open WCanoImp and save it with a file name with a .dta extension.

You now have 2 files **PHYSG3br etc .dta and MET3BR .dta** that are prepared for the CANOCO analysis.

The analysis is performed by launching **CANOCO for Windows**.

After launching you will see a **dialogue box** in the left hand side of the menu bar, click the **'page'** icon under '**file**' to begin a new project.





You will then see a dialogue box called 'available data', in which the first option 'only species data available' is automatically selected. Because you have both species and environment data available (PHYSG3br and MET3BR) you need to select the 2nd option in the dialogue box.

You then press 'next'.

You will now be asked to **identify the species and environmental data files**. You can do this by clicking the '**browse**' button in turn to select the 2 files.

	Browse
Environment data file name:	
	Browse
Covariables data file name:	Browse
Supplementary environment data file name:	
	Browse
Canoco solution file name:	
	Browse

You then have to **provide a file name** for the **CANOCO Solution file**. This is the file that will contain the results of your analysis. You can call this anything you like that you can interpret as the results but I suggest that you include the letters '**sol**' in the name and you add the extension **.xls**, that will tell Excel that it is a file that it can read. Once you have done this select '**next**'.

The next **dialogue box** will automatically selected **CCA** as the type of analysis. This stands for **Canonical Correspondence Analysis** and it is what you will use to do CLAMP.

esponse Models	Indirect	Direct	Hybrid	-
Linear	C PCA	C RDA	C hRDA	
Unimodal	C CA		C hCCA	
Unimodal (detrended)	C DCA	O DCCA	C hDCCA	

So merely press the '**next**' button.

Focus scaling on:	Scaling type:
C Inter-sample distances	biplot scaling (L^a)
Inter-species distances	Hill's scaling (L^a) / (1 - L
C Symmetric	

The next dialogue box also offers Default Options, so just click 'next'.

The same is true of the next dialogue box,

? 🔀 **Transformation of Species Data** Do not transform C Square-root transformation C Log transformation Y'=log(A*Y + B) A 1.000 B 1.000 Downweighting of rare species < Back Next > Cancel Help

CHECK APP	PROPRIATE	BOX, IF YOU	WISH TO	
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Samples				
Species				
		DEFINE INTE	RACTIONS	
Env. variables				
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ter that,

Do not use forward selection		
C Automatic selection	Best K= 11 variables	
C Manual selection	use Monte Carlo Permutation Tests	
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Evaluate current analysis with More On not perform the test Significance of first ordination a	nte-Carlo permutation test?	

You should now see a dialogue box entitled 'finish options' and assuming that you have followed these instructions all you need to do is select '**finish**'.

		are now selec		
Click the BACK —— Click the FINIS You can the a CON proj	H button to n save the s	confirm the se	ettings	

The next dialogue box asks you to give a file name that summarises the set up of this particular project. Again you can call it anything you like, but I suggest you include the letters 'con' in the file name. Select '**save**'.

Canoco Proj	ect		? 🔀
Save in: 🗀	CLAMP files	• + 6	- 📫 📰 -
Indiacon			
Indiacon2			
test2ton			
File name:	1		Save
Save as type:	Canoco projects (*.con)	-	Cancel

You will then see a dialogue box with the name of the project and a button on the right hand side which says '**analyse**'. Click this to do your analysis.

🕾 Project: testcon	? 🔀
Data: Species C Environment C Covariables	Commands Options
Path: C:\Documents and Settings\EARTHSCI\My Samples: 146 Variables: 31	<u>A</u> nalyze
Analysis Type: CCA Forward selection	CanoDraw
Permutation test:	Save log
(Scaling:Inter-species distances (biplot)	ES summary
< >>	<u>H</u> elp

To save a log of the analysis diagnostics press '**save log**' and the next dialogue box will ask you to name the Log File.

Canoco Anal	ysis Log		? 🛛
Save in: 🗀	CLAMP files	- E (* 📰 •
E testlog			
File name:	testlog		Save
Save as type:	Log Files (*.log)	•	Cancel

When you have done this you can close the dialogue boxes for CANOCO that are open and you can examine the results of your analysis by opening the **solution file** in Excel.

The analysis should take no more than 1 second.

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14	4	Clos e te	-0.4748	-0.206	0.0041	-0.017	4588	103.08							
15		Roun d te	-0.0281	-0.0564	-0.0813	0.1616	4163	129.52							
16		Acut e te	-0.6358	-0.096	0.0979	-0.0702	3726	90.65							
17		Comp our	-0.6583	-0.205	-0.0503	-0.0389	2705	82.77							
18		Nano phyl	1.3291	-0.6593	0.9099	-0.1297	627	28.52							
9		Lept ophy	0.9517	-0.5188	0.4102	-0.1249	728	49.24							
20		Lept ophy	0.4866	-0.391	-0.0193	0.0389	1465	95.32							
21		Micr ophy	0.1488	-0.1333	-0.0982	0.1078	2774	125.81							
22		Micr ophy	-0.1336	0.1107	-0.0219	0.0571	3997	129.93							
23		Micr ophy	-0.255	0.2636	-0.0038	-0.0197	2722	117.45							-
24		Meso phy	-0.2966	0.3768	-0.082	-0.0906	1343	98.52			1				
25		Meso phy	-0.2055	0.5322	-0.3063	-0.1993	482	59.75			2 X				1
26		Meso phy	-0.1494	0.7439	-0.3672	-0.2987	290	40.94						<u></u>	
27		Emar gins	0.7801	0.0413	-0.1943	-0.1831	2601	80.85							-
28		Roun d ap	0.4339	-0.1037	-0.1101	0.0094	7000	120.25			1				-
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2		Roun d ba	0.0361	-0.0211	0.0069	0.0626	7099	137.67			14 - 17 - 17 - 17 - 17 - 17 - 17 - 17 -			-	-
13		Arut e ha	0.2966	0.1965	0.0255	0.0007	4506	121.19	<						>

The first line of the solution file displays any information you added to identify this particular analysis. The first data array displays the coordinates in Axis 1 through 4 of the leaf characters. The second data array displays the coordinates in axis 1 through 4 of the PHYSG3br modern samples with the addition (from Sample 145 onwards) of any fossil samples you added.

	<u>File E</u> dit	⊻iew Inse	rt F <u>o</u> rmat	<u>T</u> ools <u>D</u> al	a <u>W</u> indov	v <u>H</u> elp							Ту	pe a questior	a for help	- 8 >
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80	124	Trout La	-0.7527	-0.8728	-1.1886	-0.1964	769	20.49								1
81	125	Sierravi	-0.1505	-1.4118	-0.939	1.1018	777	20.4								
182	126	Toya-ko.	-1.4282	0.1026	0.5302	-2.0777	784	19.02								
83	127	Satus Pa	-0.7332	-1.2594	-1.3164	-0.0919	777	19.79								
84	128	Mt. Poco	-1.1682	-0.9548	0.5364	0.5854	801	19.08								
85	129	Cheesma	-0.5117	-1.9019	-0.5965	2.8058	768	19.94								
186	130	River Fa	-1.2796	-0.5157	0.3705	-0.2441	770	20.2								
187	131	Namarika	-1.2632	0.3731	0.2085	-1.7183	769	19.62								
188	132	Rimrock	-0.8377	-1.4318	-1.092	0.019	816	18.83								
189	133	Chuzenji	-1.6351	-0.0245	0.7131	-2.7238	823	16.49								
190	134	Dannemc	-1.3334	-1.3388	-0.1627	-0.9919	811	16.76							1	
191	135	Akagawa	-1.1795	0.5421	0.6203	-1.2678	770	19.59								1.1
192	136	Republic	-1.0659	-1.3443	-0.8015	0.895	802	19.5								
193	137	Wanaker	-1.2274	-1.1577	0.2414	0.1987	798	17.5								
194	138	Hanawa-(-1.2484	0.6911	0.8587	-1.4906	757	18.37								
195	139	Teshio.	-1.3983	0.4157	0.0164	-3.2972	781	18.9								
196	140	Kogawa.	-1.4612	0.1534	0.4937	-2.7724	785	18.59								
197	141	Tadenour	-1.8548	-0.3897	0.8833	-2.2786	825	16.13								
198	142	Lake Pla	-1.3857	-1.0404	0.7349	-1.0869	810	18.67								
199	143	Suganum	-1.8948	-0.8933	0.9728	-1.7106	863	14.91								
200	144	Nukabira	-1.6989	-0.3442	0.4409	-2.6551	818	17.84								
201	145	Kukrail	-0.1725	0.6533	0.261	-1.178	0	19.35								
202	146	Makum	0.6269	3.0985	-0.3749	-0.9774	0	11.89								
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You now need to highlight the names of your fossil samples and the coordinates for axis 1 through 4 for these and 'copy' them.

You need to launch the spread sheet **RES3B** which will convert those coordinates into palaeoclimate data. Open RES3BR and at the bottom of the list of coordinates for the PHYSG3br modern calibration sites you will see a blue area beginning on line 167 where you **paste in the names and coordinates of your fossil sites** using 'paste special' and the 'values' option.

8)	Ele Edit	View	Insert Fg	rmat <u>I</u> ools	Data Window	Help					Type a ques	tion for help	0 :
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140	Los Alam	-	0.1016	-0.8267	-0.9469	2.2503	r	-0.47622805	9	11.6254624		20	
141	Wind Riv	-	-0.658	-0.4394	-0.8161	-0.5704		-0.74981087	8.9	10.1819472	-0.98152055	17.8	
142	Lake Spa	-	0.0245	-1.244	-0.6672	-0.0102		-0.47774726	8.7	11.6173903		17.8	
143	Tunkhann	-	-1.236	-1.007	-0.2248	-1.3374		-1.39983685	8.6	6.83392123	-1.16843155	21.1	18.635
144	Clallam	-	-1.0988	-0.3995	-0.7514	-0.383		-1.15489178	8.6	8.08202865	-1.32113901	13.2	
145	Parkdale	-	-0.7925	-1.2375	-1.0789	-0.2368		-1 22037469	8.5	7.74676338	-1.46017506	17.3	
146	Trout La	-	-0.7525	-0.8731	-1.1881	-0.1891		-1.05358469	8.2	8.60300994	-1.40591082	18.4	17.4125
147	Sierravi	-	-0.1504	-1.4117	-0.9367	1.1023		-0.82008569	8	9.81444317	-1.09225259	17.9	
148	Toya-ko.	-	-1.4281	0.1021	0.5289	-2.0783		-1.05182951		8.61206076	-0.56943898	21.5	
149	Satus Pa	-	-0.7329	-1.2599	-1.3166	-0.087		-1.19808645	7.5	7.86074567	-1.56163028	17.4	16.578
150	Mt. Poco	-	-1.1681	-0.955	0.537	0.5805		-1.47151278	7.2	6.47178899	-0.96964553	18.7	19.622E
151	Cheesman	-	-0.5116	-1.9016	-0.5925	2.8084		-1.48895331	7.2	6.3838848	-1 55580399	18.4	
152	River Fa		-1.2795	-0.5161	0.3696	-0.2427		-1.33397884	7	7.1678924		22.3	
153	Namarika	-	-1.2631	0.3727	0.2076	-1.7162		-0.84471531	6.8	9.68596007	-0.5898303	20.2	
154	Rimrock	-	-0.8375	-1.4322	-1.0913	0.0194		-1.3611009	6.8	7.03021125	-1.58403795	17.2	
155	Chuzenji	-	-1.6349	-0.0252	0.7102	-2.7261		-1.22081239	6.6	7.74452635	-0.58273931	18.5	
156	Dannemor		-1.3331	-1.3392	-0.163	-0.9929		-1.64638693	6.5		-1.34022805	20.4	
157	Akagawa	-	-1.1795	0.5417	0.6189	-1.2691		-0.72998306	6.3	10.2858805	-0.33022682	20	
158	Republic	1	-1.0657	-1.3446	-0.8005	0.8968		-1.60999232	6.1	5.77610287	-1.7180305	17.6	
159	Wanakena	-	-1.2271	-1.158	0.2417	0.1935		-1.57775548	5.2	5.93758635	-1.16520967	18.5	
160	Hanawa-O	1	-1.2484	0.6906	0.8569	-1.4917		-0.70554877	4.9	10.4141072		18.6	
161	Teshio.	-	-1.3982	0.4151	0.0145	-3.2949		-0.80860489	4.7	9.87439042	-0.57168045	19	
162	Kogawa.	-	-1.4611	0.1529	0.4915	-2.7732		-0.9974612	4.6	8.8928331	-0.5077232	18.5	
163	Tadenoum	-	-1.8546	-0.3903	0.881	-2.2811		-1.59782042	4.5	5.83704214	-0.8186013	16.4	
164	Lake Pla	-	-1.3855	-1.0407	0.734	-1.0899		-1.53543773	4.3		-0.83233899	17.8	
165	Suganuma	-	-1.8945	-0.8938	0.9713	-1.7154		-1.87729879	4	4.44798927	-0.99993789	15.9	
	Nukabira	-	-1.6987	-0.3447	0.4392	-2.652		-1.4192549	3.9		-0.86051843		20.1464
167	Kukrail		-0.1725	0.6533	0.261	-1.178		0.21444374	0.0	15.3603424	0.3119944	10.0	25.042
168	Makum		0.6269	3.0985	-0.3749	-0.9774		1.83671659		24,643756	1,17280184		27.782E
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Save this RES3B spreadsheet with a new name so as not to overwrite the original (if you do you will need to download a new one from the CLAMP website).

Scroll back to the top of the RES3B spreadsheet and you will see in red the predicted climate parameters for your fossil sites.

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1		14.19	24.64	15.36	1.17	MAT		-0.0949	0.0395	0.3766	0.9068	MAT	5
2		23.87	27.78	25.04	1.58	WMMT		-0.1279	0.482	0.2168	0.7493	WMMT	6
		5.66	20.89	6.69	1.88	CMMT		and the second se	-0.1943	0.3866	0.8595	CMMT	7
-		8.04	12.92	8.57	0.70	GROWSEAS	C	-0.0628	0.0956	0.3995		GROWSEAS	8
8		80.82	296.43	103.49	33.59	GSP		0.236	0.1557	0.9093	-0.0383	GSP	9
1		10.46	28.68	14.66	3.69	MMGSP		0.0997	0.2995	0.7723	-0.3724	MMGSP	10
4		43.37	125.13	56.79	14.03	3-WET		0.168	0.2333	0.867	-0.188	3-WET	11
1		18.94	53.18	32.35	9.30	3-DRY		+0.0061	0.4063	0.568	-0.5566	3-DRY	12
6		66.28	81.43	73.53	7.36	RH		-0.2755	-0.2251	0.5759	-0.4653	RH	13
		7.36	14.88	9.24	0.90	SH		-0.3771	-0.2533	0.7348	0.4566	SH	14
3		30.72	33.75	31.31	0.32	ENTHAL	6	-0.2756	-0.1659	0.5665	0.7362	ENTHAL	15
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cte	Predict	Observed		Predicted	Observed			AX4	AX3	AX2	AX1	NAME	22
	24.85	28.2	0.26072789	23,7058486	26.8	1.678 (3332)	7	-2.8627		0.1812	1.5738	Guanica.	23
		28.2	0.81019493	23.6899053	26.8	1.67 63098		-2.5628	-1.6377	0.0822	1.5933	Cabo Roj	24
	29.31	32.1	1.79464172	22.6226565	25.8	1.4/396326		-0.3636	0.9945	0.2344	1.4478	Mocuzari	25
	28 693	32.1	1.52396549	22.4337485	25.8	1. 6164698		-0.0452	0.4997	0.0875	1.5285	Mocuzari	26
		26.7	0.56921661	23.6575823	25.6	1 67015131		-1.5303	-1.5111	2.4599	0.7024	Natua, F	27
	24.298	27.7	0.11117398	22,6031272	25.5	49062465		-1.9768	-2.6818	0.0617	1.5072	Boringue	28
	28.056	26.9	1.27373171	24.3318993	25.5	1.78418155				1.7693	1.1057	Cambalac	29
	27.743	31.5	1.15871527	21.5424066	25.3	1.30850473			-0.0649	0.0526	1.3222	Tres Her	30
	27.437	26.7	1.05059111	25.945721	25.2	2.05469189		-1.5781	-1.1889	2.6208	1.0352	Keka, Fi	31
	26.320		0.68571377	72 5999777	24.8	1.49007569		-1.4166	-1.018	2.0200	0.6675	Guaiatic	32

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77									
78	N	NAME	AX1	AX2	AX3	AX4			
79									
80		R(SPEC,E	0.9644	0.9197	0.7656	0.6706			
81									
82	1	MAT	0.9068	0.3766	0.0395	-0.0949			
83	2	WMMT	0.7493	0.2168	0.482	-0.1279			
84	3	CMMT	0.8595	0.3866	-0.1943	-0.0644			
85	4	GROWSI	0.8771	0.3995	0.0956	-0.0628			
86	5	GSP	-0.0383	0.9093	0.1557	0.236			
87	6	MMGSP	-0.3724	0.7723	0.2995	0.0997			
88	7	3-WET	-0.188	0.867	0.2333	0.168			
89	8	3-DRY	-0.5566	0.568	0.4063	-0.0061			
90	9	RH	-0.4653	0.5759	-0.2251	-0.2755			
91	10	SH	0.4566	0.7348	-0.2533	-0.3771			
92	11	ENTHAL	0.7362	0.5665	-0.1659	-0.2756			
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One important check that you should carry out to insure that all is well with your analysis is to compare the environment biplot scores to the left of your predicted climate parameters with those produced during your analysis. To do this go back to your solution file, scroll down through the various data arrays until you reach the 'environment biplot' score array, it is about three guarters of the way down the document, and confirm that the values in this array match those in the RES3BR spreadsheet. If they do, all is well. If they do not, you should go back and check your analysis to ensure you are using the correct calibration sets and no errors have crept in during the analysis.

RAS/TEVS 16/03/08