



# COMPASS – Location

Interactive Weak and Strong Motion Data Processing Software

Rev 2008.11.19 Document Rev C

2011.02.22

**This COMPASS manual provides instructions how to use the location menu to perform earthquake locations (hypocenter and energy parameters) and create reports.**



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## **COMPASS – Location**

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### **Revision History:**

<b>Revision</b>	<b>Date</b>	<b>Reason for change</b>	<b>Pages</b>
C	2008.12.30	New Version 2008Nov19	All
B	2008.07.08	Updated for COMPASS	All
A	2007.05.05	Update for REF TEK SM	All
0.1	2007.02.23	Initial Draft	All

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## Notation Conventions

The following notation conventions are used throughout REF TEK documentation:

Notation	Description
ASCII	Indicates the entry conforms to the American Standard Code for Information Interchange definition of character (text) information.
Binary	Indicates the entry is a raw, numeric value.
Hex	Indicates hexadecimal notation. This is used with both ASCII characters (0 – 9, A – F) and numeric values.
BCD	Indicates the entry is a numeric value where each four bits represents a decimal digit.
FPn	Indicates the entry is the ASCII representation of a floating-point number with n places following the decimal point.
<n>	Indicates a single 8-bit byte. When the contents are numeric, it indicates a hexadecimal numeric value; i.e. <84> represents hexadecimal 84 (132 decimal). When the contents are capital letters, it represents a named ASCII control character; i.e. <SP> represents a space character, <CR> represents a carriage return character and <LF> represents a line feed character.
MSB	Most Significant Byte of a multi-byte value.
MSbit	Most Significant Bit of a binary number.
LSB	Least Significant Byte of a multi-byte value.
LSbit	Least Significant Bit (bit 0) of a binary number.
YYYY	Year as a 4-digit number
DDD	Day of year
HH	Hour of day in 24-hour format
MM	Minutes of hour
SS	Seconds of minute
TTT	Thousandths of a second (milliseconds)
IIII	Unit ID number

n, nS	nano, nanoSecond; $10^{-9} = 0.000000001$
u, uS	micro, microSecond; $10^{-6} = 0.000001$
m, mS	milli, milliSecond; $10^{-3} = 0.001$
K, KHz	Kilo, KiloHertz; $10^3 = 1,000$
M, MHz	Mega, MegaHertz; $10^6 = 1,000,000$
G, GHz	Giga, GigaHertz; $10^9 = 1,000,000,000$
Kb, KB	Kilobit, KiloByte; $2^{10} = 1,024$
Mb, MB	Megabit, MegaByte; $2^{20} = 1,048,576$
Gb, GB	Gigabit, GigaByte; $2^{30} = 1,073,741,824$

**Related Manuals:**

<b>130-SMA System Documents</b>	<b>Number</b>	<b>PDF file</b>
130-SMA Startup (Command Line)	Doc-SMA-Ops	130SMA_startup.pdf
Data Utilities Users Guide	Doc-Datautils	130_utilities.pdf
<b>130-SMA Command Interface</b>	<b>Number</b>	<b>PDF file</b>
130 Cmd Line - Theory of Operations	Doc-CmdL-Theory	130_CLtheory.pdf
130 Cmd Line - Release Notes	Doc-CmdL-Release	130_CLRN.pdf
130 Cmd Line - Reference	Doc-CmdL-Ref	130_CLcmd.pdf
130 Cmd Line - Recording Format	Doc-CmdL-Record	130_CLrecord.pdf
130-SM GUI Users Guide	Doc-130-SMGui	RT130SM.pdf
<b>Optional Manuals</b>	<b>Number</b>	<b>PDF file</b>
SNDP Installation and Users Guide	SNDP-OP-003	SNDPUser.pdf
SNDP Reference Guide	SNDP-S-002	SNDPRef.pdf
RTCC Command / Control Users Guide	RTCC-S-006	RTCC.pdf
RT_Display Users Guide	RTD-S-007	RTDisplay.pdf
RT_View Users Guide	RTV-S-005	RTView.pdf
RTPMonitor Installation and Users Guide	RTPM-S-008	RTPM.pdf
RTPD Installation and Users Guide	RTPD-OP-005	RTPD.pdf
(part of RTPD manual) RTP Protocol		
<b>Accelerometers</b>		
131A-02/3 3G Triaxial Accelerometer	Doc-131A-03/2	131A023.pdf
131A-02/2 3G Triaxial Accelerometer	Doc-131A-02/2	131A022.pdf
131A-01/3 4G Triaxial Accelerometer	Doc-131B-01/3	131B013.pdf
131B-01/1 4G Unixial Accelerometer	Doc-131B-01/1	131B011.pdf

## **REF TEK      Support and update notifications**

**As a valued user of REF TEK equipment we would like to provide the best support possible by keeping you up to date with our product updates.**

**If you would like to be notified of any REF TEK product updates please spend a couple of minutes to register with the REF TEK customer support team.**

**To register, enter your company information through the Register link on our website at <http://support.reftek.com> .**

**Our support team will send you a unique Username and Password allowing secured access to all product documentation and software sold to your company.**

**Once we register your contact we will only send necessary notifications via email. The same notifications will be shown on our website <http://support.reftek.com> notifications page**

**Thanks,**

**Your REF TEK support team**

## Software Version:

Current software and documentation is available on our web site. Some early units may require hardware modifications to use the latest software. Contact REF TEK if you have any queries on the compatibility of your unit(s) and the current software release.

## About this manual:

This COMPASS Technical Reference manual provides a detailed overview of using the Location menu of the COMPASS software. It covers the following broad operational topics:

Location	REF TEK (SMP)	Help
Hypo Location		h
Predicted TravelTimes		Shift+T
Wadati Test		v
Operator Report		
MSK-85 Report		

- Hypo Location - Determine the earthquakes hypocenter and energy parameters.
- Predicted Travel Times – Check how theoretical travel times table fits the located earthquake.
- Wadati Test Plot – Check the quality of “P” and “S” wave arrivals by linear fit to  $V_p/V_s$ .
- Operator Report – Save all measured and computed information to ASCII.
- MKS-85 Report – Seismic Intensity Scale Report.

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### 8.1 Location menu

The location menu maybe used to perform earthquake locations and create reports.

Location	REF TEK (SMP)	Help
Hypo Location		h
Predicted TravelTimes		Shift+T
Wadati Test		v
Operator Report		
MSK-85 Report		

**Figure 8-1 Location Menu**

## 8.2 Hypo Location

After all necessary arrivals and amplitude measurements are completed use the **Hypo Location** menu to determine the Earthquake hypocenter and energy parameters.

The following are minimum steps to determine hypocenter and magnitude of the event.

1. Mark all 'P' wave arrivals using manual **Pick Time** or automatic **Auto Time** commands.

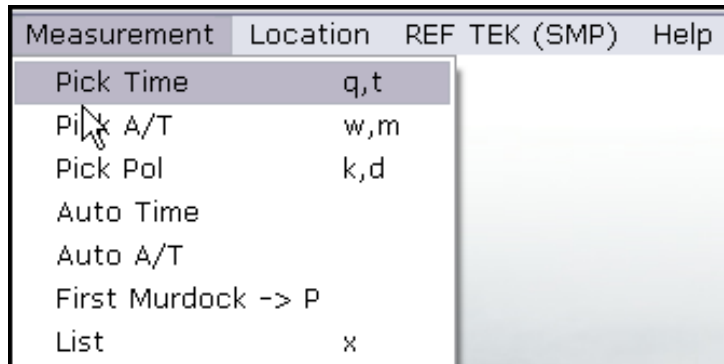


Figure 8-2 Mark P Arrivals

2. Measure all necessary maximum amplitudes using **Pick A/T** or automatic **Auto A/T** commands.

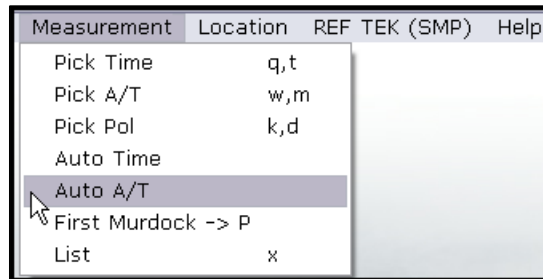


Figure 8-3 Auto A/T

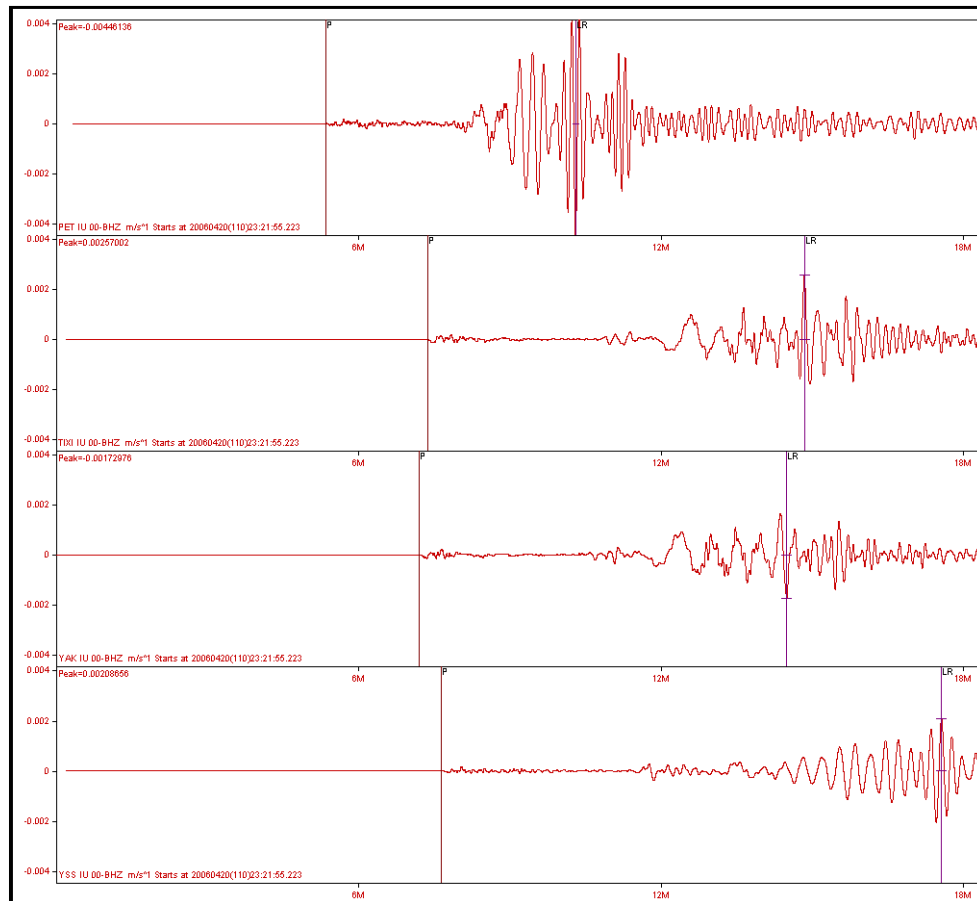
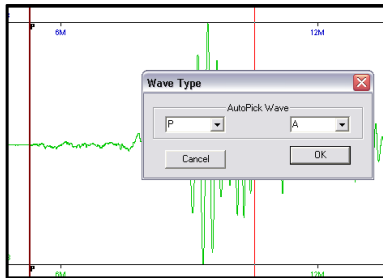


Figure 8-4 Measure Amplitudes

3. Select the **Hypo Location** command from the **Location** menu.

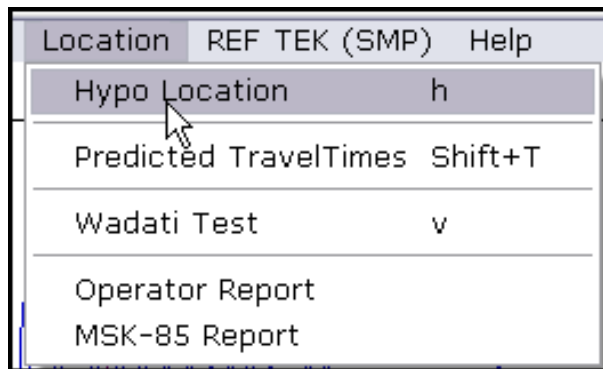


Figure 8-5 Hipo

4. Select the **StartHipo** button to start.

**Note:** Based on the selected Travel Time model the program will try to locate within the depths and epicentral distances from the nearest station to the event.

**Note:** Entering clip limits for distances and depth for the event will increase the quality of the solution. This can be done by:

- [1] Edit Depth Limits and Delta from the first station in degrees.
- [2] Select the Start Hypo button over and over again until a satisfactory solution is received.

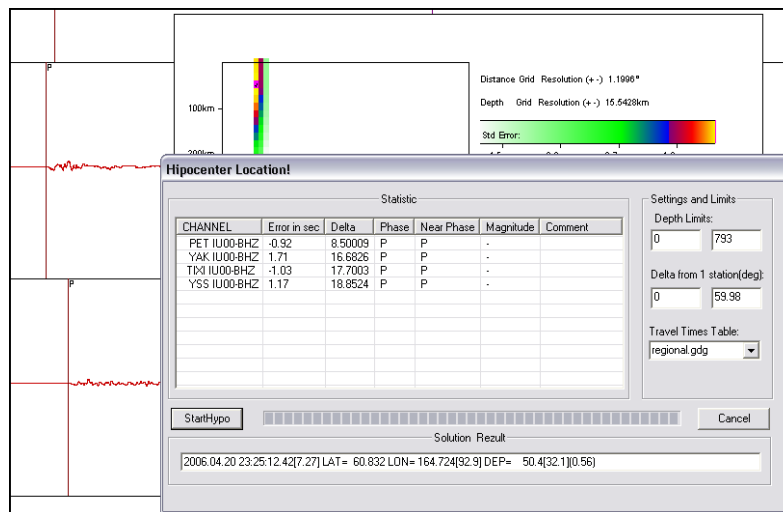


Figure 8-6 Edit settings and Re-apply

5. When done use the **Cancel** button to close the **Hipocenter Location** menu.

6. Select the **Map Plot** command to preview the result on the map.

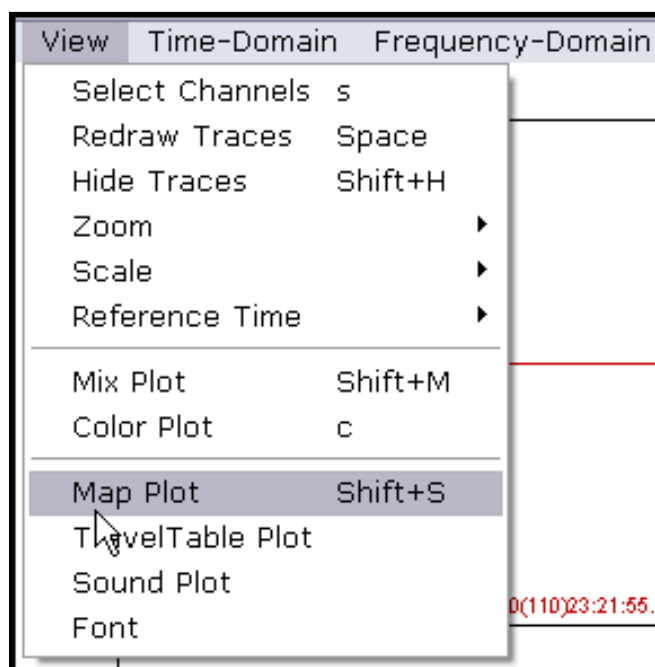
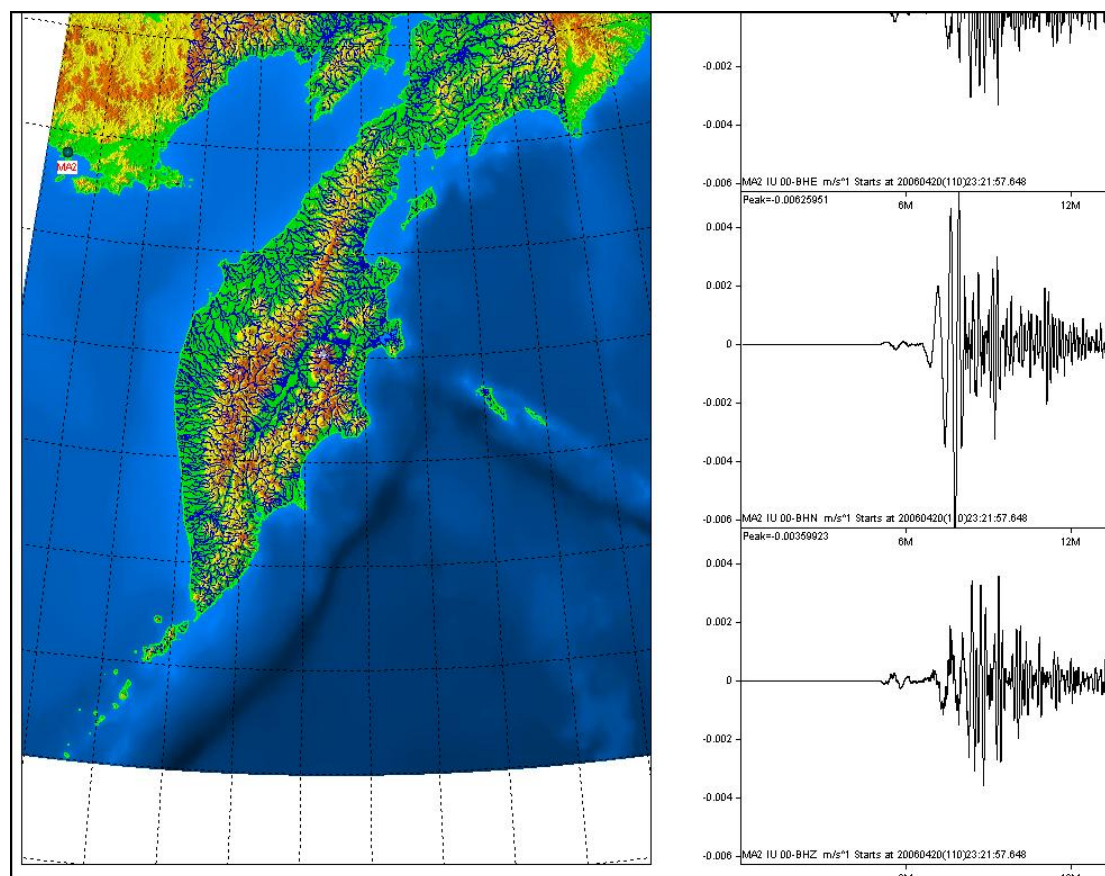
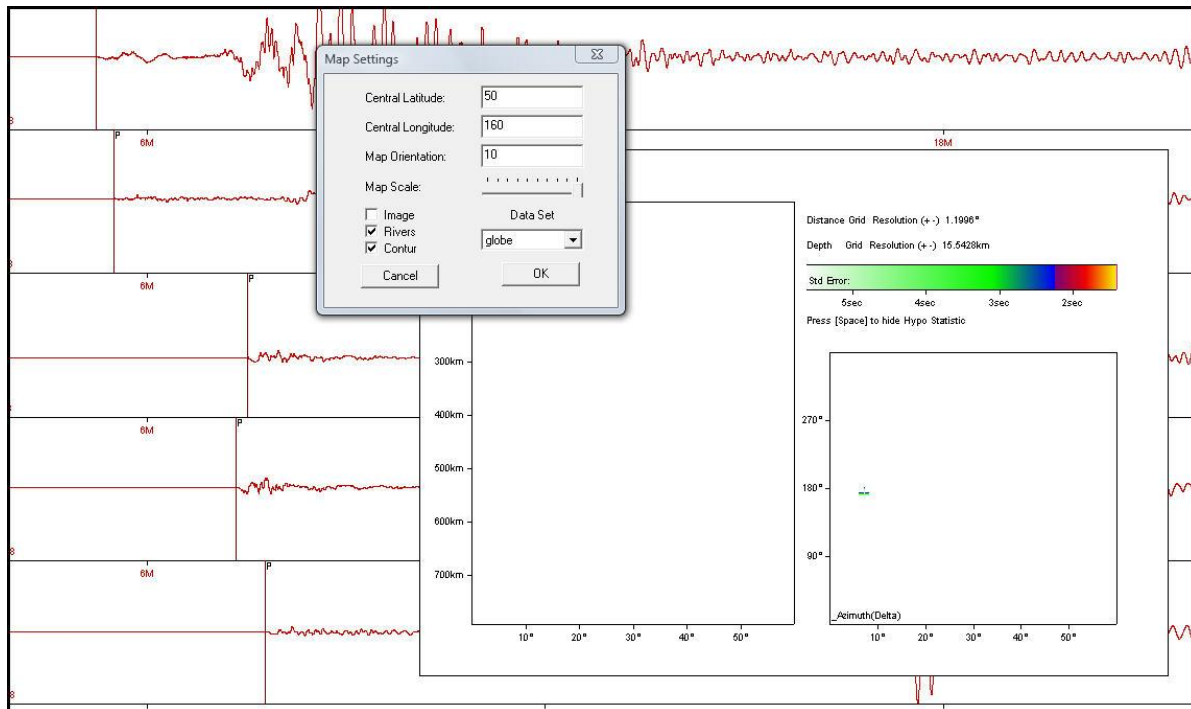


Figure 8-7 Map Plot

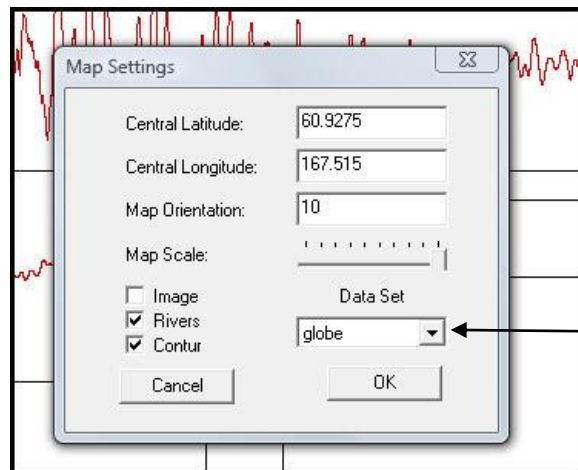


7. The **Map Settings** option menu opens to select settings.



**Figure 8-8 Map Settings**

8. Select the **Data Set** drop down button to read in the location.
9. Select the **Image** box if not already selected.
10. Adjust the **Map Scale** slider to the left to develop a better image.
11. Select the **OK** button to generate the map.





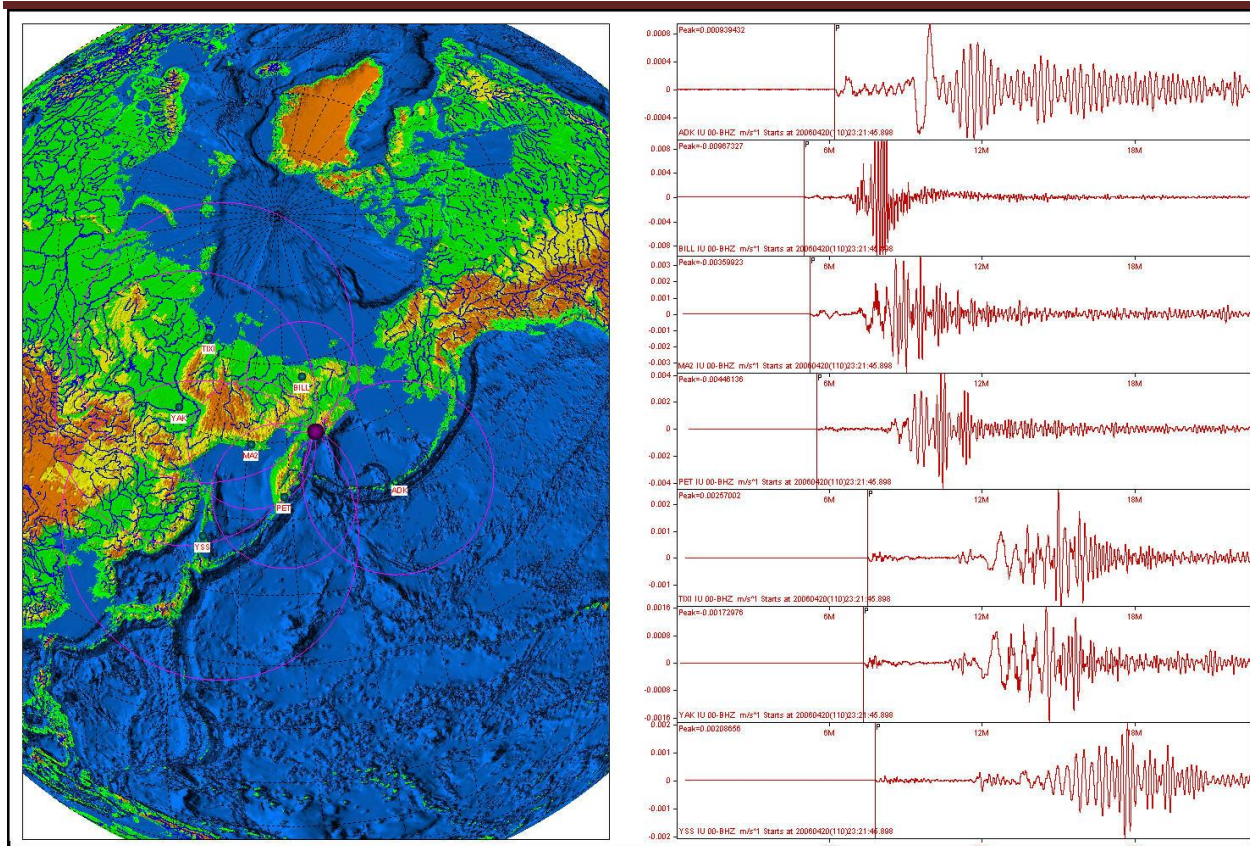


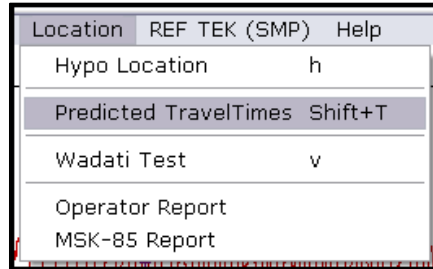
Figure 8-9 Location

## 8.3 Predicted Travel Times

To check how the theoretical travel times table fit the located earthquake use the **Predicted TravelTimes** command.

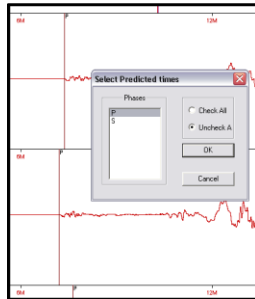
The predicted travel times are drawn in a blue color.

1. Select the **Predicted Travel Times** command from the Location menu.



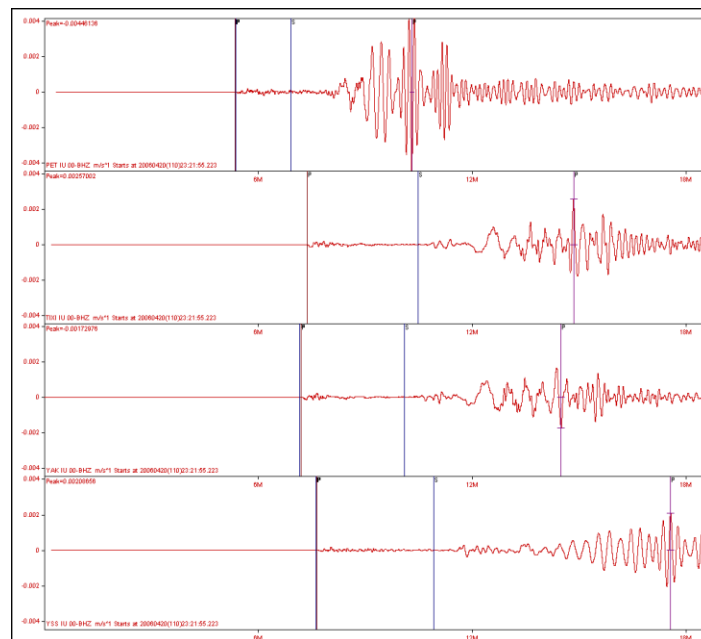
**Figure 8-10 Predicted Travel Times**

2. Select the desired phases or check all
3. Select the **OK** button to approve.



**Figure 8-11 Select Predicted Times**

4. The screen redraws the lines in blue.



**Figure 8-12 Predicted Travel Times**

## 8.4 Wadati Test Plot

To check the quality of "P" and "S" wave arrivals by linear fit to Vp/Vs ratio (for regional events it is close to 1.73):

1. Select the **Wadati Test** command from the location menu.

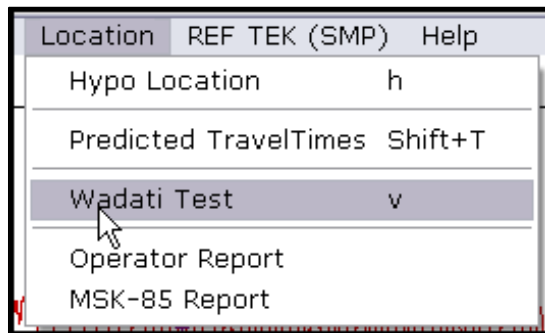


Figure 8-13 Wadati Test Command

Three lines will appear on the plot:

- **Solid Green** for  $V_p/V_s = 1.73$
- **Dashed Blue** - best fit to observed P and S arrivals
- **Dashed Red** - best fit for observed P and S arrivals passed through origin time

2. The screen redraws to show the plot.

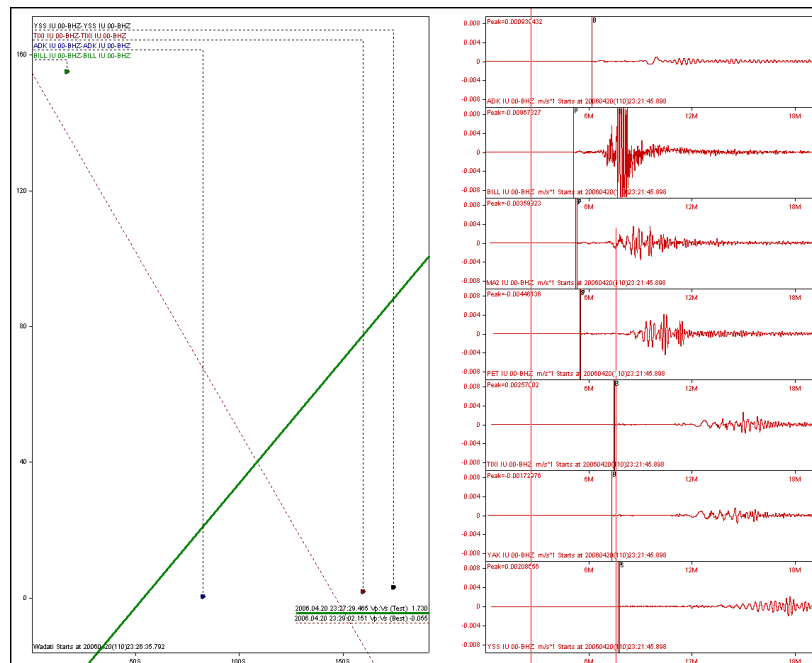
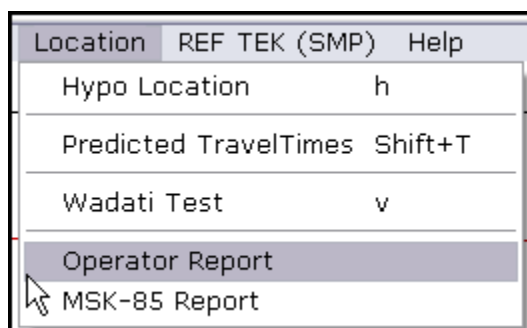


Figure 8-14 Wadati Plot

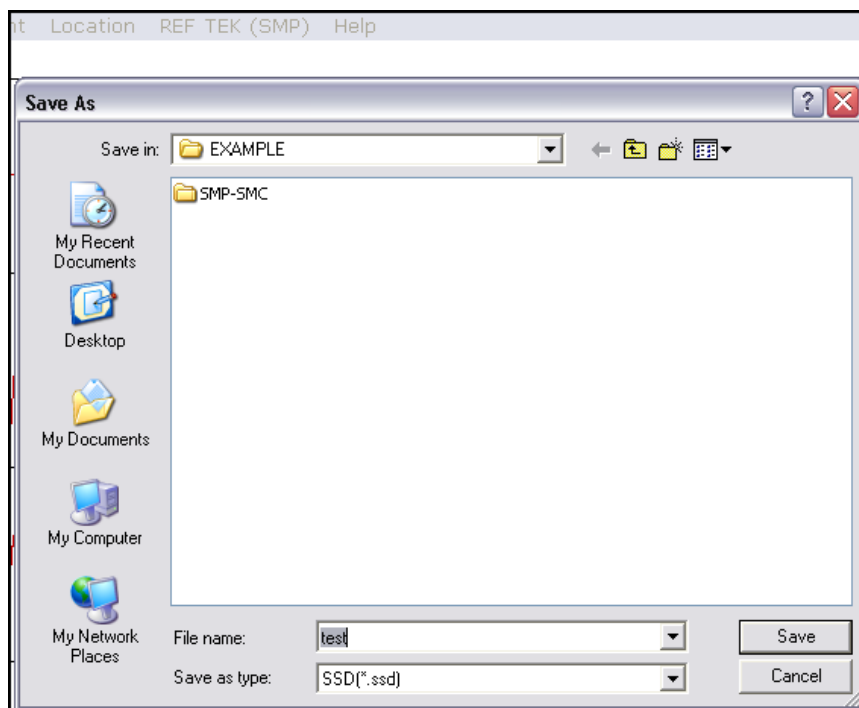
## 8.5 Operator Report

Use the Operator Report command from the location menu to save all measured and computed information about the picks and earthquake location to an ASCII file.

1. Select the **Operator Report** command.



2. Enter a file name and select the **Save** button.



**Figure 8-15 Operator Report**

## 8.6 MSK-85 Report

Use the MKS-85 Report command to generate an ASCII report based on Seismic Intensity Scale.

1. Select the **MSK-85** Report command from the **Location** menu.

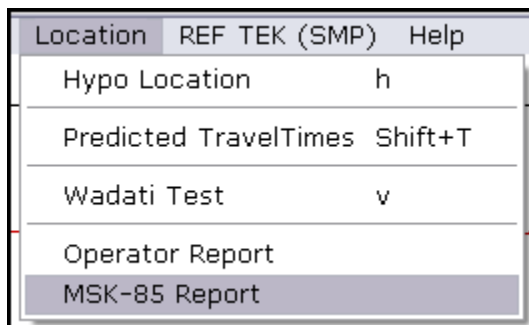
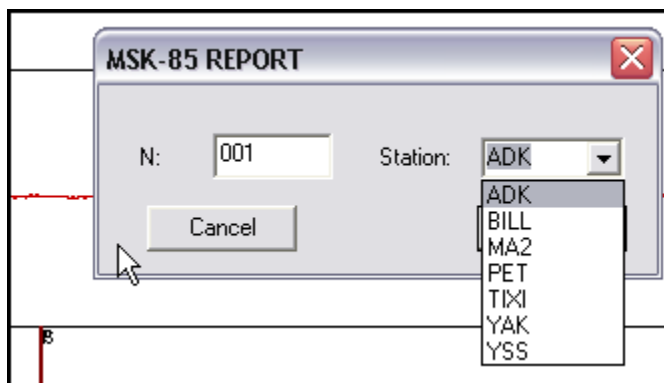
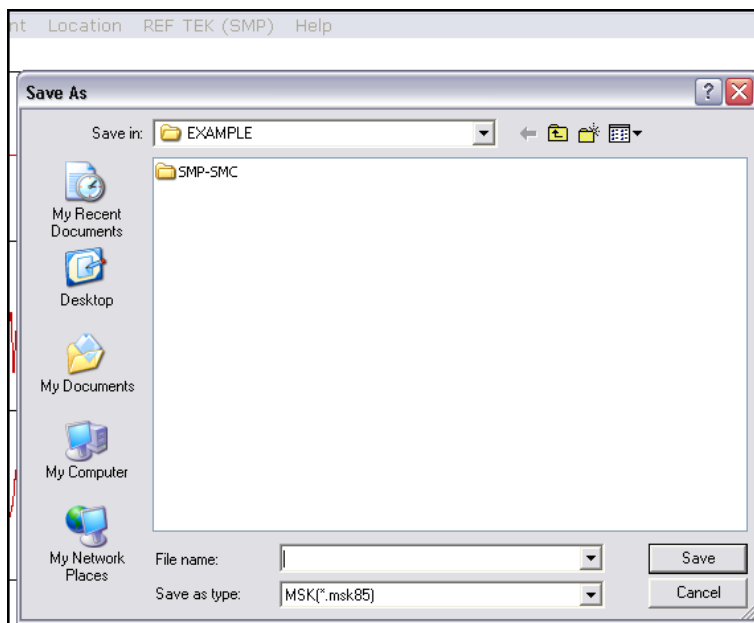


Figure 8-16 MSK-85

2. Select the desired station options.



3. Enter a file name to save the ASCII report to.





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