User's Manual for the Paleomagnetic Analysis Program V4.0

I. System Requirements

For IBM-PC or comp	patibles:
Operating System:	Windows 95, Windows NT, Windows 98 or later (including Windows XP)
Screen Setting:	800×600 or larger. Smaller setting will crop the Main Window. The Zijderveld/modified Zijderveld and Stereographic/Lambert Equal-Area Projection window can be freely resized.
RAM:	32 MB or larger (haven't tried on computers with less RAM)
For Macintoshes:	CANNOT run directly on Macintoshes. Will run if Virtual PC is installed on the Macintosh computer. The Virtual PC should have an operating system of Windows 95 or later. Same requirements for Screen Setting and RAM as IBM-PC compatibles.

II. New Features – Toolboxes

- 1. Coordinate Conversion: to convert coordinates of a single point between Spherical system (Declination, Inclination, Intensity) and Cartesian system (North (x1), East (x2), Down (x3))
- 2. Latitude Calculation: to calculate latitude from inclination, and inclination from latitude
- 3. **Points Projection**: to perform most of the tasks of the main program with a convenient Copy and Paste data input method. You may specify line color, symbol color and size, and the size (diameter or axis length) of the projections. You can even add an eclipse around the VGP (and a circle around the mean declination and inclination of the samples, if you choose to do so). You can also print out all these projections as you specified. You are strongly encouraged to experiment with this toolbox.

III. Installation

Run the **setup.exe** program, and follow instructions in the pop up windows. Keep the most recent system files on your computer. This procedure is the same for both PCs and Macintoshes running Virtual PC.

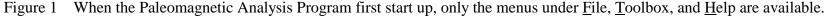
IV. Uninstallation

In the Control Panel (by clicking Start>Settings>Control Panel), double click on the Add/Remove Programs icon. In the pop up window, select the Paleomagnetic Analysis Program, and then click the Add/Remove... button.

V. Suggestions/More Information

If you have any suggestions or want to learn more about this program, please contact Chunfu ZHANG or Dr. James G. Ogg at the following address: Dept. of Earth and Atmospheric Sciences, Purdue University, West Lafayette, IN 47907-1397, USA. Or e-mail us at: czhang6@purdue.edu or jogg@purdue.edu .

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e Edit Open	Zijderveld Ctrl+O	StereoPlot	EQAreaPlot	LeastSquare	All	Toolbox	Help
Convert							
Close	Ctrl+W						
Print	Þ						
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Open	Ctrl+O							
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Exit	Ctrl+Q							
							pp, *.tab, *.cma, or *.txt files, you can select this <u>F</u> ile>Conve	

Figure 2 If you don't have a *.mag file but have suitable *.app, *.tab, *.cma, or *.txt files, you can select this <u>File>Convert</u> menu (or press Ctrl + T) to convert a desired file. For detailed file format, please refer to Help > Main Features (or press F1 key) or the PaleomagHelp.doc file.

Convert File (*.app or *.ta	ab or *.cma or *.txt) 🛛 🛛
File Selection C:(HPNOTEB] C:(C:(C:(C:(C:(C:(C:(C:(C:(C:	CRA.app CRAO.app CRB.app CRC.app CRD.app CRE.app CRF.app CRG.app CRG.app PZB.app
Con <u>v</u> ert <u>C</u>	ancel E <u>x</u> it

Figure 3 This window comes up. You can select a drive from the dropdown list in the upper left window. The folders in the drive that you selected will be displayed automatically in the lower left window, and the files in the default folder will be listed in the window on the right side. You can change to another folder other than the default one by double clicking on that folder name, and the files under that folder will then be displayed in the right window. Only those files that can be converted by the Paleomagnetic Analysis Program will be listed, i.e., *.app, *.tab, *.cma, and *.txt files. Select one file and press the Convert button (or simply hit the return key, or press Alt + V), and the file you selected will be converted to a *.mag file. If you don't want to convert any file, you can press the Cancel button to return to the main window in Figure 1. Or if you want to exit the Paleomagnetic Analysis Program, you can hit the Exit button, and the program will be terminated.

The Paleomagnetic Analysis Program will check if the corresponding *.mag file exist in that folder, and prompt you to take appropriate action.

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		StereoPlot	EQAreaPlot	LeastSquare	All	Toolbox	Help	
Open Convert	Ctrl+O Ctrl+T							
Close	Ctrl+W							
Print Exit	Ctrl+Q							

Figure 4 If you have a suitable *.mag file, you can select the <u>File</u>>Open menu (or press Ctrl + O) to open a file you want.

🔇 Open *.mag File 🛛 🔯	
File Selection	
<u>O</u> pen <u>C</u> ancel E <u>x</u> it	

Figure 5 This window comes up. You can select a drive from the dropdown list in the upper left window. The folders in the drive that you selected will be displayed automatically in the lower left window, and the files in the default folder will be listed in the window on the right side. You can change to another folder other than the default one by double clicking on that folder name, and the files under that folder will then be displayed in the right window. Only those files that can be opened by the Paleomagnetic Analysis Program will be listed, i.e., the *.mag files. Select one file and press the <u>O</u>pen button (or simply hit the return key, or press Alt + O), and the file you selected will be opened. If you don't want to open any file, you can press the <u>C</u>ancel button (or press Alt + C) to return to the main window in Figure 1. Or if you want to exit the Paleomagnetic Analysis Program, you can hit the <u>Ex</u>it button (or press Alt + X), and the program will be terminated.

😵 Paleomagnetic Analysis	- c:\Chunfu Zhang\VB6Programs\PaleomagV4.0\MagnetoStratLab\CrcOgg.mag
<u>File Edit Zijderveld StereoPla</u>	ot <u>E</u> QAreaPlot LeastSquare <u>A</u> ll <u>T</u> oolbox <u>H</u> elp
(De)activate Record	Select/Remove Points for Z-/S-/ EQ-Plot Select/Remove Points for Least Square Anslysis
CRC 203.1 Ye CRC 203.2 Ye CRC 204 Ye CRC 206.1 Ye CRC 206.2 Ye CRC 208 Ye CRC 209 Ye CRC 211.3 Ye CRC 213 Ye CRC 213 Ye CRC 218 Ye CRC 220 Ye CRC 2218 Ye CRC 225 Ye CRC 227 Ye CRC 231.2 Ye CRC 233.1 Ye CRC 233.1 Ye CRC 233.1 Ye CRC 234 Ye CRC 238.1 Ye CRC 238.1 Ye CRC 239.1 Ye CRC 239.2 Ye CRC 239.2 Ye CRC 239.2 Ye CRC 239.2	

Figure 6 After you convert a file or open a file, the sample names in that file will be automatically displayed in the left window. Note that all samples are defaulted to be active, and can be used in various plottings and analyses.

😵 Paleomagnetic Analysis - c:\Chunfu Zhang\VB6Programs\PaleomagV4.0\MagnetoStratLab\CrcOgg.mag 🛛 🔲 🔲 🔀												
<u>File E</u> dit <u>Zijderveld</u> <u>StereoPlot</u> <u>E</u> QAreaPlot <u>LeastSquare</u> <u>All</u> <u>Toolbox</u> <u>H</u> elp												
(De)activate Recor	nts for Lea	st Square A	nslysis									
Sample Act:	ive 🔼 🔲 St	teps GDec	GInc	TDec	TInc	Intensity	Error	LSquare	Plot			
CRC 201	Yes 📄 🗌 NRI	1 0 350.7	54.6	356.3	46.8	3.21E-01	0.03	No	Yes			
	Yes 🗌 🗆 TT	150 350.8		356.4	47.5	2.13E-01	0.01	No	Yes			
	Yes 🗌 TT	200 -1.1		3.7	50.3	1.77E-01	0.02	No	Yes			
	Yes 🗌 TT	250 349.8		355.8	48.1	1.15E-01	0.09	No	Yes			
	Yes 🗌 TT	290 347.0		353.7	49.5	1.02E-01	0.05	No	Yes			
	Yes TT	320 352.7		358.1	47.5	8.04E-02	0.07	No	Yes			
	Yes TT	350 352.4		358.4	50.3	5.48E-02	0.18	No	Yes			
	Yes TT	380 349.1		355.2	48.7	4.35E-02	0.03	No No	Yes			
	Yes DTT Yes DTT	410 341.3 450 4.0		348.2 9.0	47.2 57.6	4.01E-02 3.31E-02	0.10 0.17	No	Yes			
	Yes TT	450 4.0		-0.4	57.6 56.0	3.28E-02	0.17	No No	Yes Yes			
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Figure 7 By clicking on the sample name, the data for that sample will be displayed in the right window. Note that all data except the Origin (ORG) are defaulted to be suitable for plotting, and none of them are selected for Least Square Analysis.

🔇 Paleom	😵 Paleomagnetic Analysis - c:\Chunfu Zhang\VB6Programs\PaleomagV4.0\MagnetoStratLab\CrcOgg.mag 🛛 🔲 🔲 🔀												
<u>File E</u> dit ;	Zijderveld <u>S</u> tereoPlot	EQAr	eaPlot !	eastSq	uare <u>A</u> ll <u>T</u> o	olbox <u>H</u> elp)						
(De)activate Record		Seleo	:t/Rem	nove Points	for Z-/S-/ I	EQ-Plot	Select	/Remo∨e Poir	nts for Lea	st Square A	nslysis	
🗌 Sam	ple Active		🗌 Ste	eps	GDec	GInc	TDec	TInc	Intensity	Error	LSquare	Plot	
	201 Yes		🗆 NRM	0	350.7	54.6	356.3	46.8	3.21E-01	0.03	No	Yes	
	203.1 Yes		🗌 TT	150	350.8	55.3	356.4	47.5	2.13E-01	0.01	No	Yes	
	203.2 Yes		🗌 TT	200	-1.1	58.6	3.7	50.3	1.77E-01	0.02	No	Yes	
	204 Yes		🗌 TT	250	349.8	55.9	355.8	48.1	1.15E-01	0.09	No	Yes	
	206.1 Yes		🗌 TT	290	347.0	57.1	353.7	49.5	1.02E-01	0.05	No	Yes	
	206.2 Yes			320	352.7	55.5	358.1	47.5	8.04E-02	0.07	No	Yes	
	208 Yes			350	352.4	58.2	358.4	50.3	5.48E-02	0.18	No	Yes	
	209 Yes			380	349.1	56.4	355.2	48.7	4.35E-02	0.03	No	Yes	
	211.3 Yes			410	341.3	54.2	348.2	47.2	4.01E-02	0.10	No	Yes	
	213 Yes		□ TT □ TT	450	4.0	66.2	9.0	57.6	3.31E-02	0.17	No No	Yes	
	218 Yes 220 Yes			450 0	352.3 0.0	64.0 0.0	-0.4 0.0	56.0 0.0	3.28E-02 0.00E+00	0.10 0.00	No No	Yes No	
	220 1es 224 Yes				U.U *******					0.00 ******		NO	
	225 Yes			~~	~~~~~~	00 ^^^^	ampie. Cr	.0 200	. 2	~~~~~~	~~~~~		
	227 Yes												
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	238.1 Yes												
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	239.1 Yes												
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CRC	240 Yes												

Figure 8 You can deactivate a record by Check-marking it, and then press the (De)activate Record command button. And the window display will change to Figure 9.

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<u>File E</u> dit <u>Z</u> ijderveld	<u>StereoPlot</u> EQA	AreaPlot	<u>L</u> eastSq	uare <u>A</u> ll <u>T</u> o	olbox <u>H</u> elp	þ						
(De)activat	e Record	Sele	ct/Ren	no∨e Points	for Z-/S-/	EQ-Plot	Select	/Remo∨e Poir	nts for Lea	st Square A	nslysis	
Sample	Active 🔨	🔲 St	eps	GDec	GInc	TDec	TInc	Intensity	Error	LSquare	Plot	
CRC 201	Yes 📄	NRM		350.7	54.6	356.3	46.8	3.21E-01	0.03	No	Yes	
CRC 203.1	Yes	TT 🗌	150	350.8	55.3	356.4	47.5	2.13E-01	0.01	No	Yes	
CRC 203.2	No	TT 🗌	200	-1.1	58.6	3.7	50.3	1.77E-01	0.02	No	Yes	
□ CRC 204	Yes		250	349.8	55.9	355.8	48.1	1.15E-01	0.09	No	Yes	
CRC 206.1	Yes		290	347.0	57.1	353.7	49.5	1.02E-01	0.05	No	Yes	
CRC 206.2	Yes		320	352.7	55.5	358.1	47.5	8.04E-02	0.07	No	Yes	
CRC 208	Yes		350	352.4	58.2	358.4	50.3	5.48E-02	0.18	No	Yes	
CRC 209	Yes		380 410	349.1 341.3	56.4	355.2 348.2	48.7	4.35E-02	0.03 0.10	No No	Yes	
CRC 211.3	Yes Yes		410 450	341.3 4.0	54.2 66.2	340.2 9.0	47.2 57.6	4.01E-02 3.31E-02	0.10	No No	Yes Yes	
CRC 213	Yes		450 450	352.3	64.0	-0.4	56.0	3.28E-02	0.10	No	Yes	
CRC 220	Yes			0.0	0.0	0.0	0.0	0.00E+00	0.00	No	No	
CRC 224	Yes			*******					******			
CRC 225	Yes							. –				
CRC 227	Yes											
CRC 229	Yes											
CRC 231.2	Yes											
CRC 233.1	Yes											
CRC 233.2	Yes											
CRC 234	Yes 📃											
CRC 236.1	Yes											
CRC 237	Yes											
CRC 238.1	Yes Yes											
CRC 238.2	Yes											
CRC 239.2	Yes											
CRC 240.2	Yes											
CRC 240	Yes 🗸											
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Figure 9 Notice that the Active status of Sample CRC 203.2 is changed to *No*. By the same procedure, you can activate this sample again.

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<u>File E</u> dit	Zijderveld <u>S</u>	tereoPlot <u>E</u> QA	AreaPlot	<u>L</u> eastSq	uare <u>A</u> ll <u>T</u> o	olbox <u>H</u> elp	þ						
(D	e)activate R	lecord	Sele	ct/Rem	nove Points	for Z-/S-/ I	EQ-Plot	Selec	∜Remo∨e Poir	nts for Lee	ist Square A	nslysis	
🗌 Sa	mple	Active 🔨	St.	eps	GDec	GInc	TDec	TInc	Intensity	Error	LSquare	Plot	
CRC	201	Yes 📄	🗆 NRM	0	350.7	54.6	356.3	46.8	3.21E-01	0.03	No	Yes	
CRC	203.1	Yes	TT 🗌	150	350.8	55.3	356.4	47.5	2.13E-01	0.01	No	Yes	
CRC	203.2	Yes	TT 🗌	200	-1.1	58.6	3.7	50.3	1.77E-01	0.02	No	Yes	
CRC	204	Yes	🗆 TT	250	349.8	55.9	355.8	48.1	1.15E-01	0.09	Yes	Yes	
CRC	206.1	Yes		290	347.0	57.1	353.7	49.5	1.02E-01	0.05	Yes	Yes	
	206.2	Yes		320	352.7	55.5	358.1	47.5	8.04E-02	0.07	Yes	Yes	
	208	Yes		350	352.4	58.2	358.4	50.3	5.48E-02	0.18	Yes	Yes	
	209	Yes		380	349.1	56.4	355.2	48.7	4.35E-02	0.03	Yes	Yes	
	211.3	Yes		410	341.3	54.2	348.2	47.2	4.01E-02	0.10	Yes	Yes	
	213	Yes		450	4.0	66.2	9.0	57.6	3.31E-02	0.17	No.	Yes	
	218	Yes		450	352.3	64.0	-0.4	56.0	3.28E-02	0.10	Yes	Yes	
	220	Yes	ORG	0	0.0	0.0	0.0	0.0 RC 203	0.00E+00	0.00	Yes	No	
CRC	22 4 225	Yes		**	*******				.2 ** lysis=====	******	******		
	225	Yes Yes	☑ ☑ La	bel	GDec	GInc	ast Squa TDec	TInc	Intensity		#Points	Tied	
	229	Yes	V La	Dei	349.39	56.56	355.56	48.80	6.69E-02	2.18	#FOINTS	Yes	
	231.2	Yes	• N		347.37	30.30	333.30	40.00	0.076-02	2.10		163	
	233.1	Yes											
	233.2	Yes											
	234	Yes											
CRC	236.1	Yes											
CRC	237	Yes											
CRC	238.1	Yes											
CRC	238.2	Yes											
CRC	239.1	Yes											
CRC	239.2	Yes											
CRC	240.2	Yes											
CRC	240	Yes ⊻											

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Label	GDec	GInc	TDec	TInc	Intensity	Error	#Points	Tied
N	349.39	56.56	355.56	48.80	6.69E-02	2.18	7	Yes

Figure 11 Under the Zijderveld menu, you can select Geographic or Tilt-Corrected data for Zijderveld projection. You can also designate a plane for projection. The default setting is projection onto the north plane (0 degree). If you want to see the true inclination angle, you can set the Projection Plane to -2 (No projection), and the angle between the horizontal and the line connecting the point and the origin is the true inclination. The Modified Z-Plot option is for plotting the North in a conventional way, i.e., the Up direction. Note that in the Zijderveld projection, the North direction is projected to the right, i.e., the conventional East direction.

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File Ed	t Zijderveld	StereoPlot E	QAr	eaPlot I	leastSq	uare All To	olbox Help	b						
	De)activate	Geographic Tilt-Correcte		Selec	Select	(∕Remo∨e Poi	nts for Lea	st Square A	nslysis					
	Gample	Active 🗸		🗌 Ste	eps	GDec	GInc	TDec	1	TInc	Intensity	Error	LSquare	Plot
	201	Yes	1	🗆 NRM	0	350.7	54.6	356.3	4	46.8	3.21E-01	0.03	No	Yes
		Yes		🗆 TT	150	350.8	55.3	356.4		47.5	2.13E-01	0.01	No	Yes
		Yes		🗌 TT	200	-1.1	58.6	3.7		50.3	1.77E-01	0.02	No	Yes
		Yes		🗌 TT	250	349.8	55.9	355.8		48.1	1.15E-01	0.09	Yes	Yes
		Yes		🗆 TT	290	347.0	57.1	353.7		49.5	1.02E-01	0.05	Yes	Yes
		Yes		🗆 TT	320	352.7	55.5	358.1		47.5	8.04E-02	0.07	Yes	Yes
		Yes		🗆 TT	350	352.4	58.2	358.4		50.3	5.48E-02	0.18	Yes	Yes
		Yes		🗆 TT	380	349.1	56.4	355.2		48.7	4.35E-02	0.03	Yes	Yes
		Yes		🗆 TT	410	341.3	54.2	348.2		47.2	4.01E-02	0.10	Yes	Yes
		Yes		🗆 TT	450	4.0	66.2	9.0		57.6	3.31E-02	0.17	No	Yes
		Yes		🗆 TT	450	352.3	64.0	-0.4	Ĺ	56.0	3.28E-02	0.10	Yes	Yes
		Yes		ORG	0	0.0	0.0	0.0		0.0	0.00E+00	0.00	Yes	No
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Figure 12 In the <u>S</u>tereoPlot menu, you can select either Geographic or Tilt-Corrected data to perform equal-angle stereographic projection for the selected sample.

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File Edit	Zijderveld	StereoPlot	EQA	reaPlot	LeastSo	quare All To	olbox Help	b					
([)e)activate	Record		eographic ilt-Correct		nove Points	for Z-/S-/	EQ-Plot	Sel	ect/Remove Poi	nts for Lee	ast Square A	nslysis
Sa Sa	ample	Active	~	🗆 Ste	eps	GDec	GInc	TDec	TIn	c Intensity	Error	LSquare	Plot
	201	Yes	H	NRM	Î O	350.7	54.6	356.3	46.		0.03	No	Yes
CRC	203.1	Yes		🗆 TT	150	350.8	55.3	356.4	47.	5 2.13E-01	0.01	No	Yes
CRC	203.2	Yes		🗆 TT	200	-1.1	58.6	3.7	50.	3 1.77E-01	0.02	No	Yes
CRC	204	Yes		🗆 TT	250	349.8	55.9	355.8	48.	1 1.15E-01	0.09	Yes	Yes
CRC	206.1	Yes		🗆 TT	290	347.0	57.1	353.7	49.		0.05	Yes	Yes
CRC	206.2	Yes		🗆 TT	320	352.7	55.5	358.1	47.		0.07	Yes	Yes
CRC	208	Yes		🗆 TT	350	352.4	58.2	358.4	50.		0.18	Yes	Yes
CRC	209	Yes		🗆 TT	380	349.1	56.4	355.2	48.		0.03	Yes	Yes
CRC	211.3	Yes		🗆 TT	410	341.3	54.2	348.2	47.		0.10	Yes	Yes
CRC	213	Yes		🗆 TT	450	4.0	66.2	9.0	57.		0.17	No	Yes
CRC	218	Yes		🗆 TT	450	352.3	64.0	-0.4	56.		0.10	Yes	Yes
CRC	220	Yes		ORG	0	0.0	0.0	0.0	0.		0.00	Yes	No
	224	Yes			*1	******					******	*****	
	225	Yes		!						halysis=====			
	227	Yes		🖌 Lal	bel	GDec	GInc	TDec	TIn			#Points	Tied
	229	Yes		✓ N		349.39	56.56	355.56	48.8) 6.69E-02	2.18	7	Yes
	231.2	Yes											
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	240	Yes	~										
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Figure 13 In the <u>EQAreaPlot menu</u>, you can select either Geographic or Tilt-Corrected data to perform Lambert equal-area projection for the selected sample.

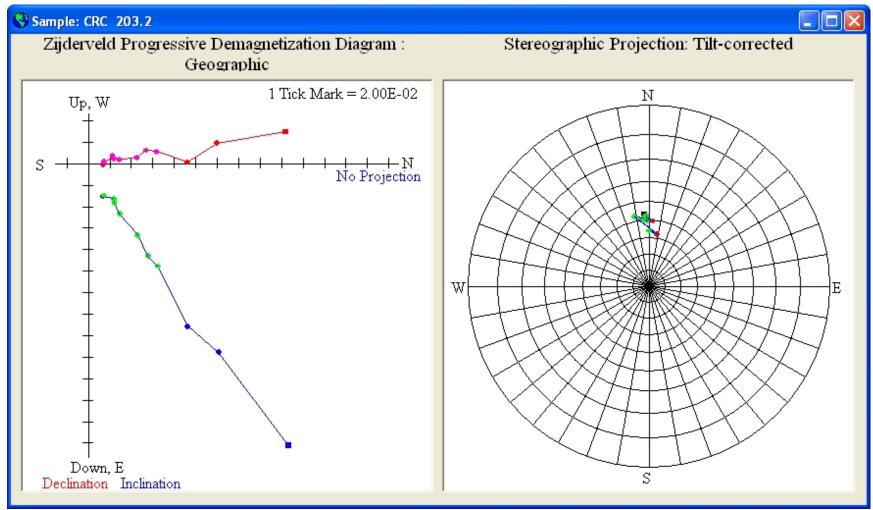


Figure 14-1 This window show the Zijderveld plot using Geographic data in the left window, and the Lambert Equal-Area Projection using Tilt-corrected data in the right window for the sample CRC 203.2. You can have any combination of display. And now you can freely resize this window to fit your need (see Figure 14-2 on next page).

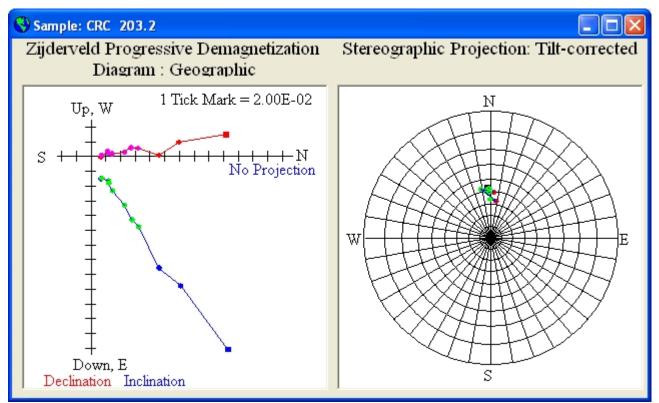


Figure 14-2 The same output window as in Figure 14-1 after resizing.

😵 P	aleom	agnetic	Analysis - c	:\CI	hunfu Z	hang\\	/B6Program	ns\Paleon	nagV4.0\Ma	gnetoS	tratLab\CrcOgg	.mag		
File	Edit	Zijderveld	StereoPlot	EQA	reaPlot	LeastSq	uare All To	olbox Hel	p					
	(De)activate	Record		Sele		: Square Analy ay All Results	/sis S-/	EQ-Plot	Sele	ct/Remove Poi	nts for Lee	ast Square A	nslysis
	San	ple	Active	~	Ste	eps	GDec	GInc	TDec	TInc	Intensity	Error	LSquare	Plot
	CRC	201	Yes		NRM	- O	350.7	54.6	356.3	46.8	3.21E-01	0.03	No	Yes
	CRC	203.1	Yes		🗆 TT	150	350.8	55.3	356.4	47.5	2.13E-01	0.01	No	Yes
	CRC	203.2	Yes		🗆 TT	200	-1.1	58.6	3.7	50.3	1.77E-01	0.02	No	Yes
	CRC	204	Yes		🗆 TT	250	349.8	55.9	355.8	48.1	1.15E-01	0.09	Yes	Yes
	CRC	206.1	Yes		🗆 TT	290	347.0	57.1	353.7	49.5	1.02E-01	0.05	Yes	Yes
	CRC	206.2	Yes		🗆 TT	320	352.7	55.5	358.1	47.5	8.04E-02	0.07	Yes	Yes
	CRC	208	Yes		🗆 TT	350	352.4	58.2	358.4	50.3	5.48E-02	0.18	Yes	Yes
	CRC	209	Yes		🗆 TT	380	349.1	56.4	355.2	48.7	4.35E-02	0.03	Yes	Yes
	CRC	211.3	Yes			410	341.3	54.2	348.2	47.2	4.01E-02	0.10	Yes	Yes
	CRC	213	Yes			450	4.0	66.2	9.0	57.6	3.31E-02	0.17	No	Yes
	CRC	218	Yes			450	352.3	64.0	-0.4	56.0	3.28E-02	0.10	Yes	Yes
	CRC	220	Yes		ORG	0	0.0	0.0	0.0	0.0	0.00E+00	0.00	Yes	No
	CRC	224	Yes			**			ample: CF			******	*****	
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	CRC	229	Yes		✓ Lal ✓ N	Del	GDec 349.39	GInc 56.56	TDec 355.56	TInc 48.80	Intensity 6.69E-02	2.18	#Points 7	Tied Yes
	CRC	231.2	Yes Yes				347.37	30.30	300.00	40.00	0.076-02	2.10	· · · · ·	res
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	CRC	237	Yes											
	CRC	238.1	Yes											
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	CRC	239.1	Yes											
	CRC	239.2	Yes											
	CRC	240.2	Yes											
	CRC	240	Yes	~										
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Figure 15 Under the LeastSquare menu, you can perform Least Square Analysis for a sample by first check-marking the data points you want and then click the Select/Remove Points for Least Square Analysis command button.

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$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	TDec TInc Intensity Error #Points 20.56 58.49 2.74E-02 2.68 4 22.49 64.37 8.04E-02 2.38 3 355.56 48.80 6.69E-02 2.18 7 84.40 38.39 8.36E-03 3.74 2 223.80 -35.40 8.26E-03 0.00 1 209.00 10.70 4.94E-03 0.00 1 170.74 -15.26 6.36E-03 6.54 2 213.85 -75.37 9.07E-03 26.86 4 199.56 -49.56 2.36E-02 13.84 5 186.01 -44.59 2.79E-02 5.47 4 358.73 60.34 2.04E-02 11.17 5 189.30 -33.19 9.38E-03 10.00 2 207.45 -60.31 5.70E-02 3.29 2 3.54 60.46 3.21E-02 11.96 5 10.90 47.13 9.20E-02 3.81 4 1.17 58.42 5.52E-02 6.30 5 30.14 66.24 9.50E-03 11.38 6 7.73 38.33 2.05E-01 2.85 4 190.10 -49.65 1.03E-02 4.60 3 164.65 -17.06 1.12E-02 9.28 2 188.03 -57.36 2.66E-02 10.61 7 150.31 -55.98 9.15E-03 10.78 2 19.13 56.68 2.05E-02 5.35 10 0.07 43.43 4.81E-02 1.78 7 357.86 48.91 4.42E-02 4.81 6 11.94 51.31 4.18E-02 3.60 4 38.94 36.38 2.12E-02 5.70 7 1.38 69.49 8.69E-03 5.06 3 11.07 64.42 9.52E-03 5.61 6

Figure 16 After clicking the LeastSquare>Display All Results menu, this window pops up displaying all the Least Square Analysis results in the file and the (AF) Temperature Steps Used in Least Square Analysis (Figure 17). You can copy and paste selected contents to another application such as MS Word.

<u> (1</u>	east	Sau	iares i	Inal	veie I	20cml	te
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V Least Squares Analysis Results		
Edit		
CRC 254 55.60 R 168.36 -54.85 174.33 -47.24 7.84E-02 3.14	3	~
CRC 257 58.00 R 190.06 -53.37 192.28 -44.56 1.19E-02 12.30	3	_
CRC 260 59.60 RP 183.79 -60.47 187.92 -51.91 2.08E-02 1.34	2	
******** (AF) Temperature Steps Used in Least Square Analysis ******** CRC 201 280 320 320 350 Org Tied		
CRC 203.1 250 330 400 Org Tied		
CRC 203.2 250 290 320 350 380 410 450 Org Tied		
CRC 204 350 350 Org Tied		
CRC 206.1 400 Org Tied		
CRC 206.2 390 Org Tied		
CRC 208 360 360 Org Tied		
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CRC 211.3 350 350 390 390 390 Org Tied		
CRC 213 380 410 410 450 Org Tied		
CRC 218 280 320 320 350 350 Org Tied CRC 220 390 390 Org Tied		
CRC 220 390 390 Org Tied CRC 224 400 400 Org Tied		
CRC 225 320 350 390 390 Org Tied		
CRC 227 280 320 350 390 Org Tied		
CRC 229 280 320 350 390 Org Tied		
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CRC 240.2 250 280 310 330 400 400 425 Org Tied		~

Figure 17 The lower half of the Least Square Analysis Results window, showing the (AF) Temperature Steps Used in Least Square Analysis.

(😵 Paleomagnetic Analysis - c:\Chunfu Zhang\VB6Programs\PaleomagV4.0\MagnetoStratLab\CrcOgg.mag 🛛 🔲 🔲 🔀													
File	Edit	Zijderveld	StereoPlot	EQA	reaPlot	LeastSq	uare All To	olbox Help						
	(D	e)activate	Record		Sele	:t/Rem		reo Plot All er statistics		Square	e Poir	nts for Lea	ist Square A	nslysis
	Sat	mple	Active	~	Ste	eps	GDec	GInc		ating Field	sity	Error	LSquare	Plot
	CRC	201	Yes		NRM	- O	350.7	54.6	(Arbitr	ary Temper	ature 3-01	0.03	No	Yes
	CRC	203.1	Yes		🗆 TT	150	350.8	55.3	356.4	47.5	2.13E-01	0.01	No	Yes
	CRC	203.2	Yes		🗆 TT	200	-1.1	58.6	3.7	50.3	1.77E-01	0.02	No	Yes
	CRC	204	Yes		🗆 TT	250	349.8	55.9	355.8	48.1	1.15E-01	0.09	Yes	Yes
	CRC	206.1	Yes		🗆 TT	290	347.0	57.1	353.7	49.5	1.02E-01	0.05	Yes	Yes
	CRC	206.2	Yes		🗆 TT	320	352.7	55.5	358.1	47.5	8.04E-02	0.07	Yes	Yes
	CRC	208	Yes		🗆 TT	350	352.4	58.2	358.4	50.3	5.48E-02	0.18	Yes	Yes
	CRC	209	Yes			380	349.1	56.4	355.2	48.7	4.35E-02	0.03	Yes	Yes
	CRC	211.3	Yes			410	341.3	54.2	348.2	47.2	4.01E-02	0.10	Yes	Yes
	CRC	213	Yes			450	4.0	66.2	9.0	57.6	3.31E-02	0.17	No	Yes
	CRC	218	Yes			450	352.3	64.0	-0.4	56.0	3.28E-02	0.10	Yes	Yes
	CRC	220	Yes		ORG	0	0.0	0.0	0.0	0.0	0.00E+00	0.00	Yes	No
	CRC	224	Yes			**	******					******	*****	
	CRC CRC	225 227	Yes		🗹 🔽 Lal	- 1	GDec	GInc		are ana. TInc	lysis=====		#D_i	T:
	CRC	229	Yes			Del	349.39	56.56	TDec 355.56	48.80	Intensity 6.69E-02	2.18	#Points 7	Tied
	CRC	229	Yes Yes		✓ N		347.37	30.30	300.00	40.00	0.076-02	2.10	· · · · ·	Yes
	CRC	233.1	Yes											
	CRC	233.2	Yes											
	CRC	234	Yes											
	CRC	236.1	Yes	-										
	CRC	237	Yes											
	CRC	238.1	Yes											
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	CRC	239.1	Yes											
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Figure 18 Under the <u>All>StereoPlot All menu</u>, you can select NRM Data or Least Square or Alternating Field or Arbitrary Temperature data to perform any type of plot for all samples (default: Tilt-corrected data, Lambert Equal-Area Projection).

۲	Paleor	nagnetic	Analysis - d	:: \ CI	hunfu Z	hang\\	/B6Program	ns\Paleon	nagV4.0\M	agnetoStr	atLab\CrcOgg	.mag			
File	Edit	Zijderveld	StereoPlot	EQA	reaPlot	LeastSq	uare All To	oolbox Helj	p						
	Stereo Plot All Image: S														
	Sat	mple	Active	~	Ste	eps	GDec	GInc			sity	Error	LSquare	Plot	
	CRC	201	Yes		🗆 NRM	0	350.7	54.6		hating Field	E-01	0.03	No	Yes	
	CRC	203.1	Yes		🗆 TT	150	350.8	55.3		ary Temper		0.01	No	Yes	
	CRC	203.2	Yes		🗆 TT	200	-1.1	58.6	3.7	50.3	1.77Ē-01	0.02	No	Yes	
	CRC	204	Yes		🗆 TT	250	349.8	55.9	355.8	48.1	1.15E-01	0.09	Yes	Yes	
	CRC	206.1	Yes			290	347.0	57.1	353.7	49.5	1.02E-01	0.05	Yes	Yes	
	CRC	206.2	Yes			320	352.7	55.5	358.1	47.5	8.04E-02	0.07	Yes	Yes	
	CRC	208	Yes			350	352.4	58.2	358.4	50.3	5.48E-02	0.18	Yes	Yes	
	CRC	209	Yes			380	349.1	56.4	355.2	48.7	4.35E-02	0.03	Yes	Yes	
	CRC	211.3	Yes			410	341.3	54.2	348.2	47.2	4.01E-02	0.10	Yes	Yes	
	CRC	213	Yes			450	4.0	66.2	9.0	57.6	3.31E-02	0.17	No	Yes	
	CRC	218	Yes			450	352.3	64.0	-0.4	56.0	3.28E-02	0.10	Yes	Yes	
	CRC CRC	220 224	Yes		ORG	0	0.0 *******	0.0	0.0	0.0 RC 203	0.00E+00	0.00 ******	Yes	No	
	CRC	224	Yes Yes		V	**					.2 ** lysis======		*****		
	CRC	227	Yes		🗸 Lal	he 1	GDec	GInc	TDec	TInc		Error	#Points	Tied	
	CRC	229	Yes		V N	001	349.39	56.56	355.56	48.80	6.69E-02	2.18	7	Yes	
	CRC	231.2	Yes				017.07		000.00	10.00	0.072 02	2.20	· · · · ·		
	CRC	233.1	Yes												
	CRC	233.2	Yes												
	CRC	234	Yes												
	CRC	236.1	Yes	_											
	CRC	237	Yes												
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	CRC	240.2	Yes												
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Figure 19 Under the <u>All>F</u>isher Statistics menu, you can select NRM or Least Square or Alternating Field or Arbitrary Temperature data to perform Fisher Analysis for all suitable samples. Change Active or Plot setting to remove data for Fisher Analysis.

🔇 Paleon	nagnetic Anal	ysis - c:\C	Chunfu Z	hang\V	/B6Program	ns\Paleon	agV4.0\Ma	agnetoStr	atLab\CrcOgg	.mag					
File Edit	Zijderveld Ster	eoPlot EQ	AreaPlot	LeastSq	uare All T	oolbox Help	D								
(D	(De)activate Record Select/Remove Point Coordinate Conversion Latitude Calculation Select/Remove Points for Least Square Anslysis														
Sa:	mple Ad	ctive 👗	□ St	eps	GDec	Points Proje	ection	Inc	Intensity	Error	LSquare	Plot			
CRC	201	Yes	NRM		350.7	54.6	356.3	46.8	3.21E-01	0.03	No	Yes			
CRC	203.1	Yes	TT 🗌	150	350.8	55.3	356.4	47.5	2.13E-01	0.01	No	Yes			
CRC	203.2	Yes	🗆 TT	200	-1.1	58.6	3.7	50.3	1.77E-01	0.02	No	Yes			
CRC	204	Yes	🗆 TT	250	349.8	55.9	355.8	48.1	1.15E-01	0.09	Yes	Yes			
CRC	206.1	Yes	TT 🗌	290	347.0	57.1	353.7	49.5	1.02E-01	0.05	Yes	Yes			
CRC	206.2	Yes	🗆 TT	320	352.7	55.5	358.1	47.5	8.04E-02	0.07	Yes	Yes			
CRC	208	Yes	🗆 TT	350	352.4	58.2	358.4	50.3	5.48E-02	0.18	Yes	Yes			
CRC	209	Yes	🗆 TT	380	349.1	56.4	355.2	48.7	4.35E-02	0.03	Yes	Yes			
CRC	211.3	Yes	TT 🗌	410	341.3	54.2	348.2	47.2	4.01E-02	0.10	Yes	Yes			
CRC	213	Yes		450	4.0	66.2	9.0	57.6	3.31E-02	0.17	No	Yes			
	218	Yes		450	352.3	64.0	-0.4	56.0	3.28E-02	0.10	Yes	Yes			
	220	Yes	ORG		0.0	0.0	0.0	0.0	0.00E+00	0.00	Yes	No			
	224	Yes		**			ample: CH			******	*****				
	225	Yes		L _ 1					lysis=====		#D	T:			
CRC	227 229	Yes	✓ La	bel	GDec 349.39	GInc 56.56	TDec 355.56	TInc 48.80	Intensity 6.69E-02	Error 2.18	#Points 7	Tied			
	231.2	Yes Yes	N N		347.37	30.30	355.50	40.00	0.076-02	2.10	· · · · ·	Yes			
	233.1	Yes													
	233.2	Yes													
	234	Yes													
	236.1	Yes													
	237	Yes													
CRC	238.1	Yes													
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CRC	239.1	Yes													
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CRC	240.2	Yes													
CRC	240	Yes 💌													

Fig. 20 Added toolboxes in *Paleomagnetic Analysis Program V4.0* as compare to the previous versions. The menu commands \underline{T} oolbox > \underline{C} oordinate Conversion or \underline{T} oolbox > \underline{L} atitude Calculation all bring up the screen shown in Figure 21. The menu command \underline{T} oolbox > \underline{P} oints Projection will bring up the screen shown in Figure 22.

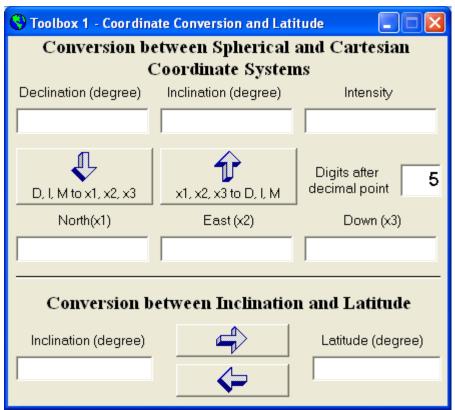


Fig. 21 Diagram showing the first toolbox which has the functions of coordinate conversion and latitude calculation.

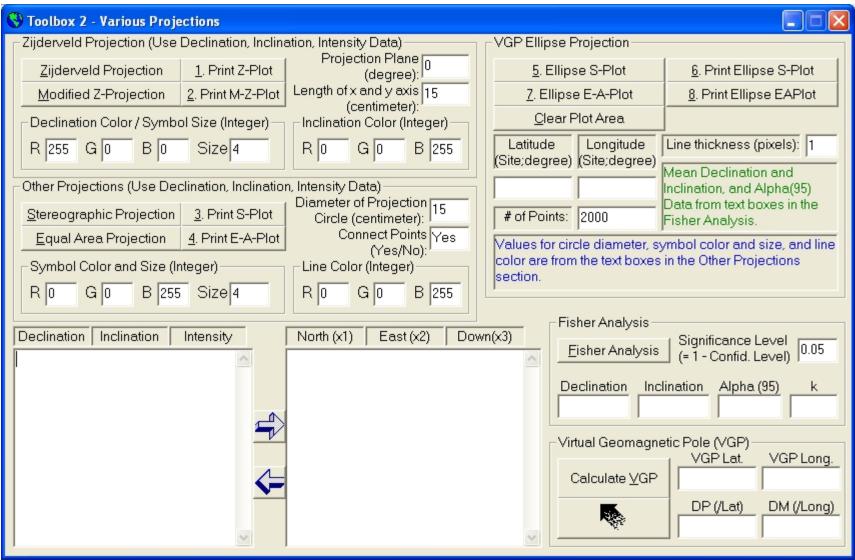


Fig. 22 Diagram showing toolbox 2. You can type or copy and paste data in the textboxes, then use the left or right arrow to convert the data. You can also change the settings for the symbol size and color, line color. This toolbox provides all the functions in the main program except the least squares analysis, but it has some added capacity of its own: projection of the VGP ellipse which can be added to the original data, and can also add the a circle around the mean direction of the samples.

🔇 Paleor	nagnetic A	alysis - c:V	Chunf	u Zhang	WB6Progra	ms\Paleor	nagV4.0\M	agnetoStr	ratLab\CrcOgg	.mag					
File Edit	Zijderveld	StereoPlot EQ	AreaPlo	t LeastS	iquare All T	oolbox He	lp								
(D	Main Features F1 (De)activate Record Select/Remove Points for Z ₇ About Paleomagnetic Analysis Program F2 or Least Square Analysis Sample Active A Steps GDec GInc TDec TInc Intensity Error LSquare Plot														
🗌 Sa	mple	Active 🔥		Steps	GDec	GInc	TDec	TInc	Intensity	Error	LSquare	Plot			
CRC	201	Yes		RM 0	350.7	54.6	356.3	46.8	3.21E-01	0.03	No	Yes			
CRC	203.1	Yes		T 150		55.3	356.4	47.5	2.13E-01	0.01	No	Yes			
CRC	203.2	Yes		T 200		58.6	3.7	50.3	1.77E-01	0.02	No	Yes			
CRC	204	Yes		T 250		55.9	355.8	48.1	1.15E-01	0.09	Yes	Yes			
CRC	206.1	Yes	🗆 T			57.1	353.7	49.5	1.02E-01	0.05	Yes	Yes			
CRC 🗌	206.2	Yes	🗆 T			55.5	358.1	47.5	8.04E-02	0.07	Yes	Yes			
CRC	208	Yes		T 350		58.2	358.4	50.3	5.48E-02	0.18	Yes	Yes			
CRC	209	Yes		T 380		56.4	355.2	48.7	4.35E-02	0.03	Yes	Yes			
	211.3	Yes				54.2	348.2	47.2	4.01E-02	0.10	Yes	Yes			
	213	Yes				66.2	9.0	57.6	3.31E-02	0.17	No	Yes			
	218	Yes		T 450		64.0	-0.4	56.0	3.28E-02	0.10	Yes	Yes			
	220	Yes		RG 0		0.0	0.0	0.0	0.00E+00	0.00	Yes	No			
	224	Yes		*	*******					******	*****				
	225 227	Yes	~	Label	GDec	GInc			lysis=====		#D-i-+-	Tind			
	229	Yes Yes			349.39	56.56	TDec 355.56	TInc 48.80	Intensity 6.69E-02	Error 2.18	#Points 7	Tied Yes			
	231.2	Yes			347.37	30.30	300.00	40.00	0.076-02	2.10	/	res			
	231.2	Yes													
	233.1	Yes													
	233.2	Yes													
	236.1	Yes													
	237	Yes													
	238.1	Yes													
	238.2	Yes													
CRC	239.1	Yes													
CRC	239.2	Yes													
CRC	240.2	Yes													
CRC	240	Yes 🔽													

Figure 23 Under the <u>H</u>elp menu, you can learn about the main features of this Paleomagnetic Analysis Program by selecting the <u>H</u>elp><u>M</u>ain Features menu (or press the F1 key) (Figure 21).

S Paleomagnetic Analysis Program - Help

Paleomagnetic Analysis Program - Help	
Edit	
Copy CtHCMain Features At a Glance1. Convert the following files to *.mag files that the program can u (1) Fixed length files: *.app (2) Tab-delimited files: *.tab (3) Comma-delimited files: *.tab (4) Text Files (space-delimited): *.txt Each file can contain up to 500 samples, and each sample can have to 50 demagnetization steps.2. View the sample list and data of selected sample simultaneously.3. Zijderveld projection of selected sample.4. Stereographic projection of a selected sample or all samples.5. Lambert equal-area projection of a selected sample or all samples.6. Least square analysis using the selected demagnetization steps.7. Fisher analysis using selected data set of selected samples.8. Print Zijderveld-, stereographic-, and equal-area projection of a selected sample. And print stereographic- and equal-area projection of all samples.	e up s.
I. Accepted File Formats 1. Fixed length files: *.app Sample file: CRA.app CRA Crussol A 44.9 4.8 -1.3 60.7 291 27 1 CRA 101 -9.50 199.7 21.0 8.0 16.7 15 16 2 CRA 101 NRM 0 318.0 80.8 344.8 75.0 2.71E-2 0.08 3 CRA 101 TT 250 42.3 67.8 36.0 60.4 9.60E-3 0.35 4 CRA 101 TT 250 16.9 70.3 16.8 62.3 9.74E-3 0.31 5 CRA 101 TT 300 12.3 76.8 13.9 68.8 4.14E-3 0.41 6 CRA 101 TT 300 173.6 61.6 165.7 68.7 3.67E-3 0.28 7 CRA 101 TT 350 188.8 20.4 188.3 28.3 3.11E-3 0.44 8 CRA 101 TT 350 179.6 29.5 178.0 37.1 2.71E-3 0.44 9 CRA 101 TT 390 181.7 36.1 179.8 43.8 3.07E-3 0.13 10 CRA 101 TT 390 164.8 30.5 161.8 37.2 3.19E-3 0.31 11	

Figure 24 The Help window for the Paleomagnetic Analysis Program. You can use the Edit>Copy menu (or press Ctrl + C) to copy the selected content and paste it to another application such as MS Word.

😪 About Paleomagnetic Analysis Program	<
Paleomagnetic Analysis Program Version: 4.0 March 2002 Designed by: Chunfu ZHANG	
For more information, please contact: Chunfu Zhang (or Dr. James G. Ogg) Dept. of Earth and Atmospheric Sciences Purdue University, West Lafayette IN 47907-1397, USA E-mail: czhang6@purdue.edu (or jogg@purdue.edu)	
Revision history of previous Paleomag.exe program:Version 3.3Nov. 2001, by Chunfu ZhangVersion 3.2Dec. 2000, by Chunfu ZhangVersion 3.1Oct. 2000, by Chunfu ZhangVersion 3.0Aug. 2000, by Chunfu ZhangVersion 2.10Jul. 1990, by Rhon HasenyagerVersion 2.00Oct. 1989, by Rhon HasenyagerVersion 1.20Sep. 1989, by Jim OggVersion 1.10Aug. 1989, by KMCVersion 1.00Jun. 1989, Original Programby Russell Schwab (Purdue EAS undergrad)	

Figure 25 By selecting the <u>Help>A</u>bout Paleomagnetic Analysis Program (or press the F2 key, this window pops up, showing the information about the version, the author, contact information, and the revision history of this program. The previous programs (up to Version 2.10) were written in Quick Basic language. Version 3.0 is produced by completely rewriting the whole program in Microsoft Visual Basic 6.0. Some functionalities are added to this new Paleomagnetic Analysis Program, such as converting *.tab, *.cma, and *.txt files, the <u>Edit>Copy</u> menu for copying and pasting selected contents to another application, and the <u>Help</u> menu. Some bugs in the previous version have also been fixed. Version 3.1 made resizing the Zijderveld and Stereographic Projection window possible, used a different color for data used in Least Square Analysis, and added a verification procedure when converting a file to prevent losing your work if you have converted the same file and worked on it before. This Version 3.2 added some error handling instructions to make the program even more robust, made copying multiple lines of data in the main window possible, and slightly improved the appearance of the Zijderveld and Stereographic Projection window after resizing.