SEEQUENT

CTRAN/W
CTRAN3D

Solute and Gas Transport Analysis

GeoStudio

CTRAN/W are powerful finite element software products for modeling solute and gas transfer in porous media. CTRAN/W can be used to model simple diffusion-dominated systems through to complex advection-dispersion systems with first-order reactions.

Add CTRAN3D to CTRAN/W to analyse 3D solute and gas transfer using the same comprehensive set of material models and boundary conditions.

Comprehensive Formulation

CTRAN/W and CTRAN3D offer the capability to model a diverse set of solute and gas transport mechanisms including diffusion, advection, dispersion, adsorption, decay, and density-dependent flow due to its comprehensive formulation.

Dual Phase Gas Transfer

CTRAN/W and CTRAN3D model gas transfer in both the gaseous and aqueous phases. A bulk diffusion coefficient, longitudinal dispersivity, and transverse dispersivity are defined for each phase.

Saturated and Unsaturated

CTRAN/W and CTRAN3D are formulated for saturated and unsaturated transport, allowing the coefficient of diffusion to vary with water content and the advection process to adjust as groundwater velocities change in the unsaturated zone.

Sorption and Kinetic Reactions

CTRAN/W and CTRAN3D can model equilibrium sorption and first-order reactions such as radioactive decay, biodegradation, and hydrolysis.

CTRAN/W and CTRAN3D offer simple but powerful analytical capabilities when used in combination with other GeoStudio products.

Integrated solute and gas transfer with CTRAN/W and CTRAN3D

One of the major components of solute and gas transport analyses is pore-water velocity, which can be simulated in SEEP/W and SEEP3D. Combining CTRAN/W and SEEP/W+SEEP3D analyses allows for a comprehensive assessment of solute and gas transport in porous media.

Density dependent flow with CTRAN/W and CTRAN3D

Density-dependent fluid flow forms when solute or gas concentration variability causes significant density differences. Fluid movement in turn influences the domain distribution of solutes or gases. A coupled CTRAN/W+CTRAN3D and SEEP/W+SEEP3D analysis allows for simultaneously simulating solute/gas and water movement associated with density-dependent 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+TEMP3D coupled with SEEP/W+SEEP3D and CTRAN/W+CTRAN3D can simulate these processes and provide insight on vadose zone hydrology.

CTRAN/W and CTRAN3D model solute and gas transfer problems

Migration and remediation of contaminants

CTRAN/W and CTRAN3D provide a range of approaches for assessing the migration of gases and solutes through porous media, including simple diffusion-only transport or when coupled with SEEP/W and SEEP3D, complex advection-dispersion and density-dependent problems. The transient formulation, sophisticated boundary condition options, and ability to include kinematic reactions and/or adsorption, also allow for the evaluation and design of remediation systems.

Seawater intrusion in to coastal aquifers

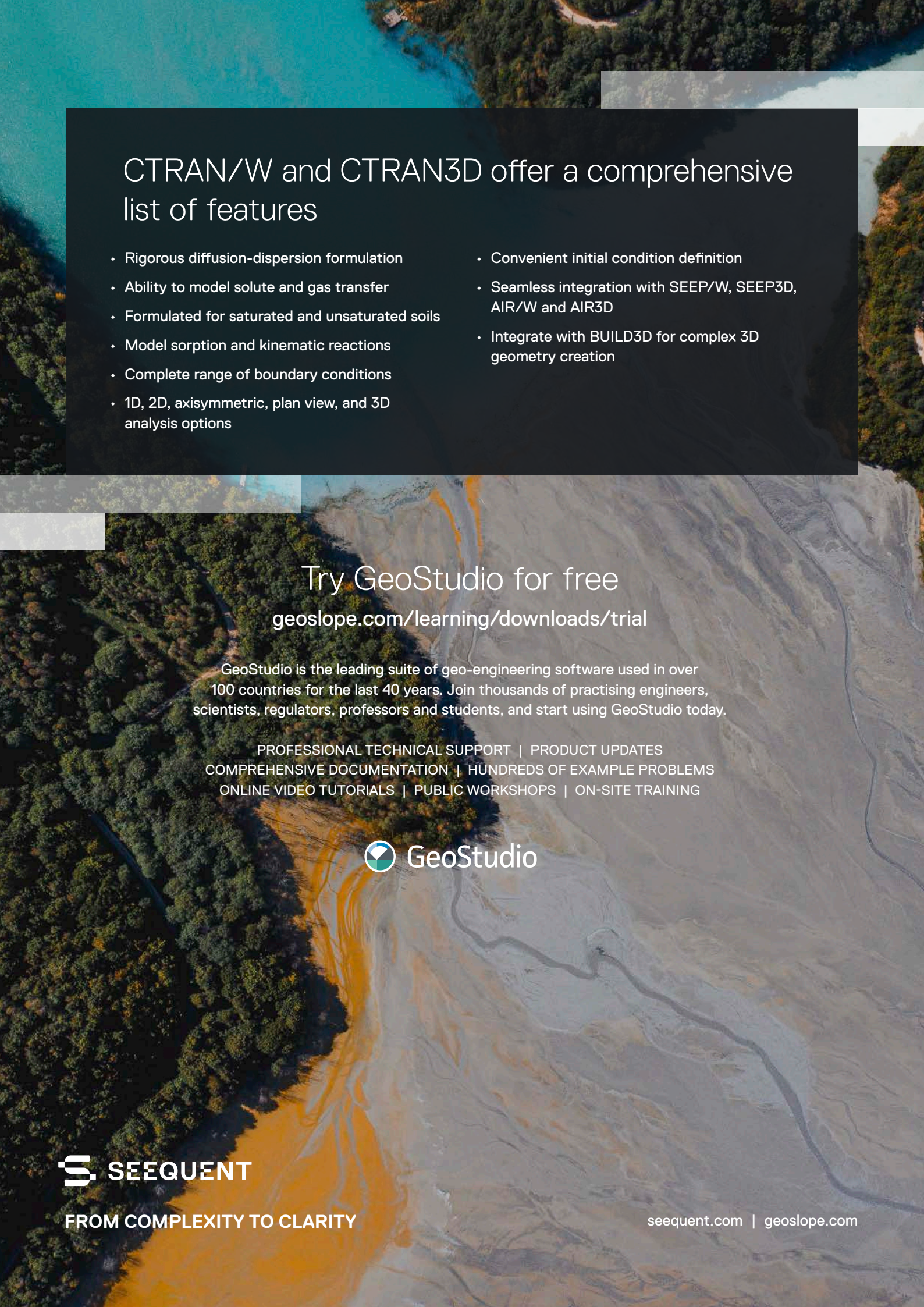
Seawater intrusion into coastal aquifers is an increasing issue due to both anthropogenic and natural forces. When coupled with SEEP/W, CTRAN/W can simulate the movement of salt water via advection-dispersion with groundwater flow, for example, due to inland drawdown. Spatial variation in salt concentrations may also contribute to groundwater movement via density-dependent flow. CTRAN/W+CTRAN3D may be coupled with SEEP/W+SEEP3D as well as TEMP/W+TEMP3D, to assess the potential for density-dependent flow to contribute to seawater intrusion.

Cover design for acid rock drainage

Acid rock drainage (ARD) results from the disturbance and consequent oxidation of sulfide minerals. Water flowing through an acidic medium transports the ARD via advection-dispersion. Thus, covers are used to limit the exposure of oxygen and/or water to rock or waste piles containing sulfide minerals. CTRAN/W and CTRAN3D can assess oxygen ingress through a cover system via free phase and dissolved phase transport with consideration to oxygen consumption.

Design of liner systems

Liners are often used to minimize the movement of solutes from municipal or industrial waste storage facilities to underlying hydrogeological systems. Diffusive mass transport is generally the dominant mass transport mechanism in liners with very low hydraulic conductivities. CTRAN/W and CTRAN3D can be used to simulate diffusive mass transport, or may be coupled with SEEP/W and SEEP3D to determine the sensitivity of mass transport through the liner due to its hydraulic conductivity.



CTRAN/W and CTRAN3D offer a comprehensive list of features

- Rigorous diffusion-dispersion formulation
- Ability to model solute and gas transfer
- Formulated for saturated and unsaturated soils
- Model sorption and kinematic reactions
- Complete range of boundary conditions
- 1D, 2D, axisymmetric, plan view, and 3D analysis options
- Convenient initial condition definition
- Seamless integration with SEEP/W, SEEP3D, AIR/W and AIR3D
- Integrate with BUILD3D for complex 3D geometry creation

Try GeoStudio for free

geoslope.com/learning/downloads/trial

GeoStudio is 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.

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

GeoStudio

SEEQUENT

FROM COMPLEXITY TO CLARITY

seequent.com | geoslope.com