

Exceptional service in the national interest



Technical Meeting on SHI Software Engineering at the IDC

Refines Event Storyboards

17-19 June 2015

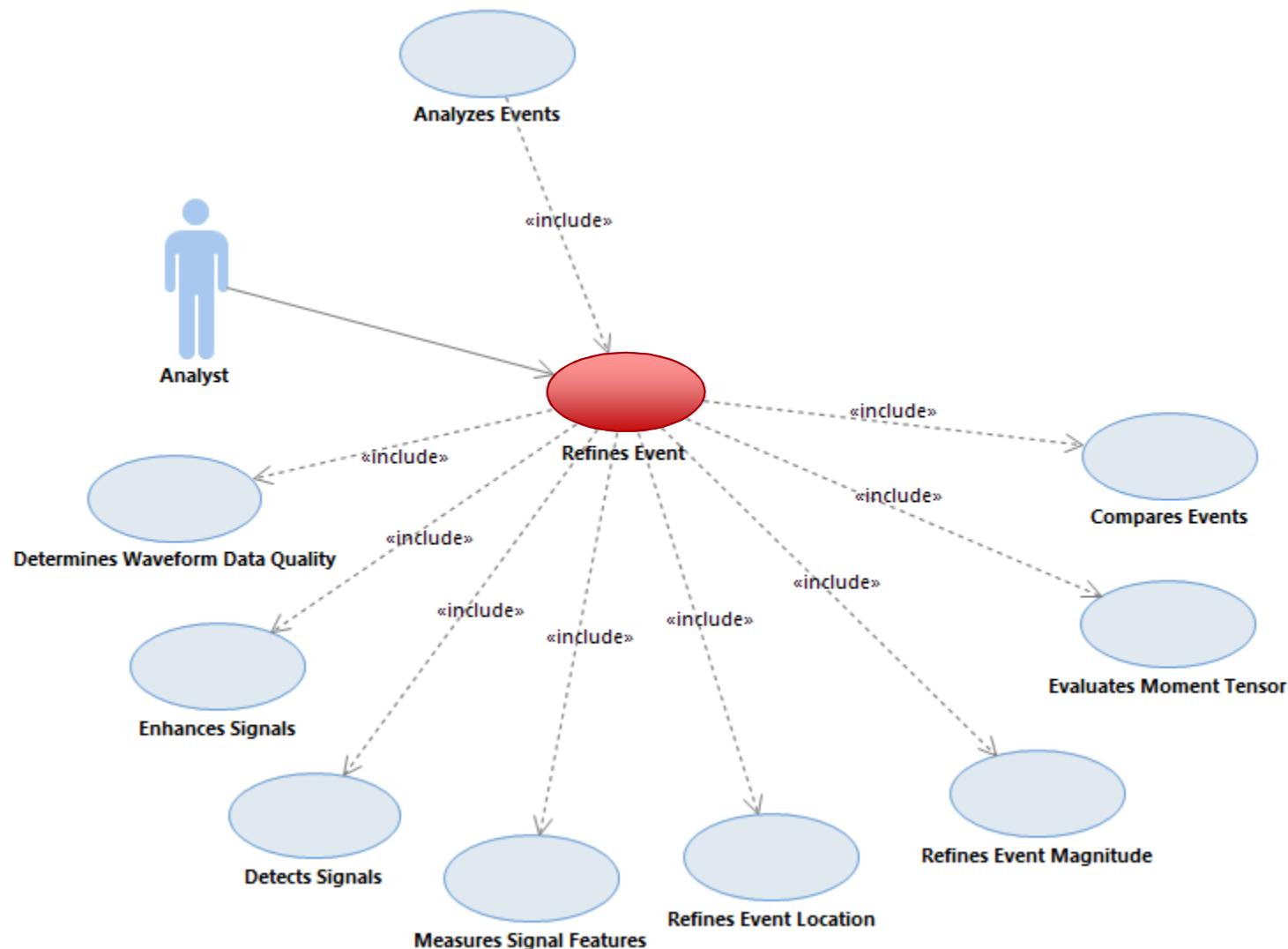
Overview

- The Analyst accesses the interfaces represented by these storyboards by opening the Analyst workspace (Analyzes Events UC), selecting data for analysis (Selects Data for Analysis UC), and selecting an event to refine (Refines Event UC, these storyboards)
- These storyboards represent the primary Analyst interface where Analysts can refine events

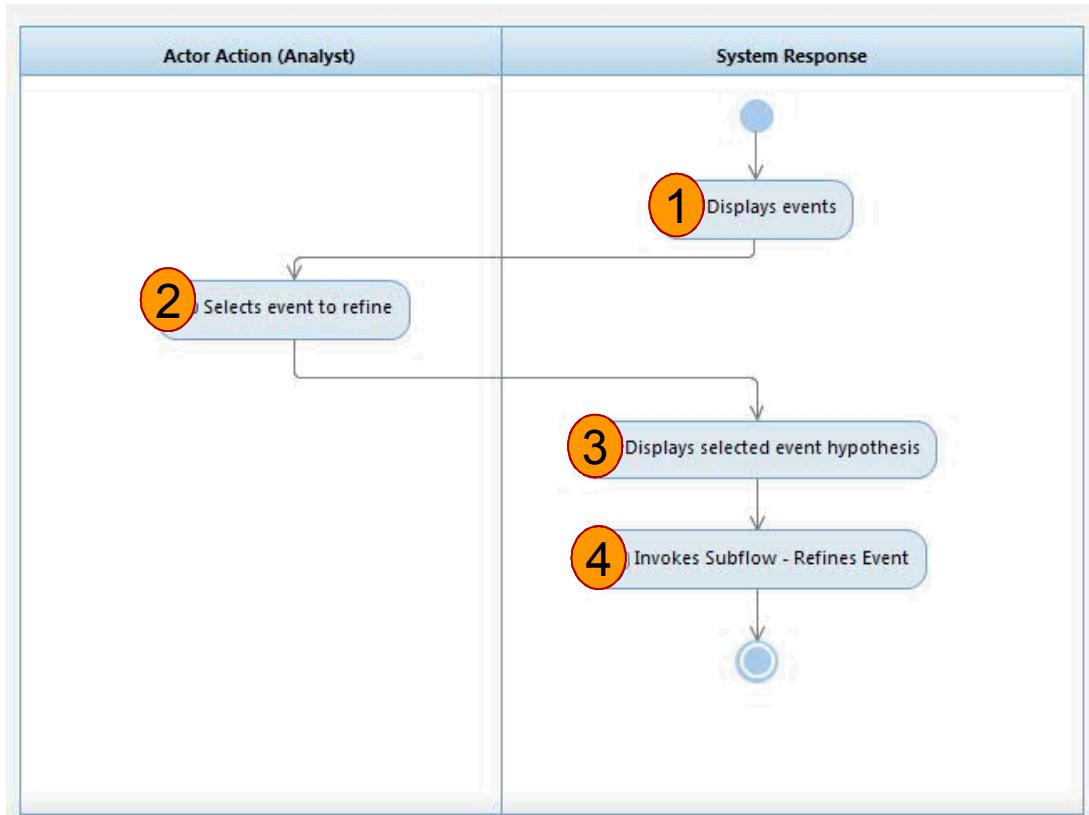
Key concepts

- Tabs are used to represent UI elements that can be:
 - Docked/Undocked
 - Positioned where desired
- This supports a range of Analyst environments – from a laptop to working with multiple monitors
- The menu items shown are for items that are only available via a menu. Other menu items will exist, but may not be shown on storyboards
- Hot keys are not shown

Refines Event: Use Case



Refines Event: Use Case - Main Flow



- 1) Displays event list
- 2) Selects event to refine
- 3) Displays preferred event hypothesis for selected event
- 4) Refines selected event

System Action: Displays events

1 Displays events

Events Filters Beams* Location Magnitude Compare with Past Events

Events to Work

id	lat	lon	depth	time	mag	region [descriptor]	worked by	stage	active analyst	EQM	conflict
####	####	####	####	##/##/#### ####:##:##	####	XXXX	XXXX	XXXX	XXXX	#.##	
####	####						XXXX	XXXX	XXXX	#.##	
####	####						XXXX	XXXX	XXXX	#.##	
####	####	####	####	##/##/#### ####:##:##	####	XXXX	XXXX	XXXX	XXXX	#.##	X
####	####	####	####	##/##/#### ####:##:##	####	XXXX	XXXX	XXXX	XXXX	#.##	X
####	####	####	####	##/##/#### ####:##:##	####	XXXX	XXXX	XXXX	XXXX	#.##	
####	####	####	####	##/##/#### ####:##:##	####	XXXX	XXXX	XXXX	XXXX	#.##	

This event list is populated when the Analyst 'Selects Data for Analysis' (described in the Analyzes Events storyboards)

Reviewed Events

id	lat	lon	depth	time	mag	region [descriptor]	worked by	stage	active analyst	EQM	conflict	complete []
####	####	####	####	##/##/#### ####:##:##	####	XXXX	XXXX	XXXX	XXXX	#.##		
####	####	####	####	##/##/#### ####:##:##	####	XXXX	XXXX	XXXX	XXXX	#.##	✓	

Comments

forward 01/19/2013, 14:12:00

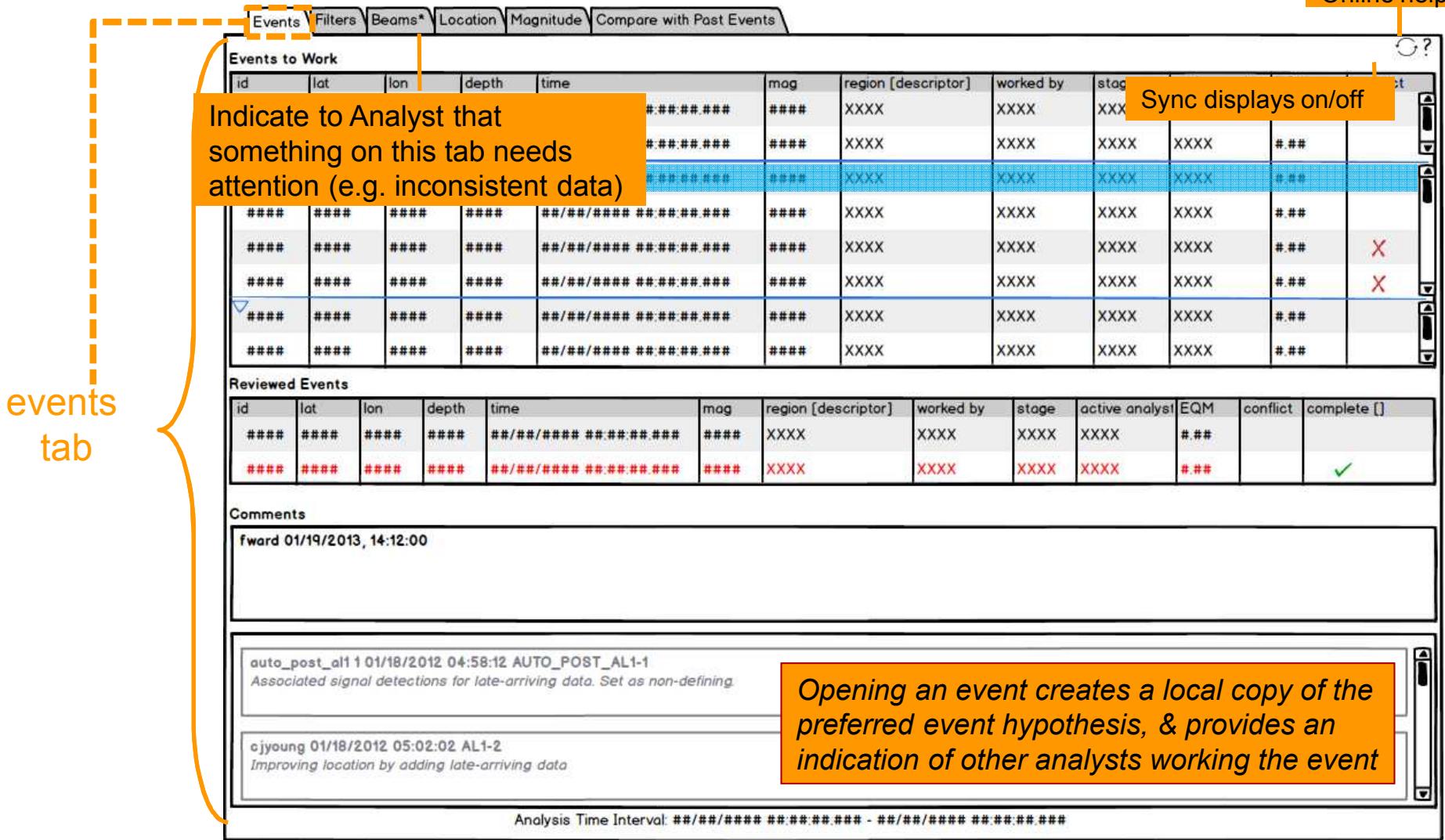
auto_post_al1 1 01/18/2012 04:58:12 AUTO_POST_AL1-1
Associated signal detections for late-arriving data. Set as non-defining.

cjyoung 01/18/2012 05:02:02 AL1-2
Improving location by adding late-arriving data

Analysis Time Interval: ##/##/#### ####:##:## - ##/##/#### ####:##:##

System Action: Displays events

events tab



Events Filters Beams* Location Magnitude Compare with Past Events

Events to Work

id	lat	lon	depth	time	mag	region [descriptor]	worked by	stage	active analyst	EQM	conflict	complete []
####	####	####	####	##/##/#### ####:##:##.##	####	XXXX	XXXX	XXXX	XXXX	####	##.##	
####	####	####	####	##/##/#### ####:##:##.##	####	XXXX	XXXX	XXXX	XXXX	####	##.##	X
####	####	####	####	##/##/#### ####:##:##.##	####	XXXX	XXXX	XXXX	XXXX	####	##.##	X
####	####	####	####	##/##/#### ####:##:##.##	####	XXXX	XXXX	XXXX	XXXX	####	##.##	
####	####	####	####	##/##/#### ####:##:##.##	####	XXXX	XXXX	XXXX	XXXX	####	##.##	

Sync displays on/off

Reviewed Events

id	lat	lon	depth	time	mag	region [descriptor]	worked by	stage	active analyst	EQM	conflict	complete []
####	####	####	####	##/##/#### ####:##:##.##	####	XXXX	XXXX	XXXX	XXXX	####	##.##	
####	####	####	####	##/##/#### ####:##:##.##	####	XXXX	XXXX	XXXX	XXXX	####	##.##	✓

Comments

forward 01/19/2013, 14:12:00

auto_post_all 1 01/18/2012 04:58:12 AUTO_POST_AL1-1
Associated signal detections for late-arriving data. Set as non-defining.

cjyoung 01/18/2012 05:02:02 AL1-2
Improving location by adding late-arriving data

Analysis Time Interval: ##/##/#### ####:##:##.## - ##/##/#### ####:##:##.##

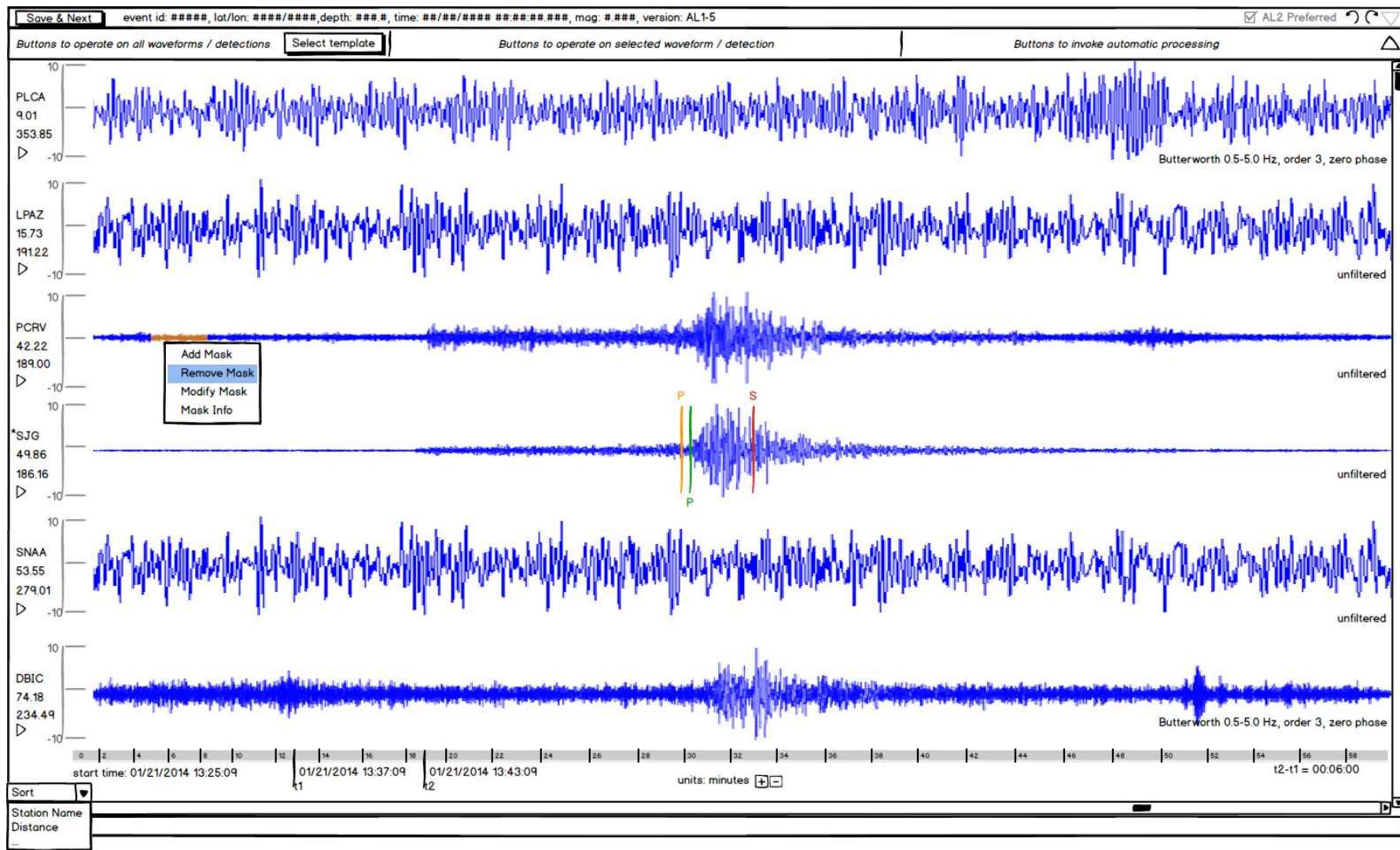
Indicate to Analyst that something on this tab needs attention (e.g. inconsistent data)

Opening an event creates a local copy of the preferred event hypothesis, & provides an indication of other analysts working the event

System Action: Displays selected event hypothesis (preferred hypothesis for selected event)

3

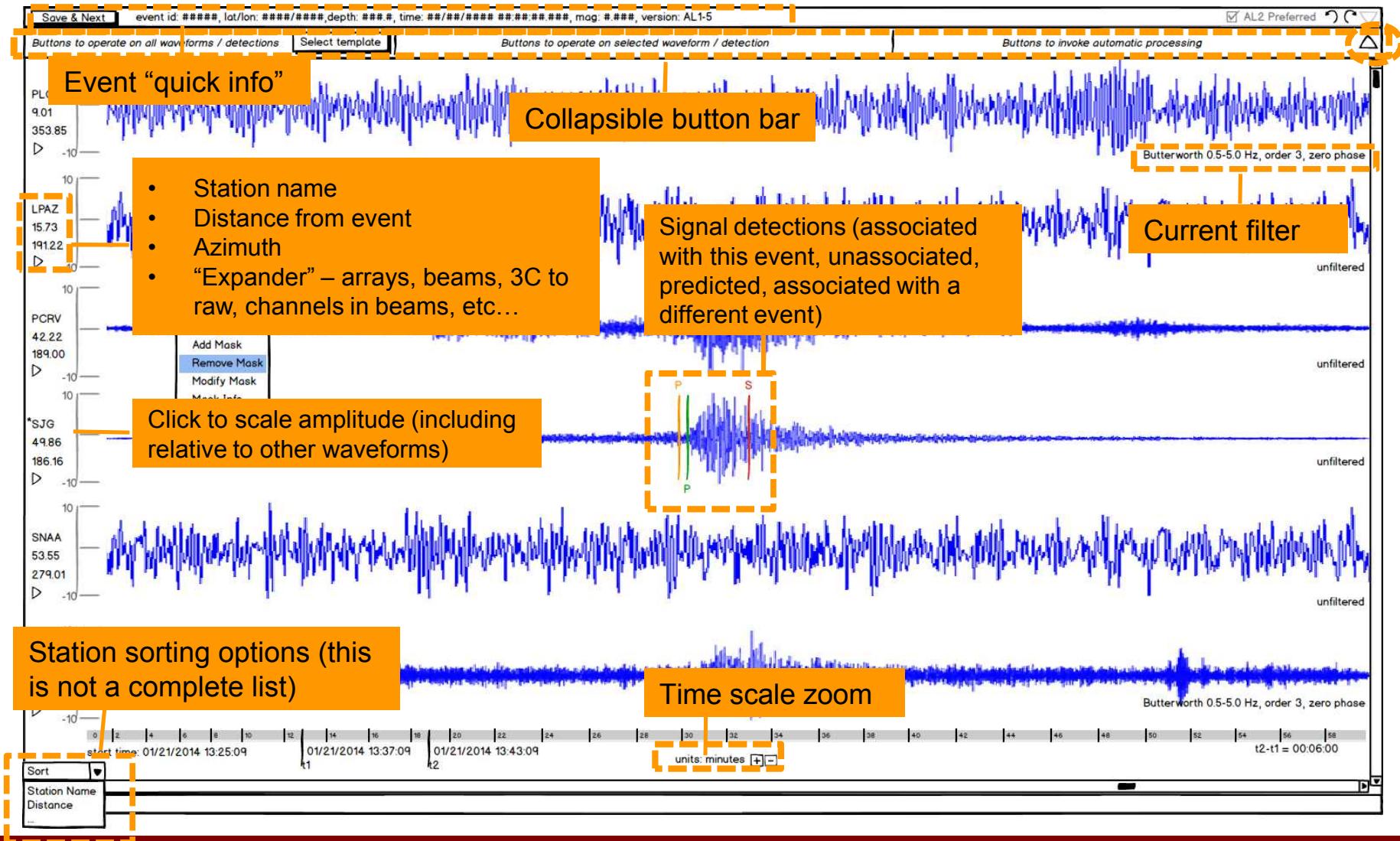
Displays selected event hypothesis



System Action: Displays selected event hypothesis (preferred hypothesis for selected event)

3

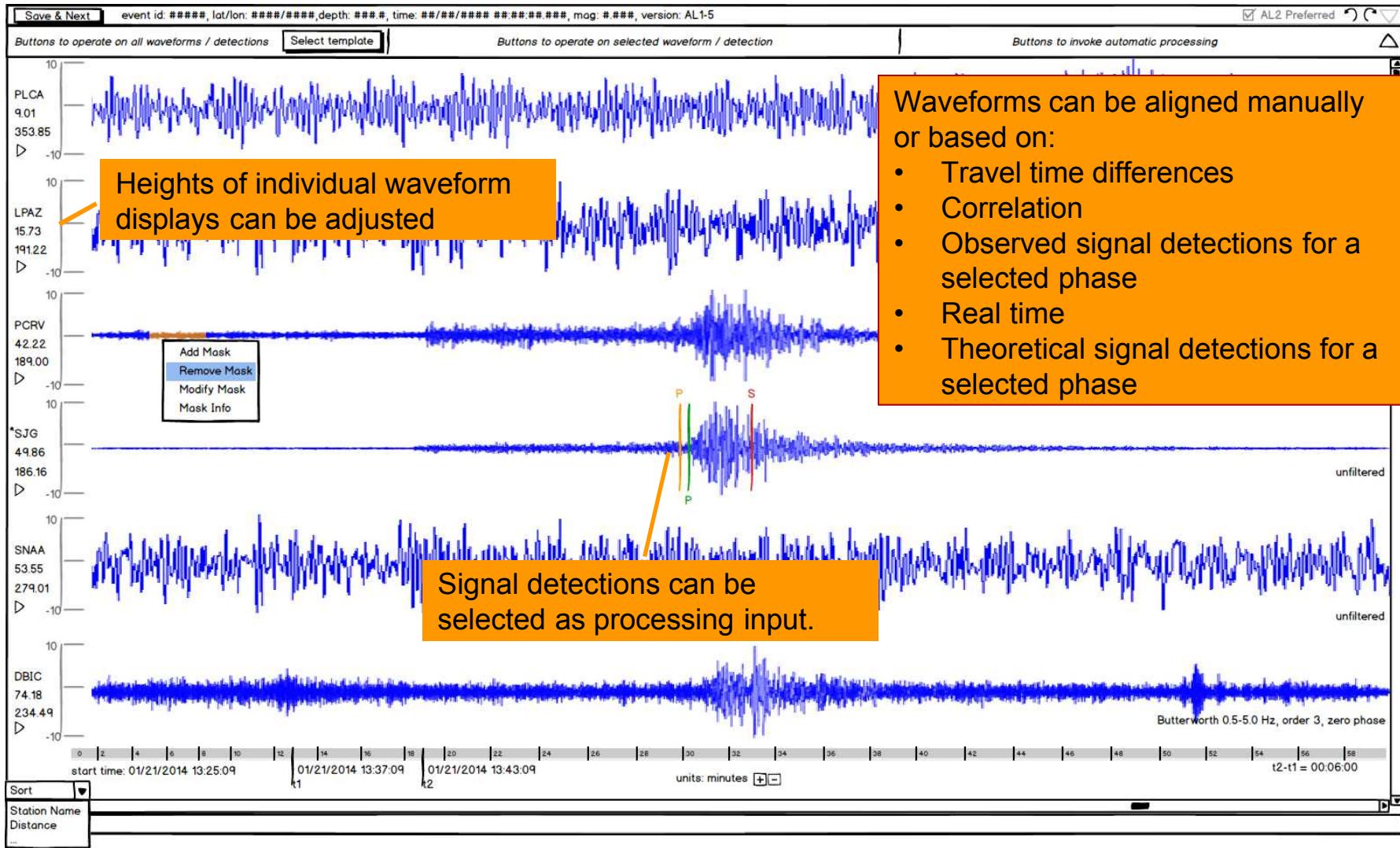
Displays selected event hypothesis



System Action: Displays selected event hypothesis (preferred hypothesis for selected event)

3

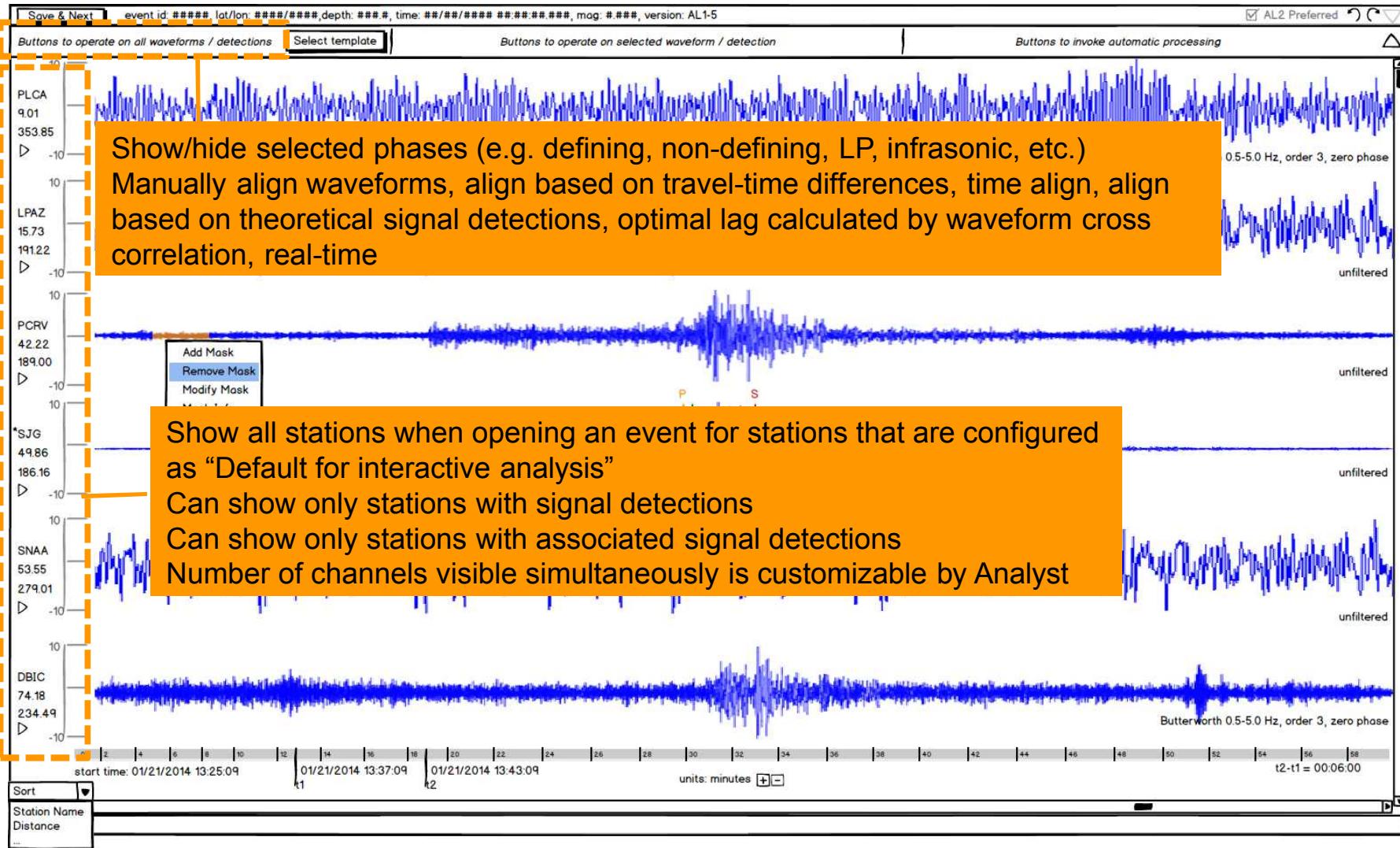
Displays selected event hypothesis



System Action: Displays selected event hypothesis (preferred hypothesis for selected event)

3

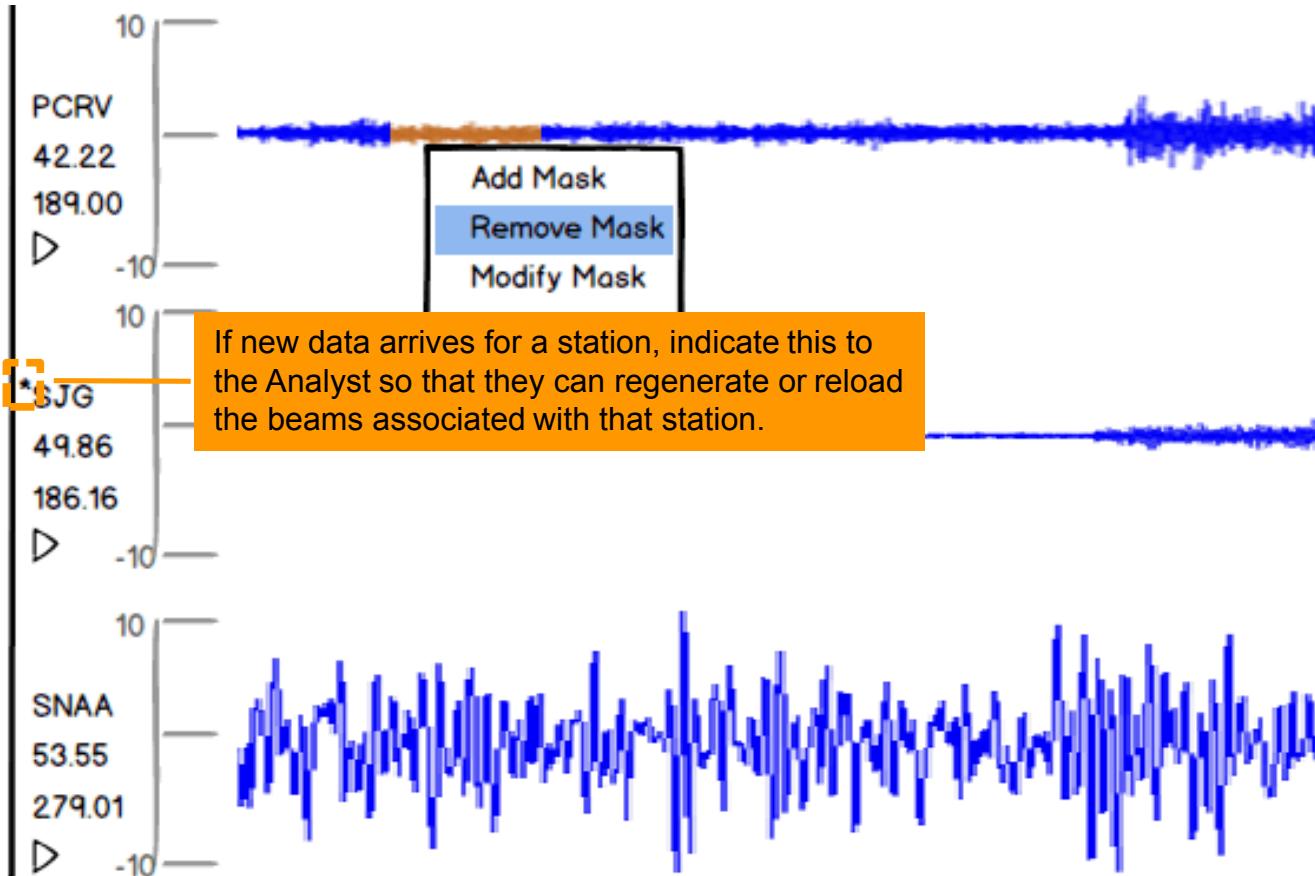
Displays selected event hypothesis



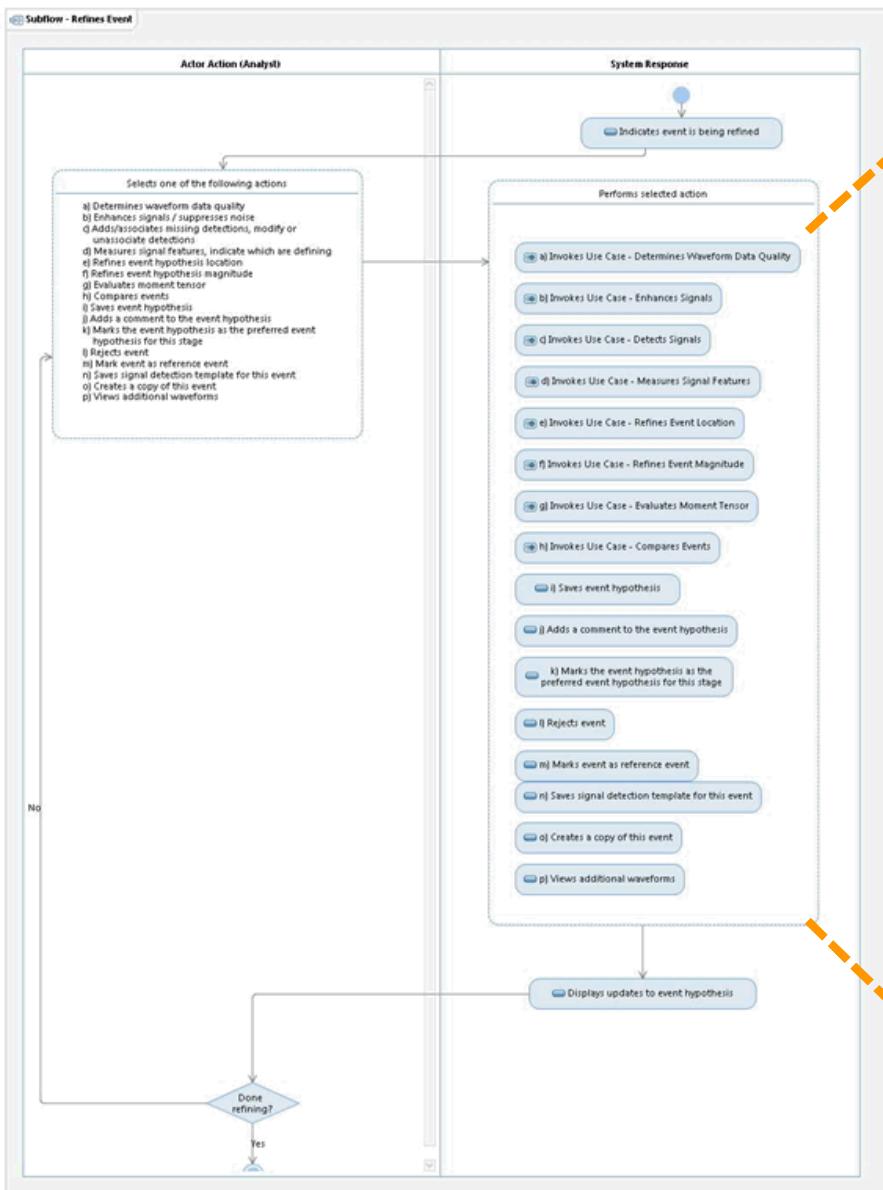
System Action: Displays selected event hypothesis (preferred hypothesis for selected event)

3

Displays selected event hypothesis



User Action: Selects one of the following actions



4

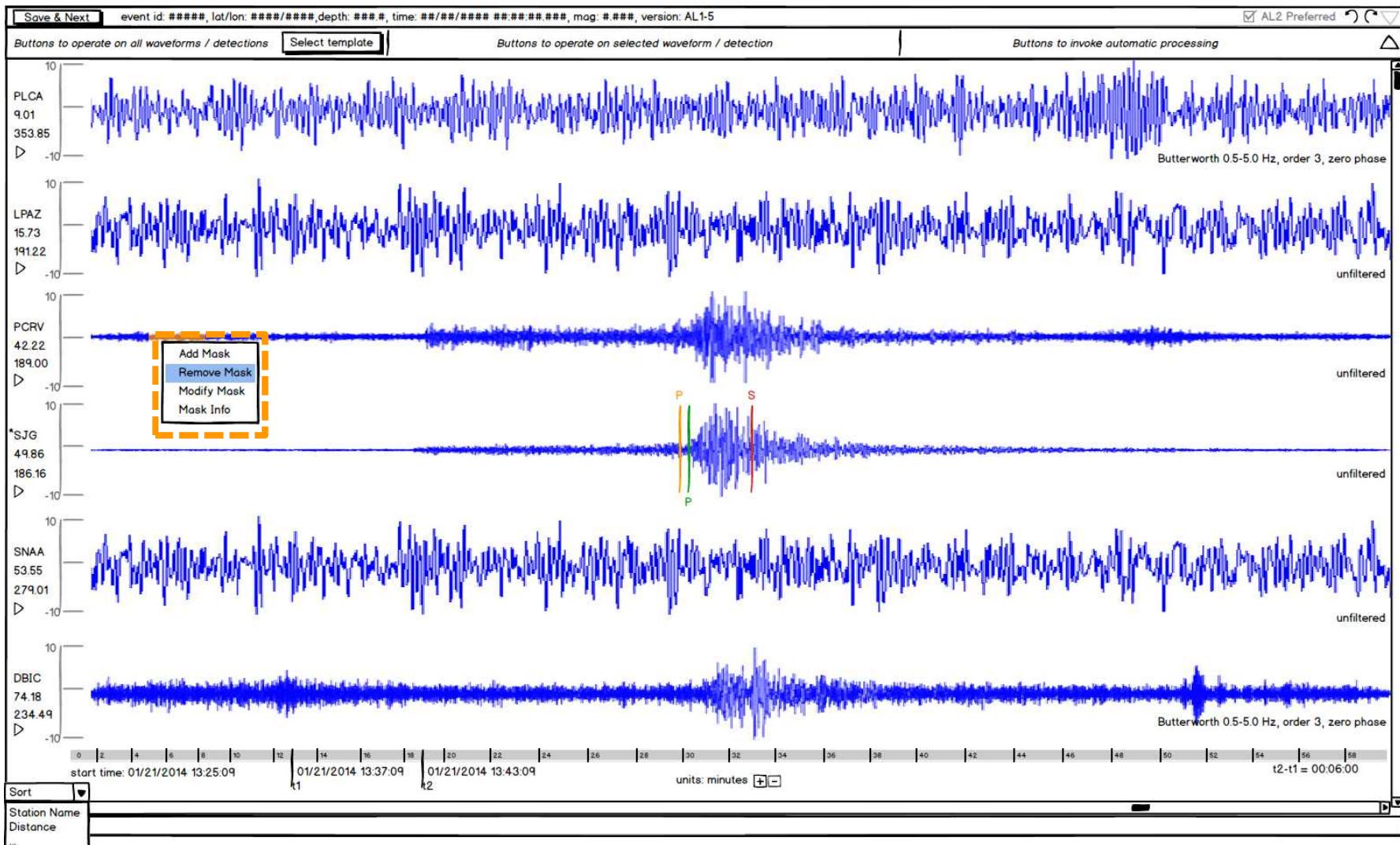
Invokes Subflow - Refines Event

- a) Determines Waveform Data Quality
- b) Enhances Signals
- c) Detects Signals
- d) Measures Signal Features
- e) Refines Event Location
- f) Refines Event Magnitude
- g) Evaluates Moment Tensor
- h) Compares Events
- i) Provides Analyst Feedback
- j) Saves event hypothesis
- k) Adds a comment to the event hypothesis
- l) Marks the event hypothesis as the preferred event hypothesis for this stage
- m) Rejects event
- n) Marks event as reference event
- o) Saves signal detection template for this event
- p) Creates a copy of this event
- q) Views additional waveforms

User Action: Determines Waveform Data Quality UC

4a

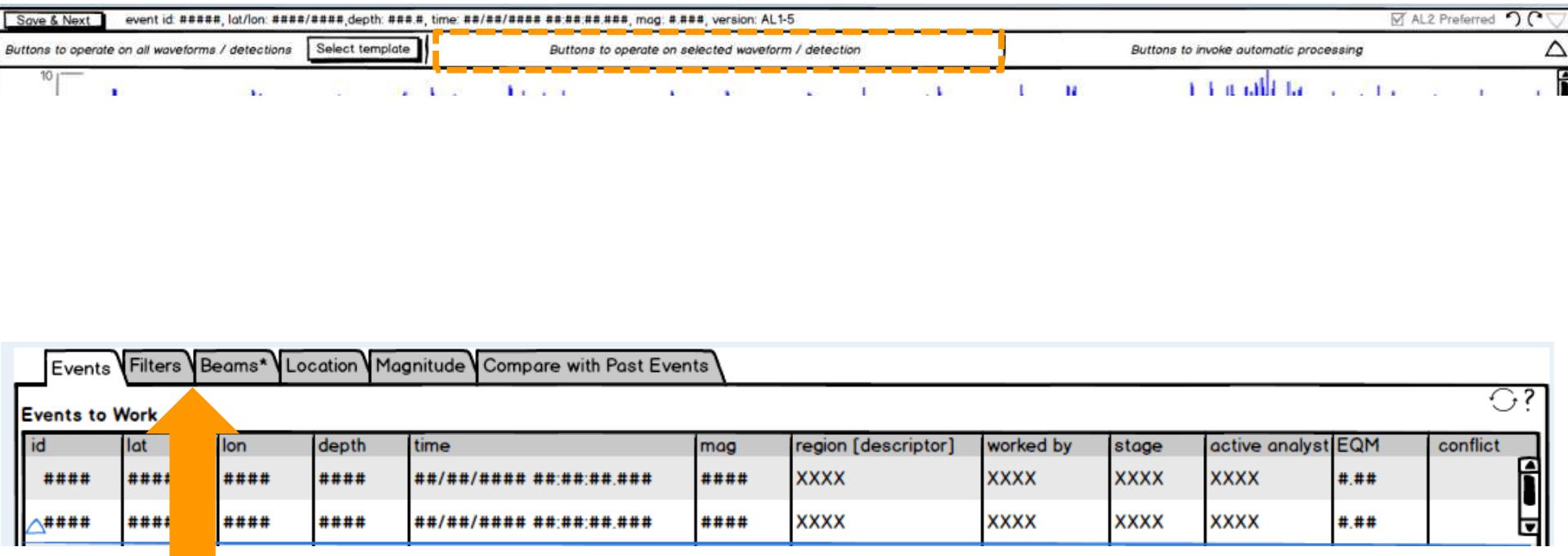
Invokes Use Case - Determines Waveform Data Quality



User Action: Enhances Signals UC

4b

Invokes Use Case - Enhances Signals



Save & Next event id: #####, lat/lon: #####/#####, depth: #####, time: ##/##/#### ## ##:##.##, mag: #.##, version: AL1-5

Buttons to operate on all waveforms / detections Select template Buttons to operate on selected waveform / detection Buttons to invoke automatic processing

10

Events Filters Beams* Location Magnitude Compare with Past Events

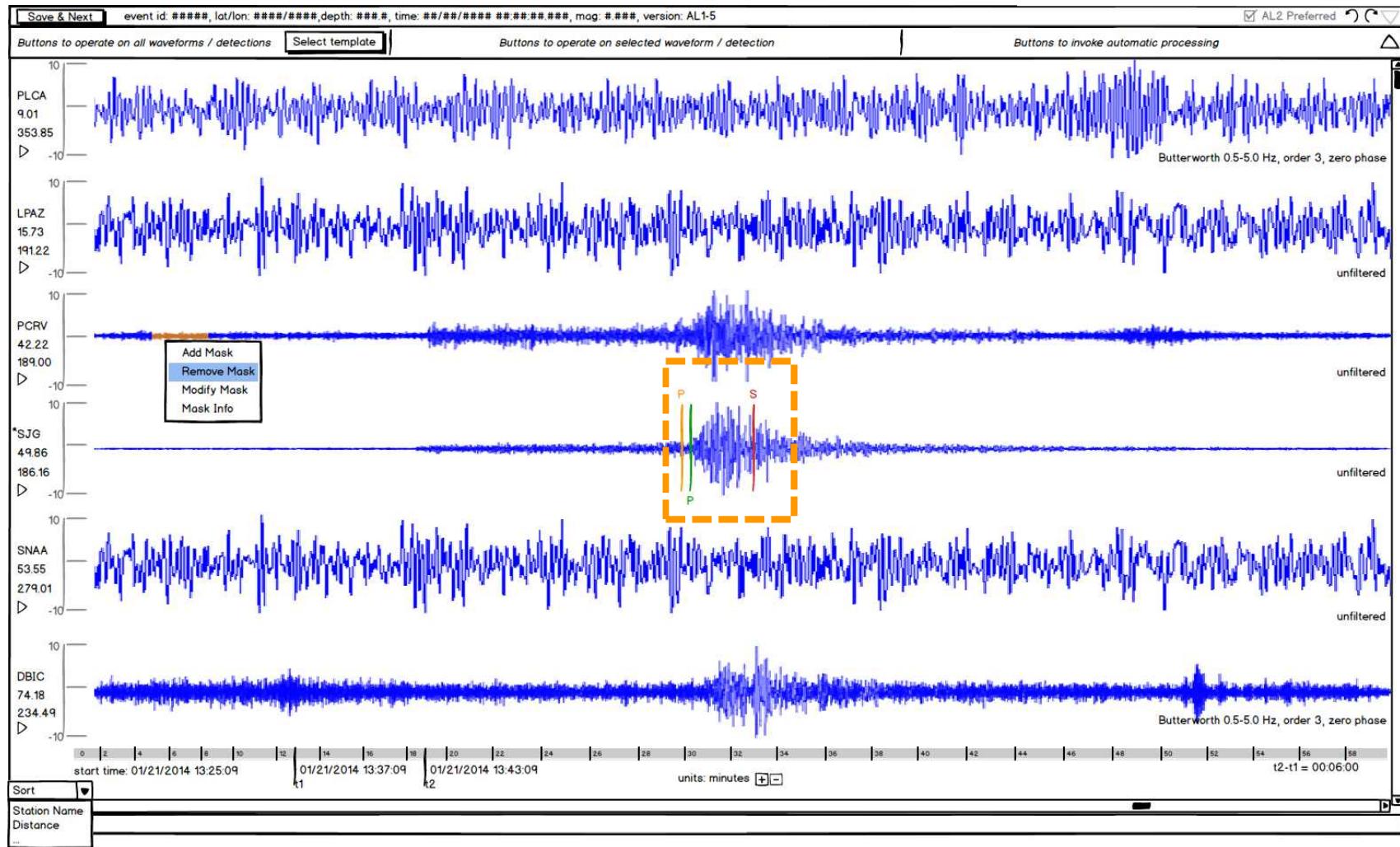
Events to Work

id	lat	lon	depth	time	mag	region [descriptor]	worked by	stage	active analyst	EQM	conflict
####	####	####	####	##/##/#### ## ##:##.##	####	XXXX	XXXX	XXXX	XXXX	#.##	
####	####	####	####	##/##/#### ## ##:##.##	####	XXXX	XXXX	XXXX	XXXX	#.##	

User Action: Detects Signals UC

4c Invokes Use Case - Detects Signals

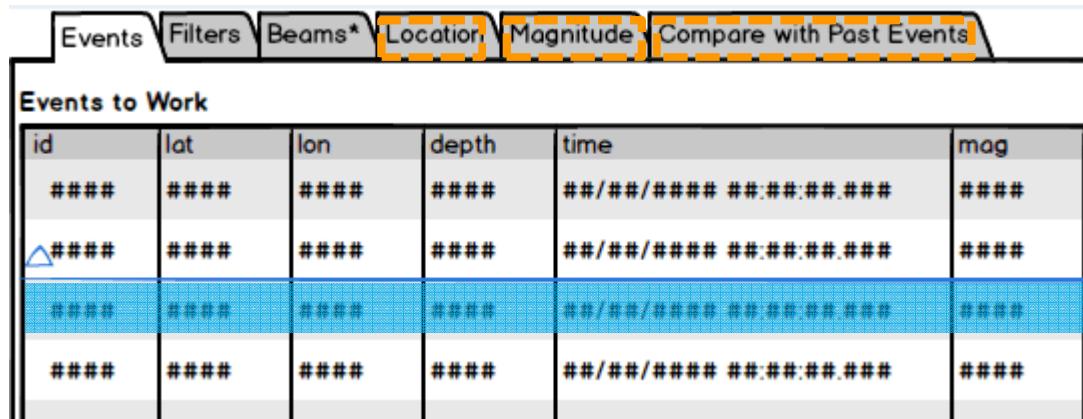
4d Invokes Use Case - Measures Signal Features



User Actions

- 4e Invokes Use Case - Refines Event Location
- 4f Invokes Use Case - Refines Event Magnitude
- 4h Invokes Use Case - Compares Events

- Refines Event Location UC
- Refines Event Magnitude UC
- Compares Events UC

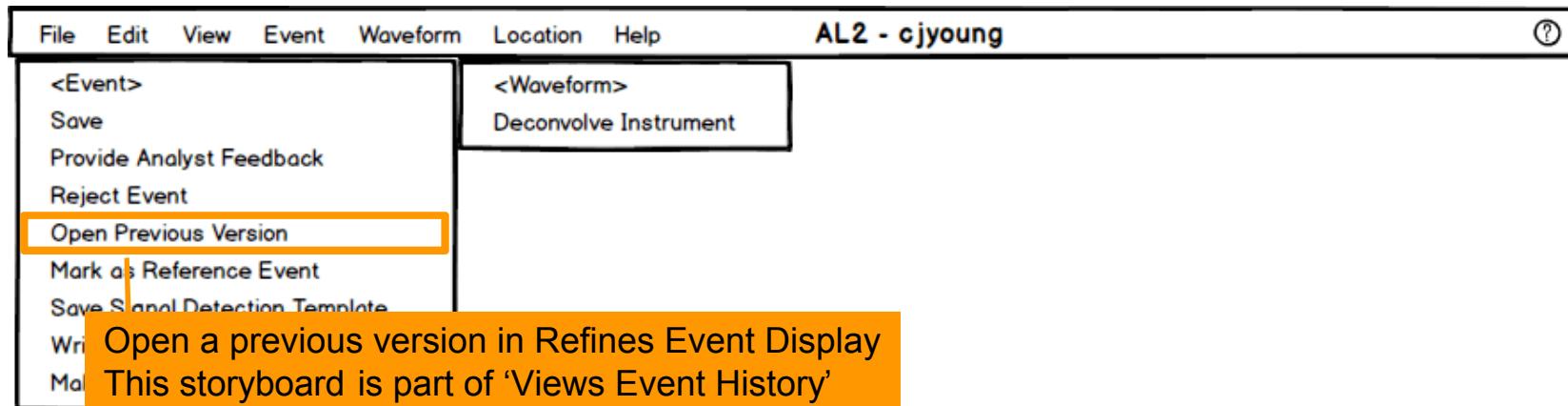


The screenshot shows a software interface for managing seismic events. At the top, there is a navigation bar with tabs: Events, Filters, Beams*, Location, Magnitude, and Compare with Past Events. The 'Location' tab is currently selected, indicated by a yellow dashed border. Below the navigation bar is a section titled 'Events to Work' containing a table of event data. The table has columns for id, lat, lon, depth, time, and mag. The data rows are represented by placeholder text (e.g., #####) and a single row with a blue triangle icon. The row with the blue triangle is highlighted with a blue background.

Events to Work						
id	lat	lon	depth	time	mag	
#####	#####	#####	#####	##/##/#### ##:##:##.##	#####	
△#####	#####	#####	#####	##/##/#### ##:##:##.##	#####	
## ##	## ##	## ##	## ##	##/##/## ##:##:##.##	## ##	
#####	#####	#####	#####	##/##/#### ##:##:##.##	#####	

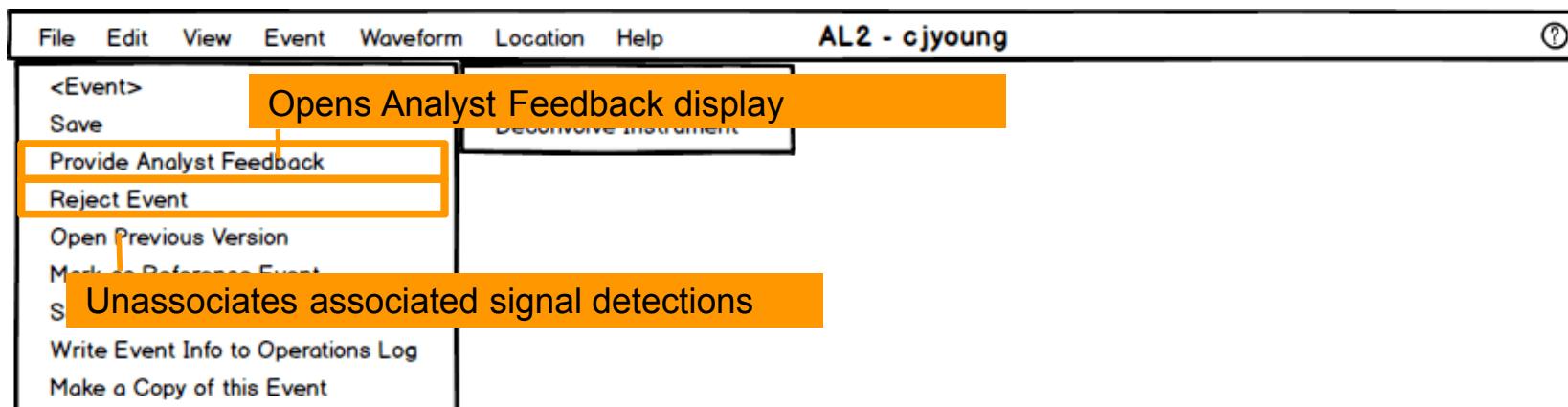
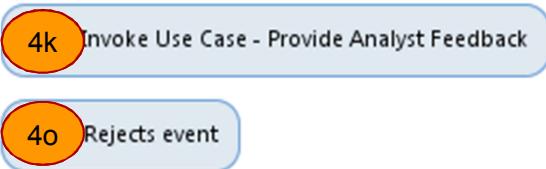
User Actions

- Open Previous Version



User Actions

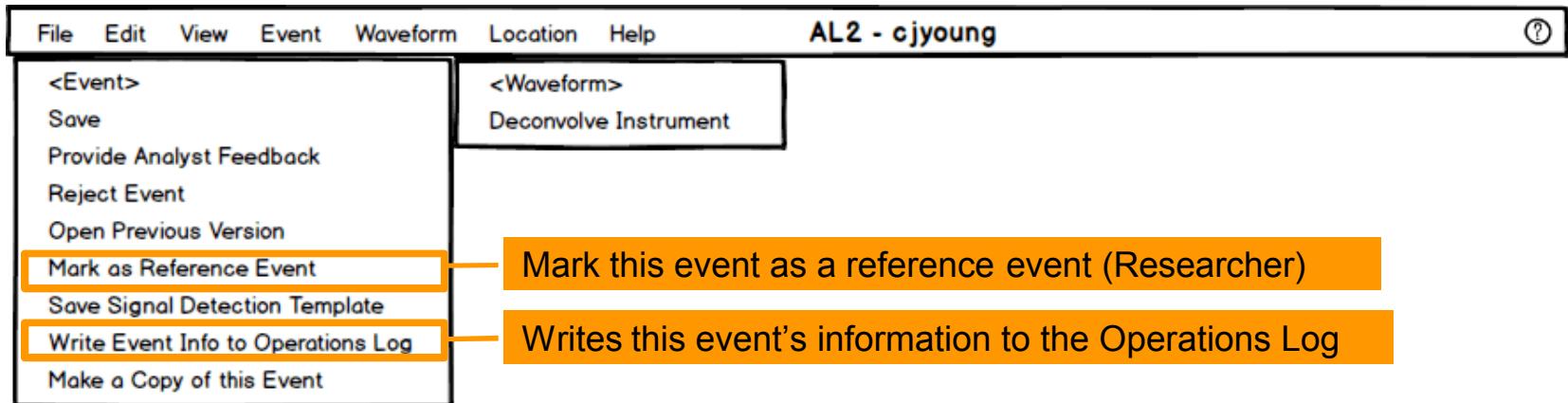
- Provides Analyst Feedback UC
- Rejects event



User Actions

4p

Marks event as reference event



A “reference event” is an event that has been categorized as a certain type of an event. Part of marking an event as a reference event will include indicating 1 or more categories of reference event.

User Actions

File Edit View Event Waveform Location Help **AL2 - cjyoung** 

<Event>

- Save
- Provide Analyst Feedback
- Reject Event
- Open Previous Version
- Mark as Reference Event
- Save Signal Detection Template**
- Write Event Info to Operations Log
- Make a Copy of this Event

<Waveform>

- Deconvolve Instrument

Save a template representing the currently selected signal detections

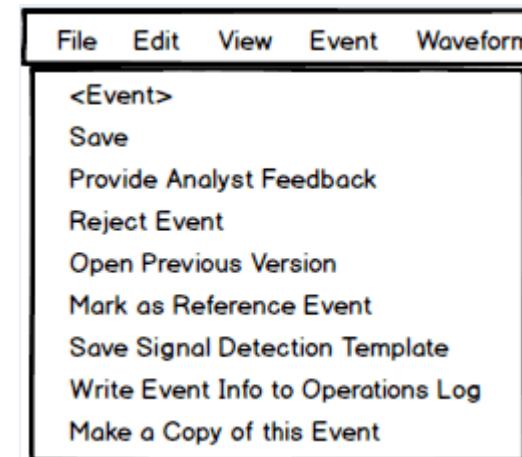
4q

Saves signal detection template for this event

User Action: Saves event hypothesis

41 Saves event hypothesis

- Saves the current event hypothesis and all related information, including new derived waveforms that contain associated signal detections
- Saves a new version and starts a new session (clear session stack, create a new working copy/version of the event hypothesis). Until the Analyst reviews the event, it stays in the “Events to Work” list
- This is how the user saves the current event hypothesis (not the unassociated detections)



User Action: Saves event hypothesis

This display represents a status check of the data

This display could be modified to have error information only

Save Event Hypothesis		
<input checked="" type="checkbox"/> No new incoming data		
<input checked="" type="checkbox"/> Inconsistent data		
	Origins beams target out of date location	
<input checked="" type="checkbox"/> No conflicts with other Analysts		
<input checked="" type="checkbox"/> Preferred event hypothesis set for this event		
<input checked="" type="checkbox"/> This event's signal detections are not shared by another event in this stage		
	Save	Reviewed
		Complete

Becomes enabled when there are no conflicts
(Conflict could be more than one event the same time and space, events that share a signal detection)

When checked, indicates a conflict exists between the checked event and another event

Check all complete checkboxes

conflict	complete ()

When checked, indicates the Analyst considers this event to be done (no need to rework, automatic post processing can be run, no conflicts allowed)
This will update the number of events completed count shown in the workflow.

User Action: Adds a comment to the event hypothesis

4m Adds a comment to the event hypothesis

Events Filters Beams* Location Magnitude Compare with Past Events

Events to Work

id	lat	lon	depth	time	mag	region [descriptor]	worked by	stage	active analyst	EQM	conflict
####	####	####	####	##/##/#### ##:##:##.##	####	XXXX	XXXX	XXXX	XXXX	#.##	
####	####	####	####	##/##/#### ##:##:##.##	####	XXXX	XXXX	XXXX	XXXX	#.##	
####	####	####	####	##/##/#### ##:##:##.##	####	XXXX	XXXX	XXXX	XXXX	#.##	
####	####	####	####	##/##/#### ##:##:##.##	####	XXXX	XXXX	XXXX	XXXX	#.##	X
####	####	####	####	##/##/#### ##:##:##.##	####	XXXX					
####	####	####	####	##/##/#### ##:##:##.##	####	XXXX					
####	####	####	####	##/##/#### ##:##:##.##	####	XXXX					

Reviewed Events

id	lat	lon	depth	time	mag	region [descriptor]	worked by	stage	active analyst	EQM	conflict	complete []
####	####	####	####	##/##/#### ##:##:##.##	####	XXXX	XXXX	XXXX	XXXX	#.##		
####	####	####	####	##/##/#### ##:##:##.##	####	XXXX	XXXX	XXXX	XXXX	#.##	✓	

Comments

Forward 01/19/2013, 14:12:00

version

auto_post_all 01/18/2012 04:58:12 AUTO_POST_AL1-1
Associated signal detections for late-arriving data. Set as non-defining.

cjyoung 01/18/2012 05:02:02 AL1-2
Improving location by adding late-arriving data

Analysis T

The comments shown for this event hypothesis are for the full event history (not just the current branch if branched)

Time ordered comments – newest at top

Un-editable comments (in this display) for previous event hypotheses. Comment data editable by authorized user from elsewhere

User Action: Marks the event hypothesis as the preferred event hypothesis for this stage



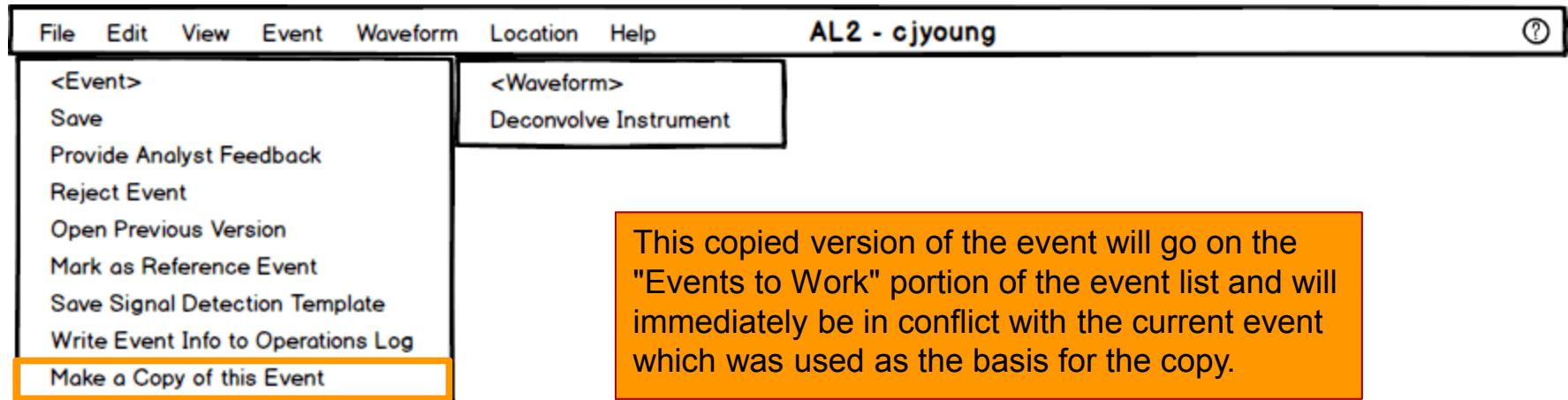
4n n) Marks the event hypothesis as the preferred event hypothesis for this stage

- There should be at least one and only one preferred event hypothesis for an event per processing stage.
- This check box is selected by default when the Analyst opens the current preferred event hypothesis.
- If the preferred event hypothesis check box is checked when the event hypothesis is saved, the saved event hypothesis is the preferred for the event for the current processing stage.
- The Analyst can open a previous event hypothesis version (e.g. through Open Previous Version menu) and mark that event hypothesis as preferred. AL2 Preferred
- If the Analyst deselects the check box and saves, the currently preferred event hypothesis will not change. This is to ensure that there is always a preferred event hypothesis.

User Action: Creates a copy of this event

4r

Creates a copy of this event



File Edit View Event Waveform Location Help AL2 - cjyoung ?

<Event>

- Save
- Provide Analyst Feedback
- Reject Event
- Open Previous Version
- Mark as Reference Event
- Save Signal Detection Template
- Write Event Info to Operations Log
- Make a Copy of this Event**

<Waveform>

- Deconvolve Instrument

This copied version of the event will go on the "Events to Work" portion of the event list and will immediately be in conflict with the current event which was used as the basis for the copy.

Signal Detection List

- This list is synced with displays related to refining an event
- Portions of this list will be available elsewhere (e.g. portions related to location will be in the Refines Event Location tab)

Signal Detection List

Event Hypothesis

event id	event hypothesis id	time	lat	lon	depth	sdobs	ndef	mb	ms	grname	smajax	sminax	strike	sdepth	sime	conf
####	####	####/##/#### ##:##:##.##	####	####	####	####	####	####	####	XXXX	####	####	####	####	####	####

Show Signal Detections with

Associated

sta	channel	phase	travel time	Location Defining	medef	az	per	fk-az	res	azdef	fk-dis	distRes	eve-dis	slofdef	slow	magdef	mb	ms	snr	qual	id
XXXX	XXXX	XXXX	####	All Defining	<input checked="" type="checkbox"/>	(S)	####	####	####	<input checked="" type="checkbox"/>	(A)	####	####	<input type="checkbox"/>	(S)	####	XXXX	####	####	####	####
XXXX	XXXX	XXXX	####	Non-Defining SP	<input checked="" type="checkbox"/>	(S)	####	####	####	<input type="checkbox"/>	(S)	####	####	<input type="checkbox"/>	(S)	####	XXXX	####	####	####	####
XXXX	XXXX	XXXX	####	LP	<input checked="" type="checkbox"/>	(S)	####	####	####	<input type="checkbox"/>	(S)	####	####	<input type="checkbox"/>	(S)	####	XXXX	####	####	####	####
XXXX	XXXX	XXXX	####	Noise	<input checked="" type="checkbox"/>	(S)	####	####	####	<input type="checkbox"/>	(S)	####	####	<input type="checkbox"/>	(S)	####	XXXX	####	####	####	####
XXXX	XXXX	XXXX	####	Infrasonic	<input type="checkbox"/>	(A)	####	####	####	<input type="checkbox"/>	(S)	####	####	<input type="checkbox"/>	(S)	####	XXXX	####	####	####	####
XXXX	XXXX	XXXX	####	Hydroacoustic	<input checked="" type="checkbox"/>	(S)	####	####	####	<input checked="" type="checkbox"/>	(S)	####	####	<input checked="" type="checkbox"/>	(S)	####	XXXX	####	####	####	####
ZZZZ	XXXX	XXXX	####		<input checked="" type="checkbox"/>	(S)	####	####	####	<input checked="" type="checkbox"/>	(S)	####	####	<input checked="" type="checkbox"/>	(S)	####	XXXX	####	####	####	####
XXXX	XXXX	XXXX	####		<input type="checkbox"/>	(S)	####	####	####	<input type="checkbox"/>	(S)	####	####	<input type="checkbox"/>	(S)	####	XXXX	####	####	####	####
AAAA	XXXX	XXXX	####		<input checked="" type="checkbox"/>	(S)	####	####	####	<input checked="" type="checkbox"/>	(S)	####	####	<input checked="" type="checkbox"/>	(S)	####	XXXX	####	####	####	####
BBBB	XXXX	XXXX	####		<input checked="" type="checkbox"/>	(S)	####	####	####	<input checked="" type="checkbox"/>	(S)	####	####	<input checked="" type="checkbox"/>	(S)	####	XXXX	####	####	####	####

Data for the same station

Unassociated

sta	channel	phase	travel time	travel time res	timedef	az	per	fk-az	res	azdef	fk-dis	distRes	eve-dis	slofdef	slow	magdef	mb	ms	snr	qual	id
XXXX	XXXX	XXXX	####	####	<input type="checkbox"/>	(S)	####	####	####	<input type="checkbox"/>	(S)	####	####	<input type="checkbox"/>	(S)	####	XXXX	####	####	####	####
XXXX	XXXX	XXXX	####	####	<input type="checkbox"/>	(S)	####	####	####	<input type="checkbox"/>	(S)	####	####	<input type="checkbox"/>	(S)	####	XXXX	####	####	####	####
XXXX	XXXX	XXXX	####	####	<input type="checkbox"/>	(S)	####	####	####	<input type="checkbox"/>	(S)	####	####	<input type="checkbox"/>	(S)	####	XXXX	####	####	####	####

Session stack

- User can select to move to a given state (as opposed to manually stepping forward / backward through stack)
- Stack clears when event hypothesis is saved

8	Locate (Loc 989)
7	Retime SD 456
6	Locate (Loc 988)
5	Set SD 456 defining = true
4	Locate (Loc 987)
3	Associate SD 456 to EH 123
2	Create signal detection (SD 456)
1	Open Event Hypothesis (EH 123)

Notes

- Please see the Analyzes Event UIS for more information about how the system supports more than one Analyst analyzing an event at the same time.
- For associated signal detections, derived waveforms are saved with the current event hypothesis. For unassociated signal detections, derived waveforms can be saved at any time.

Open Issues

- These storyboards do not currently address the display of hydroacoustic and infrasound data.