Landlab: A Python library for building and coupling 2D numerical models

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ABSTRACT

Landlab is a Python-language library that speeds the building and coupling of 2D numerical models, with a primary focus on models of earth-surface processes. Landlab’s capabilities include: (1) create and configure a grid with one or a few lines of code; (2) choose from a variety of grid types, either structured and unstructured; (3) connect data arrays directly to the grid, where they can be accessed and shared; (4) assemble integrated models from reusable components, each of which models a particular process; (4) perform input and output using standardized data formats; and (5) design continuous-time stochastic cellular automaton models by specifying cell states and a set of transition rules. More information about Landlab is available at http://landlab.github.io.

What is Landlab?

• An open-source, Python-language library that helps geoscience researchers efficiently develop 2D grid-based numerical models
• A set of pre-built model components, each of which models a particular landscape process (see examples below)
• A framework for combining components into multi-process models
• Learn more at http://landlab.github.io

GRIDS

Grids are built from primitives such as nodes, links, and cells

DIFFERENT GRID TYPES

- Node (core)
- Node (open boundary)
- Node (closed boundary)
- Active link
- Inactive link

UTILITIES

- Import ESRI Arc AsciiGrid format digital elevation data
- Read and write netCDF files
- Read model parameters from formatted text files

EXAMPLES

- Landform evolution
- Rainfall, runoff, and erosion
- Soil moisture and leaf-area index (LAI)
- Vegetation dynamics

SCRIPTING

Example: a nine-line diffusion model

Acknowledgments:

Development of Landlab is supported by NSF (ACI-1450409 and ACI-1147454)