

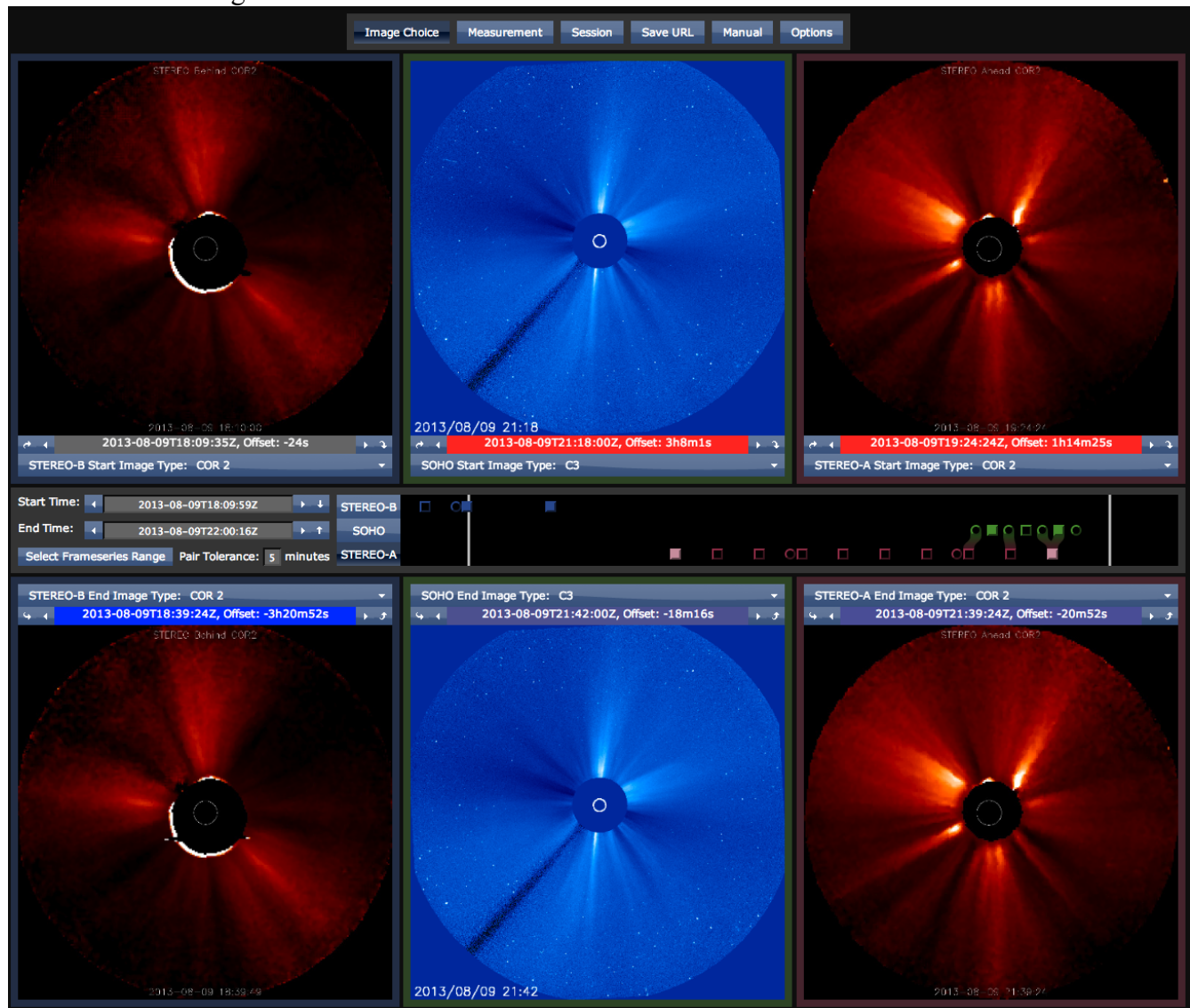
StereoCat Manual
2013-08-09

About

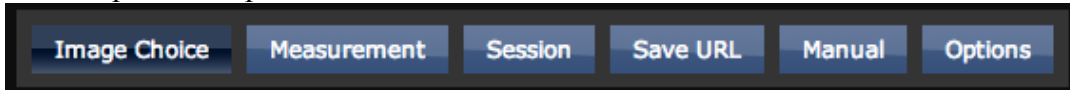
StereoCat is a CME analysis tool developed by Jack LaSota, an intern at the CCMC from 2012-2013. The main stereoscopic algorithm is based on the STEREO Analysis tool, written by Dr. Antti Pulkkinen, and refined through the efforts of Dr. M. Leila Mays. The responsible NASA official is Dr. Masha Kuznetsova. All coordinates are in HEEQ. The latest versions of Firefox, Chrome, and Internet Explorer are fully supported. As of the writing of this manual, Opera and Safari are fully supported except for the saving of files, for which workarounds are included. In some browsers, zooming can cause layout issues in StereoCat (different browsers implement it differently), so it is best to reset the zoom when using it. This can usually be done with “Command-0” on a mac, or “Control-0” on a PC. StereoCat is most easily used on a desktop or laptop computer. However, mobile devices are supported.

Image Choice Screen and Top Buttons Bar

You start at the Image Choice Screen. It looks like this:



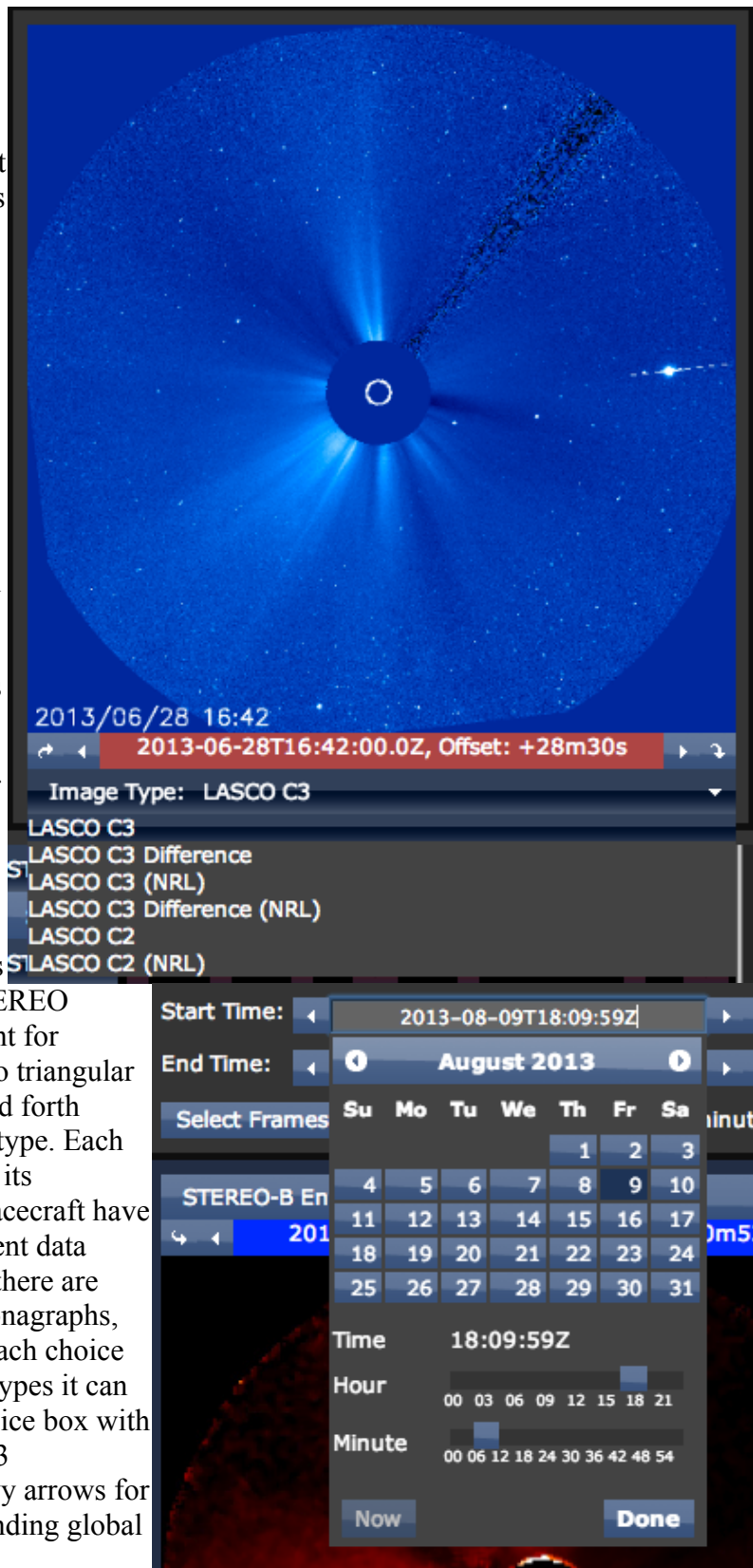
The thing at the top is the Top Buttons Bar. It looks like this:



The "Image Choice" button is active (darker blue) because the Image Choice Screen is open. StereoCat is divided into three "screens." Besides the Image Choice Screen, there are the Measurement and Session screens. The next two buttons in the top buttons bar are for them. Entering a screen will change most of the interface, but no matter which screen you are in, you can always see the top buttons bar. The next button, "Save URL" produces a Save URL, in a dialog for you to copy. Following this URL will restore the state of the web app as it was when you pressed this button. The next button, "Manual" will open this file. The last button, "Options," opens a dialog that can be used to configure rarely-used features.

The purpose of the image choice screen is to select coronagraphs for measuring on.

The Image Choice Screen is composed of six Choice Boxes, and some other stuff in the Middle Bar. The top three choice boxes are "Start" choice boxes, and the bottom three are "End" choice boxes. Each column of choice boxes corresponds to a spacecraft. The left column is for STEREO Behind, the center for SOHO, and the right for STEREO Ahead. Each choice box has two triangular arrow buttons, which let you step back and forth between images it is viewing of a certain type. Each choice box will only display images from its designated spacecraft, but because the spacecraft have different instruments, and there are different data feeds supplying those coronagraphs, and there are difference images available for some coronagraphs, they can view different "Image Types." Each choice box has a dropdown menu for the image types it can show. To the right is a screenshot of a choice box with its image type menu open, displaying a C3 coronagraph from SOHO. It also has curvy arrows for copying its date to and from the corresponding global



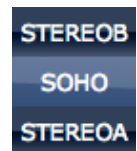
date.

The two global dates are shown in text fields labeled “Start Time (UTC):” and “End Time (UTC):” in the middle of the screen. Clicking on one of these text fields will open a calendar interface. The screenshot to the right shows the calendar for the global start time open. You can change it by typing something in the text field, or by clicking a date and using the sliders to set the time.

When a global date is changed, its choice boxes will move to the nearest image available of their spacecraft and image type. Their date displays color themselves to show their offset from their global date. The more red the are, the more they are ahead of their target, the more blue, the more behind. If they are grey, they are close to it.

A basic measurement requires the selection of four coronagraphs, two for each of two spacecraft, and two at each of two times, so that stereoscopic calculations can be made at each time, and the difference used to calculate speed. An advanced mode, called “Frameseries Mode” is entered by activating the “Select Range” toggle. This mode uses an arbitrary number of images to generate plots of Coronal Mass Ejection motion over time.

When frameseries mode is not active, images are selected by moving to them with choice boxes, and by activating their spacecraft's toggle. The spacecraft toggles look like this, and are shown to the left of the timeline.



The timeline is this thing:



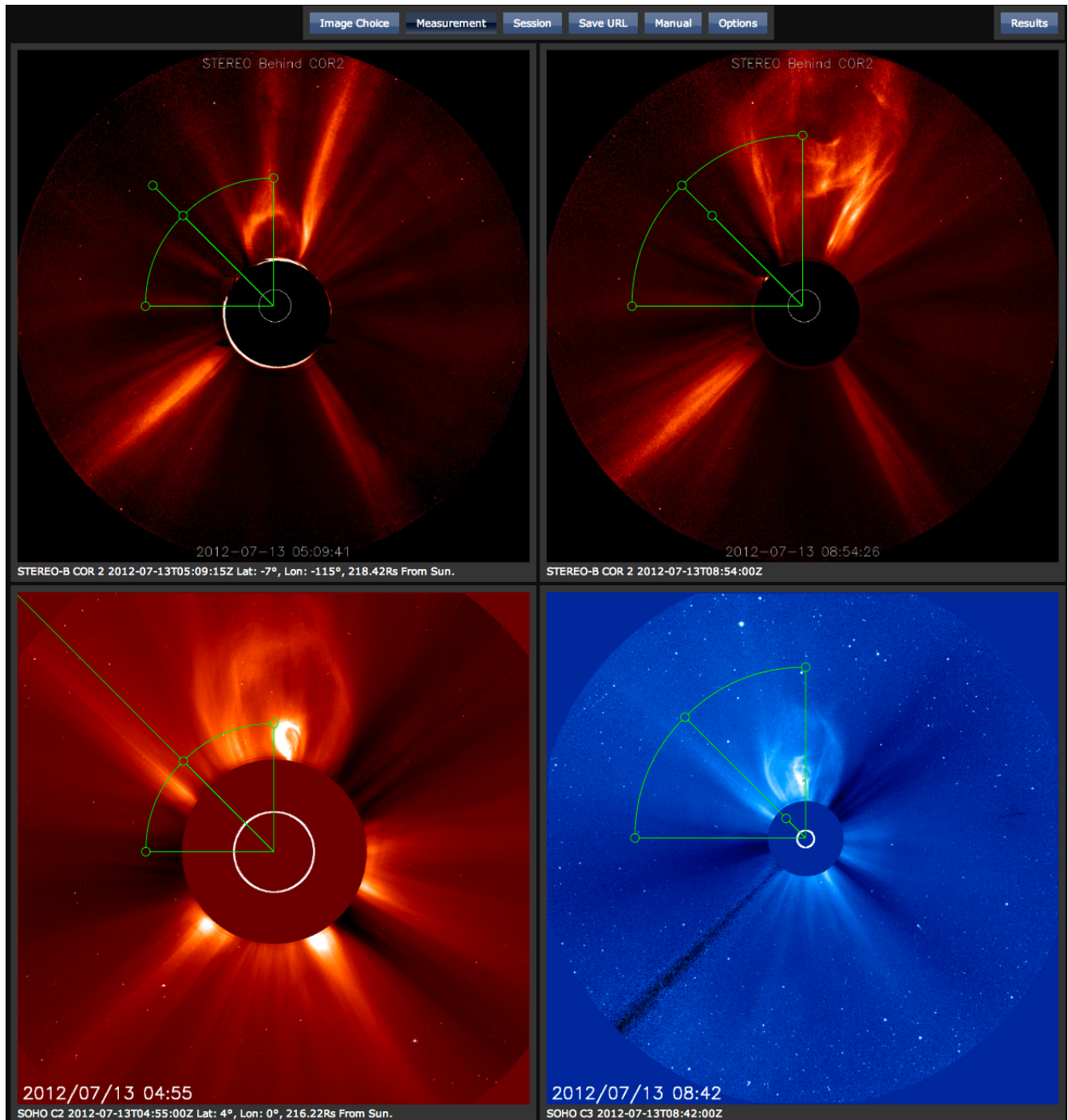
On the timeline, the white bars are the global start and end time. Each of the shapes in rows are coronagraphs available on the server. Blue are for STEREO Behind, green for SOHO, and red for STEREO Ahead. Circles are for the smallest coronagraph the spacecraft has (COR1 and C2 for STEREO and SOHO respectively), squares are for the larger one (COR2 and C3). Image types that are from the same instrument will be stacked together to make single shapes in the timeline. Hovering over a shape will produce a tooltip like that seen to the right, which will show which image types are available at that time. The curvy paths between them indicate potential matchings of images close together, with a tolerance set in the field to the left. This is only meaningful to the program in frameseries mode, but you can use it as a guide when not using frameseries mode. It is important that paired images be close together for the accuracy of the stereoscopic calculations. Matches between the two STEREO spacecraft wrap around the top/bottom of the image (think old arcade games, like Asteroids). A filled shape means there is a choicebox viewing that image. A lighter shape means that image is selected.

Clicking on one of the shapes on the timeline will move the start choice box that can view that image to it, if necessary setting the image type of that choice box. Clicking the background will move the global start time. Alt-clicking will move the end choice box or global end time instead.

Once a selection has been made, you can move on to the measurement screen. Until then, you will not be allowed to enter it.

Measurement Screen

This is the measurement screen.

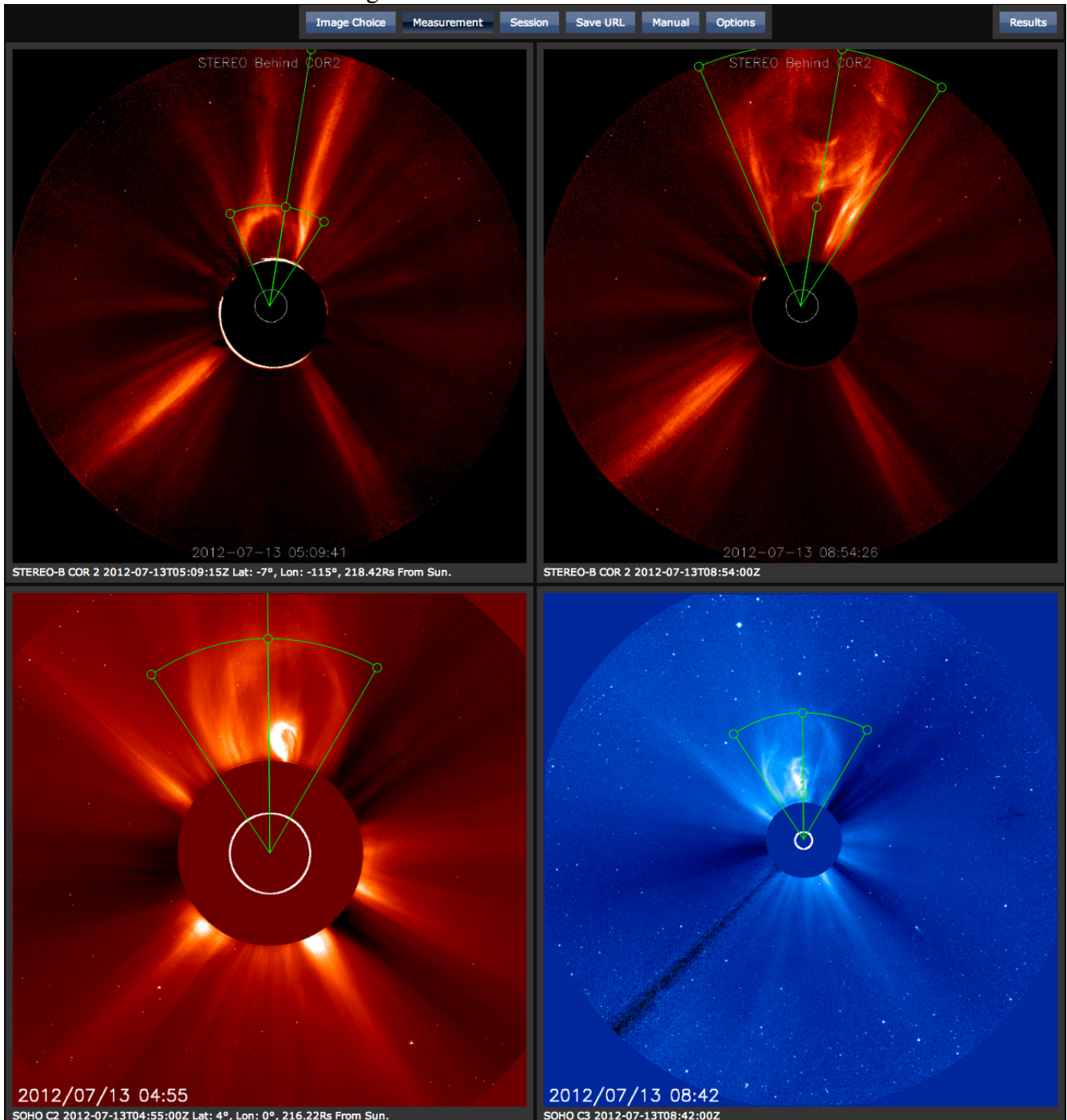


The top two images are for one of the spacecraft you selected, and the bottom two images are for the other. The left images come first chronologically. The white text under the images shows the time they are taken, and the position (in HEEQ) of the spacecraft that took them.

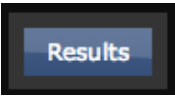
You can see that I have selected C2 as a start image, and C3 as an end image for SOHO, which allows me to follow the CME over a longer span of time, for more accuracy, due to C2's smaller field of view. The green handles specify the position of the CME in the images. The center handle on the arc around

the sun specifies some feature of the CME you want to measure, and the other two are for specifying the edges of the CME so that its width can be determined. Note that the arc will show up where the CME is in that image. For convenience, there is a handle corresponding to the edge of the CME in the other image. Moving it will move the other handles for the same spacecraft.

Handles can be moved by clicking and dragging the circles, or instantly by alt-clicking on their image. Which handle to move because of an alt-click is decided as follows: If this is the first click, during this time that “alt” has been held down, move the center handle. If it is the second click, move one of the edge handles. On the third click, move the other edge handle. The fourth click repeats the process. The measurement should look something like this:



The results of the calculation can be seen in the results dialog, which is opened by clicking on the button that showed up in the top right as soon as you opened the measurement screen. It can be seen to the right.



The results of the calculation are automatically updated as you move the handles. The “Keep” button adds the measurement to the session.

While the Image Choice Screen sizes itself to fit the window (as long as it is above a certain size), within the constraint of keeping the correct aspect ratio, the Measurement screen sizes itself to fit the window horizontally. This is so you can view images at higher resolution, to make more precise measurements.

The “Start Ensemble” button creates an ensemble, which is used to generate N^2 result sets from N measurements. This functionality will be covered later.

A screenshot of a software window titled "Results" with a close button (X) in the top right corner. The window displays two sections of data: "Plane-Of-Sky Results" and "3D Results".

	STEREOB	SOHO
Speed:	500km/s	469km/s
Half-Width:	26°	32°
Latitude:	79°	87°
Projection Boundary Time:	2012-07-13T 11:03:48.5Z	2012-07-13T 11:30:15.6Z

Half-Width:	32°
Speed:	494km/s
Longitude:	14°
Latitude:	77°
21.5Rs Boundary Time:	2012-07-13T 11:07:01.3Z

At the bottom of the window, there are three buttons: "Keep", "Kept: 0", and "Start Ensemble".

Session Screen

A record of all measurements of every type taken during the program's use can be seen in the session screen. It looks like this:

Two-Timepoint Measurements										
Projected Measurements						3D Results				
Speed		Half-Width				Half-Width	Speed	Longitude	Latitude	Passes 21.5Rs At
STEREO-B	SOHO	STEREO-A	STEREO-B	SOHO	STEREO-A					
Free Measurements										
510km/s	475km/s	-	28°	32°	-	29°	632km/s	28°	56°	2012-07-13T09:21:06Z
514km/s	493km/s	-	28°	32°	-	29°	641km/s	31°	56°	2012-07-13T09:17:46Z
514km/s	493km/s	-	26°	31°	-	30°	646km/s	31°	56°	2012-07-13T09:15:08Z
Means										
513km/s	487km/s	-	27°	32°	-	29°	640km/s	30°	56°	2012-07-13T09:18:00Z
Standard Deviations										
2km/s	9km/s	-	1°	0°	-	1°	6km/s	2°	0°	2m27s

There are two tables. One for two-timepoint measurements (which includes ensembles), and one for frameseries. The frameseries table automatically hides when it is empty, and is not shown in this screenshot.

The buttons at the top, from right to left, load a saved session from a file, save a session to a file, clear the session, edit a comment for the session, and download a combined ensemble control file (worry about this later).

Session files are text files that contain a textual representation of the session table, and a URL that can be used to restore the session.

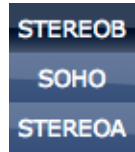
Besides copy-pasting the url, and opening the file with the file browser opened by the “open folder” button, a file can be opened by dragging it into the session screen, if your browser supports it (Chrome does).

Each measurement you have made (it is called a free measurement if not part of an ensemble or frameseries) has a row in the table, where its results are shown. The buttons to the right of it, in order from right to left, will delete it, open it in the measurement screen again, or edit a comment for it. Comment buttons change from a pencil icon to a notebook icon if there is a comment present.

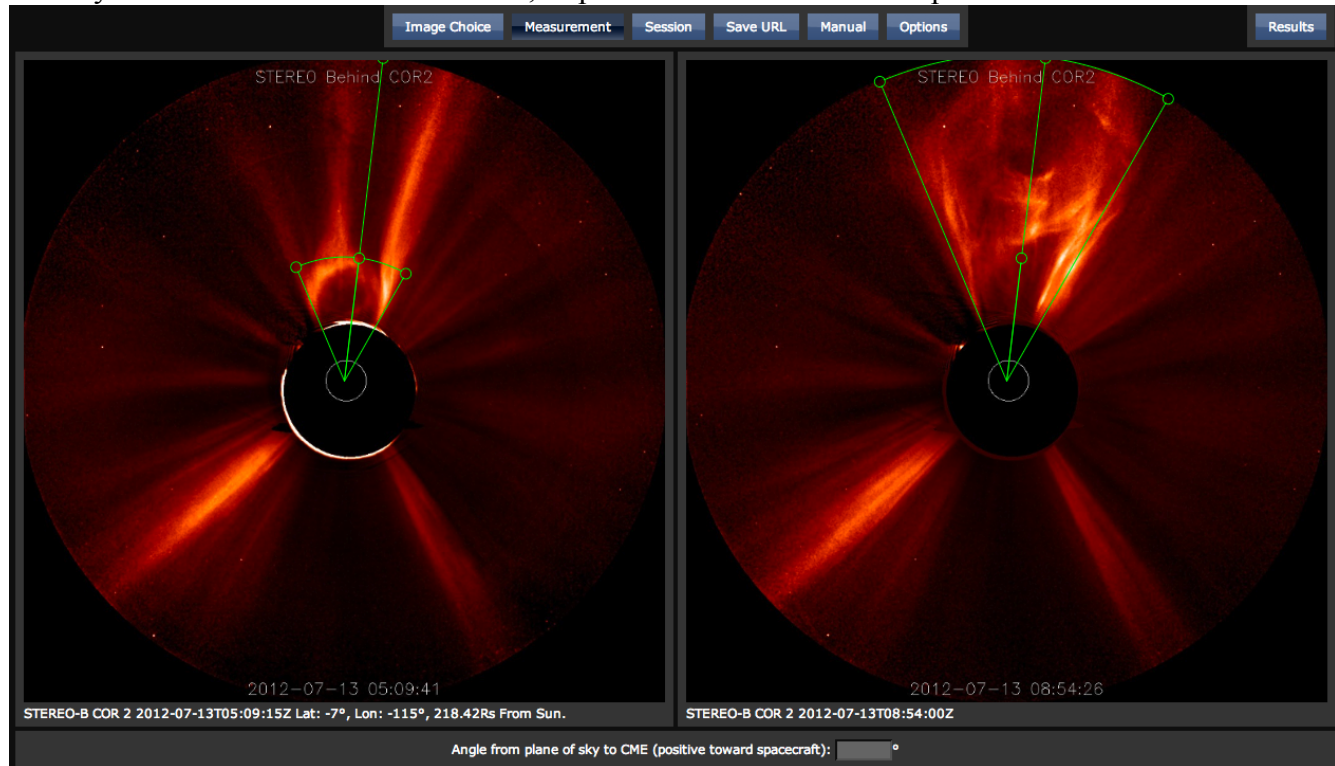
The rows at the bottom of the free measurements section of the two-timepoint measurements table calculate statistics for each column. These are circular standard deviations and means for the half widths, longitude, and latitude.

Single-Spacecraft Mode

Because of data gaps, sometimes there may be only one spacecraft online that can view a CME of interest. In this case, single-spacecraft mode becomes useful. To enter single-spacecraft mode, activate only one of the spacecraft selection toggles in the image choice screen.



When you enter the measurement screen, a special interface will show up at the bottom of the screen.



This allows you to enter the shortest angle from the plane of sky of the spacecraft to the CME (this could perhaps be determined if the active region from which the CME emerged is known). Without filling this field, the “3D Results” section of the Results dialog is impoverished, because stereoscopy cannot be performed, and there is no substitute to determine the effect of projection on the apparent height of the CME.

Single-spacecraft measurements show up in a lighter-grey color in the Session Screen. You can use single-spacecraft measurements to create ensembles.

466km/s	494km/s	-	27°	-	30°	457km/s	20	73	2012-07-13T10:54:19.12	✕	⌂	↶
468km/s	-	-	27°	-	27°	-	-	79°	-	✕	⌂	↶

Ensembles

An ensemble is a way of generating a multitude of result sets (or “members”) (which are simulation inputs) from fewer manually-made measurements. This is used to generate a spread of possible CMEs for simulation. An ensemble is created by clicking the “Start Ensemble” button in the measurement screen's results dialog. Clicking it will transform the results dialog, as shown.

The screenshot shows a 'Results' dialog box with a close button (X) in the top right corner. It is titled 'Results' and contains two sections: 'Plane-Of-Sky Results' and '3D Results'. The 'Plane-Of-Sky Results' section compares data for STEREOB and SOHO spacecraft. The '3D Results' section shows a single set of data. At the bottom, there is a 'Keep' button, the text 'Kept: 4', and a 'Start Ensemble' button.

	STEREOB	SOHO
Speed:	468km/s	494km/s
Half-Width:	27°	30°
Latitude:	79°	82°
Projection Boundary Time:	2012-07-13T 11:12:59.3Z	2012-07-13T 11:08:58.1Z

Half-Width:	30°
Speed:	497km/s
Longitude:	26°
Latitude:	73°
21.5Rs Boundary Time:	2012-07-13T 10:54:19.1Z

Keep Kept: 4 Start Ensemble

The screenshot shows the same 'Results' dialog box, but the 'Start Ensemble' button has been replaced by 'Add to Ensemble' and 'Finish Ensemble' buttons. Below these, there is a 'View All Measurements in Ensemble' button and two status lines: 'Measurements in Ensemble: 0' and 'Calculated Members in Ensemble: 0'.

	STEREOB	SOHO
Speed:	468km/s	494km/s
Half-Width:	27°	30°
Latitude:	79°	82°
Projection Boundary Time:	2012-07-13T 11:12:59.3Z	2012-07-13T 11:08:58.1Z

Half-Width:	30°
Speed:	497km/s
Longitude:	26°
Latitude:	73°
21.5Rs Boundary Time:	2012-07-13T 10:54:19.1Z

Add to Ensemble Finish Ensemble

View All Measurements in Ensemble

Measurements in Ensemble: 0

Calculated Members in Ensemble: 0

Clicking the “Add to Ensemble” button will save the current measurement to the ensemble, adjusting the counters at the bottom of the dialog. Doing so will also reset the measurement handles, to force you to make each measurement from scratch, and guarantee their independence. As you add more measurements to the ensemble, the calculated members will grow as the square of the number, if you are using two spacecraft. This is because the program splits up the part of the measurement you made for each individual spacecraft, and recombines all of those partial measurements with partial measurements from other complete measurements you have saved.

If you are using one spacecraft, you can only create an ensemble if you have entered an angle in the “angle from plane of sky to CME” field. You can get a similar effect of quadratic growth of the number of calculated measurements if you enter different possible angles here.

You can view all the handle positions you have specified by clicking the “View All Measurements In Ensemble” button.

The interface features a top navigation bar with buttons: Image Choice, Measurement, Session, Save URL, Manual, Options, and Results. The main area is divided into four panels, each showing a different view of the Sun's corona with green circles indicating measurement points.

Top Left Panel: STEREO Behind COR2, 2012-07-13 05:09:41. STEREO-B COR 2 2012-07-13T05:09:15Z Lat: -7°, Lon: -115°, 218.42Rs From Sun.

Top Right Panel: STEREO Behind COR2, 2012-07-13 08:54:26. STEREO-B COR 2 2012-07-13T08:54:00Z.

Bottom Left Panel: 2012/07/13 04:55. SOHO C2 2012-07-13T04:55:00Z Lat: 4°, Lon: 0°, 216.22Rs From Sun.

Bottom Right Panel: 2012/07/13 08:42. SOHO C3 2012-07-13T08:42:00Z.

Central Results Window:

Results

Projected Results

	STEREO-B	SOHO
Speed:	137km/s	847km/s
Half-Width:	45°	45°
Latitude:	45°	45°
Projection Boundary Time:	2012-07-14T 00:20:23Z	2012-07-13T 09:05:32Z

3D Results

Half-Width:	45°
Speed:	632km/s
Longitude:	-132°
Latitude:	33°
21.5Rs Boundary Time:	2012-07-13T 09:59:48Z

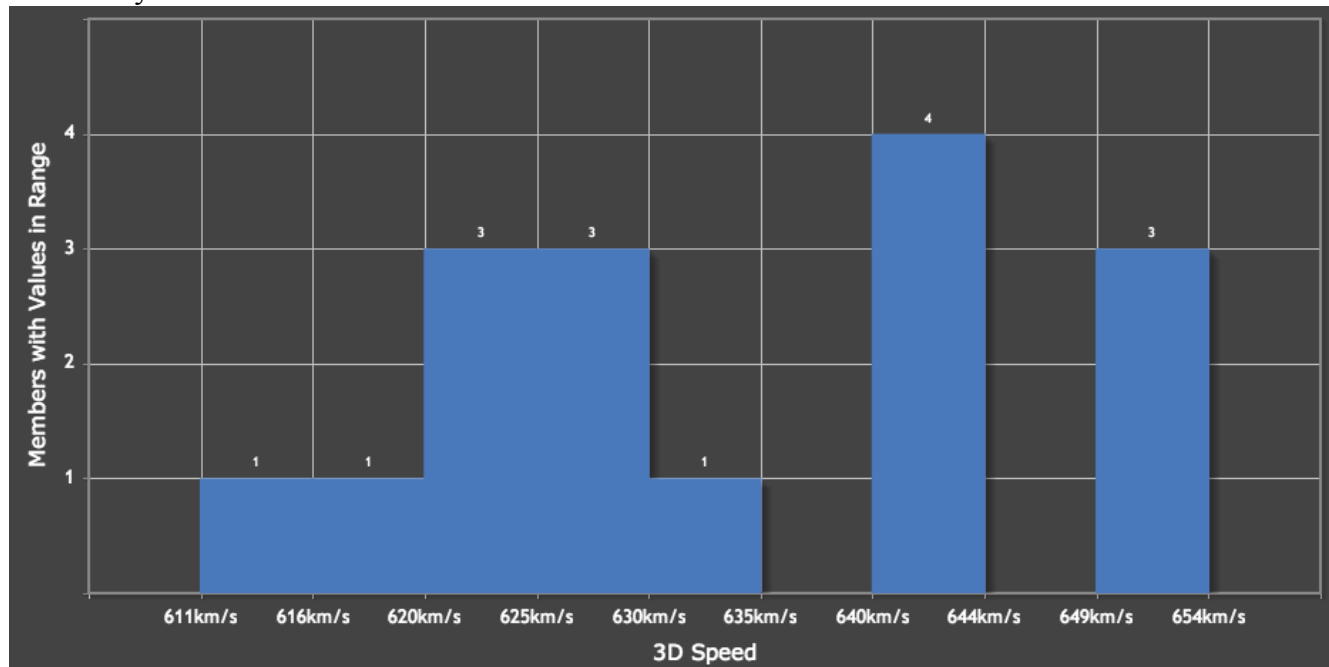
Buttons: Add to Ensemble, Finish Ensemble, View All Measurements In Ensemble

Measurements in Ensemble: 4
Calculated Members in Ensemble: 16

When you have enough calculated members, you can close the ensemble by hitting “Finish Ensemble,” and go to the session screen. In the session screen, the ensemble will show up in the “Two-Timepoint Measurements” table, it will look like this:

Untitled Ensemble (16 calculated members, 0 custom)											x	ρ	↗	
Histogram	Histogram	Histogram	Histogram	Histogram	Histogram	Histogram	Histogram	Histogram	Histogram	Histogram	Histogram	←	+	±
468km/s	494km/s	-	27°	30°	-	30°	497km/s	26°	73°	2012-07-13T10:54:19.1Z	x	ρ	↗	
491km/s	510km/s	-	27°	23°	-	23°	504km/s	-6°	80°	2012-07-13T11:00:14.7Z	x	ρ	↗	
482km/s	500km/s	-	29°	32°	-	32°	492km/s	-5°	84°	2012-07-13T11:12:04.9Z	x	ρ	↗	
482km/s	506km/s	-	28°	31°	-	31°	495km/s	-25°	84°	2012-07-13T11:08:02.3Z	x	ρ	↗	
Medians														
482km/s	503km/s	-	28°	31°	-	31°	496km/s	-6°	82°	2012-07-13T11:04:08.5Z				
Standard Deviations														
8km/s	6km/s	-	1°	3°	-	3°	4km/s	18°	5°	6m52s				

You can click one of the histogram buttons to view calculated member spread for a specific quantity, which may look like this:



The six buttons to the right of the ensemble title row and histogram button row, From top left to top right, then from bottom left to bottom right, delete the ensemble, open the ensemble in the measurement screen again where you can add more measurements or view the spread of measurements in it, title it, toggle between viewing the measurements and the members, create a custom member, and download simulation control files generated from the ensemble.



When members are shown instead of measurements, the ensemble looks like this:

Untitled Ensemble (12 calculated members, 0 custom)											x	⌂	↗	
Histogram	Histogram	Histogram	Histogram	Histogram	Histogram	Histogram	Histogram	Histogram	Histogram	Histogram	Histogram	▼	+	±
469km/s	493km/s	-	27°	30°	-	30°	497km/s	26°	73°	2012-07-13T10:54:27.6Z	✓			
469km/s	510km/s	-	27°	23°	-	27°	494km/s	-5°	78°	2012-07-13T11:01:44.2Z	✓			
469km/s	500km/s	-	27°	32°	-	27°	490km/s	-2°	78°	2012-07-13T11:04:59.5Z	✓			
469km/s	505km/s	-	27°	31°	-	31°	491km/s	-13°	79°	2012-07-13T11:03:22.0Z	✓			
491km/s	493km/s	-	27°	30°	-	27°	505km/s	29°	74°	2012-07-13T10:54:25.9Z	✓			
491km/s	510km/s	-	27°	23°	-	23°	504km/s	-6°	80°	2012-07-13T11:00:23.7Z	✓			
491km/s	500km/s	-	27°	32°	-	32°	499km/s	-3°	80°	2012-07-13T11:03:40.4Z	✓			
491km/s	505km/s	-	27°	31°	-	27°	501km/s	-16°	81°	2012-07-13T11:01:48.1Z	✓			
481km/s	493km/s	-	29°	30°	-	29°	495km/s	39°	78°	2012-07-13T11:05:12.6Z	✗			
481km/s	510km/s	-	29°	23°	-	23°	496km/s	-12°	85°	2012-07-13T11:08:35.1Z	✗			
481km/s	500km/s	-	29°	32°	-	32°	492km/s	-5°	84°	2012-07-13T11:12:13.1Z	✓			
481km/s	505km/s	-	29°	31°	-	29°	494km/s	-30°	85°	2012-07-13T11:09:34.1Z	✓			
483km/s	493km/s	-	28°	30°	-	30°	497km/s	36°	77°	2012-07-13T11:03:04.0Z	✗			
483km/s	510km/s	-	28°	23°	-	28°	497km/s	-10°	84°	2012-07-13T11:07:03.4Z	✗			
483km/s	500km/s	-	28°	32°	-	28°	493km/s	-5°	83°	2012-07-13T11:10:37.0Z	✓			
483km/s	505km/s	-	28°	31°	-	31°	495km/s	-25°	84°	2012-07-13T11:08:08.5Z	✓			

The blue highlight means that those members will be included in the control file. If you don't like them, click on the checkbox to their right to remove them. The plus button at the top of the ensemble creates a custom member, which allows you to enter simulation inputs manually.

Untitled Ensemble (16 calculated members, 3 custom)											x	⌂	↗
Histogram	Histogram	Histogram	Histogram	Histogram	Histogram	Histogram	Histogram	Histogram	Histogram	Histogram	▼	+	±
-	-	-	-	-	-	25°	635km/s	35°	60°	2012-07-13T09:15:21Z	✗		
-	-	-	-	-	-	26°	628km/s	34°	55°	2012-07-13T09:14:00Z	✗		
-	-	-	-	-	-	29°	625km/s	25°	50°	2012-07-13T09:16:00Z	✗		

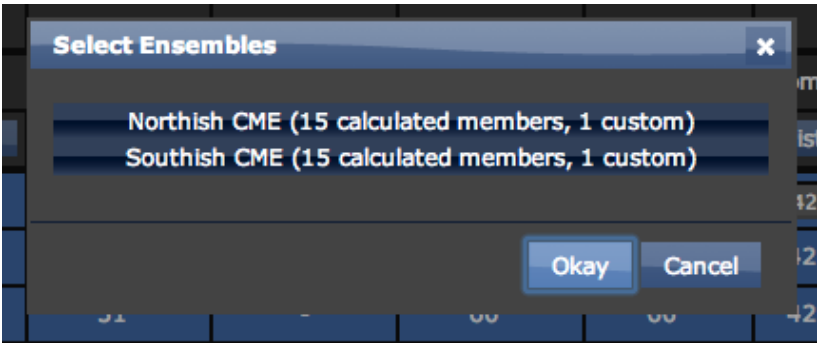
You can also create a custom member from a measurement, by holding down alt, and dragging to the ensemble's title row.

The “x” button to the right of the custom members lets you delete them.

Combined control files can be generated with the down-arrow button at the top of the session screen.

Clicking that button opens this dialog, which allows you to select ensembles to combine for the control file.

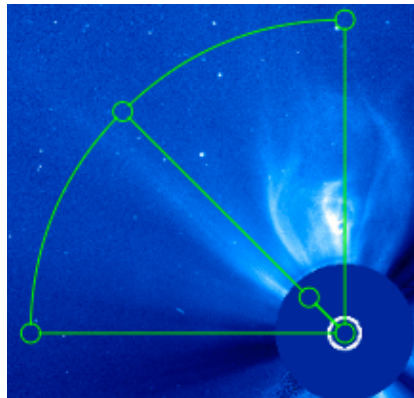
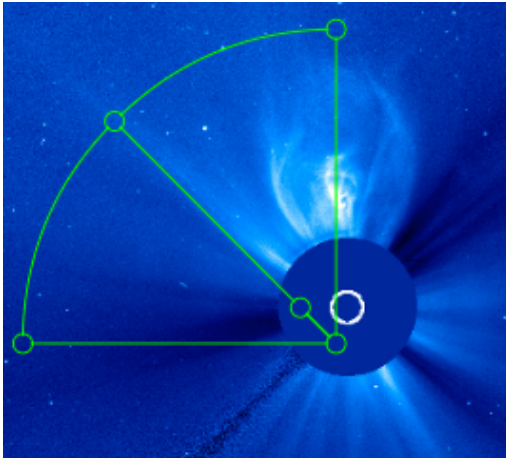
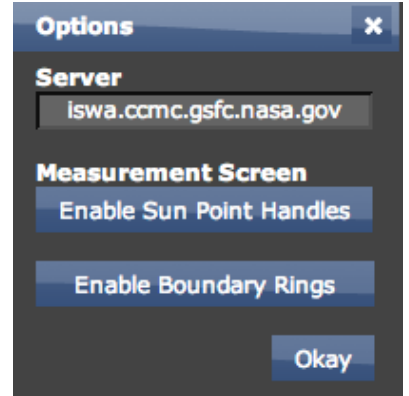
All CMEs to be combined must have the same number of members.



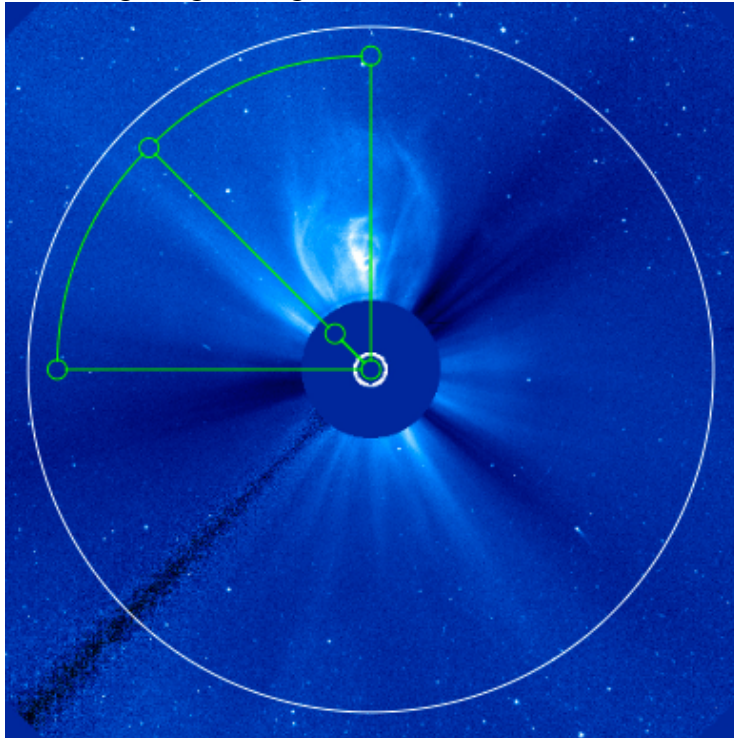
Options Menu

The options menu looks like this:

The “server” field can be used if one of the servers that provide coronagraphs and other data to StereoCat is unresponsive, and another might not be. The “Enable Sun Point Handles” toggle allows you to adjust in the measurement screen which part of the image the program thinks the sun is at, which may be useful if the tool or the servlets reporting image metadata to it are misconfigured, as shown below.



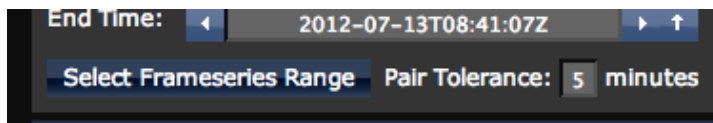
The “Enable Boundary Rings” option will show a white circle at 21.5Rs from the center of the sun in each image large enough to show it, which looks like this:



Frameseries Mode

Frameseries Mode allows you to measure on a series of images in a specified range, to generate graphs of CME height, latitude, longitude, speed, acceleration, and half-width over time. Pairing for the stereoscopy algorithm is done automatically, using a tolerance set in the Image Choice Screen. The swaths of color between the shapes that represent images in the timeline are potential pairings that fit this tolerance.

Frameseries mode requires a different kind of selection in the Image Choice Screen. To do this, click the “Select Frameseries Range” toggle.

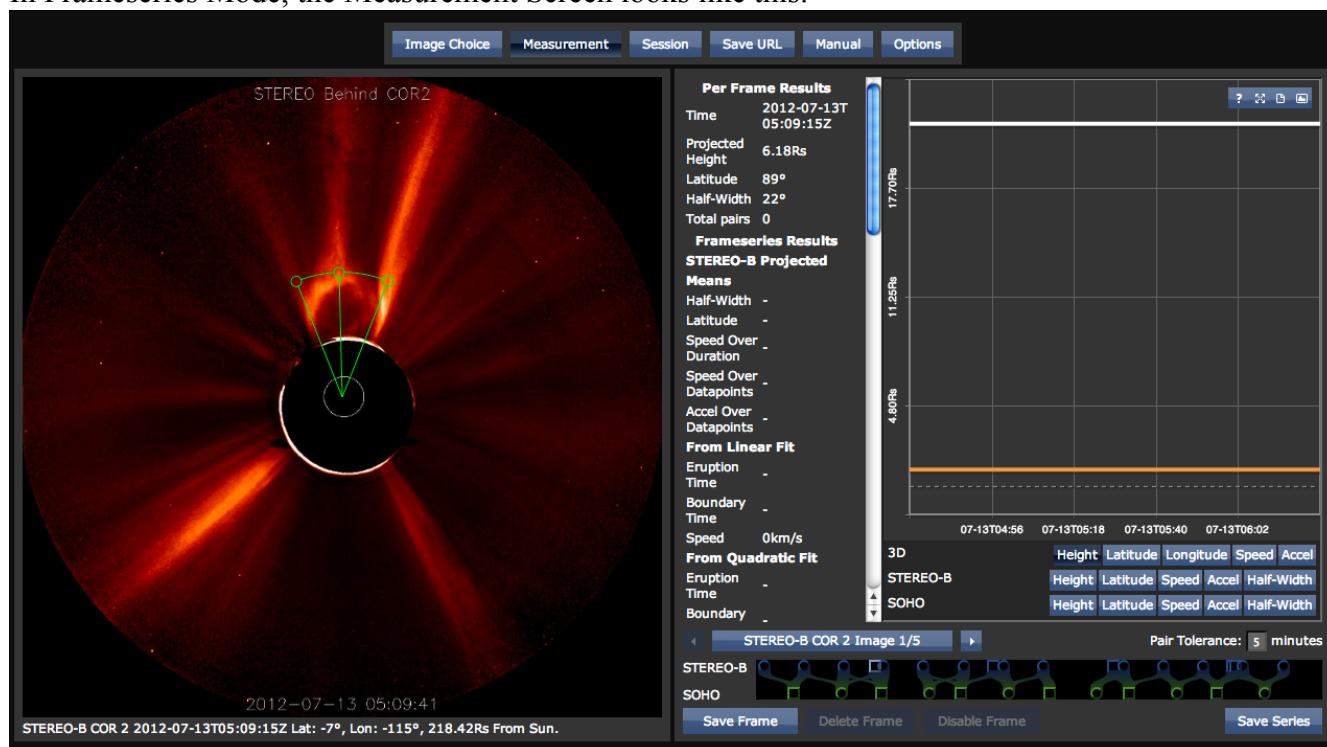


When this is active, a region on the timeline between the global start and end time will lighten, as seen to the right. In this mode, choicebox selections are unimportant.



When you enter the Measurement Screen with the Select Frameseries Range Toggle active, it creates a frameseries, which will persist in the Measurement Screen until you leave. The frameseries must be saved into the session if you want to keep it but leave the Measurement Screen.

In Frameseries Mode, the Measurement Screen looks like this:



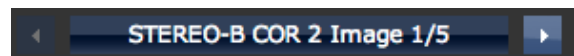
The handles to the left work much like in Two-Timepoint Mode. Note that only three handles are shown, because only one image is measured on at a time. To the right is the “Frameseries Panel.” Near the bottom of the Frameseries Panel is a timeline like the one in the Image Choice Screen, permanently fixed at the range chosen in the Image Choice Screen. Above it and to the right is a field that can

change the pair tolerance for the frameseries. At the bottom left is the “Save Frame” button (Hotkey: shift-enter), which will save the current single-image measurement to the frameseries. At the bottom right is the “Save Series” button (Hotkey: alt-enter), which will save the entire frameseries to the session, and take you to the Session Screen. The “Delete Frame” button (Hotkey: delete (the small one, not backspace)) can be used to delete your measurement on a particular frame.

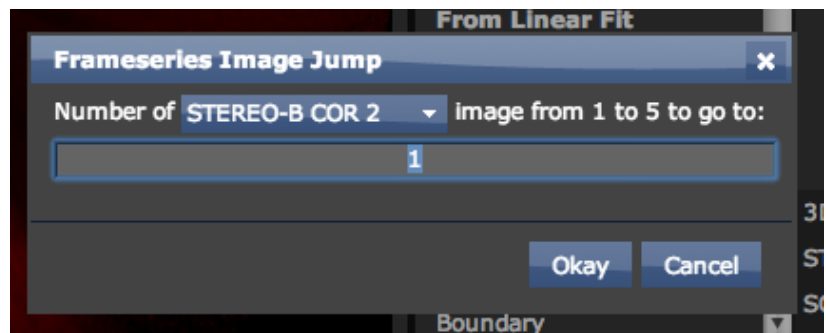
As you save frames, the shapes corresponding to them in the timeline will fill in, and the Measurement Screen will advance to the next if there is one, and datapoints will populate on the graph, and the results shown in the scrolling table on the left of the Frameseries Panel will update.

You can navigate between images by clicking on shapes in the timeline, pressing the arrow buttons above it, pressing the arrow keys (left and right step back and forth within an image type or to the next or previous spacecraft if you are at the end or beginning of the current spacecraft's images. Up and down step between spacecraft), and with the jump dialog.

The jump dialog is accessed by pressing the button between the arrow buttons, which looks like this:



The jump dialog itself looks like this:



You can select an image type, and an image number within that image type to jump to with this dialog.

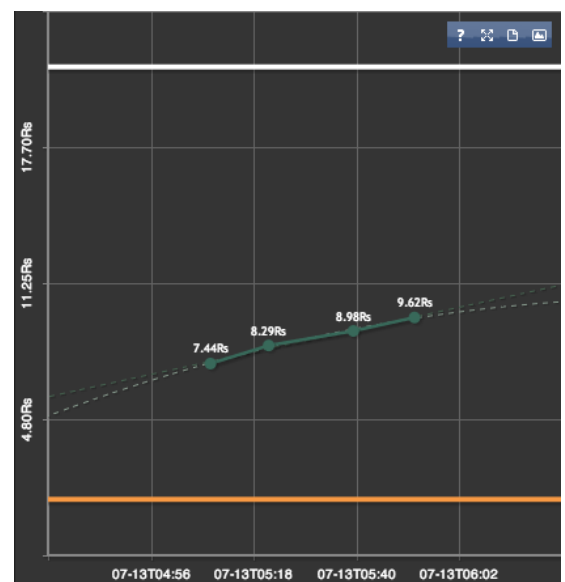
You can select which graph is shown using the grid of buttons shown under it, which looks like this:



The name of a spacecraft is for graphs of plane-of-sky results for that spacecraft. 3D graphs are accessed with the buttons across from the text “3D” A graph with actual data will look something like this:

The dashed lines are least-squares fits. The lighter of the two is a quadratic fit, the darker is a linear fit. The orange line is the surface of the sun, and the white line is the 21.5Rs boundary.

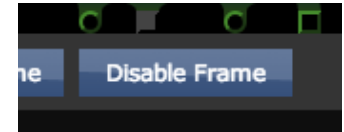
The buttons in the top right, from left to right, show/hide a legend (the question mark), enter/exit full-window graph mode (the outward-pointing arrows), download a CSV file for the graph's data (the document), and download an image of the graph (The picture).



If a graph is of a quantity where each datapoint is linked specifically to one or two frames (not speed or acceleration, which are differentiated), clicking the point on the graph will disable its source frames, and exclude them from calculations. When this happens, the point will show up as grey, on the graph, but will not affect the fits (as it doesn't affect calculations). Clicking on it again will re-enable it. Disabled frames show up as grey in the timeline, like this:



You can also enable/disable the current frame by the Enable/Disable Frame button, at the bottom of the Frameseries Panel.



The table in the Frameseries Panel is divided into several sections. The first section, "Per Frame Results," is updated continuously during handle dragging, and is specific to the frame being measured.

Per Frame Results	
Time	2012-07-13T 05:52:00Z
Projected Height	7.63Rs
Latitude	88°
Half-Width	20°
Total pairs	4

The last section, "Range Info," is about the range selected in the image screen, and the number of images used.

Range Info	
Start Time	2012-07-13T 04:55:05Z
End Time	2012-07-13T 06:04:24Z
STEREO-B Images	
Used	3 of 18
Disabled	1 of 4
Paired	4
SOHO Images	
Used	4 of 12
Disabled	1 of 5
Paired	4

The in-between sections (collectively, "Frameseries Results") depend on what spacecraft are selected.

There will be one Frameseries Results section for each spacecraft, showing data based solely on its visible projection.

Each source of three dimensional results will also have its own section. This can be a pair of spacecraft (there can be more than one pair of spacecraft if you do a three-spacecraft frameseries), or the combination of a spacecraft and an angle from the plane of sky to the CME (if you do a one-spacecraft frameseries).

When you save them, frameseries show up in the Frameseries Table in the Session Screen. As with ordinary measurements, you can press the magnifying glass button to edit them in the Measurement Screen (saving changes will overwrite the Frameseries in the session, instead of creating a copy, like with measurements). You can press the other buttons by its row to delete it or comment on it.

Frameseries													
Start Time	End Time	Pairs	Frames Used Per Spacecraft			3D Results Summary							
			STEREO-B	SOHO	STEREO-A	Mean Half-Width	Linear Fit Speed	Mean Longitude	Mean Latitude	Linear Fit Boundary Time			
2012-07-13T04:55:05Z	2012-07-13T06:04:24Z	4	3/18	4/12	-	21°	587km/s	37°	61°	2012-07-13T09:47:28Z			

Hotkeys

Shift-clicking (or option clicking, it doesn't matter) on an image in the Measurement Screen will move handles instantly, with no need to drag.

Shift-clicking (or option clicking, it doesn't matter) on the Image Choice Screen's timeline will move the end date or an end choice box instead of the start one.

Alt-L will bring up the interface to load a session file.

Alt-S will save the session to a file.

Alt-E in the Measurement Screen in Two-Timepoint mode starts an ensemble.

R opens the Results Dialog in the Measurement Screen.

Arrows navigate through images in a Frameseries.

Shift-Enter saves a single measurement or frame in the Measurement Screen.

Alt-Enter saves an entire ensemble or frameseries in the Measurement Screen.

V toggles viewing all the measurements in an ensemble in the Measurement Screen.

Delete (The small key, not Backspace) deletes a frame in Frameseries Mode.

If you hold down alt in the Session Screen, you can drag measurement rows onto ensemble title rows to add them as custom members.