



PROBABILISTIC FRACTURE MECHANICS CODE

EVENTS

1. Models Overview

June 3rd | 10-12 EDT

2. Setting Up the Inputs

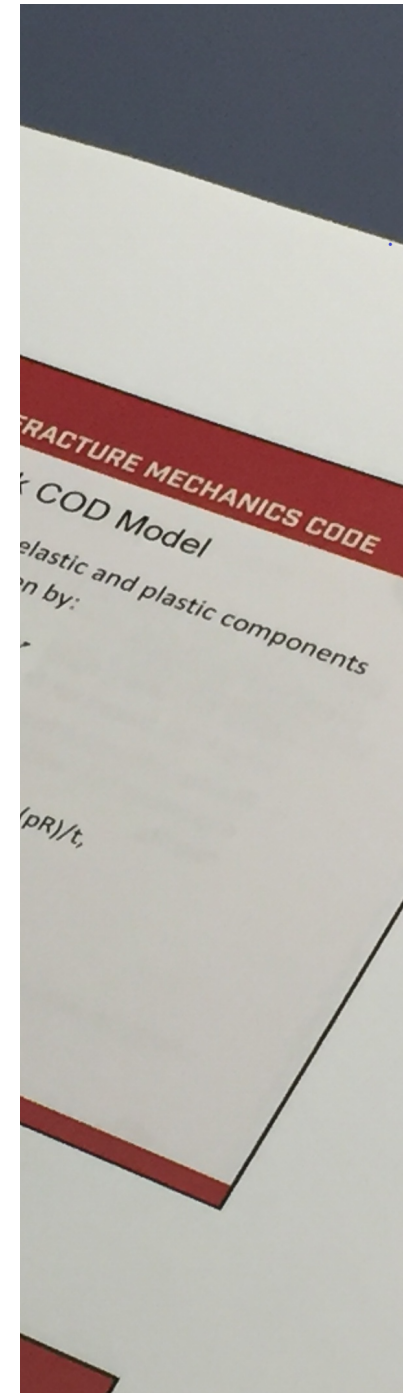
July 15th | 10-12 EDT

3. Running the Simulation and Retrieving Results

July 29th | 10-12 EDT

4. Advanced Methods

August 5th | 10-12
EDT





PROBABILISTIC FRACTURE MECHANICS CODE

Seminar 3 Agenda **Running the Simulation and Retrieving Results**

Introduction and Opening Remarks

File Structure Review

Running the Preprocessor

Setting Sampling Options and Controlling a Run

Viewing Results

Errors Display

Navigating through the Framework

Break

Questions and Answers

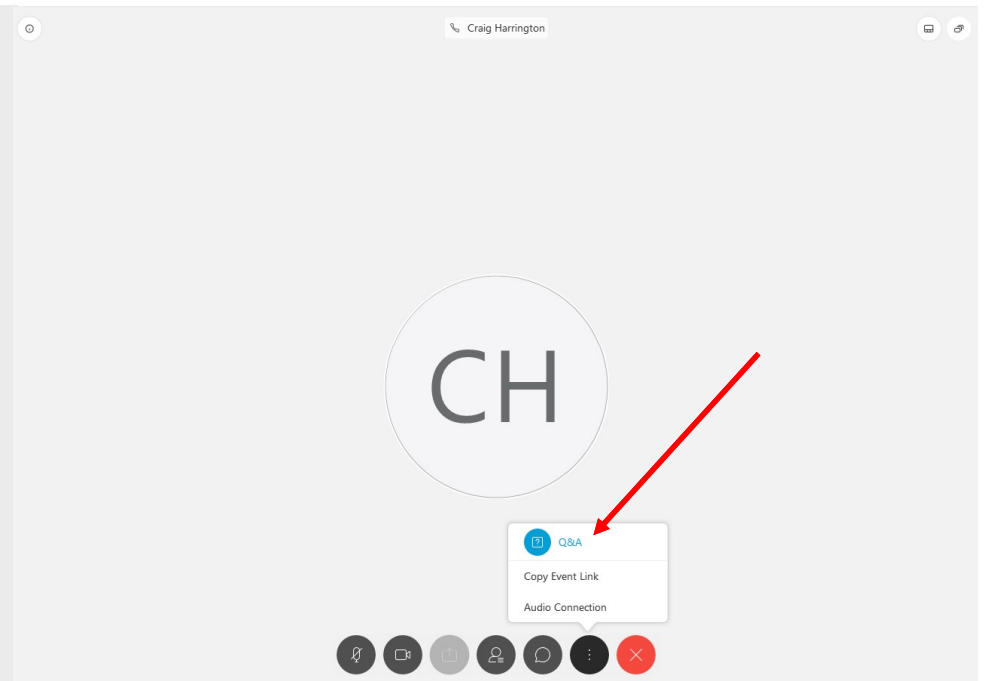
Closing Remarks



WEBEX Q+A



Webex Internet Browser



Webex Desktop Client



Resources

- User Manual Chapter 3
 - Section 3.3.2 (p. 59) to set up the sample size and random seed
 - Section 3.4 (p. 60-61) to run the code
 - Section 3.5.2 to inspect for errors (and Chapter 5 for the list of error codes)
 - Section 3.5.3 to look at the results
- xLPR-GR-FW, “Computational Framework Development, Testing, and Analysis”*

*To be released at a later date



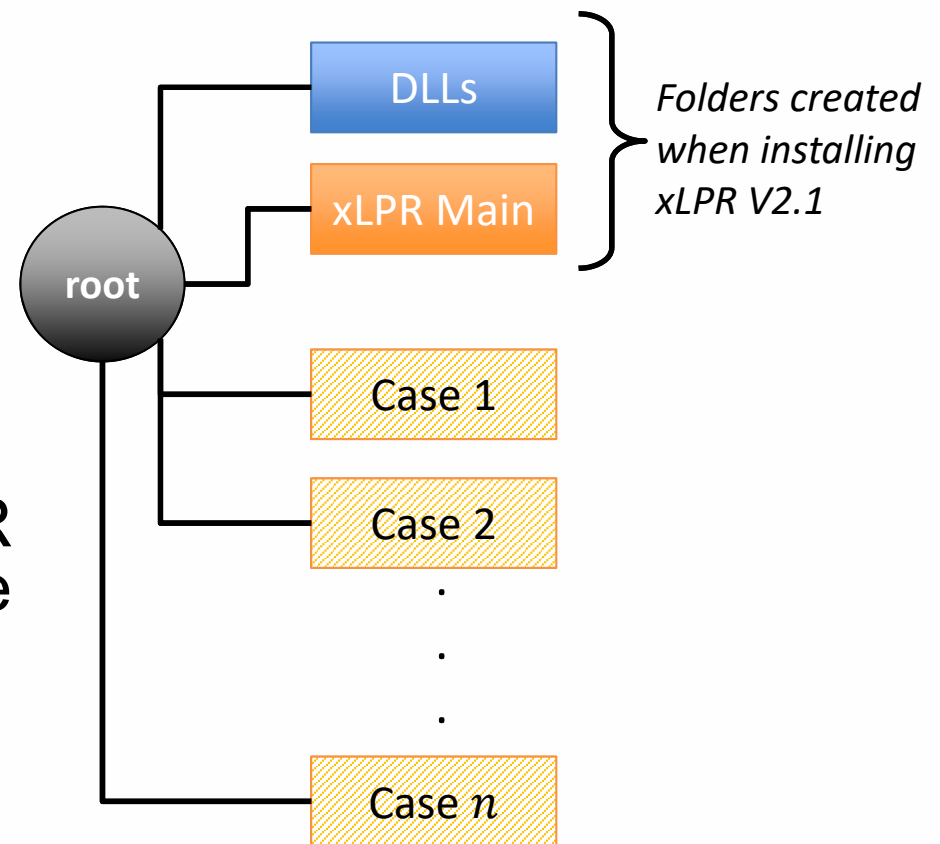
File Structure

Navigate through xLPR file structure



Running the Code

- To run Extremely Low Probability of Rupture (xLPR) Version 2.1 (V2.1) code, the user needs:
 - One folder with a GoldSim player file (.gsp) or full version (.gsm) and the input Excel file
 - One folder named “DLLs” with all the dynamic link libraries (DLLs)
- It is thus possible to create a new folder at the root of xLPR v2.1 to separate runs and use only one DLLs folder
- Once xLPR V2.1 has been run, the GoldSim file can be saved and accessed from any location





File Names

- Excel input file name (*xLPR-2.1 Input Set.xlsx*) **cannot be changed**. GoldSim requires this name to read the inputs.
- GoldSim file name (*xLPR-2.1.gsm* / *xLPR-2.1.gsp*) can be changed. In theory, one can thus have multiple GoldSim files in the same folder. This is useful for replicate runs.
- DLLs folder name and DLL names cannot be changed





Steps for Running the Code

1. Set up input set file (presented in previous seminar)
2. Run preprocessors
3. Set up GoldSim parameters and output settings
4. Run GoldSim
5. Save once run is complete
6. Save and extract results



Preprocessors

What to run before running the code and when to run it



Preprocessing Parts

- To improve runtimes, two aspects of the calculations are done in the preprocessing stage
 - Calculate leak rates as a function of crack opening displacements and crack lengths (LEAPOR – Leak Analysis of Piping – Oak Ridge)
 - Calculate stress intensity factors and other information for all transients (TIFFANY - Thermal Stress Intensity Factors for ANY Coolant History)
- The preprocessors create lookup tables read by GoldSim. GoldSim linearly interpolates from these tables during the simulation.

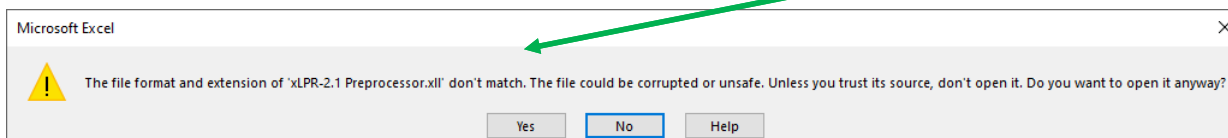
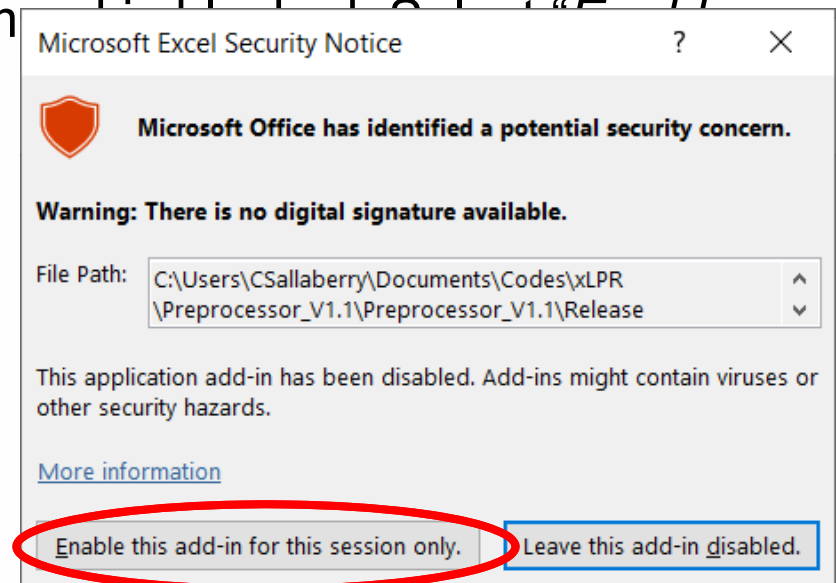


Running the Preprocessors (1/3)

- The preprocessors are run by double clicking on *xLPR-2.1 Preprocessor.xll*
- Currently the Excel add-in works only with the **32-bit** version of Excel. Any use with 64-bit versions will lead to an error.
- Since the file is an Excel add-in without a digital signature, a window will pop-up to inform the user that the command has been disabled for this session only.

Note: it is possible that due to some companies' security protocols, any macro is disabled by default. Check with your information technology department if this is the case.

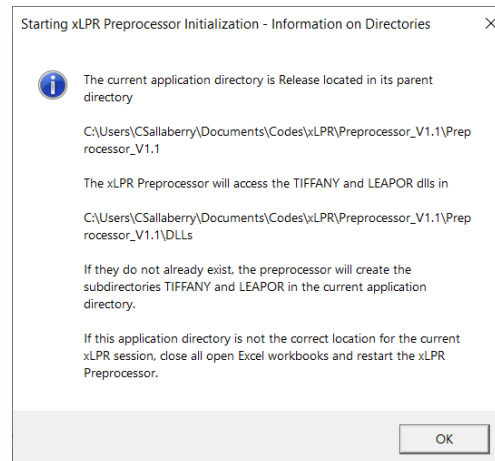
If run with the 64-bit version of Excel, an error window pops up



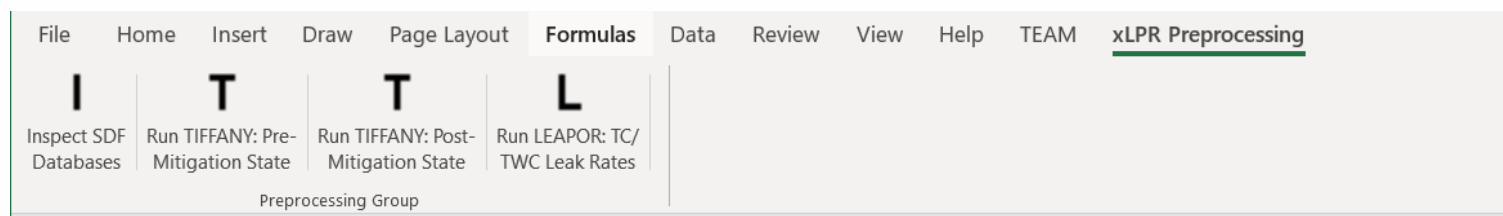


Running the Preprocessors (2/3)

- Once activated, the xll file generates an information message on the file location. The preprocessor must be run where the Excel input set file and GoldSim file are located.

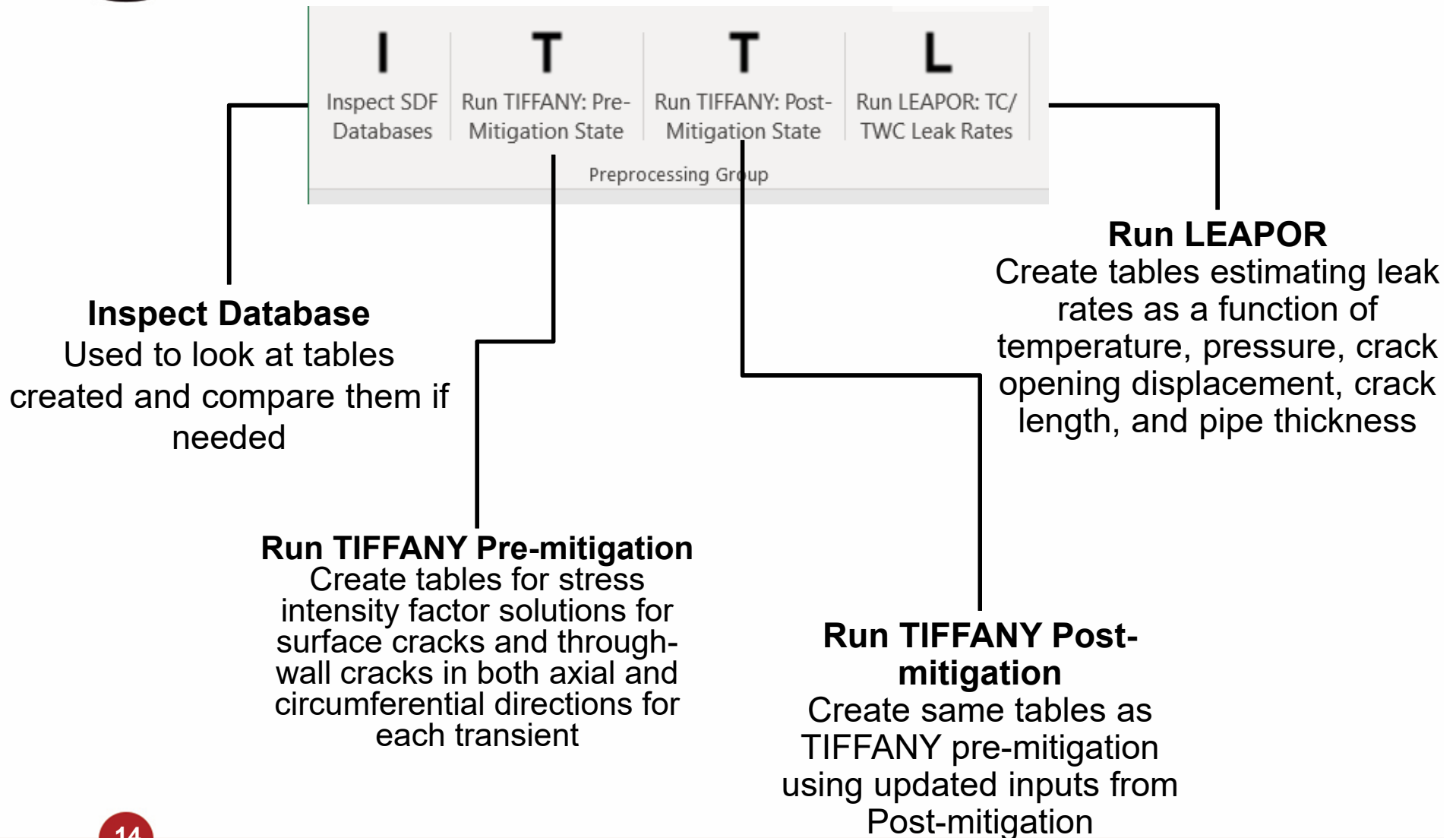


- After pressing “OK,” a new option (xLPR Preprocessing) is added to the main ribbon on top with the following buttons:





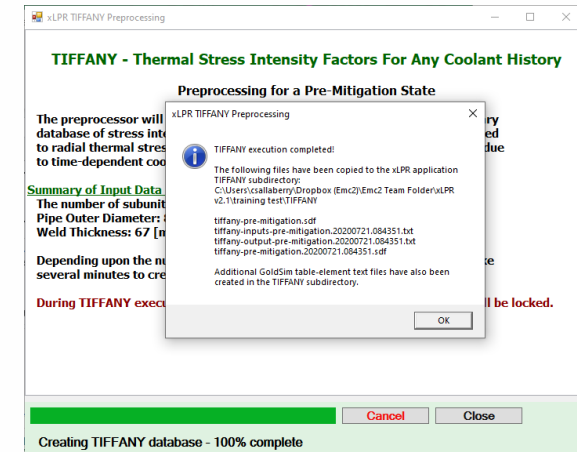
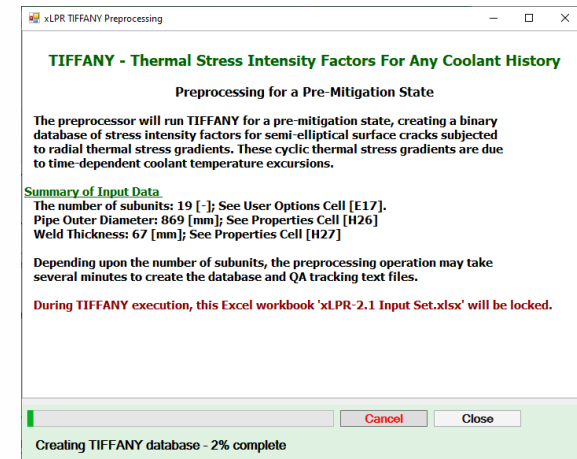
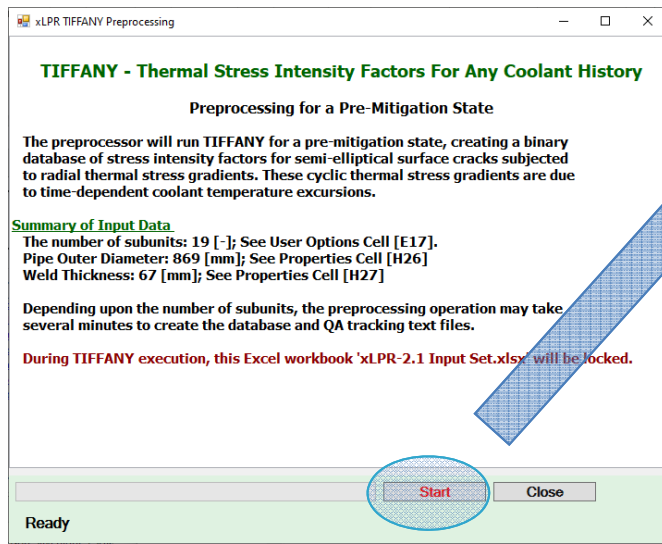
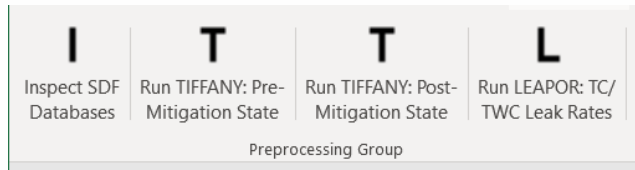
Running the Preprocessors (3/3)





Demonstration

• Running the pre-processors





When Are the Preprocessors Needed ? (1/2)

If the preprocessors are not re-run, GoldSim uses the last text files generated. If no text files are available, GoldSim uses the values saved in the .gsm or .gsp file.

Modeling fatigue?

- **No:** No need to run TIFFANY
- **Yes:** Run TIFFANY pre-mitigation
 - Modeling mitigation?
 - **No:** No need to run TIFFANY post-mitigation
 - **Yes:** Run TIFFANY post-mitigation

The TIFFANY and LEAPOR inputs are identified by color-coding in the Excel inputs set file

COLOR CODING KEY*
Input that cannot be changed by the user
Property used by LEAPOR and TIFFANY
Property used by TIFFANY
Property used by LEAPOR

Change in temperature range, pressure range, or pipe geometry?

- **No:** No need to run LEAPOR
- **Yes:** Run LEAPOR



When Are the Preprocessors Needed? (2/2)

- If unsure, it is safer to re-run all preprocessors (date will coincide with the run date)
- LEAPOR and TIFFANY generate new folders of similar names to host the tables. Delete folders before running to confirm latest values are used.



PROBABILISTIC FRACTURE MECHANICS CODE

Global Settings Dashboard

How to Run xLPR



GoldSim Dashboard Overview



Global Settings Dashboard

Version 2.1

Controls to set up epistemic sample size, random seed, and Latin hypercube sampling (LHS) options

Displays some of the sampling options

Controls to refresh input data and run the code

Sampling Approach

Epistemic (Outer Loop)

Set up epistemic sample size and random seed

Sample Size
(Display only)

1

Related Epistemic Sampling Inputs (Display Only)

Importance Sampling

Internal

Adaptive Sampling

No

Discretization

No

Number of Strata*

1

*Number of strata must be an integer greater than 1 and less than the epistemic sample size

Aleatory (Inner Loop)

Set up aleatory random seed

Click on 'Monte Carlo' tab when window opens

Sample Size
(Display only)

20

Related Aleatory Sampling Inputs (Display Only)

Importance Sampling

None

Adaptive Sampling

No

Discretization

No

Number of Strata*

10

*Number of strata must be an integer greater than 1 and less than the aleatory sample size

Refresh All Inputs

Run xLPR Model

Results Options

Go to Results - Axial Cracks

Go to Error Dashboard - Axial Cracks

Go to Results - Circ. Cracks

Go to Error Dashboard - Circ. Cracks

External Navigation

Inputs

Go to Excel Input Set

Preprocessors

Run TIFFANY

When Excel Input Set opens, select 'Enable the add-in for this session only.' Double check all values highlighted in pink to see if they have changed. Go to the top ribbon and select 'xLPR Preprocessing,' click on 'Run TIFFANY: Pre-Mitigation State' and let the code run. Click on 'Run TIFFANY: Post-Mitigation State' and let the code run. (Optional) Click on 'Inspect SDF Databases' to check the output generated/input used.

Run LEAPOR

When Excel Input Set opens, select 'Enable the add-in for this session only.' Double check all values highlighted in pink to see if they have changed. Go to the top ribbon and select 'xLPR Preprocessing,' click on 'Run LEAPOR: TC/TWC Leak Rates' and let the code run. (Optional) Click on 'Inspect SDF Databases' to check the output generated/input used.



Options Set in GoldSim - Epistemic (Outer) Loop (Main Options)

Epistemic (outer) loop sample size

Use LHS or not

Use random number generated from random seed and set up random seed*

* If this box is unchecked, then a random seed is generated randomly, and the results are not reproducible

The screenshot shows the GoldSim Global Settings Dashboard (Version 2.1) and the Simulation Settings dialog box. The dashboard has a red header with the xLPR logo and the title 'Global Settings Dashboard'. It is divided into several sections: 'Sampling Approach' (Epistemic (Outer Loop) and Aleatory (Inner Loop)), 'External Navigation' (Inputs, Preprocessors), and 'Sampling Inputs (Display Only)'. The 'Simulation Settings' dialog box is open, showing the 'Monte Carlo' tab. It has a title bar 'Simulation Settings...' and a close button. The dialog is divided into 'Time', 'Monte Carlo', 'Globals', and 'Information' tabs. The 'Monte Carlo' tab is active, showing options for 'Probabilistic Simulation' and 'Deterministic Simulation'. The 'Probabilistic Simulation' section is expanded, showing '# Realizations: 1', 'Run the following Realization only: 4', 'Use Latin Hypercube Sampling' (unchecked), 'Repeat Sampling Sequences' (checked), 'Specify Realization Weights: Epis_Weight', and 'Random Seed: 1'. A red box highlights the 'Repeat Sampling Sequences' checkbox and the 'Random Seed' field. A green box highlights the '# Realizations' field. A blue box highlights the 'Use Latin Hypercube Sampling' checkbox. A red box highlights the 'Set up epistemic sample size and random seed' button in the dashboard. A green line connects the 'Epistemic (outer) loop sample size' text to the 'Set up epistemic sample size and random seed' button. A blue line connects the 'Use LHS or not' text to the 'Use Latin Hypercube Sampling' checkbox. A red line connects the 'Use random number generated from random seed and set up random seed*' text to the 'Repeat Sampling Sequences' checkbox and the 'Random Seed' field. The 'Deterministic Simulation' section is collapsed, showing 'Solve Simulation deterministically using:' with options 'Element Deterministic Values' (selected), 'Element Mean Values', and 'Specified Quantile: 0.5'. The 'Result Size' is shown as '2.80 KB histories, 176.8 KB final values'. The dialog has 'OK', 'Cancel', and 'Help' buttons at the bottom.



Options Set in GoldSim - Epistemic (Outer) Loop (Advanced Options)

Run a specific realization (will be described in next seminar)

Used by importance sampling. Should **always** be checked even when importance sampling is not used.

Option to run the outer loop deterministically. Can be used, but we recommend setting up a deterministic run differently.

The screenshot shows the GoldSim Global Settings Dashboard (Version 2.1) and the Simulation Settings dialog box. The dashboard has tabs for Sampling Approach, Aleatory (Inner Loop), and External Navigation. The Simulation Settings dialog box has tabs for Time, Monte Carlo, Globals, and Information. The Monte Carlo tab is active, showing options for Probabilistic Simulation and Deterministic Simulation. The Probabilistic Simulation section includes a checkbox for 'Run the following Realization only:' with a dropdown set to 4, a checkbox for 'Specify Realization Weights:' with a dropdown set to 'Epis_Weight', and a checkbox for 'Repeat Sampling Sequences'. The Deterministic Simulation section includes radio buttons for 'Element Deterministic Values', 'Element Mean Values', and 'Specified Quantile' (set to 0.5). The Result Size is displayed as 2.80 KB histories, 176.8 KB final values. A red box highlights the 'Set up epistemic sample size and random seed' button on the dashboard. A green box highlights the 'Run the following Realization only:' dropdown. A blue box highlights the 'Specify Realization Weights:' dropdown. A red box highlights the 'Deterministic Simulation' section. A purple box highlights the 'Result Size' text.

Global Settings Dashboard

Version 2.1

Sampling Approach

Epistemic (Outer Loop)

Aleatory (Inner Loop)

Set up epistemic sample size and random seed

Set up aleatory random seed

Click on 'Monte Carlo' tab when window opens

Sample Size: 1

Sample Size: 20

Simulation Settings...

Time Monte Carlo Globals Information

Define Monte Carlo options to carry out a probabilistic simulation, and specify the sampling method for Stochastic variables.

☒ Probabilistic Simulation

Realizations: 1

Result Options...

☐ Run the following Realization only: Realization: 4

☐ Use Latin Hypercube Sampling

Use random points in strata

☒ Repeat Sampling Sequences

Random Seed: 1

☒ Specify Realization Weights: Epis_Weight

☐ Deterministic Simulation

Solve Simulation deterministically using:

☒ Element Deterministic Values

☐ Element Mean Values

☐ Specified Quantile: 0.5

Result Size: 2.80 KB histories, 176.8 KB final values

OK Cancel Help

External Navigation

Inputs

Go to Excel Input Set

Preprocessors

Run TIFFANY

When Excel Input Set opens, select 'Enable the add-in for this session only.' Double check all values highlighted in pink to see if they have changed. Go to the top ribbon and select 'xLPR Preprocessing.' Click on 'Run TIFFANY: Pre-Mitigation State' and let the code run. Click on 'Run TIFFANY: Post-Mitigation State' and let the code run. (Optional) Click on 'Inspect SDF Database' to check the output generated input used.

Run LEAPOR

When Excel Input Set opens, select 'Enable the add-in for this session only.' Double check all values highlighted in pink to see if they have changed. Go to the top ribbon and select 'xLPR Preprocessing.' Click on 'Run LEAPOR: TC/TWC Leak Rate' and let the code run. (Optional) Click on 'Inspect SDF Database' to check the output generated input used.

Sampling Inputs (Display Only)

Adaptive Sampling

No

Number of Strata

10

*Number of strata must be an integer greater than 1 and less than the aleatory sample size.

File size. This will be discussed later with respect to memory limitations.



Options Set in GoldSim - Aleatory (Inner) Loop

By default, the window opens on the “Definition” tab. The user needs to click on the “Monte Carlo” tab.

Aleatory sample size is set in Excel inputs set file. **It should not be changed here.**

These options are the same as the ones for the epistemic (outer) loop

The aleatory (inner) loop can use the same sampled values for each new outer loop instance or change them. This option is checked by default.

The screenshot shows the xLPR Global Settings Dashboard with the 'Monte Carlo' tab selected in the 'SubModel Properties : Main_Model (Ready to Run)' dialog. The 'Probabilistic Simulation' section is active, showing the following options:

- ☒ # Realizations: 10107
- ☐ Run the following Realization only: Realization: 1
- ☐ Use Latin Hypercube Sampling
- ☒ Repeat Sampling Sequences
- ☒ Specify Realization Weights: \Property_Imports\Optio... \AleatoryWeight
- ☒ Use a different random seed for each realization of the parent model

The 'Deterministic Simulation' section is also visible, with the following options:

- ☒ Solve Simulation deterministically using:
 - ☒ Element Deterministic Values
 - ☐ Element Mean Values
 - ☐ Specified Quantile: 0.5

At the bottom, the 'Result Size' is displayed as 178.6 MB histories, 26.4 MB final values.

File size. This will be discussed later with respect to memory limitations.



Sampling Options

Different sampling strategies are available:

- Use of one loop or two (separation between epistemic and aleatory uncertainties)
- Control of epistemic sample size and random seed
- Control of aleatory sample size and random seed
- LHS on either or both loops
- Application of importance sampling on selected values for either or both loops
- Use of discrete probability distribution for either or both loops
- Repeat random data or generate new data for the aleatory (inner) loop for each new sample of the outer loop



GoldSim



Excel

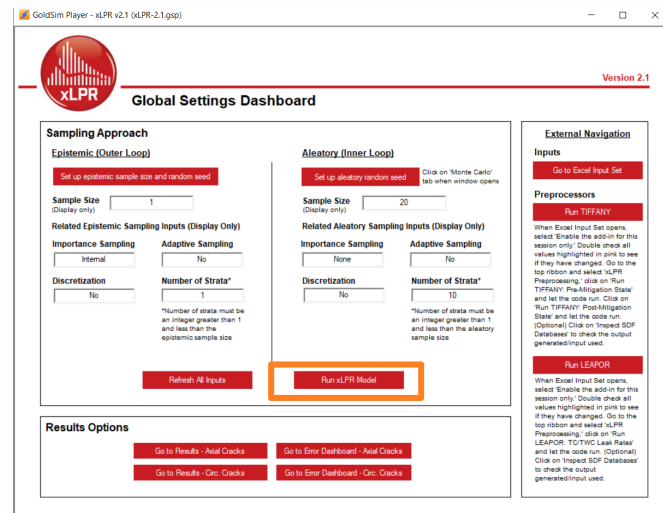


Both



Starting a Run

- Example with Challenge Problem 1 presented in previous seminar
- If the file structure is correct and all sampling options have been set, we are ready to run:



- **Three ways to start a run:**

1. Click on “Run xLPR Model” button on the Global Settings Dashboard
2. Click “Play” button on GoldSim Run Controller
3. Press F5 on the keyboard



Run Controller – Main Modes

Edit mode
(before running)

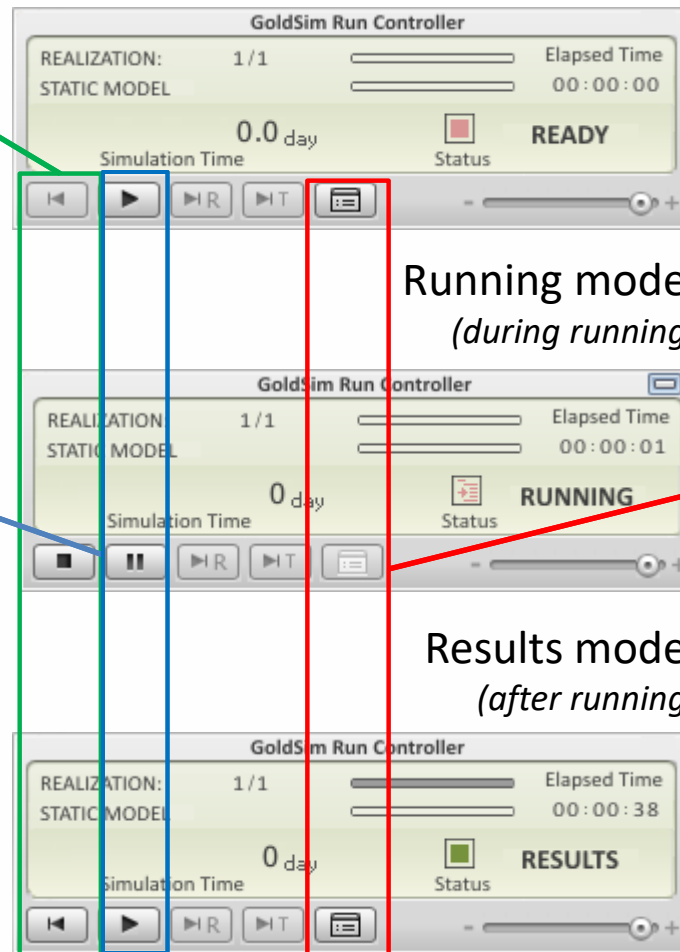
Delete results or abort the simulation (not available in Edit mode)

Run or rerun the simulation. Pause in Running mode.

Running mode
(during running)

Menu: Access to file options and navigation controls (not available in Run mode).

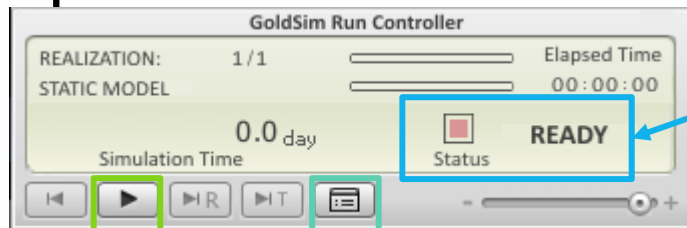
Results mode
(after running)





Run Controller – Edit Mode

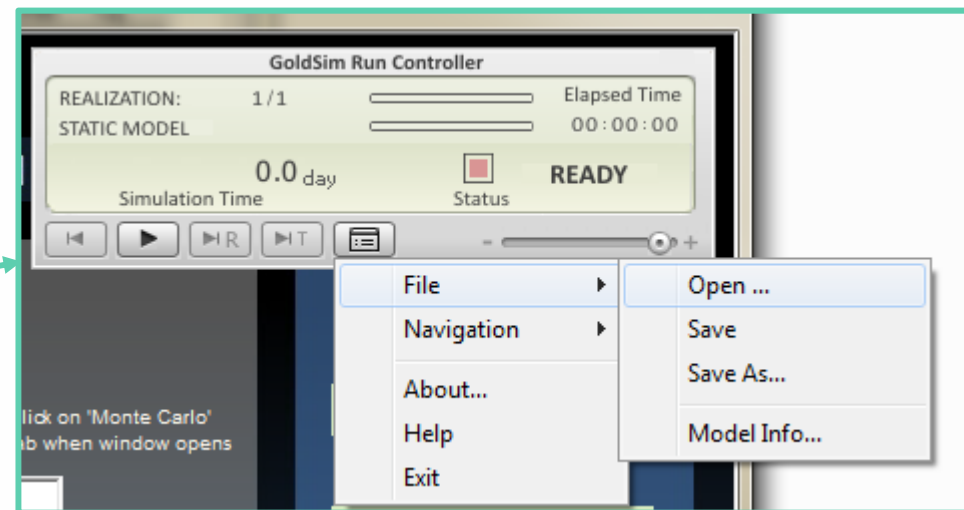
- GoldSim Run Controller in “Ready” state provides user run controls as well as access to common menu bar options.



Play button
starts a
simulation

“READY” indicates that
simulation is ready to start but
is not yet running

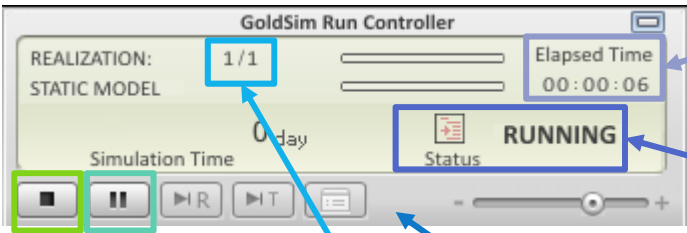
Menu button
provides
access to
options and
navigation
controls





Run Controller – Run Mode

- GoldSim Run Controller in “Running” state provides user run controls and information about simulation status



Elapsed time shows the runtime for the simulation

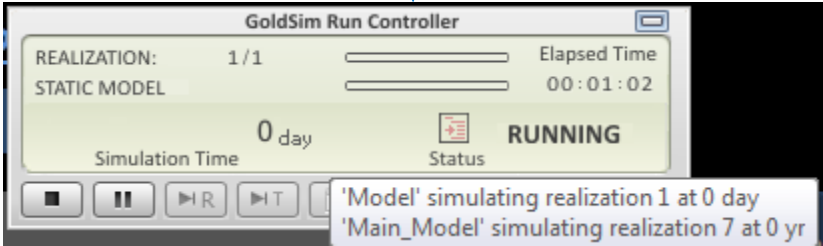
“RUNNING” indicates that simulation is running without error

Hovering over the GoldSim Run Controller in “Running” state shows the current epistemic realization (top line) and current aleatory realization (bottom line) with operating time

Pause

Stop button aborts a simulation

Realization number shows the epistemic realization that is currently running



'Model' simulating realization 1 at 0 day
'Main_Model' simulating realization 7 at 0 yr



What to Do when a Run is Finished

SAVE RUN (very important)

GoldSim saves a lot of data and displaying them may sometimes make the software crash. If the file has not been saved after completion of the run, all the results are lost.





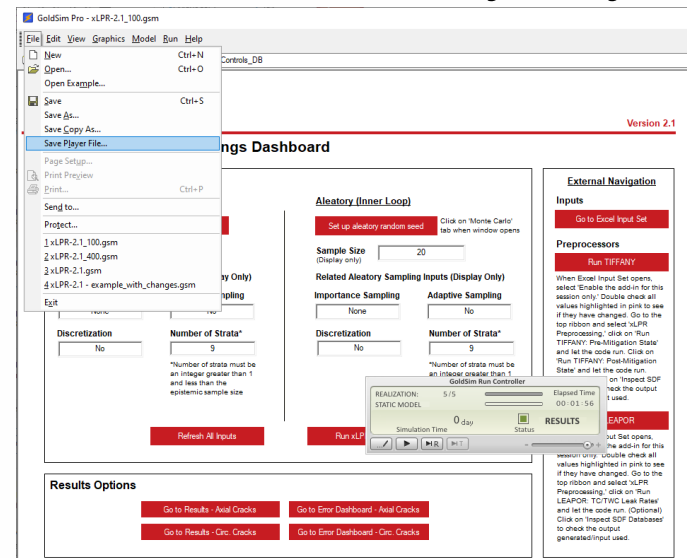
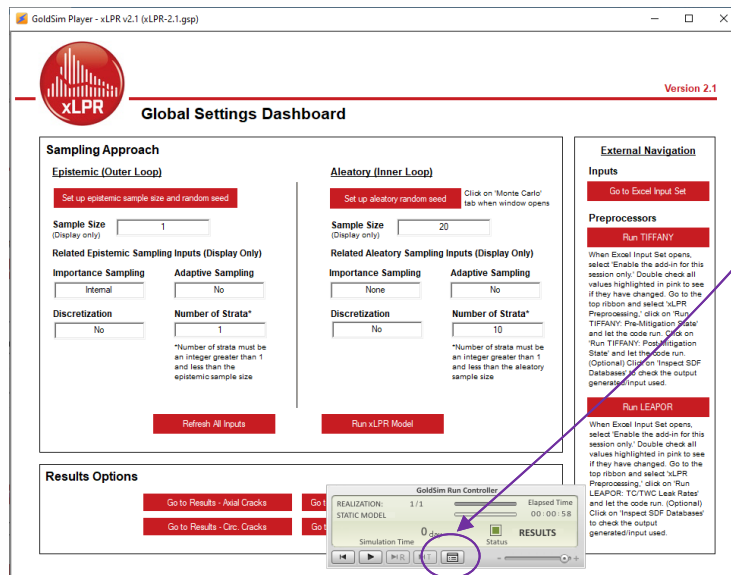
Saving the GoldSim File

Player

- The option button in the Controller has a file section to save and open
- Shortcuts **Ctrl+S** (save) or **Alt+FA** (save as...) also work

Full Version

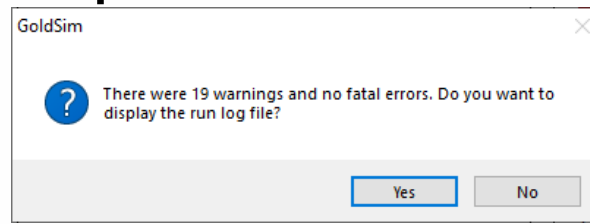
- Same option as in the player
- In addition, a file menu is available at the top with the option to **Save Player file** which saves a player version that can be seen by anybody





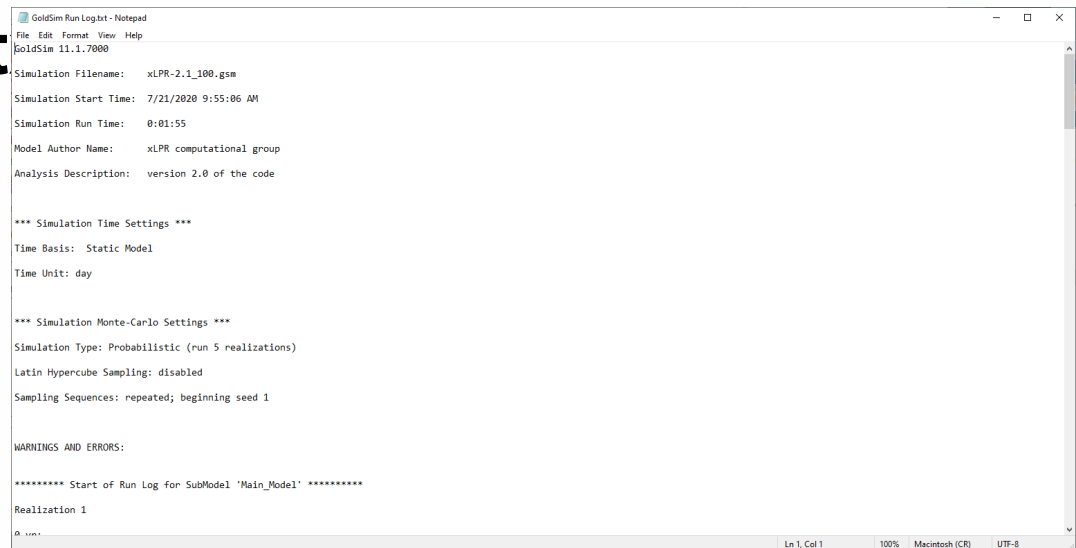
GoldSim Run Log

- A run log is generated for each simulation
 - GoldSim proposes to check it once a simulation is complete



- It can also be looked at in the folder and is named **GoldSim Run log.txt**

The file lists all the warnings and errors. It is an additional source in case of any issue.





PROBABILISTIC FRACTURE MECHANICS CODE

Short Break for Questions

xlpr@nrc.gov

xlpr@epri.com

for Additional Information



Results

Looking at results of a run and exporting them



Access Results from the Dashboard



Global Settings Dashboard

Version 2.1

Sampling Approach

Epistemic (Outer Loop)

Set up epistemic sample size and random seed

Sample Size (Display only)

Related Epistemic Sampling Inputs (Display Only)

Importance Sampling <input type="text" value="Internal"/>	Adaptive Sampling <input type="text" value="No"/>
Discretization <input type="text" value="No"/>	Number of Strata* <input type="text" value="1"/>

*Number of strata must be an integer greater than 1 and less than the epistemic sample size

Aleatory (Inner Loop)

Set up aleatory random seed Click on 'Monte Carlo' tab when window opens

Sample Size (Display only)

Related Aleatory Sampling Inputs (Display Only)

Importance Sampling <input type="text" value="None"/>	Adaptive Sampling <input type="text" value="No"/>
Discretization <input type="text" value="No"/>	Number of Strata* <input type="text" value="10"/>

*Number of strata must be an integer greater than 1 and less than the aleatory sample size

External Navigation

Inputs

Preprocessors

When Excel Input Set opens, select 'Enable the add-in for this session only.' Double check all values highlighted in pink to see if they have changed. Go to the top ribbon and select 'xLPR Preprocessing,' click on 'Run TIFFANY: Pre-Mitigation State' and let the code run. Click on 'Run TIFFANY: Post-Mitigation State' and let the code run. (Optional) Click on 'Inspect SDF Databases' to check the output generated/input used.

When Excel Input Set opens, select 'Enable the add-in for this session only.' Double check all values highlighted in pink to see if they have changed. Go to the top ribbon and select 'xLPR Preprocessing,' click on 'Run LEAPOR: TC/TWC Leak Rates' and let the code run. (Optional) Click on 'Inspect SDF Databases' to check the output generated/input used.

Results Options

<input type="button" value="Go to Results - Axial Cracks"/>	<input type="button" value="Go to Error Dashboard - Axial Cracks"/>
<input type="button" value="Go to Results - Circ. Cracks"/>	<input type="button" value="Go to Error Dashboard - Circ. Cracks"/>

Access to results for circumferential and axial cracks

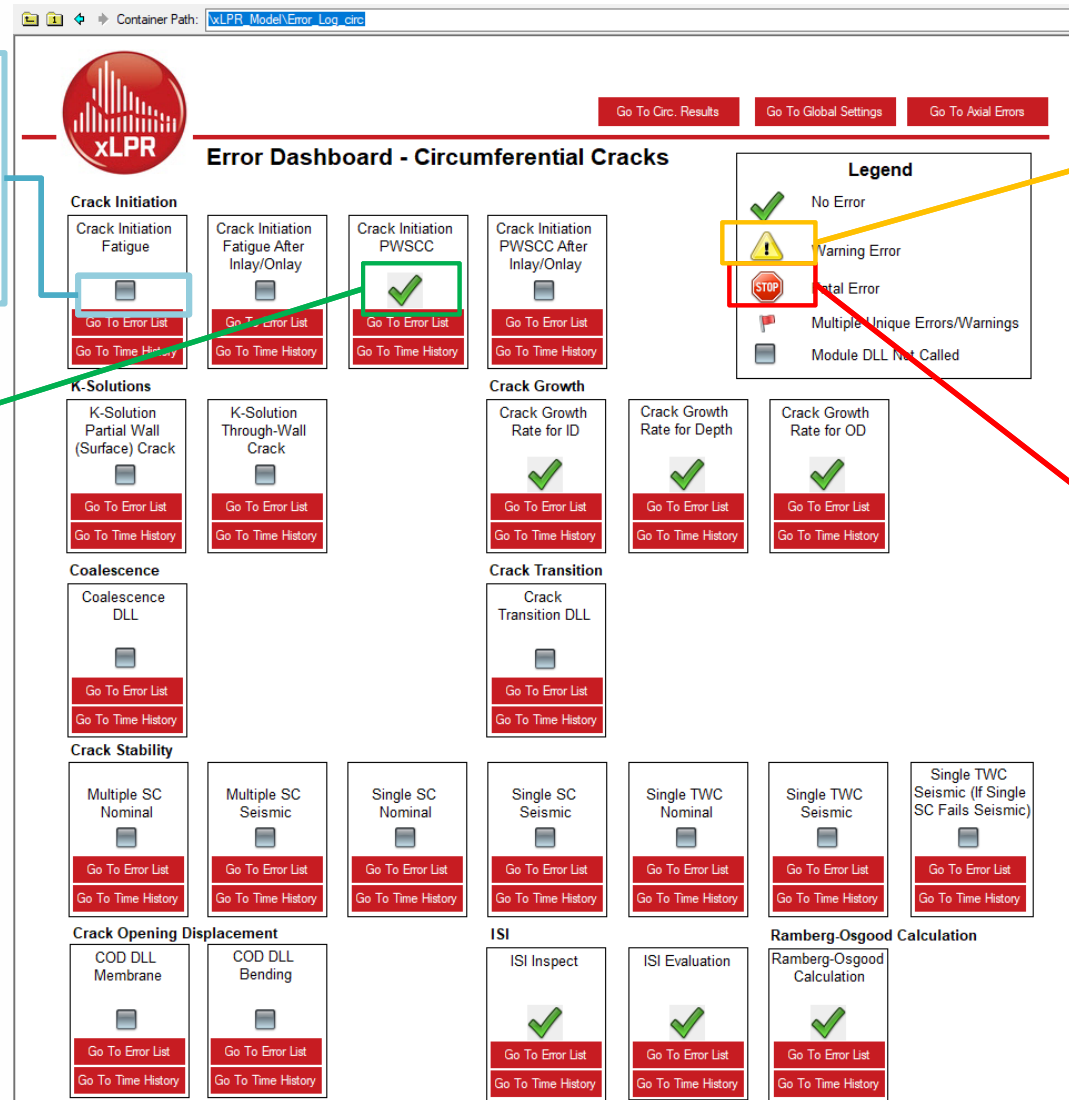
Access to error dashboards for circumferential and axial cracks



Checking for Potential Errors and Warnings

Gray square: module not used

Green check mark: module performed as expected



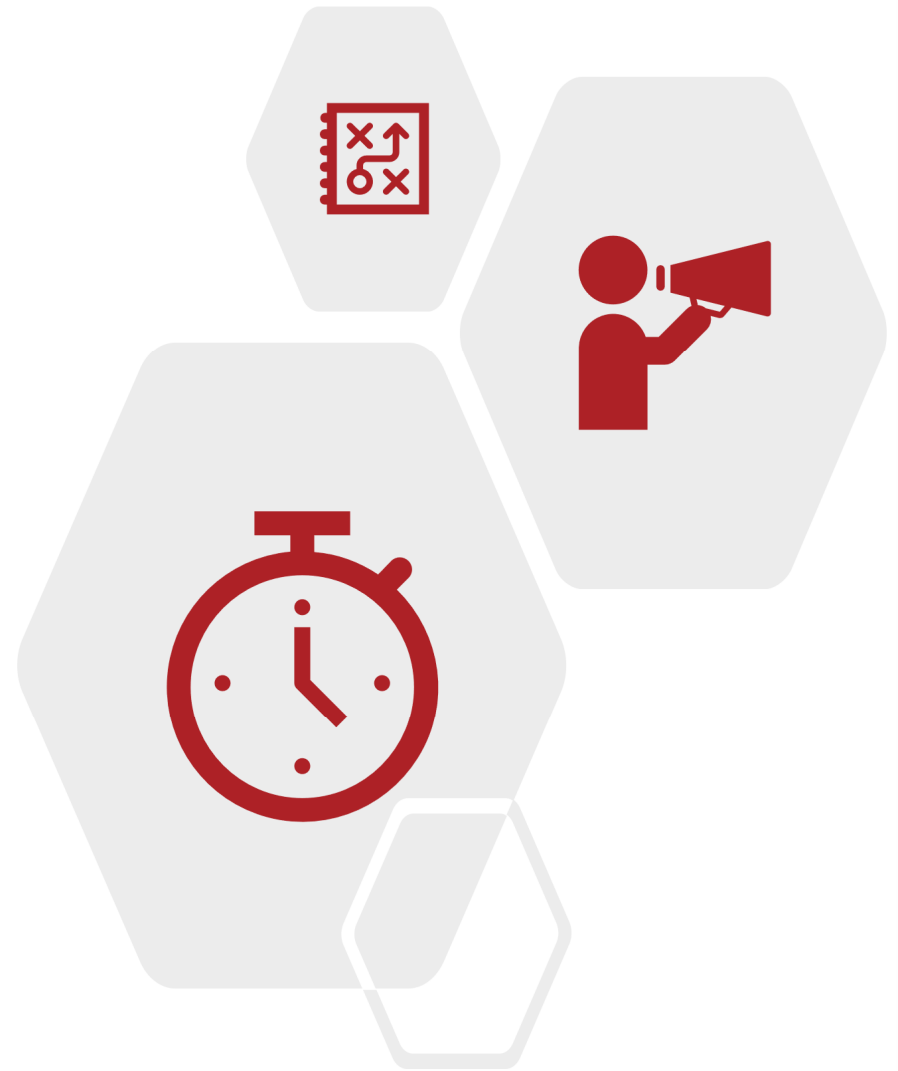
Warning sign: warning error – may not be serious but needs to be checked

Stop sign: fatal error - usually stops the code before the end of a simulation



Running a Large Sample Size

For a long simulation taking several hours, it is recommended to first run with a **very small** sample size (1-5 minute simulation duration) to confirm that no errors or warnings occur and that the results look “reasonable”





Standard Results

General results:

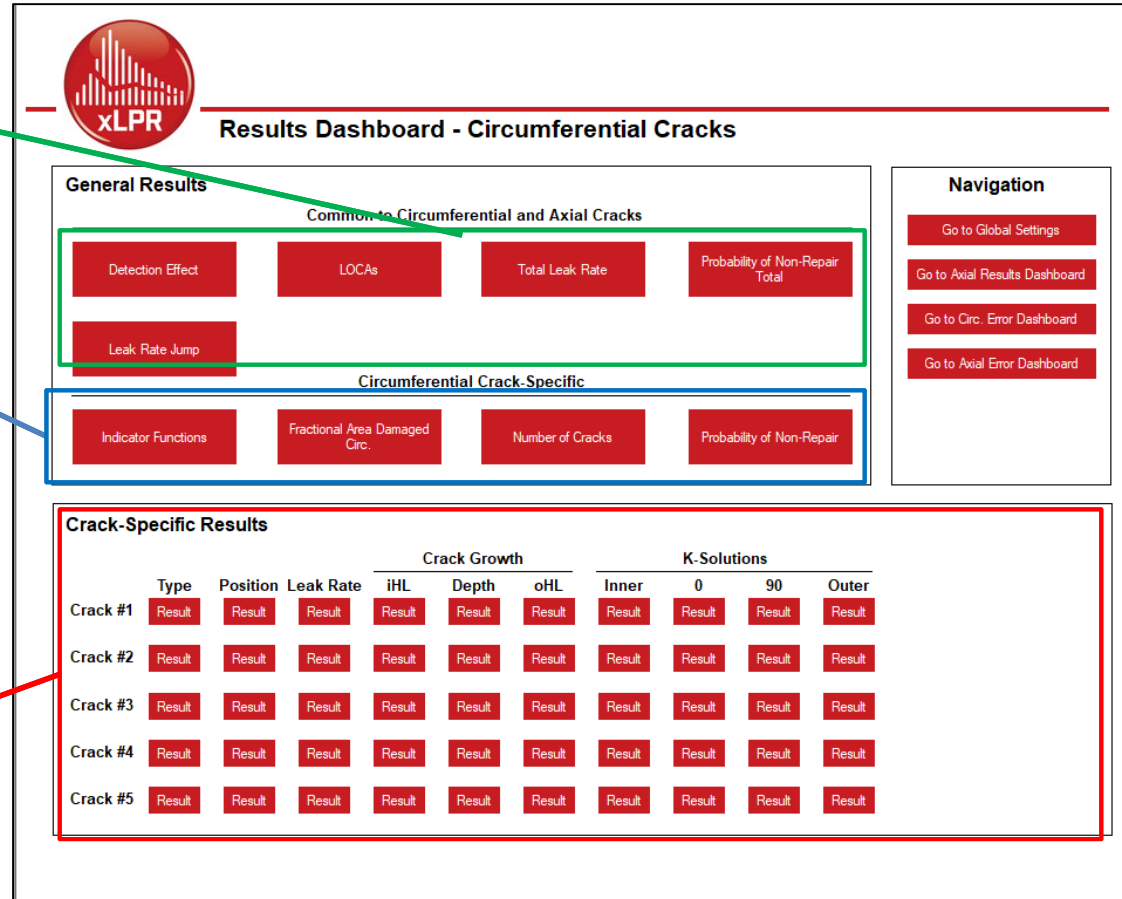
Consider both axial and circumferential cracks

Direction-specific results:

Summary results for either axial or circumferential cracks as applicable

Crack-specific results:

Statistics for the first 5 cracks that occur





Results Options

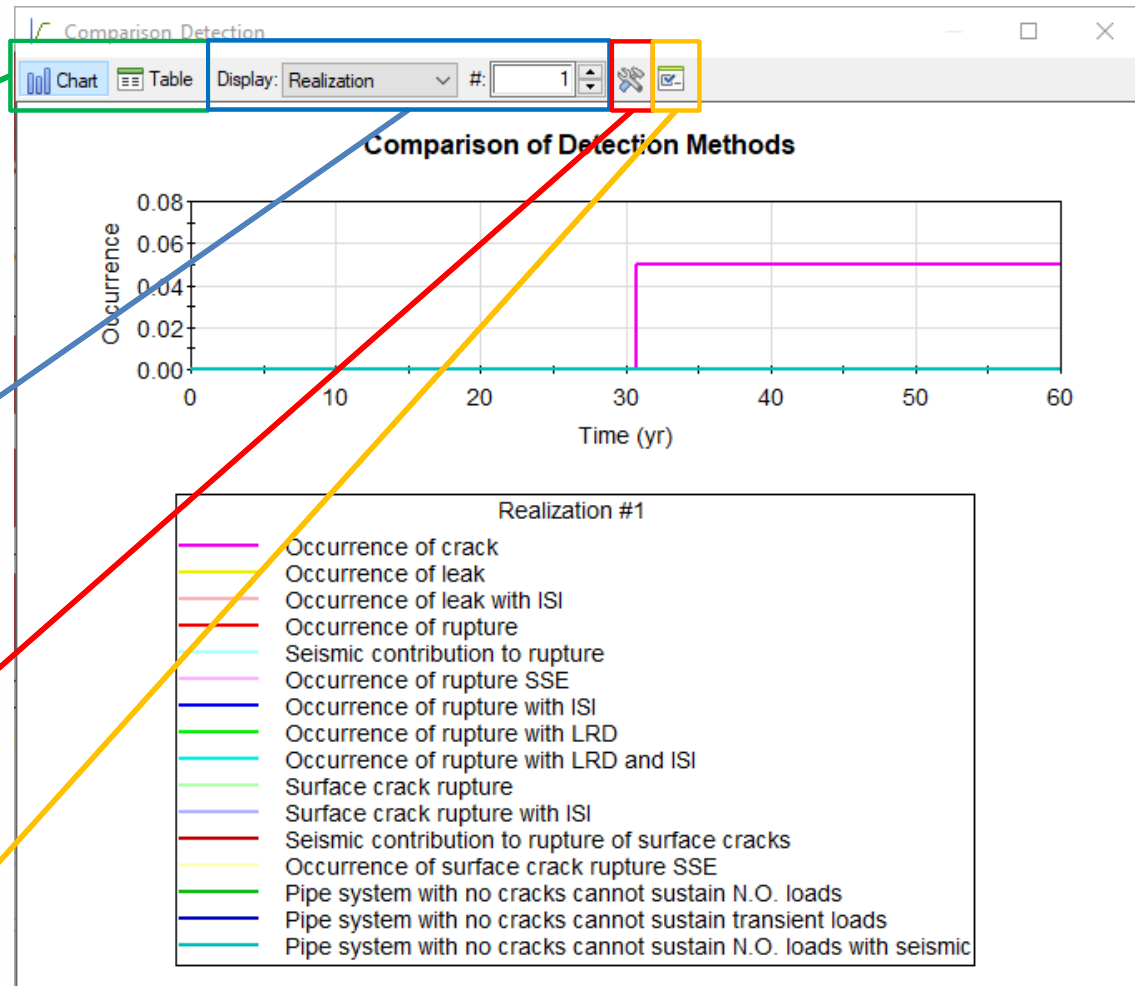
Chart: Look at plot of results
Table: Table of results that can be copied and pasted to Excel or text file, for instance

Display:

Realization: Only one (epistemic) realization, selected by the next box
All realizations: Display all realizations - /!\: DO NOT TRY THIS if large # of realizations (>2000)
Probabilities: Quantiles over realizations
Statistics: Selected statistic (selection in the next box)

Chart Style (chart mode): Changing x-axis, y-axis ...
Sorting (table mode):

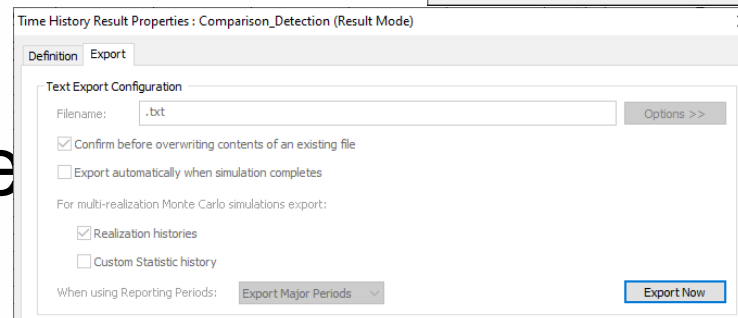
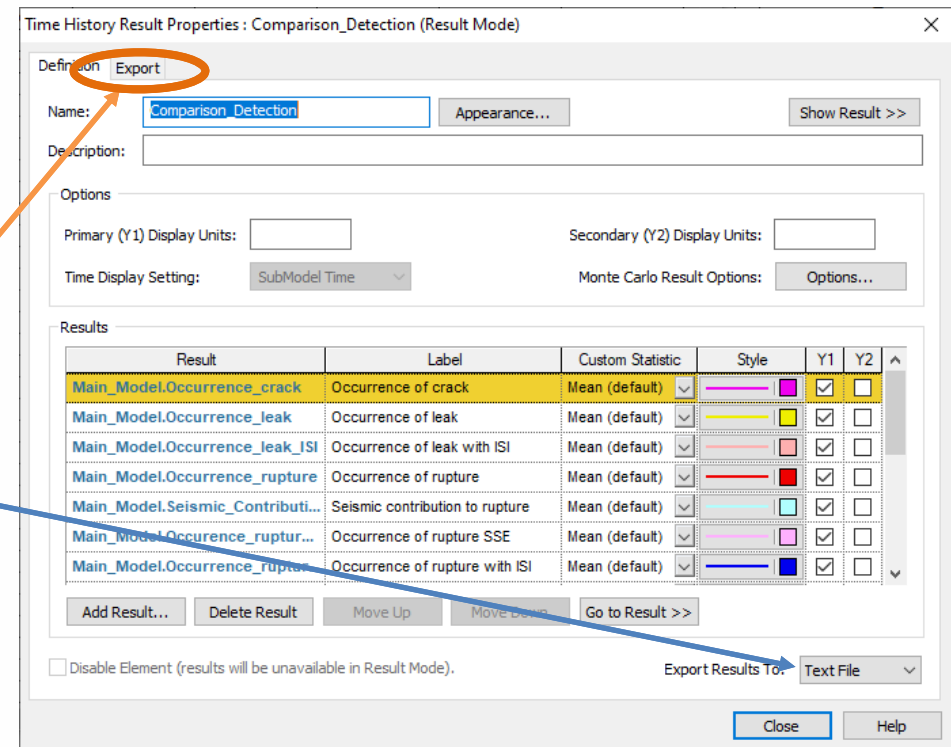
Access to result element
 (greyed-out in Player version)





Saving Results (Full Version of GoldSim)

- Needs to be done *before* running the code
- Access result element
- Select a type of results to export (text or Excel), opens a new tab
- New tab gives for exporting

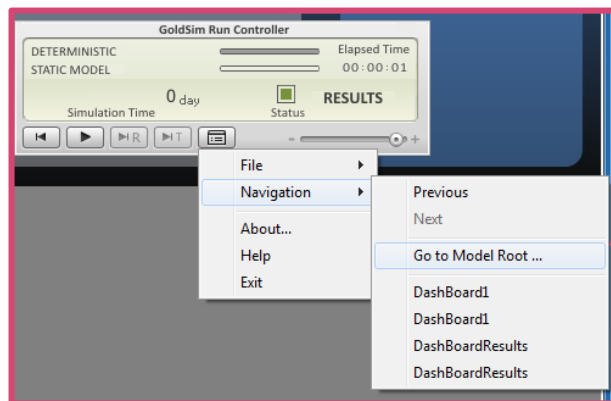




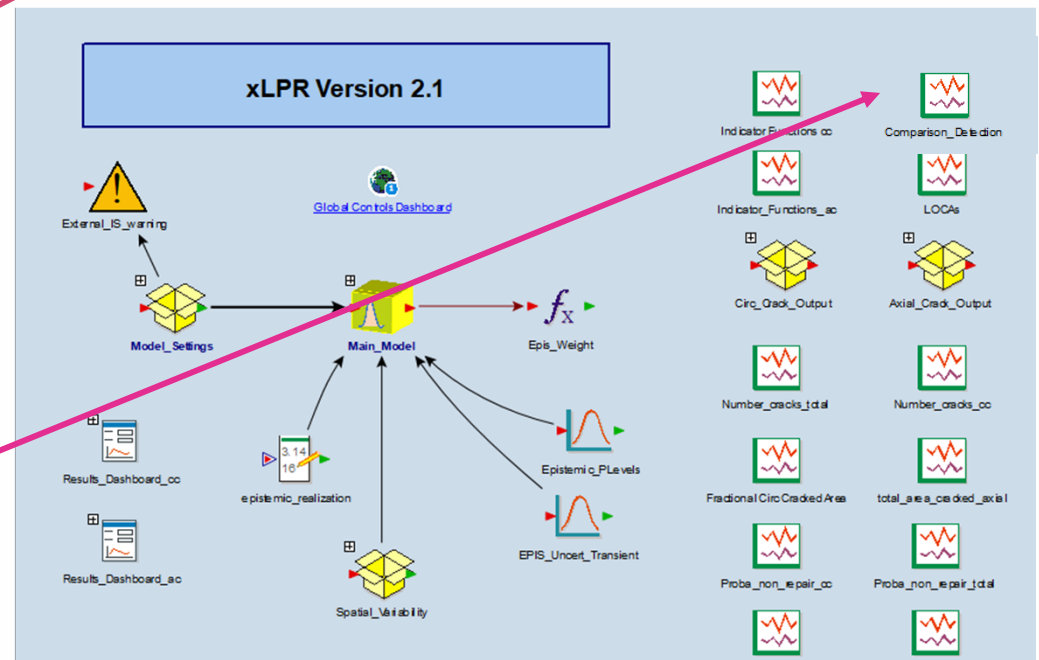
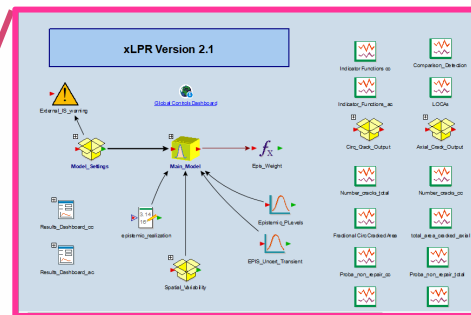
Saving Results (GoldSim Player Version)

- Extra step to access the result element

Navigate to the model root



Right-click on a result element and click "Properties" to open a result properties window





Runtime Errors

Most common issues and how to fix them



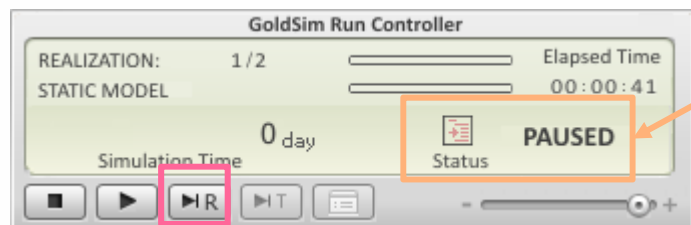
Runtime Error – Run Controller Message

- GoldSim Run Controller in “Error” and “Paused” states provides user run controls.



“ERROR” indicates that simulation has encountered an error and is stopped or paused

Reset simulation



“PAUSED” indicates that simulation has been paused

Advance simulation by running one realization (epistemic)



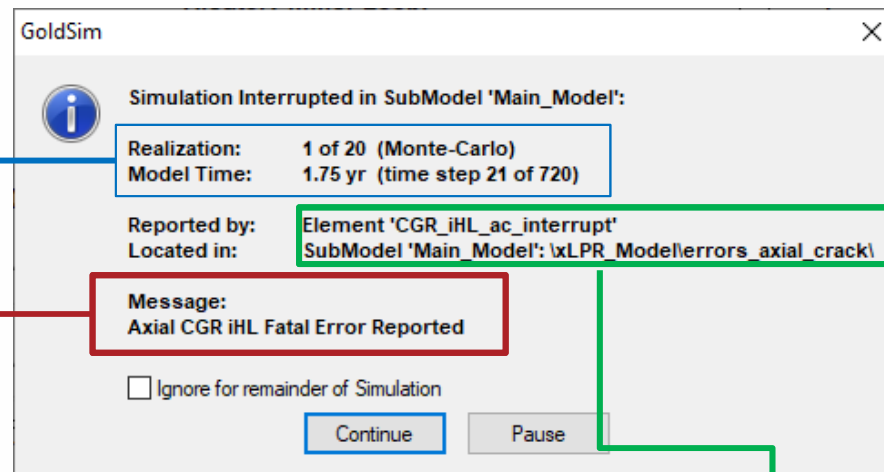
Example of Error (1/3)

- Example with negative crack growth

Crack Growth Properties										
[0, nomax)	2588	Power Law Constant, Alpha	$(\text{m/s})/(\text{Mpa}\cdot\text{m}^{1/2})^{(-\text{beta})}$	Constant	no	0.5	-3.00E+00	DISCRETE	1	1

Realization and time of error occurrence

Module affected



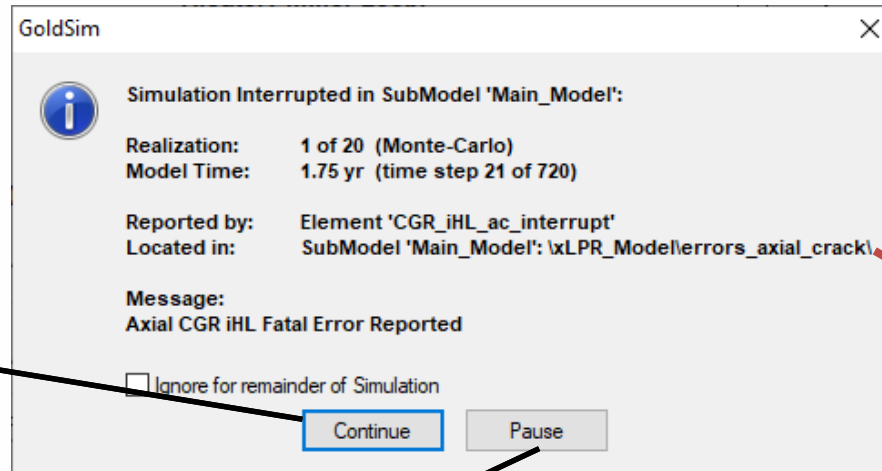
Location in GoldSim



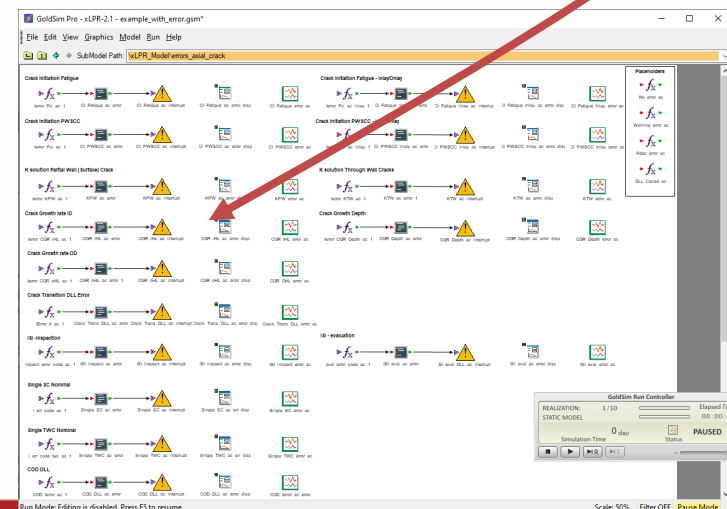
Example of Error (2/3)

- Tracking an error

Continues the simulation



Pauses the simulation and brings to the GoldSim section where the error occurs





Example of Error (3/3)

- Debugging from the error dashboard

The screenshot shows the GoldSim Pro - xLPR-2.1 interface. The 'Error Dashboard - Axial Cracks' is displayed, showing various error categories and their status. A yellow box highlights the 'Crack Growth' section, specifically the 'Crack Growth Rate for ID' error. The dashboard includes buttons for 'Go To Error List' and 'Go To Time History' for each error category. A legend indicates the status of errors: No Error (green check), Warning Error (yellow warning), Fatal Error (red stop), Multiple Unique Errors/Warnings (red flag), and Module DLL Not Called (grey box).

Crack Growth

- Crack Growth Rate for ID: Fatal Error (Red STOP icon)
- Crack Growth Rate for Depth: Fatal Error (Red STOP icon)
- Crack Growth Rate for OD: No Error (Green check icon)

Crack Stability

- Single SC Nominal: No Error (Green check icon)
- Single TWC Nominal: Fatal Error (Red STOP icon)
- Ramberg-Osgood Calculation: No Error (Green check icon)

Crack Opening Displacement

- COD DLL: Fatal Error (Red STOP icon)

ISI

- ISI Inspect: Fatal Error (Red STOP icon)
- ISI Evaluation: Fatal Error (Red STOP icon)

Run Mode: Editing is disabled. Press F5 to resume.

The screenshot shows the 'Description of Errors' window in GoldSim Pro - xLPR-2.1. It lists various error flags and their descriptions. A yellow box highlights the 'Crack Growth Rate for ID (Axial)' error, which is listed as '106: Material group flag is out of range of validity'. The window also includes buttons for 'Go To Axial Results' and 'Go To Axial Errors'.

Description of Errors

Crack Growth Rate for ID (Axial)

Crack #	Error Flag	Description
1	106	Material group flag is out of range of validity
2	0	Not Used
3	0	Operating temperature is out of range of validity
4	0	Reference temperature is out of range of validity
5	0	Power-law constant is out of range of validity
6	0	Not Used
7	0	Not Used
8	0	Not Used
9	0	Not Used
10	0	Not Used
11	0	Not Used
12	0	Not Used
13	0	Not Used
14	0	Not Used
15	0	Not Used
16	0	Not Used
17	0	Not Used
18	0	Not Used
19	0	Not Used
20	0	Not Used
21	0	Not Used
22	0	Not Used
23	0	Not Used
24	0	Not Used

Run Mode: Editing is disabled. Press F5 to resume.

The screenshot shows a table with 'Crack #' and 'Error Flag' columns. A yellow box highlights the error flag '106' for Crack # 1. To the right, a list of error descriptions is shown, with '106: Material group flag is out of range of validity' highlighted in yellow.

Crack #	Error Flag
1	106
2	0
3	0

101: Material group flag is out of range of validity
102: Mechanism type flag is out of range of validity
103: Not Used
104: Operating temperature is out of range of validity
105: Reference temperature is out of range of validity
106: Power-law constant is out of range of validity



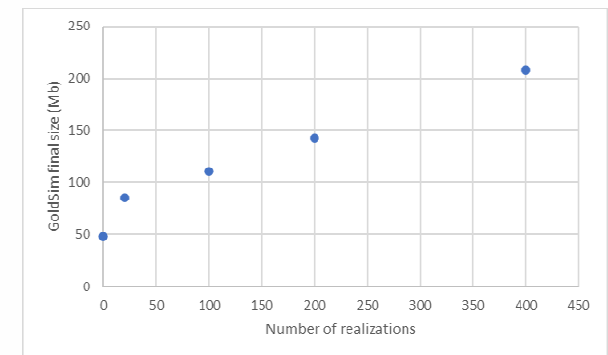
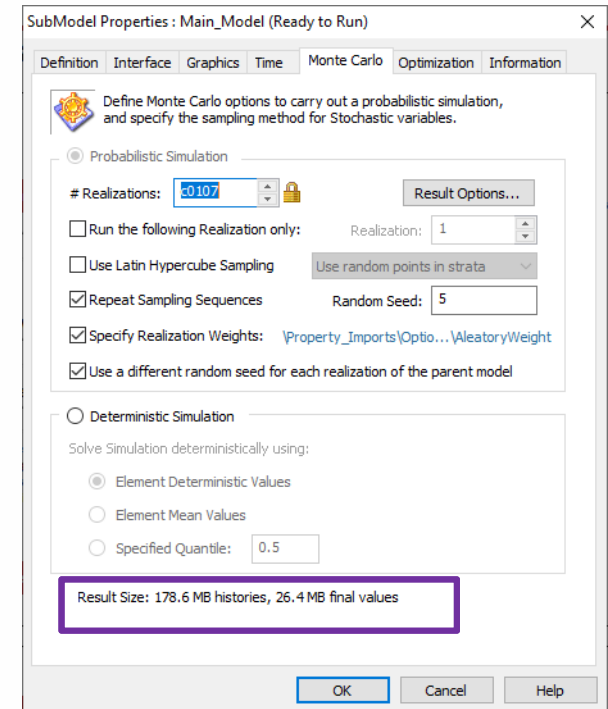
Memory Errors

- GoldSim V11.1 is a 32-bit program. It is limited to 3Gb of data.
- If the amount of data required is larger, GoldSim will crash and stop, then rerun. But **no results will be saved**. This is why it is important to always save when a run is complete.



Memory Requirements

- Memory requirement as reported in the Monte-Carlo tab for the aleatory (inner) loop
- The epistemic loop reports additional memory but is not of concern usually
- Experience is that aleatory loop is limited to 3k to 4k realizations
- Can be expanded to 8k using 80 epistemic x 100 aleatory, for instance
- With no changes, xLPR V2.1 requires 79 Mb of initial memory plus ~0.325 Mb per realization
 - Maximum size with original model ~8k realizations





Framework

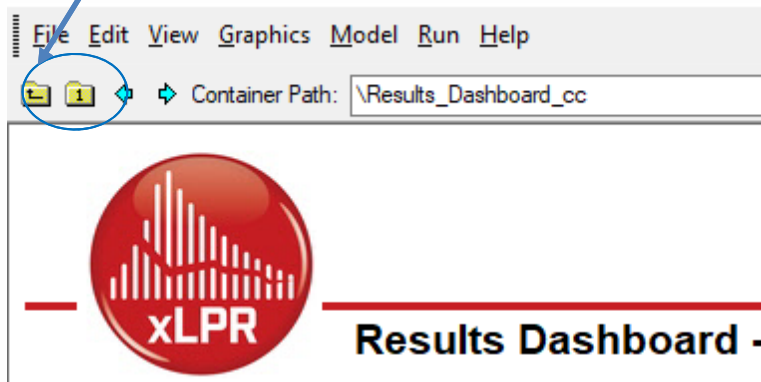
How to navigate through the GoldSim model



Accessing the model

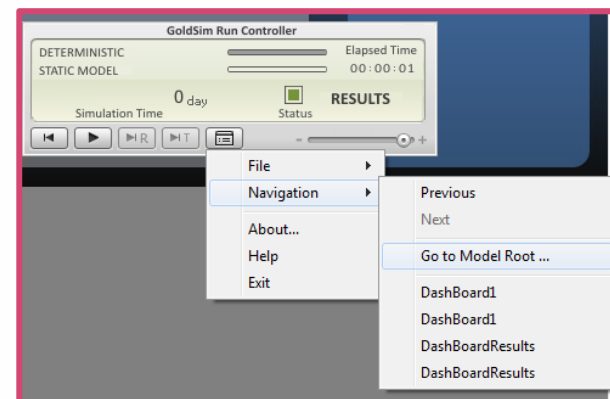
Full version of GoldSim

Click on the yellow icon with a “1” inside (second icon) on the top toolbar



Player version

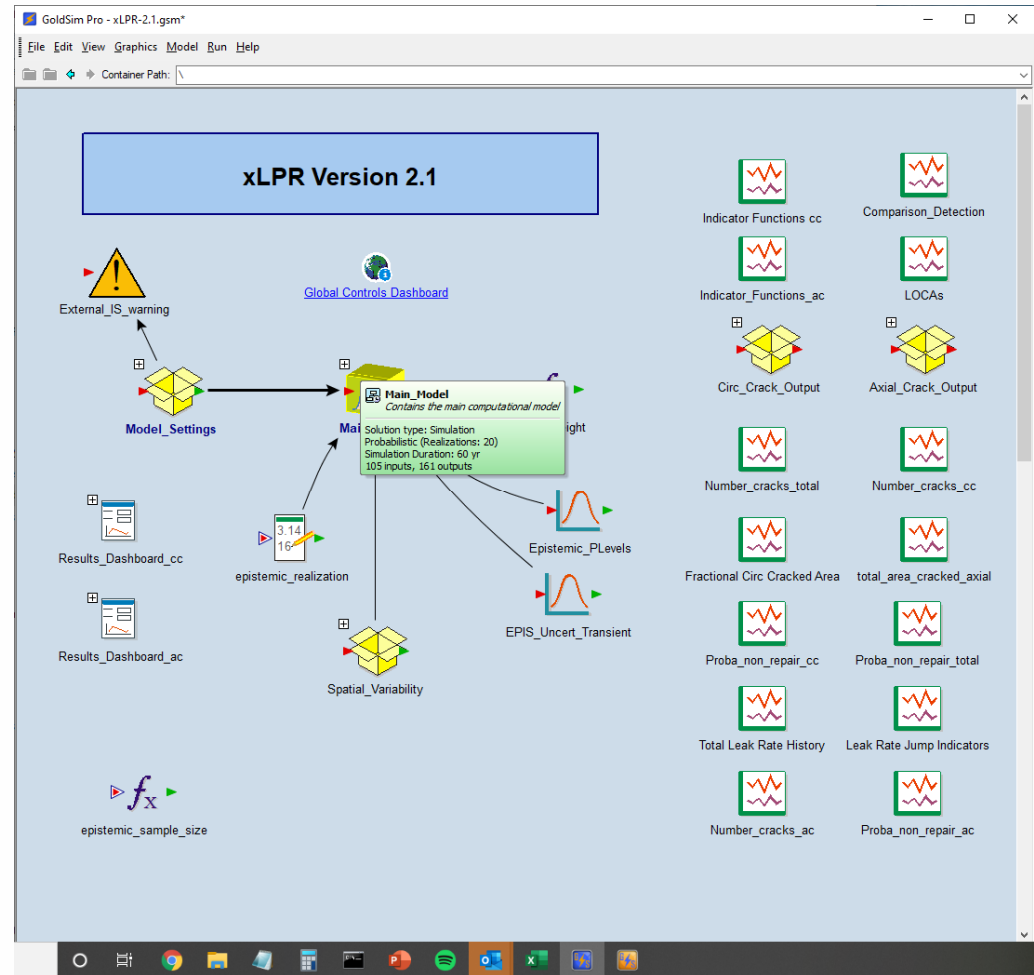
Select the last icon in the controller, then *Navigation* and *Go to model root...*





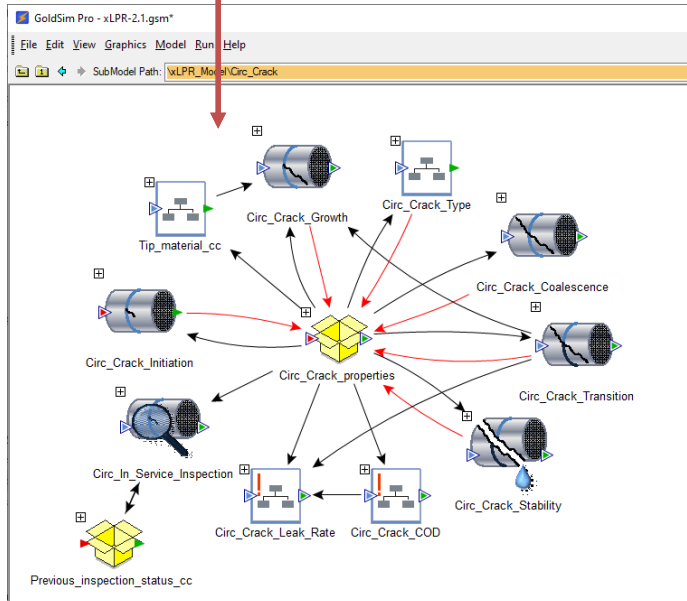
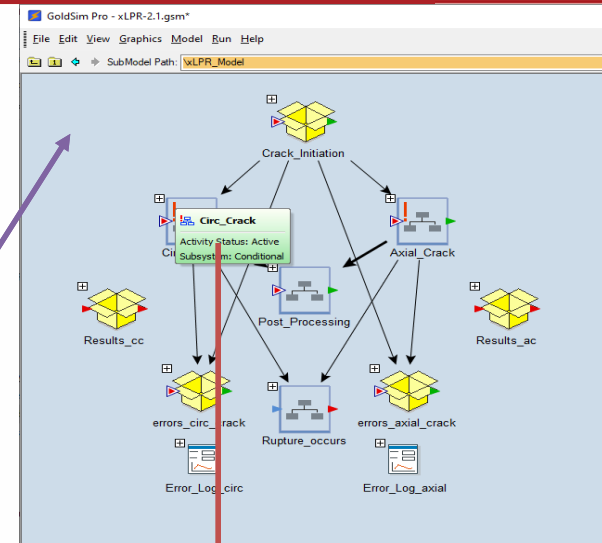
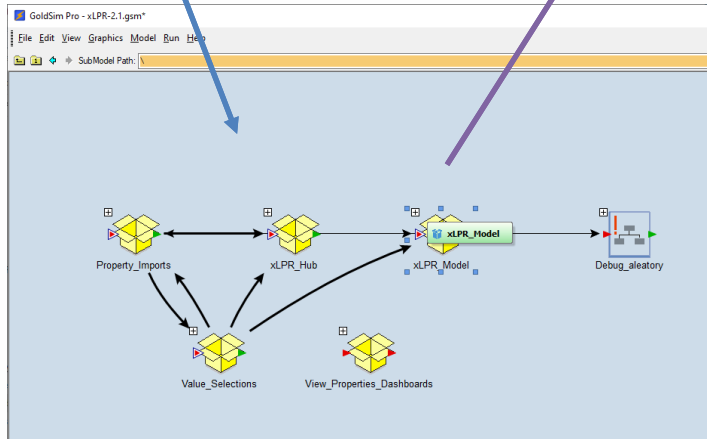
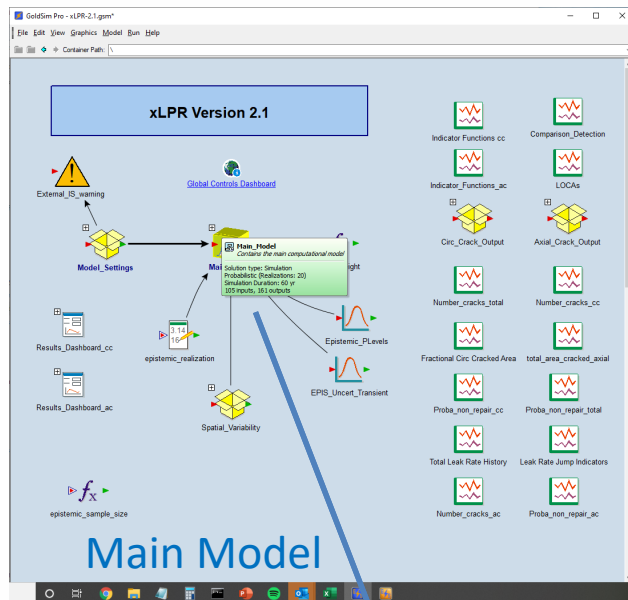
Navigating through the Model

- Containers are equivalent to folders
- Clicking on the “plus” sign in the upper left corner provides access to the container





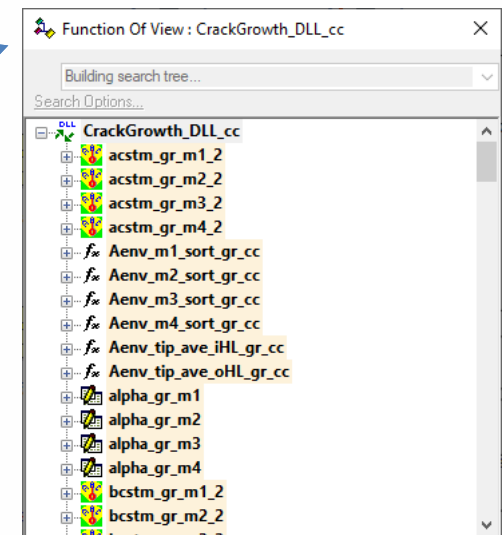
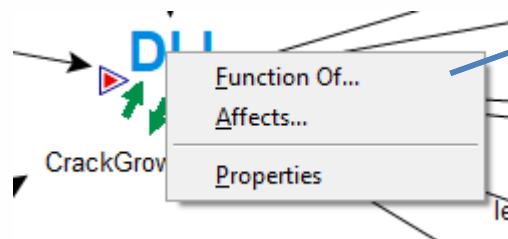
Important Containers





Navigating through the Flow Path (1/2)

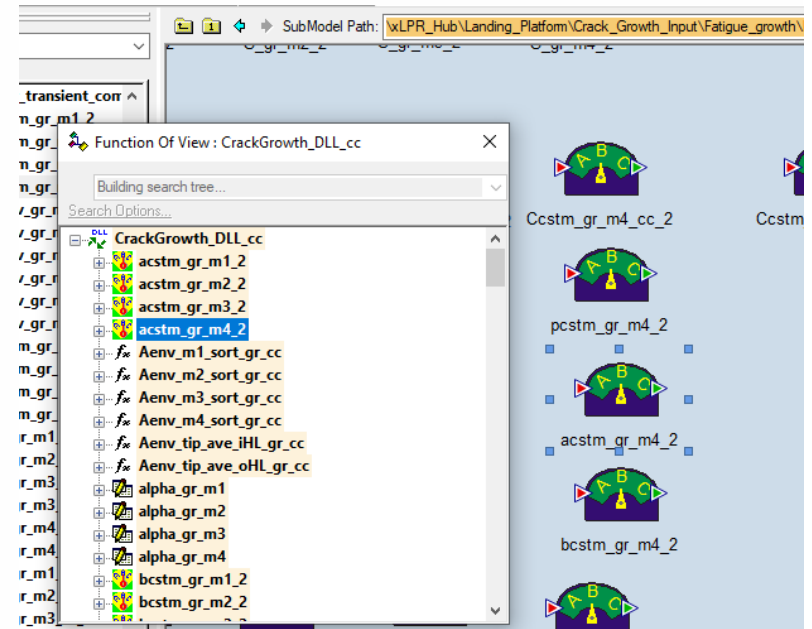
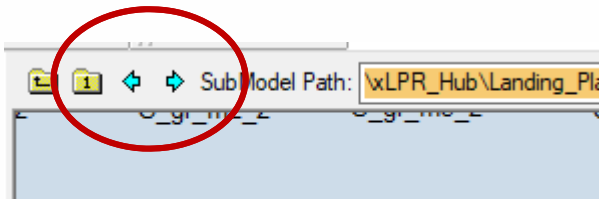
- Right clicking on each element gives access to the commands **Function Of**, **Affects**, or both:
 - **Function Of** gives the upstream information (which elements affect this one). A primary element does not have this function.
 - **Affects** gives the downstream information (which elements are influenced by this one). A final element does not have this function.





Navigating through the Flow Path (2/2)

- Clicking an element in the Function Of or Affects windows will navigate to the corresponding element
- Use the blue arrows to go back and forth between locations





PROBABILISTIC FRACTURE MECHANICS CODE

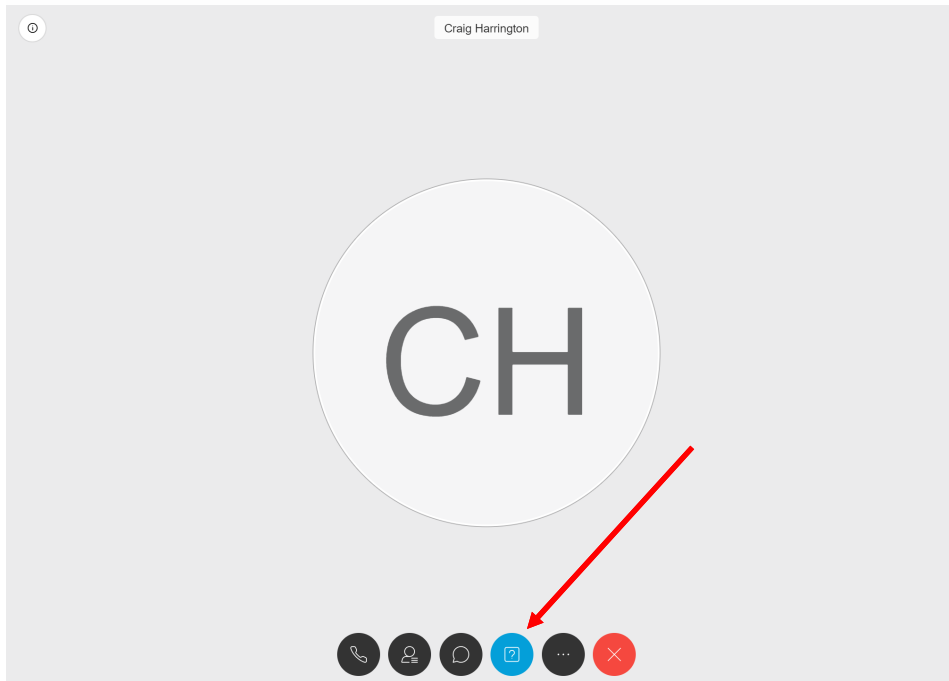
Break



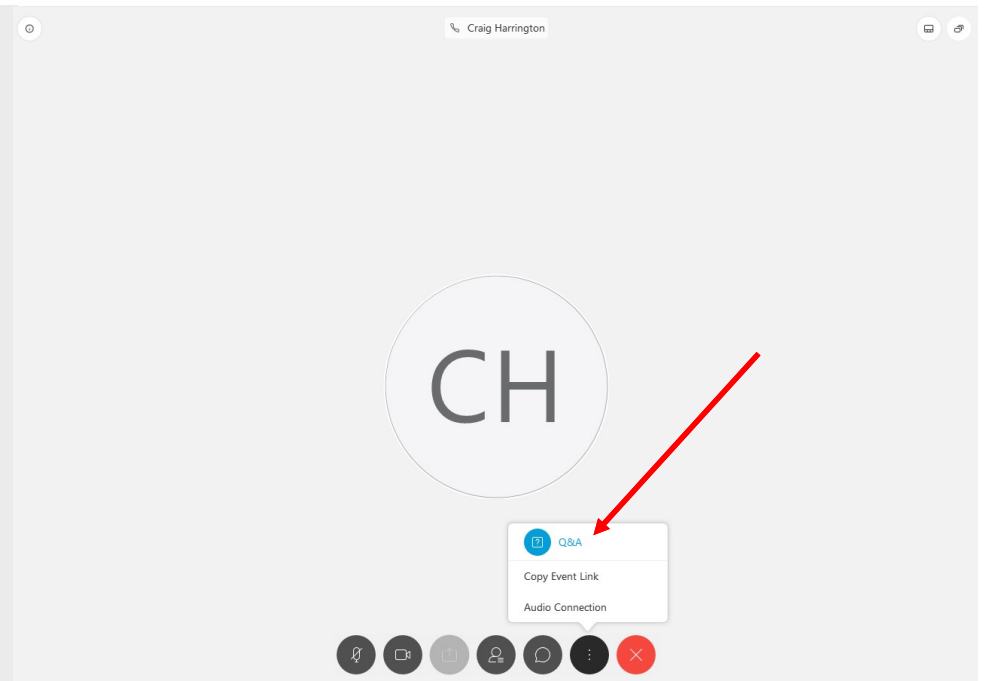
Questions and Answers



WEBEX Q+A



Webex Internet Browser



Webex Desktop Client



Closing Remarks



Looking Forward

- Advanced Methods
 - **August 5th | 10-12 EDT**



PROBABILISTIC FRACTURE MECHANICS CODE

Questions?

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xlpr@epri.com