FLAC3D™ VERSION 9.0

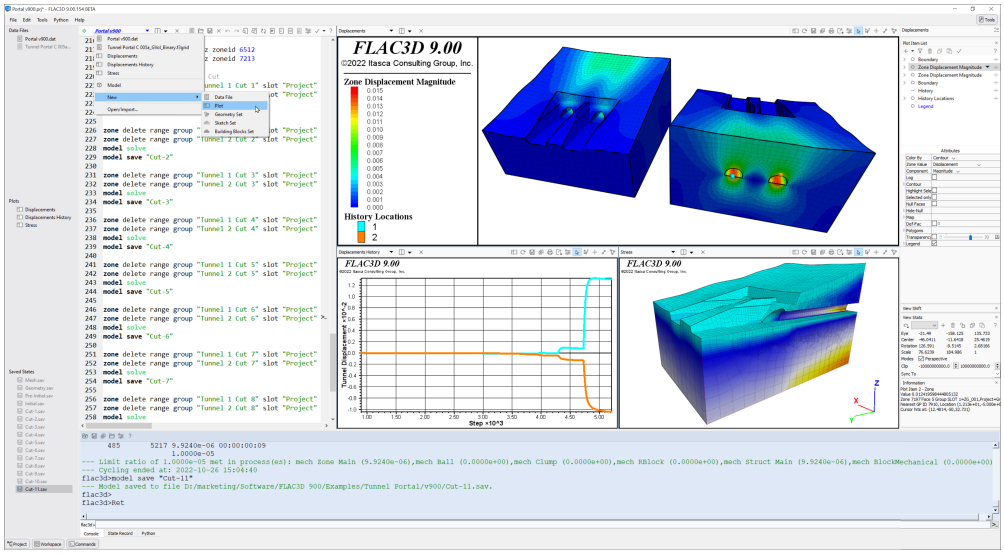
Continuum Modeling for Geomechanics in 3D

SOLVE YOUR MOST COMPLEX GEOTECHNICAL PROBLEMS

FLAC3D is the best solution to solve complex geotechnical problems for three-dimensional analyses of soil, rock, concrete, structural ground support, and groundwater flow. Options can be added to expand analyses (dynamic, creep, thermal, and *IMASS*) and to create user-defined constitutive models (UDMs). *FLAC3D* 9 has an improved user interface (UI) and new interactive tools to construct and interpret models easily. *FLAC3D* provides an incredibly accurate simulation of real-world geotechnical conditions for engineering applications, such as slope stability, underground excavation behavior, and earthquake simulations[1]. Flexible commands and scripting allow for model parameterization, flexibility, customization, and automation. With *FLAC3D*, the only modeling limitation is your imagination.

EASE-OF-USE

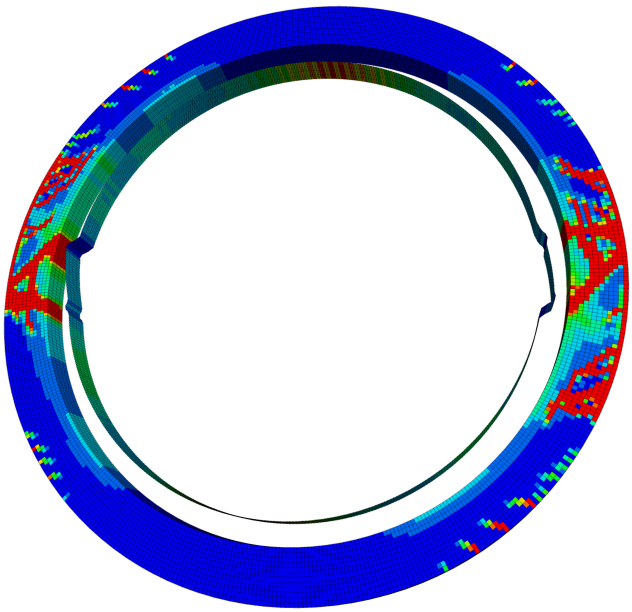
- Interactively create models from CAD files (DXF, STL), sketching, or images
- Automatic structured and unstructured mesh generation
- Extrude linearly and along curves **NEW**
- Skinning to automatically identify model boundaries to set boundary conditions
- Interactively assign groups, constitutive models, and properties/distributions
- Built-in database to save/import/export material properties **NEW**
- Automatic stress initialization
- Intuitive commands are easy to learn
- Most UI interactions are automatically translated into commands, which can be saved to a datafile and re-used
- Built-in help / command auto-complete
- Advanced built-in text editor makes creating and running models simple
- With Version 9's common UI, seamlessly move between programs or easily couple to other Itasca software[3]



FLAC3D 9 features a new user interface (UI) where you can tile plots, data files, and panes. It shares this with other Version 9 Itasca software, making it easy to switch between them or seamlessly work with them all in the same UI[3].

EVEN FASTER

- New solution optimization enables 40% faster static modeling and dynamic time steps up to 2.6x larger than before **NEW**
- Multi-threaded to utilize the full power of your computer for faster solutions
- Multi-threaded *FISH* Lists and Operators to query or modify the model incredibly quickly, even while cycling
- New Maxwell damping for 10-200x faster performance for dynamic[1] models **NEW**
- Faster implicit solvers for fluid flow and thermal calculations **NEW**
- Fast analytical temperature calculation for specified sources **NEW**



A new concrete constitutive model and non-linear structural elements (ground support) have been added to *FLAC3D* 9. Here you can see a section through a shaft lined with concrete which is yielding and an inner steel liner that is buckling.

Not shown are the outer rock mass or the deformable grout between the liner and the concrete ring.

POWERFUL

- Large-strain simulations to capture the full extent of model deformation
- Includes 27 built-in constitutive models:
  - Null
  - Elastic
  - Orthotropic Elastic
  - Anisotropic
  - Druker-Prager
  - Mohr-Coulumb
  - Ubiquitous-Joint
  - Ubiquitous-Anisotropic[4]
  - Strain-Softening/Hardening
  - Double-Yield
  - Modified Cam-Clay
  - Swell
  - Bilinear Strain-Softening/ Hardening Ubiquitous-Joint
  - Hoek-Brown
  - Hoek-Brown-PAC
  - CYSoil
  - CHSoil
  - Plastic-Hardening[4]
  - Mohr-Coulomb-Tension
  - Soft-Soil
  - Finn
  - NorSand
  - P2PSand
  - *IMASS*[1]
  - Von-Mises **NEW**
  - Columnar-Basalt **NEW**
  - Concrete **NEW**
- Non-linear deformable ground support elastic and elastoplastic **NEW** structures
- Advanced plotting tools to understand your model results and for working with hundreds of plots on real projects **NEW**
- *FISH*, Itasca's scripting language, provides unparalleled control over, and customization of, the model
- Built-in Python 3.10 scripting includes SciPy for plotting, NumPy for computing, and Pyside for UI customization
- Statistical generation tools for Discrete Fracture Networks (DFNs)
- All model changes (via mouse, commands, or scripting) are recorded for repeatability, learning, and re-use

FLEXIBLE

- Highly customizable UI **NEW** and modeling
- All licenses permit two instances of *FLAC3D* to be run on the same computer
- Access and modify almost all variables (including "EXTRA" variables for zones, piles, gridpoints, etc.) via *FISH*/Python
- Import and export any ASCII data format
- UDMs[1] can be written in C++ using Visual Studio template

ANALYSES

- Static and dynamic[2] stability
- Automatic factor of safety analysis (shear strength reduction method)
- Back-analyze failure and calibrate forward-prediction
- Parametric studies via *FISH* or Python
- Service limit state (SLS) and ultimate limit states (ULS) based on displacements
- Zone relaxation simulates gradual excavation for construction sequencing
- Simulate material damage and failure
- Effective stress using conventional or complex pore pressure distributions
- Fluid flow, seepage, and consolidation
- Coupled ground-structure interaction (beams, cables, piles, shells, geotextiles, liners)
- Simulate discontinuities (faults, joints, bedding planes, and construction boundaries) using interfaces; capture yielding or failure, shear displacements, opening, and closure along them
- Static and dynamic[1] liquefaction

AVAILABLE OPTIONS

DYNAMIC

- Permits 3D, fully dynamic analysis
- May be coupled to structural elements, ground water flow, and thermal models[2]
- Free-field and quiet boundaries
- Five hysteretic models, including Ramberg-Osgood **NEW**
- Finn, P2PSand and other UDM material models for dynamic liquefaction analysis
- Rayleigh and Maxwell **NEW** damping
- Seismic wizard for pre-processing ground waves

CREEP

- Used to simulate materials that exhibit time-dependent material behavior
- 11 creep constitutive models, including Columnar-Basalt **NEW**

THERMAL

- Includes both a conduction (material thermal stresses and displacements) and an advection (fluid density) model
- Includes a thermal hydration model
- New, faster implicit solvers for thermal calculations **NEW**
- Fast analytical temperature calculation for specified sources **NEW**

USER DEFINED CONSTITUTIVE MODELS

- Allows users to create their own *FLAC3D* C++ and *FISH* constitutive model (UDM) and functions

IMASS

- Unique Itasca constitutive model
- Captures progressive failure and disintegration of the rock mass due to induced stress changes
- Underground/surface mining applications, including caving
- Available as an annual lease

LICENSES

- **TERM:** available as a monthly or annual lease and as a perpetual license
- **TYPE:** desktop and network licenses, via USB security keys, and web licenses are available (plus node locked upon request)
- Use network and web licenses with one or more seats across organizations
- Share desktop USB security keys between computers in the same office or remotely
- Without a license, the software may be run in demonstration mode (some modeling restrictions apply)
- Trial licenses are available upon request

ONLINE RESOURCES

Demonstration Software
www.itascacg.com/demos

Itasca's Software Forum
forum.itascainternational.com

Itasca Software Academy
academy.itascainternational.com

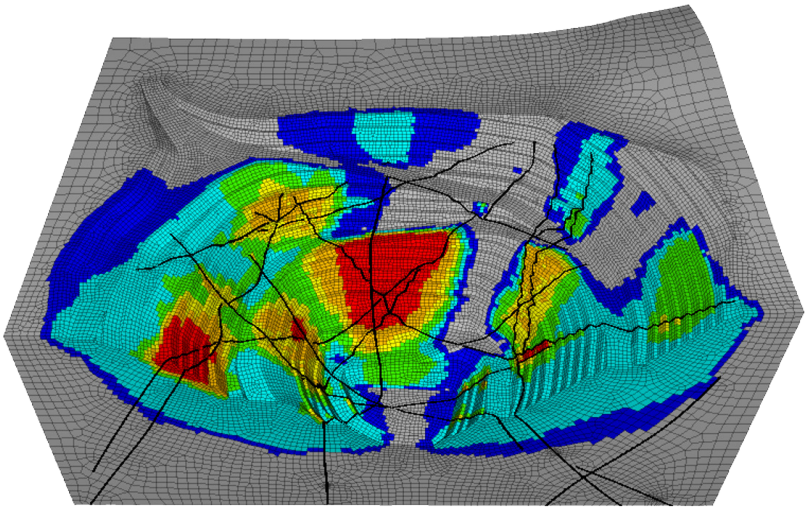
Technical Support
www.itascacg.com/help

UDM Library
www.itascacg.com/udms

Software Price Quote
www.itascacg.com/sales

The most successful global engineering companies, leading universities, and critical government agencies ***trust*** the ***reliable*** results of Itasca software to solve the most difficult geotechnical problems.

FLAC3D can capture the behavior of soil and rock via constitutive models, but can also explicitly represent faults or joints (shearing, separation, and closure). In the model shown, the *IMASS*[1] constitutive model simulates the progressive failure of the rock, capturing the emergent rock mass damage due to stress relaxation.



ITASCA Consulting Group, Inc.

[1]Option is required.
[2]Formerly the Extruder Pane.
[3]Valid licenses are required for each software.
[4]Improved