

# FLAC3D™ VERSION 7.0

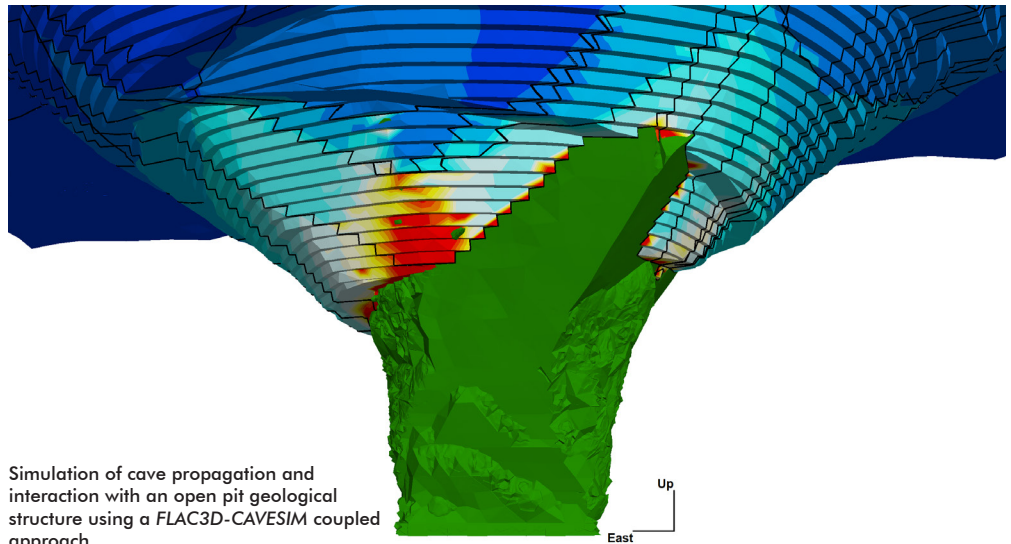
## Explicit Continuum Modeling of Non-linear Material Behavior in 3D

### ABOUT FLAC3D

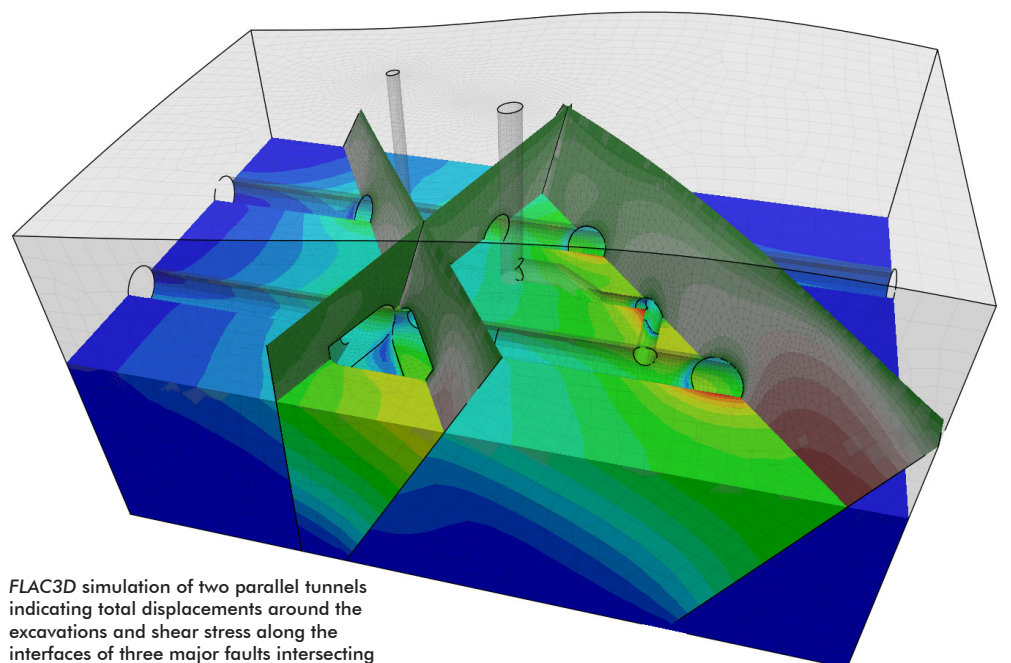
FLAC3D is numerical modeling software for geotechnical analyses of soil, rock, groundwater, constructs, and ground support. Such analyses include engineering design, factor of safety prediction, research and testing, and back-analysis of failure. Continuum analysis can be applied to engineering design of civil, mining, and geotechnical excavations and constructs in soil, intact rock, and rock masses. Using interfaces, *FLAC3D* can also simulate discontinuities such as faults, joints, bedding planes, and engineered boundaries along constructs.

### FEATURES

- Small- and large-strain simulations
- Multi-physics modeling
- Multi-threaded, 64-bit solutions with no CPU locks or additional fees
- Built-in project management tools, text editor, automatic movie-frame generation, and extensive plotting tools
- Includes null, three elastic, and 20 plastic constitutive models for soil, clay, and rock (such as Hoek-Brown, Plastic Hardening, Strain Softening, and Soft-Soil)
- New liquefaction models (P2P-Sand and NorSand) are now included **NEW**
- Commands are intuitive, easy to learn, and easy to apply
- Groundwater analyses are included at no additional cost:
  - Water table (i.e., effective stress)
  - Steady-state fluid flow
  - Transient fluid flow
  - Coupled fluid flow analysis to mechanical model (two-way coupling) as well as to dynamic and thermal analyses (optional)
- Six forms of ground support (beam, cable, pile, shell, geogrid, and liner)
- *FISH* scripting provides powerful functionality to parameterize, analyze, review, and modify nearly every aspect of the simulation, even during cycling
- Automatic factor of safety analysis using the shear strength reduction method
- Assign zones, gridpoints, faces, structural elements, and more to groups and slots
- Define groups interactively using visual and property-based ranges
- Track histories of model properties and results for comparison to actual monitoring and instrumentation data
- Bundle project files into a single file for easy distribution and archiving
- Seismic wizard for pre-processing ground waves for optional dynamic analysis



Simulation of cave propagation and interaction with an open pit geological structure using a *FLAC3D*-CAVESIM coupled approach.



*FLAC3D* simulation of two parallel tunnels indicating total displacements around the excavations and shear stress along the interfaces of three major faults intersecting the tunnels.

- All model changes (whether interactive in the user interface, or by command or scripting) are recorded to assure repeatability or for use in model scripts
- "Extra" variables can store custom data for zones, faces, gridpoints, interfaces, structural elements, and more
- Result files store subsets of model data, *FISH*, geometry, or structural elements for more compact files for archiving, distribution, and post-processing purposes
- Compatible versions of *PFC* and *3DEC* are included\* to allow coupling of different numerical methods within a single model **NEW**

## MESHING AND GEOMETRY

- Create models from primitive shapes using parametric commands
- Automatic octree mesh generation using geometric surfaces and volumes
- Extrude zones from a topography
- Create structured meshes interactively from the *Building Blocks* pane using primitives, CAD data, draping, basic *Griddle* tools, and predefined library sets
- Built-in 2D extruder is integrated seamlessly with *Building Blocks* and the *Model* pane
- An unstructured mesh generator has been added to the 2D extruder **NEW**
- Import ABAQUS/ANSYS meshes
- Built-in tools to generate Discrete Fracture Networks (DFN) and visualize continuum model properties on the virtual fractures
- Interactively define shells, geogrids, and liners using the *Model* pane
- Beam, cable, and pile geometry can be imported from CAD data

## MODEL PANE

- Interactively view, select, and operate on model objects
- Easily assign zones or faces to groups and slots
- Hide/show, delete, and recolor group zones and faces
- Interactive zone densification
- Use a break angle to make zone face selection easy on complex surfaces
- Automatically group and name internal and external boundaries via a break-angle setting
- Easily select and group zone faces to assign boundary conditions
- Interactively assign material models **NEW**

## BOUNDARIES/CONDITIONS

- Displacement, stress, and artificial boundaries
- Interfaces allow inclusion of faults, joints, and boundaries that permit slip, separation, and closure
- Zone relaxation (excavation sequencing)
- Westergaard method (dynamic option)
- *FISH* integration for easy variation of boundary conditions in time and space

## FISH SCRIPTING

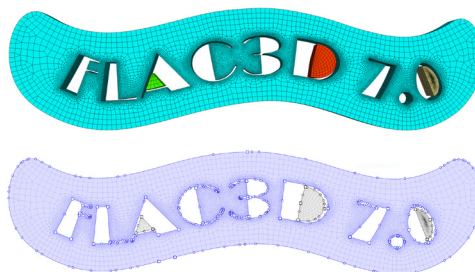
- Built-in text editor provides command syntax error checking and context-sensitive help
- Text editor includes a built-in conversion tool to translate modern data files
- Inline *FISH* for scripting within commands
- *FISH* management control set displays the current values of *FISH* variables and functions, even during cycling
- *FISH* is now multi-threaded with lists, splitting, and operators providing speed increases during iterative calculations, replacing loops in many cases **NEW**
- Extensive **Python scripting** is also available

## FASTER

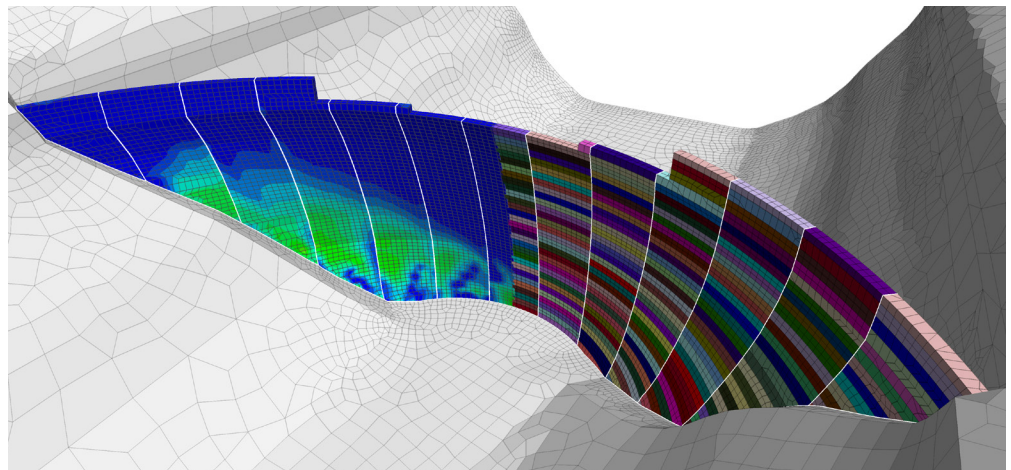
- Mechanical calculations now optimized to run 70% faster, depending on model features and constitutive model **NEW**
- Fluid, thermal, and the attach-logic calculations are now multi-threaded, running 2.5x to 10x faster **NEW**
- *FISH* scripting is now multi-threaded for faster, more powerful modeling **NEW**
- Creating a save file is 25% faster. **NEW**

## HELP

- Access Instant Help at the command prompt or within a data file [F1]
- Access Keyword Help [?] + Enter] at the command prompt to list the possible commands/keywords given the preceding command input
- Access Inline Help [Ctrl + Spacebar] to auto-complete commands



2D extruder now has an unstructured mesh generator.



FLAC3D model of a concrete arch dam (looking downstream) showing contours of tensile stress (blue indicates compression) after 5 seconds of shaking (left) and groups of ubiquitous joint zones (right) indicating the horizontal construction joints. The vertical contraction joint interfaces are also indicated as white outlines.

## AVAILABLE OPTIONS

### DYNAMIC

- Permits 3D, fully dynamic analysis
- May be coupled to structural elements, ground water flow, and thermal (optional) models
- P2P-Sand and NorSand liquefaction material models for dynamic analysis **NEW**

### CREEP

- Used to simulate materials that exhibit time-dependent material behavior
- Includes 10 creep constitutive models
- Soft-soil creep material model **NEW**

### THERMAL

- Includes both a conduction (material thermal stresses and displacements) and an advection (fluid density) model
- Includes a thermal hydration model
- Now multi-threaded **NEW**

### C++ PLUG-IN

- Allows users to create their own *FLAC3D* C++ constitutive model and functions
- Microsoft Visual Studio 2017/2019 **NEW**

The exchange of user-defined *FLAC3D* constitutive models can be found at:

[www.itascacg.com/udms](http://www.itascacg.com/udms)

## TRY THE DEMO

Itasca is pleased to offer free demo versions of all software. For more information, visit:

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