CENTURY: Modeling Ecosystem Responses to Climate Change, Version 4 (VEMAP 1995)

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Overview:

This specialized version of the CENTURY model runs simulations on a cell-by-cell basis for each identified cell of interest within the defined grid. There is no inter-cell communication when running the simulations.

The VEMAP simulations were run for the continental U.S using a 1/2 degree grid.

- midpoint of the upper left hand corner at latitude -124.25, longitude 48.75
- midpoint of the lower right hand corner at latitude -67.25, longitude 25.25.

The VEMAP grid has 48 rows and 115 columns. 3168 cells were simulated.

To run a Gridded Century simulation the model expects to read an initialization file named century.init. This driver file contains information about the type of simulation to be run and the location and file names of the input files that will be used to run the simulation. The weather files used for the VEMAP simulations are in netCDF format. The geog.nc netCDF file is used to obtain the site specific parameters required to run a single grid cell. The soil texture information for a given grid cell is extracted from ASCII files organized by row and column to match the VEMAP grid.

Target computer platform(s):

The VEMAP simulations were run on UNIX using a specialized gridded version of the Century 4.0 model.

Model build environment:

A Gridded Century spinup simulation will use the lu*.100 files to get the initial information required for a Century simulation. At the end of the spinup simulation the information that is required for initializating a subsequent simulation, run as a extension of the spinup simulation, will be saved in a netCDF file named site.nc. The initialization information in the site.nc file represents the state of the site at the end of the spinup simulation and will be used to set the initial conditions for the subsequent simulations.

The phase1.ncdf file contains mean weather data for each of the grid cells simulated in the Century VEMAP runs. There is one year of monthly data for each cell. The pptT1.nc, tnT1.nc, and txT1.nc files contain several years of monthly transient weather for each grid cell. These files hold precipitation, minimum temperature, and maximum temperature values respectively.

The mbd1_m1.v2, mcl1_m1.v2, and msa1_m1.v2 files contain bulk density, clay, and sand values, respectively, for the VEMAP grid cells.

When running a VEMAP simulation Gridded Century will write the simulation output to several netCDF files.

Source code files:
    *.f   - Fortran 77 source code files
    *.inc - Fortran include files
    *.c   - C source code files
    *.h   - C header files
    Makefile_util - Makefile used to build the Century executable on a SUN OS

Landuse types as defined for the VEMAP simulations:
    lu   Description
     1   Tundra
     2   Subalpine Coniferous Forest
     3   Maritime Coniferous Forest
     4   Continental Coniferous Forest
     5   Cool Temperate Mixed Forest
     6   Warm Temperate/Subtropical Mixed Forest
     7   Temperate Deciduous Forest
    10   Temperate Mixed Xeromorphic Woodland
    11   Temperate Coniferous Xeromorphic Woodland
    13   Temperate/Subtropical Deciduous Savanna
    14   Warm Temperate/Subtropical Mixed Savanna
    15   Temperate Coniferous Savanna
    17   C3 Grasslands
    18   C4 Grasslands
    19   Mediterranean Shrubland
    20   Temperate Arid Shrubland
    21   Subtropical Arid Shrubland

Parameter files:
    crop.100 - grass/crop options
    cult.100 - cultivation options
    fert.100 - fertilizer options
    fire.100 - fire options
    biome specific fix files:

arcfix.100 - used for landuse type 1
borfix.100 - used for landuse type 2
drygfix - used for landuse types 11, 17, 20, and 21
drytrpfix.100 - used for landuse type 19
ffix.100 - used for landuse types 3, 4, 5, 6, and 7
gfix.100 - used for landuse types 13, 14, 15, and 18
graz.100 - grazing options
harv.100 - harvest options
irri.100 - irrigation options
omad.100 - organic matter addition options
tree.100 - tree options
trem.100 - tree removal options
<site>.100 - landuse type specific site files
lu1.100
lu2.100
lu3.100
lu4.100
lu5.100
lu6.100
lu7.100
lu10.100
lu11.100
lu13.100
lu14.100
lu15.100
lu17.100
lu18.100
lu19.100
lu20.100
lu21.100

Sample initialization files:
century.new.spin – example century.init file for a spinup run
century.tran.vveg1940.NoCO2.No24Burn – example century.init file
    for a transient weather run
(NOTE: The Gridded Century executable expects to read a file named century.init.
These example files would have to be renamed before running the simulation. The
VEMAP simulations did not use the nitrogen deposition grid file or the nitrogen
deposition scalers file so these files, referenced in the initialization files, are not included
in the archive.)

Weather files:
phase1.ncdf – mean weather data
pptT1.nc – transient precipitation
tnT1.nc – transient minimum temperature
txT1.nc – transient maximum temperature

Soil files:
    mbd1_m1.v2 – bulk density
    mcl1_m1.v2 – clay
    msa1_m1.v2 – sand

Technical documentation for Century version 4.0:
    Century User's Manual.doc

Reference:

VEMAP, et al., J.M. Melillo, J. Borchers, J. Chaney, H. Fisher, S. Fox, A Haxeltine, A. Janetos, D.W. Kicklighter, T.G.F. Kittel, A.D. McGuire, R. McKeown, R. Neilson, R. Nemani, D.S. Ojima, T. Painter, Y. Pan, W.J. Parton, L. Pierce, L. Pitelka, C. Prentice,B. Rizzo, N.A. Rosenbloom, S. Running, D.S. Schimel, S. Sitch, T. Smith and I. Woodward. 1995. Vegetation/ecosystem modeling and analysis project: comparing biogeography and biogeochemistry models in a continental-scale study of terrestrial ecosystem responses to climate change and CO2 doubling. Global Biogeochemical Cycles 9:407-437. (743)