

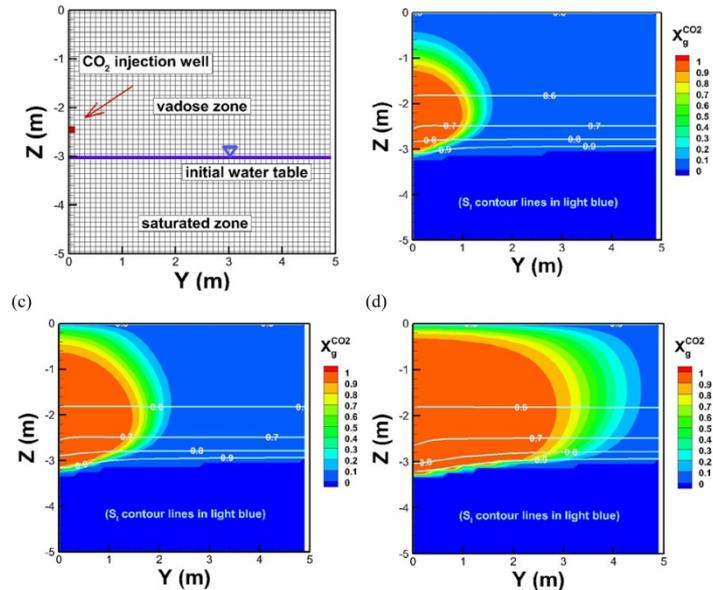
# TOUGH2/EOS7CA Version 1.0:

## TOUGH2 module for water, air, and CO<sub>2</sub>, CH<sub>4</sub>, or N<sub>2</sub> in shallow subsurface systems

- Shallow CO<sub>2</sub> migration (e.g., leakage from GCS sites)
- Methane leakage (e.g., from buried pipelines)
- Biogenic methane or CO<sub>2</sub> generation and migration

### Overview:

EOS7CA is a TOUGH2 module for mixtures of a non-condensable gas (NCG) and air with or without a gas tracer, an aqueous phase with or without brine, and water vapor. The user can select the NCG as being CO<sub>2</sub>, N<sub>2</sub>, or CH<sub>4</sub>. EOS7CA uses a cubic equation of state with a multiphase version of Darcy's Law to model flow and transport of gas and aqueous phase mixtures over a range of pressures and temperatures appropriate to shallow subsurface porous media systems. Transport of the gaseous and dissolved components is by advection and Fickian molecular diffusion.



TOUGH2/EOS7CA can be ordered from:

<http://esd1.lbl.gov/research/projects/tough/licensing/tough2.html>

**Academic and non-commercial:** \$500 (source code)

**Commercial:** \$800 (executable), \$2000 (source code)

*(all royalties from TOUGH software sales are used to further the development, testing, and documentation of the TOUGH codes)*

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### User Guide:

Oldenburg, C.M., EOS7CA Version 1.0: TOUGH2 Module for Gas Migration in Shallow Subsurface Porous Media Systems, Lawrence Berkeley National Laboratory Report LBNL-175204, March 2015.

### Peer-reviewed articles based on EOS7CA:

Oldenburg, C.M., J.L. Lewicki, L. Pan, L. Dobeck, and L. Spangler, Origin of the patchy emission pattern at the ZERT CO<sub>2</sub> release test, *Env. Earth Sci.*, 60(2), 241-250, 2010. LBNL-3063E.

Oldenburg, C.M., J.L. Lewicki, L. Dobeck, and L. Spangler, Modeling gas transport in the shallow subsurface during the ZERT CO<sub>2</sub> release test, *Transport in Porous Media*, 82(1), 77-92, 2010. LBNL-1529E.

Lewicki, J.L., C.M. Oldenburg, L. Dobeck, and L. Spangler, Surface CO<sub>2</sub> leakage during two shallow subsurface CO<sub>2</sub> releases, *Geophys. Res. Lett.*, 34, L24402, 2007. LBNL-63528.