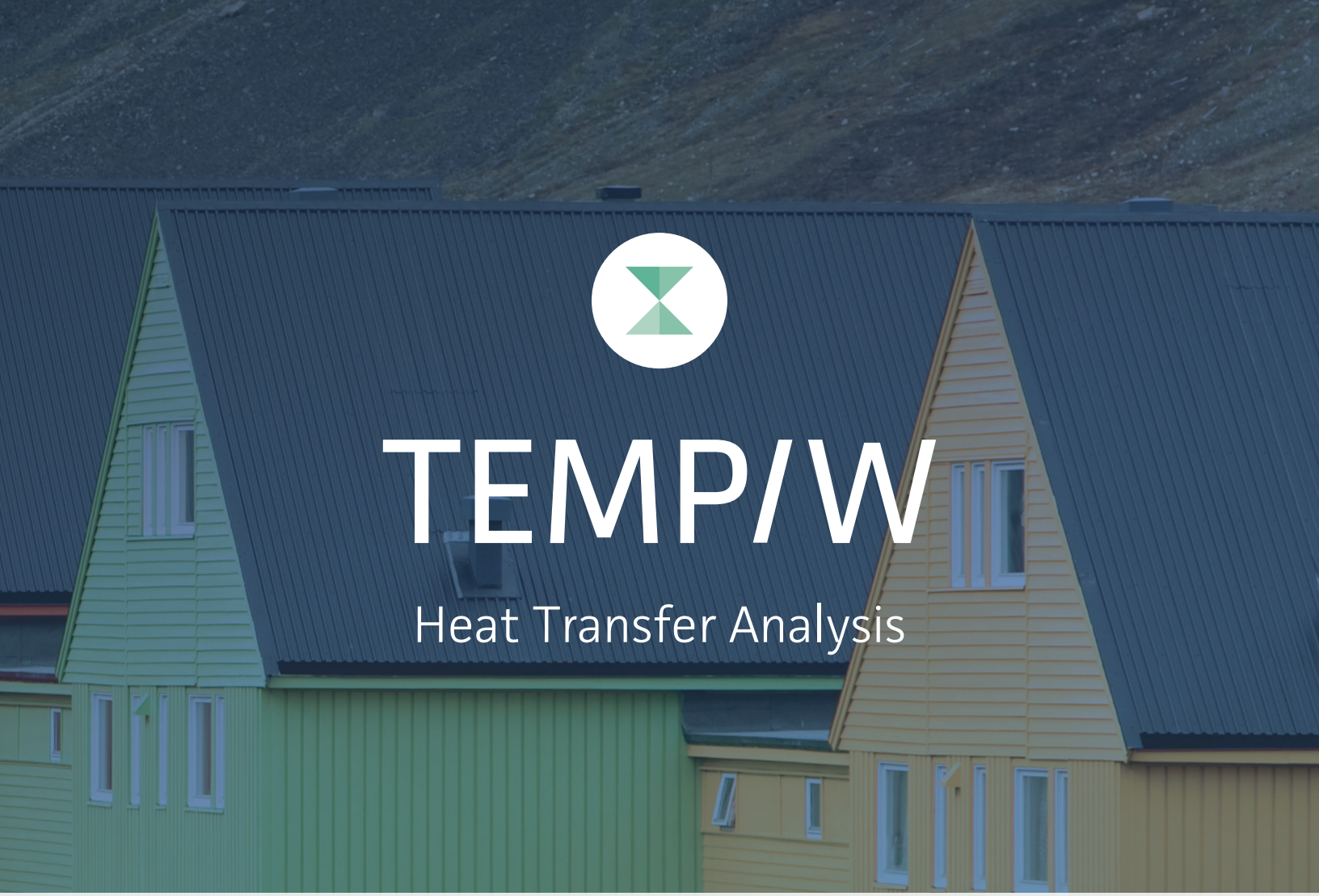


TEMP/W

Heat Transfer Analysis

TEMP/W is a powerful finite element software product for modeling heat transfer and phase change in porous media. TEMP/W can analyze simple conduction problems to complex surface energy simulations with cyclical freeze-thaw.

CONVECTIVE BOUNDARY

The convective heat transfer boundary condition simulates artificial ground freezing or other processes involving the flow of fluid over or within a bounding surface.

FORCED CONVECTION

Heat transfer is often governed by forced convection in natural hydrogeological systems. TEMP/W can be fully-integrated with SEEP/W or AIR/W to analyze heat transfer via groundwater flow or air flow, respectively.

LAND CLIMATE INTERACTION

Analyze problems that involve a coupling between climatic conditions and the thermal response within the ground in TEMP/W using the surface energy balance boundary condition.

MODEL THERMOSYPHONS

TEMP/W implements a rigorous thermosyphon boundary condition that can accommodate either two-dimensional or pseudo-3D analysis of thermosyphons.

TEMP/W models a full range of heat transfer problems

DESIGN OF GROUND FREEZING SYSTEMS

Controlling groundwater flow and stabilizing ground is critical in many tunnelling, waste management, and civil engineering projects. The convective surface and thermosyphon boundary conditions in TEMP/W can be used to analyze and design ground freezing systems in porous media. Combined with SEEP/W and AIR/W, forced-convection heat transfer can be analyzed in even the most challenging physical systems.

EFFECT OF CLIMATE CHANGE ON INFRASTRUCTURE

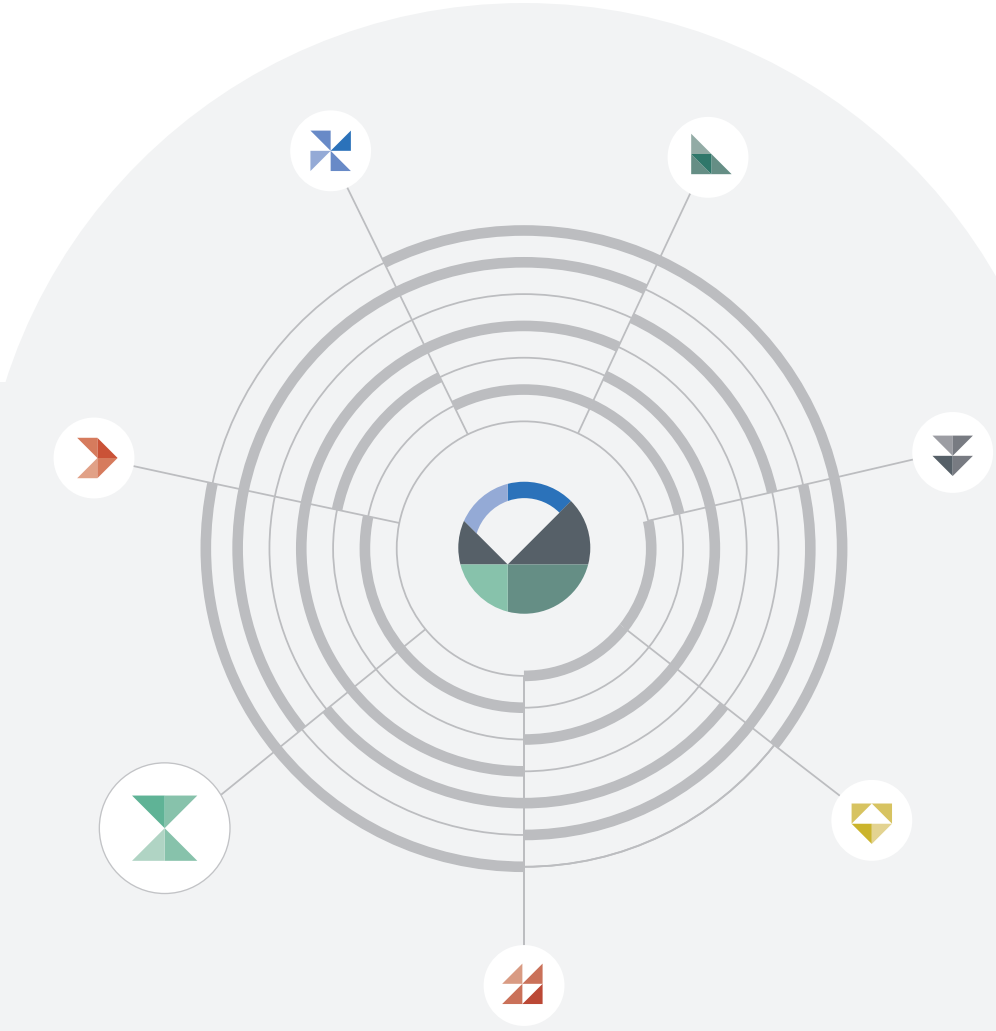
TEMP/W is used worldwide to analyze the effect of climate change on infrastructure located in northern regions. The sophisticated surface energy balance boundary condition models the exchange of thermal energy at the ground surface for a breadth of climatic and ground cover conditions. The rigorous phase change formulation provides an accurate solution to problems involving freeze-thaw of saturated-unsaturated porous media.

DESIGN OF WASTE COVER SYSTEMS

Cover systems for mine waste, landfills, and mine reclamation in northern regions often involve complex thermal and hydraulic behaviour that effect long-term performance of these structures. TEMP/W provides the ideal tool for understanding the thermal response of saturated-unsaturated cover systems and may be combined with SEEP/W and CTRAN/W to analyze moisture and solute movement in seasonally frozen systems.

SNOWMELT INFILTRATION

In seasonally frozen environments, snowmelt is typically the dominant water input to a watershed. Infiltration into frozen ground has a significant impact on run-off and the behaviour of engineered systems. Thus, understanding snowmelt infiltration is critical to managing water movement in agricultural and engineered systems. TEMP/W can be used to simulate snowmelt and the corresponding infiltration into the ground.

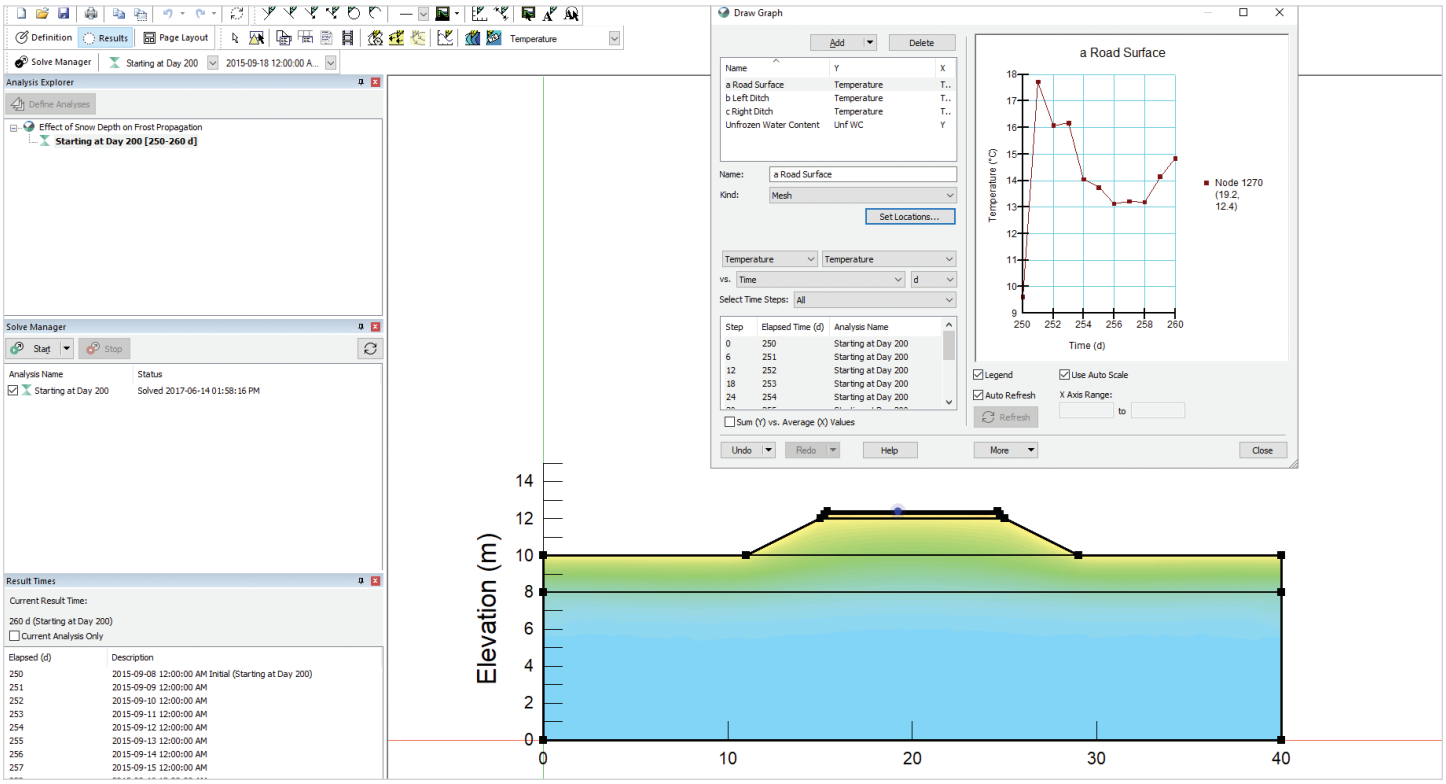


The power of integration

TEMP/W offers simple but powerful analytical capabilities when used in combination with other GeoStudio products.

TEMP/W offers a comprehensive list of features

- ✓ Comprehensive formulation, including phase change
- ✓ Rigorous under-relaxation and convergence strategies
- ✓ Thermal functions estimation
- ✓ Complete range of boundary conditions
- ✓ Steady-state or transient flow formulation
- ✓ Convenient initial condition definition
- ✓ Surface energy balance capabilities
- ✓ Forced convection with water, air, and vapor transfers
- ✓ Powerful results graphing



INTEGRATED WATER TRANSFER WITH SEEP/W

Density-dependent fluid flow forms when temperature variations cause significant density differences. Fluid movement in turn influences the temperature distribution throughout the domain. A coupled TEMP/W and SEEP/W analysis allows for the simultaneous simulation of heat and water movement associated with density-dependent flow.

INTEGRATED AIR TRANSFER WITH AIR/W

TEMP/W can use the air fluxes from AIR/W to model forced-convection heat transfer. TEMP/W can also be integrated with AIR/W to model density-dependent air flow.

INTEGRATED HEAT, WATER AND GAS TRANSFER

Water, energy and gas transfers within the unsaturated zone are often complex and inter-related processes. TEMP/W coupled with SEEP/W and CTRAN/W can simulate these processes and provide insight on vadose zone hydrology.

GEOSLOPE

PROFESSIONAL TECHNICAL SUPPORT | PRODUCT UPDATES
COMPREHENSIVE DOCUMENTATION | HUNDREDS OF EXAMPLE PROBLEMS
ONLINE VIDEO TUTORIALS | PUBLIC WORKSHOPS | ON-SITE TRAINING

GEOSLOPE develops GeoStudio, the leading suite of geo-engineering software used in over 100 countries for the last 40 years. Join thousands of practising engineers, scientists, regulators, professors and students, and start using GeoStudio today.

TRY GEOSTUDIO FOR FREE AT WWW.GEOSLOPE.COM/TRIAL