ED-2.1 - May 14, 2010

***(web-address updated Sept. 13, 2013)**

This document describes the contents of the package containing the ED-2.1 code. The file ED-2.1.tar.gz is a compressed file. Once you uncompress it, you should have a directory called ED-2.1 with the following structure:

- **ED**: This directory contains the ED-2.1 source code (src) and the directory for compilation (build). For further instructions on how to compile and use the model, we strongly suggest accessing the ED-2.1 *Wiki website: http://128.197.34.149/wiki/index.php/ED2_Documentation

- **RAPP**: This directory contains the NCEP reanalysis pre-processor, that produces meteorological forcing in the ED-friendly format (HDF5) based on the NCEP/NCAR reanalysis (Kalnay et al 1996). The source code (*src*) and a *build* directory are included. The run directory contains the namelist and a shell script to help with the downloading process. A brief instruction can be found in the directory too.

- **test_run**: This is a test directory in which you should be able to run the Harvard Forest, MA, United States test run. This is a very simplified test simulation, and the settings may need to be adjusted for each case. The wiki website contains further information on the variables. This setting will NOT produce the results presented by Medvigy et al. (2009) (check the end of this document). This directory includes:
    - **ED2IN**: ED-2.1 Namelist. Please check the wiki for more information on how to set up the simulation.
    - **HARVARD_MET**: example of a meteorological forcing header.
    - **histo**: output directory that will store the history files in the test run.
    - **analy**: output directory that will store the monthly mean files in the test run.
    - **ed_2.1**: a link to the executable that should be created in ED if you compile the model according to the wiki instructions.

- **input_data**:
    - **chd+dgd+glu**: a collection of files that list the global distribution of land-use change (*glu*), and phenology (*dgd* & *chd*).
    - **harvard_met_driver**: the list of HDF5 files that contain the meteorological forcing for Harvard Forest as described by the HARVARD_MET header file.
    - **phenology**: a file containing the prescribed phenology for Harvard Forest.

  - **restart_files**: the initial ecosystem state files for Harvard Forest. These are written in the ED-2.0 (old version) format.
  - **soil** (none of these are used in the test run but may be useful):
    - **depth**: a text file containing 1-degree resolution soil depth information.
    - **tempsmoist**: an example file containing the format for temperature and soil moisture initialization.
    - **type_FAO**: HDF5 files containing global soil texture information, with 1 degree resolution.
  - **veg_OGE2**: The *Olson Global Ecosystem* dataset, this contains vegetation class data and it is used only to determine land vs. water areas for regional runs.

- **ed_monmean_plotter.r** : this is a sample *R* script that reads in the monthly mean output file and creates some different kinds of plot. If you run the test case, then running this script should read the files in *test_run/analy* directory, and create the plots in *test_run/epost* directory.

- **R-extrasrc**: additional R files used by *ed_monmean_plotter.r*. For simulations other than the test_case, you will probably need to change at least the *location.r* and *rconstants.r* files.

List of changes needed to obtain results similar to Medvigy et al. (2009)

Changes that must be done in the source code

1. ED/src/io/ed_read_ed10_20_history.f90:
   a. **Line 56** – enable Harvard Override

2. ED/src/init/ed_params.f90:
   a. **Line 931** – make frost_mortality = 0.

3. ED/src/dynamics/twostream_rad.f90:
   a. **Line 91** – beam backscatter = 0.5

4. ED/src/dynamics/photosyn_driv.f90:
   a. **Line 143** – constant CO2 mixing ratio of 360.e-6
   b. **Line 214** – constant CO2 mixing ratio of 360.e-6

5. ED/src/utils/update_derived_props.f90:
   a. **Line 389** – enable Harvard Override

6. ED/src/dynamics/growth_balive.f90
   a. Update leaf biomass to have a daily update (David's recommendations)

b. **Line 38** – add a new line:
```
use ed_misc_coms, only : current_time
```
c. **Line 67** – add the following lines:
```
integer, external :: julday
integer           :: doy
```
d. **Line 119-123** – Update move of bstorage to balive:
```
doy = julday(current_time%month,current_time%date &
            ,current_time%year)
if (doy < 210) then
   call transfer_C_from_storage(cpatch,ico,salloc &
             ,salloci,nitrogen_uptake,N_uptake_pot)
end if
```

Namelist specifications (i.e. ED2IN)

- Use the same restart file (NL%SFILIN) and meteorological database (NL%ED_MET_DRIVER_DB) as the test run.

- Use the same phenology file as the test run (NL%PHENPATH).

- In addition, ensure that the ED2IN contains the following settings:

```
NL%RUNTYPE        = 'INITIAL'

NL%IMONTHA        = 01
NL%IDATEA         = 01
NL%IYEARA         = 1993
NL%ITIMEA         = 0000

NL%IMONTHZ        = 01
NL%IDATEZ         = 01
NL%IYEARZ         = 2001
NL%ITIMEZ         = 0000

NL%DTLSM          = 900.
NL%RADFRQ         = 900.

NL%N_ED_REGION    = 0
NL%N_POI          = 1
NL%POI_LAT        =  42.50
NL%POI_LON        = -72.50

NL%IED_INIT_MODE  = 2
NL%NZG            = 4
NL%NZS            = 1
NL%NSLCON         = 3 ! This will be overwritten in the
                      ! modified source code...
NL%SLZ            = -1.85, -1.10, -0.60, -0.25
NL%SLMSTR         =  0.60,  0.60,  0.60,  0.60
NL%STGOFF         =  0.00,  0.00,  0.00,  0.00
NL%SLXCLAY        = -1.
NL%SLXSAND        = -1.
```

```
NL%ISOILBC        =  0
```

- In ED model options... set all options to 0 **except**:

```
NL%INTEGRATION_SCHEME        = 1
NL%RK4_TOLERANCE             = 0.01
NL%IPHEN_SCHEME              = 1
NL%REPRO_SCHEME              = 1
NL%ICANTURB                  = 2
NL%ISFCLYRM                  = 1
```

- Additional settings:

```
NL%INCLUDE_THESE_PFT         = 5,6,8,9,10,11
NL%MAXPATCH                  = 15
NL%MAXCOHORT                 = 20

NL%ZROUGH                    = 0.01
NL%TREEFALL_DISTURBANCE_RATE = 0.0
NL%RUNOFF_TIME               = 86400.0

NL%METCYC1                   = 1993
NL%METCYCF                   = 2003

NL%INITIAL_CO2               = 370.

NL%IPHENYS1                  = 1992
NL%IPHENYSF                  = 2003
NL%IPHENYF1                  = 1992
NL%IPHENYFF                  = 2003
```