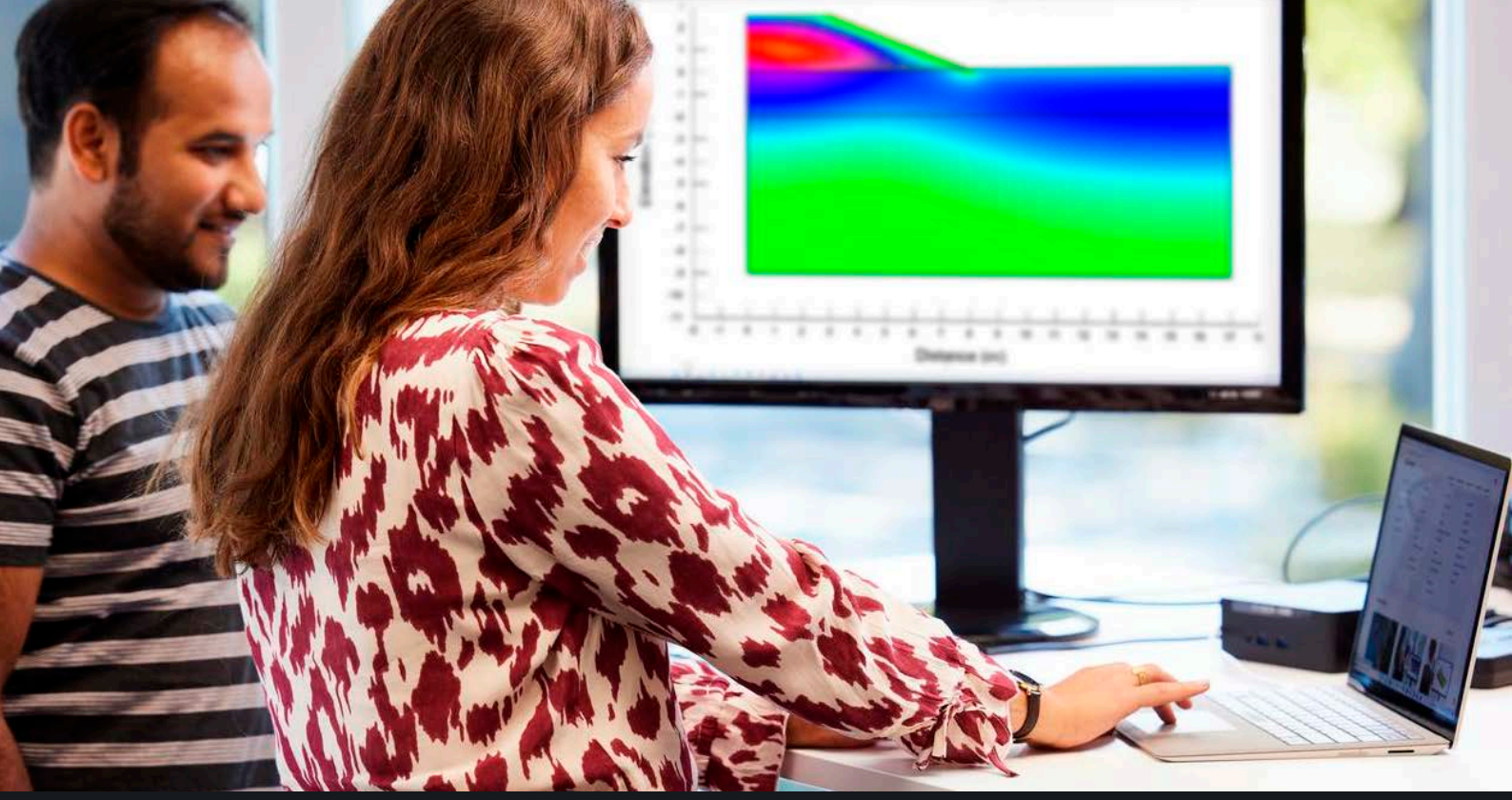

SEEQUENT
AIR/W
AIR3D
Air Transfer Analysis
GeoStudio



AIR/W is a powerful finite element software product for modeling air transfer in mine waste and other porous media.

Add AIR3D to unlock the power of 3D air transfer in porous media. AIR3D provides the tools to quickly create 3D geometry, apply materials and boundary conditions to 3D objects, generate finite element mesh, and solve and interpret 3D results.

Density Dependent Air Flow

AIR/W and AIR3D can be integrated with TEMP/W and TEMP3D to model air transfer via free convection. Density-driven air transfer is often a dominant mechanism in systems subjected to seasonal ground temperature variations.

Estimate Material Properties

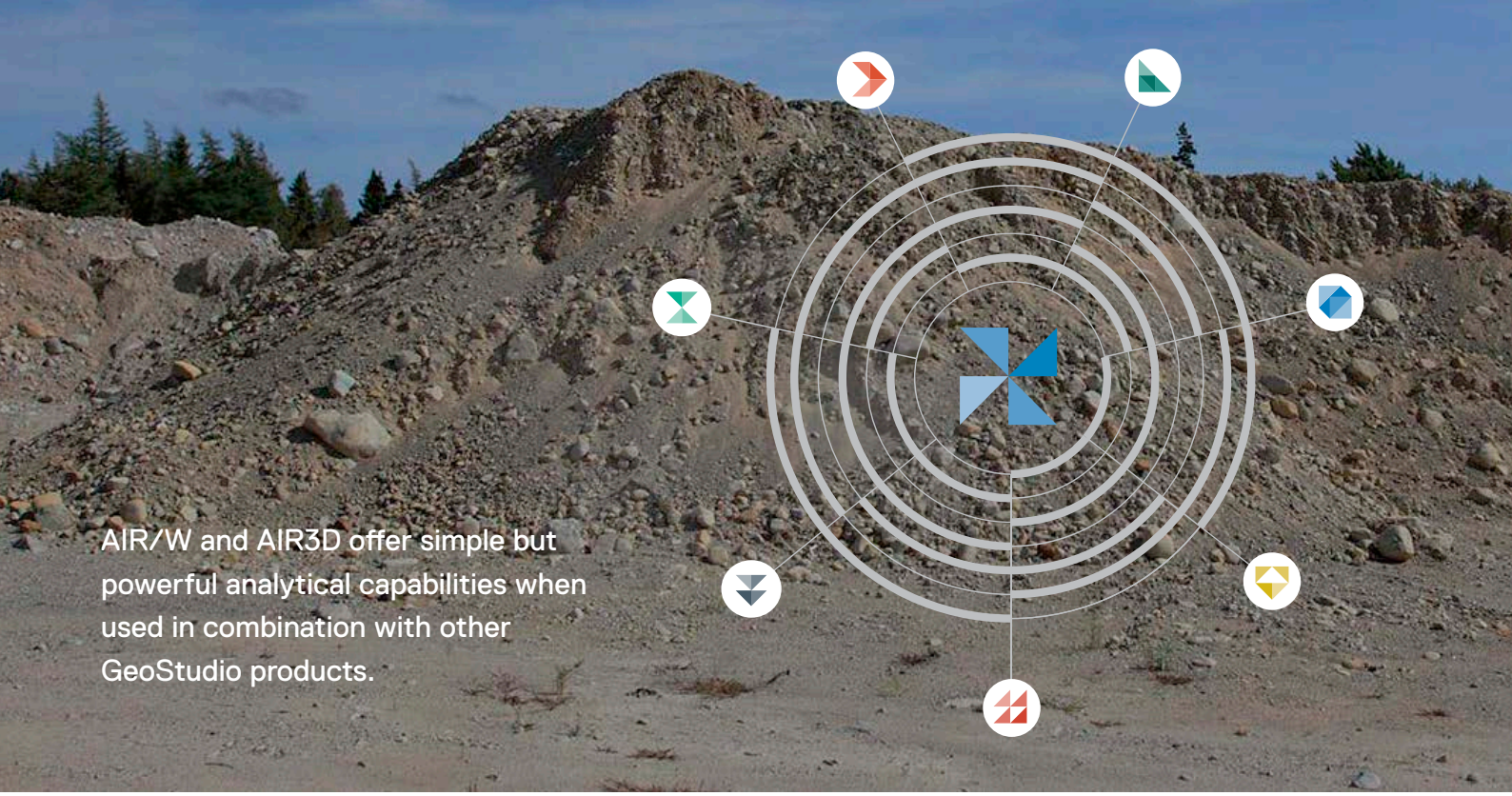
The air conductivity function can be generated based on the dry-soil air conductivity, a user-selected volumetric water content function, and basic soil properties, such as soil classification or grain size distribution.

Forced-Convection Heat Transfer

Combine AIR/W and AIR3D with TEMP/W and TEMP3D to model forced-convection heat transfer. This process often governs the thermal regime in coarse-grain materials such as waste rock piles, rip-rap, and layered embankments.

Single or Dual Phase Flow

Air transfer analyses can be conducted using a single phase material model that only considers pressure and gravity-driven air flow. Alternatively, a dual phase material model can be used by coupling air flow and water transfer.



AIR/W and AIR3D offer simple but powerful analytical capabilities when used in combination with other GeoStudio products.

Integrated water transfer with SEEP/W+SEEP3D

Coupled air-water systems can be modeled by coupling SEEP/W+SEEP3D and AIR/W+AIR3D via the matric suction (the difference between pore-air and pore-water pressures). A change in air pressure will cause a change in the water pressure and vice versa. This is useful for modelling mine closure cover systems or water/air movement in acid generating waste rock.

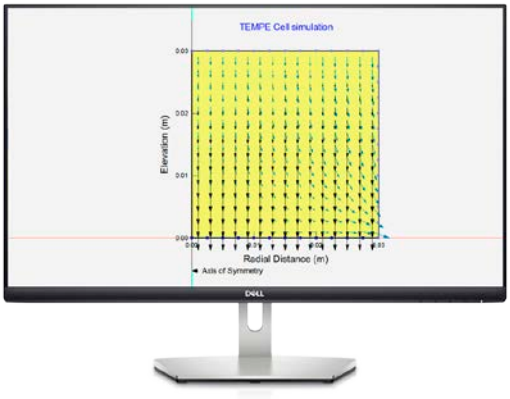
Density dependent flow with TEMP/W+TEMP3D

Density-dependent fluid flow forms when temperature variations cause significant density differences. Air movement in turn influences the temperature distribution throughout the domain. A coupled AIR/W+AIR3D and TEMP/W+TEMP3D analysis allows for the simultaneous simulation of heat and air movement associated with density-dependent flow.

AIR/W+AIR3D results in TEMP/W+TEMP3D

One of the major components of heat flow analyses in unsaturated materials is air flow, as it causes forced convection heat transfer. Combining AIR/W+AIR3D and TEMP/W+TEMP3D analyses allows for a comprehensive assessment of heat transport in unsaturated porous media.

AIR/W and AIR3D model a full range of air transfer problems



Thermal response of gravel embankments

Forced convective heat transfer through coarse grain embankments may occur as a result of air movement. In northern regions, convection can cause significant temperature reduction within an embankment during winter months. Conversely, convection through the embankment during summer months may affect permafrost within the underlying formation. When coupled with TEMP/W+TEMP3D, AIR/W+AIR3D may be used to investigate these effects.

Design of waste cover systems

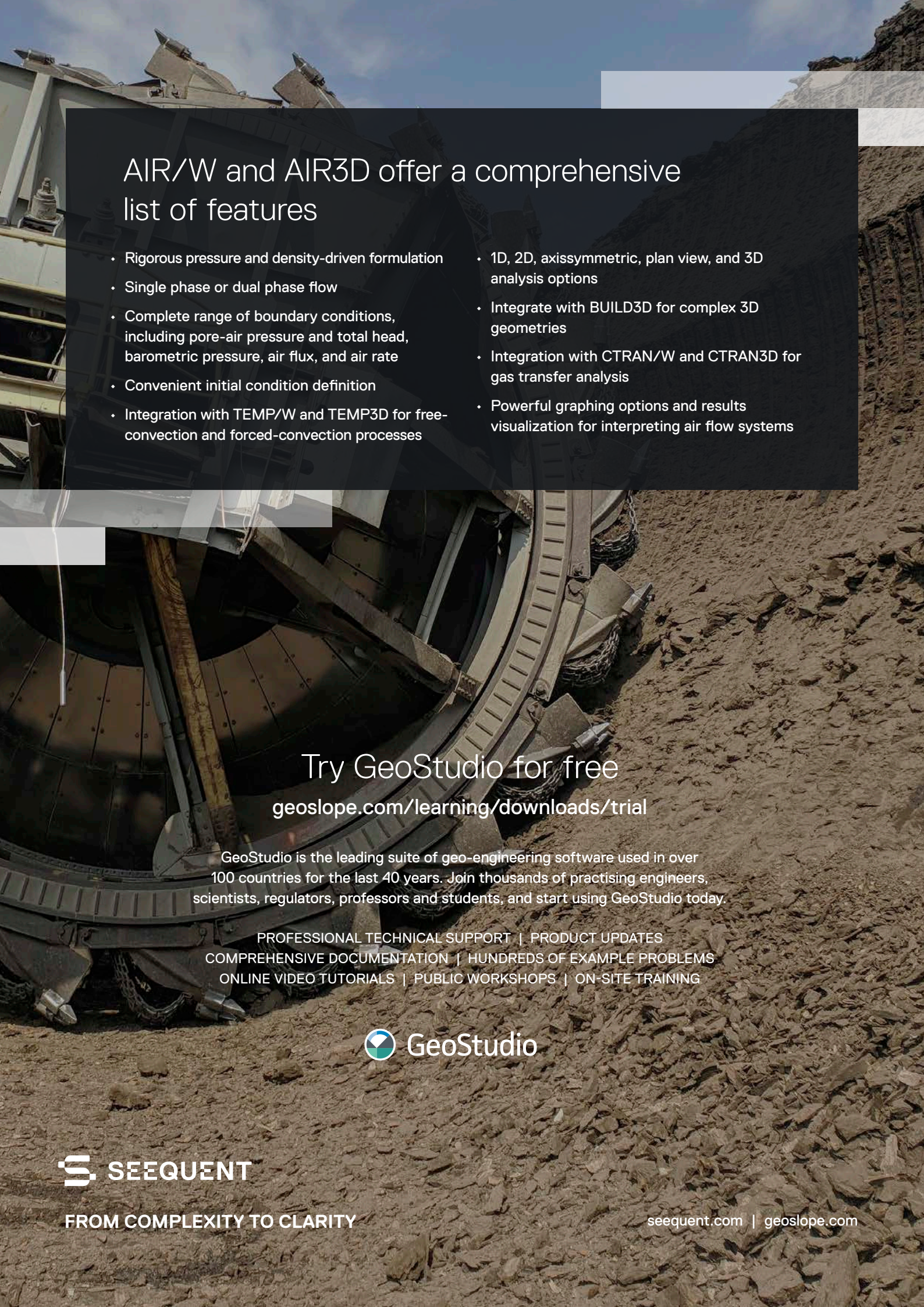
Cover systems for mine waste, landfills, and mine reclamation often involve complex hydraulic behaviour that effect long-term performance of these structures. AIR/W+AIR3D may be coupled with SEEP/W+SEEP3D to understand the movement of air and water through saturated-unsaturated cover systems. A cover analysis may also include gas migration when AIR/W is coupled with CTRAN/W+CTRAN3D.

Gas particle movement in porous media

The single phase AIR/W material model allows for the simulation of pressure driven air flow. In a single phase simulation, the particle tracking option may be selected to evaluate gas particle movement through the porous medium.

Density effects on air flow

Air movement through porous media may be influenced by spatial variations in temperature, causing density-dependent air flow, or free convection. Together, AIR/W+AIR3D and TEMP/W+TEMP3D can simulate air flow generated by density differences throughout the domain.



AIR/W and AIR3D offer a comprehensive list of features

- Rigorous pressure and density-driven formulation
- Single phase or dual phase flow
- Complete range of boundary conditions, including pore-air pressure and total head, barometric pressure, air flux, and air rate
- Convenient initial condition definition
- Integration with TEMP/W and TEMP3D for free-convection and forced-convection processes
- 1D, 2D, axissymmetric, plan view, and 3D analysis options
- Integrate with BUILD3D for complex 3D geometries
- Integration with CTRAN/W and CTRAN3D for gas transfer analysis
- Powerful graphing options and results visualization for interpreting air flow systems

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