

PEcAn Modular Workflow

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Load PEcAn packages

```
library("PEcAn.all")
```

```
## Loading required package: PEcAn.DB
```

```
## Loading required package: PEcAn.settings
```

```
## Loading required package: PEcAn.MA
```

```
## Loading required package: PEcAn.logger
```

```
## Loading required package: PEcAn.utils
```

```
## Loading required package: PEcAn.uncertainty
```

```
## Loading required package: PEcAn.data.atmosphere
```

```
## Loading required package: PEcAn.data.land
```

```
## Loading required package: PEcAn.data.remote
```

```
## Loading required package: PEcAn.assim.batch
```

```
## Loading required package: PEcAn.emulator
```

```
## Loading required package: PEcAn.priors
```

```
## Loading required package: PEcAn.benchmark
```

```
## Loading required package: PEcAn.remote
```

```
## Loading required package: PEcAn.workflow
```

Load PEcAn settings files.

Open and read in settings file for PEcAn run. To create a pecan.xml, you can download one generated in the PEcAn web interface or one of the pecan.<modelname>.xml files in the tests/ directory of the PEcAn repository (github.com/pecanproject/pecan).

```
settings_path <- "~/pecan.xml"
settings <- PEcAn.settings::read.settings(settings_path)
sapply(settings, function(x) is.null(x) || length(x) == 0)
```

```
##           outdir           database           pfts
##           FALSE           FALSE           FALSE
## meta.analysis           ensemble sensitivity.analysis
##           FALSE           FALSE           FALSE
##           model           run           host
##           FALSE           FALSE           FALSE
```

```
print(settings$sensitivity.analysis$quantiles$sigma)
```

```
## [1] "-1"
```

```
if ("benchmarking" %in% names(settings)) {
  library(PEcAn.benchmark)
  settings <- papply(settings, read_settings_BRR)
}

# Process sitegroup settings
if ("sitegroup" %in% names(settings)) {
  if (is.null(settings$sitegroup$nSite)) {
    settings <- PEcAn.settings::createSitegroupMultiSettings(settings,
      sitegroupId = settings$sitegroup$id
    )
  } else {
    settings <- PEcAn.settings::createSitegroupMultiSettings(
      settings,
      sitegroupId = settings$sitegroup$id,
      nSite = settings$sitegroup$nSite
    )
  }
  # Zero out so it doesn't expand a second time if re-reading
  settings$sitegroup <- NULL
}
```

```
settings$outdir <- "/home/user/pecan_runs"
settings <- PEcAn.settings::prepare.settings(settings)
```

```
## Warning: <PostgreSQLConnection> uses an old dbplyr interface
## i Please install a newer version of the package or contact the maintainer
## This warning is displayed once every 8 hours.
```

```

if (!is.list(settings$host) || length(settings$host) > 1) {
  settings$host <- list(name = as.character(settings$host)[1]) # Ensure single-element list
}

settings <- PEcAn.workflow::do_conversions(settings)

## Warning in utils::read.table(file, row.names = 1, header = FALSE, sep = "\t", :
## incomplete final line found by readTableHeader on
## '/home/user/pecan_runs/STATUS'

## Warning in postgresqlExecStatement(conn, statement, ...): RPostgreSQL warning:
## unrecognized PostgreSQL field type geometry (id:20620) in column 17

```

Trait and Meta Analysis

Fetches plant trait data and prior distributions from external databases for the specified Plant Functional Types (PFTs), then combines trait data across multiple sources to derive probabilistic distributions for model parameters. If this step is skipped, a posterior file should be specified in the settings.

```

#if (settings$debug) cat("Starting trait and meta-analysis...\n")
# Retrieve trait data and prior distributions for the specified Plant Functional Types (PFTs)
settings <- PEcAn.workflow::runModule.get.trait.data(settings)
# Perform meta-analysis to derive probabilistic distributions for model parameters
PEcAn.MA::runModule.run.meta.analysis(settings)

```

```

## Each meta-analysis will be run with:
## 3000 total iterations,
## 4 chains,
## a burnin of 1500 samples,
## ,
## thus the total number of samples will be 6000
## #####
## -----
## starting meta-analysis for:
##
## Amax
##
## -----
## prior for Amax
## (using R parameterization):
## unif(0, 40)
## data max: 25.69
## data min: 1.7845
## mean: 10.3
## n: 28
## stem plot of data points
##
## The decimal point is at the |
##
## 0 | 88
## 2 | 37

```

```

##      4 | 0
##      6 | 523466
##      8 | 1235556
##     10 | 0
##     12 | 55
##     14 | 0
##     16 | 6
##     18 | 3939
##     20 |
##     22 |
##     24 | 7
##
## stem plot of obs.prec:
##
##   The decimal point is 2 digit(s) to the right of the |
##
##    0 | 0000000000125
##    2 |
##    4 |
##    6 | 5
##
## Compiling model graph
##   Resolving undeclared variables
##   Allocating nodes
## Graph information:
##   Observed stochastic nodes: 42
##   Unobserved stochastic nodes: 16
##   Total graph size: 118
##
## Initializing model
##
##
## Iterations = 1002:4000
## Thinning interval = 2
## Number of chains = 4
## Sample size per chain = 1500
##
## 1. Empirical mean and standard deviation for each variable,
##    plus standard error of the mean:
##
##           Mean      SD Naive SE Time-series SE
## beta.o 16.838 0.17786 0.0022961      0.0024648
## sd.y    3.843 0.04736 0.0006114      0.0006498
##
## 2. Quantiles for each variable:
##
##           2.5%    25%    50%    75%   97.5%
## beta.o 16.491 16.720 16.840 16.958 17.185
## sd.y    3.752  3.811  3.842  3.875  3.936
##
## #####
## -----
## starting meta-analysis for:
##

```

```

## leafC
##
## -----
## prior for leafC
##           (using R parameterization):
## norm(50.6, 1.32)
## data max: 53.7
## data min: 47.7
## mean: 50.5
## n: 12
## stem plot of data points
##
##   The decimal point is at the |
##
##   46 | 7
##   48 | 349
##   50 | 55691
##   52 | 387
##
## stem plot of obs.prec:
##
##   The decimal point is 3 digit(s) to the right of the |
##
##   0 | 000000000002
##   0 |
##   1 |
##   1 |
##   2 |
##   2 | 5
##
## Compiling model graph
##   Resolving undeclared variables
##   Allocating nodes
## Graph information:
##   Observed stochastic nodes: 24
##   Unobserved stochastic nodes: 2
##   Total graph size: 49
##
## Initializing model
##
##
## Iterations = 1002:4000
## Thinning interval = 2
## Number of chains = 4
## Sample size per chain = 1500
##
## 1. Empirical mean and standard deviation for each variable,
##    plus standard error of the mean:
##
##           Mean      SD Naive SE Time-series SE
## beta.o 50.4789 0.18167 0.0023453      0.0024102
## sd.y   0.8932 0.04439 0.0005731      0.0006147
##
## 2. Quantiles for each variable:

```

```

##
##          2.5%    25%    50%    75%    97.5%
## beta.o 50.1207 50.3574 50.480 50.602 50.8393
## sd.y   0.8096 0.8628 0.892 0.923 0.9835
##
## #####
## -----
## starting meta-analysis for:
##
## SLA
##
## -----
## prior for SLA
##          (using R parameterization):
## lnorm(1.89, 0.61)
## data max: 17.7
## data min: 2.73
## mean: 7.41
## n: 47
## stem plot of data points
##
## The decimal point is at the |
##
## 2 | 7802334555559
## 4 | 015991789
## 6 | 77889134
## 8 | 0673
## 10 | 07
## 12 | 67748
## 14 | 344
## 16 | 87
##
## stem plot of obs.prec:
##
## The decimal point is 3 digit(s) to the right of the |
##
## 0 | 0000000000000000000000002224
## 1 | 12
## 2 |
## 3 |
## 4 |
## 5 |
## 6 |
## 7 |
## 8 | 6
##
## Compiling model graph
##   Resolving undeclared variables
##   Allocating nodes
## Graph information:
##   Observed stochastic nodes: 75
##   Unobserved stochastic nodes: 22
##   Total graph size: 220
##

```

```

## Initializing model
##
##
## Iterations = 1002:4000
## Thinning interval = 2
## Number of chains = 4
## Sample size per chain = 1500
##
## 1. Empirical mean and standard deviation for each variable,
##    plus standard error of the mean:
##
##           Mean      SD Naive SE Time-series SE
## beta.ghs[2] 4.902 0.19502 0.002518      0.0032047
## beta.o      5.181 0.13054 0.001685      0.0023896
## sd.y        1.074 0.01812 0.000234      0.0002411
##
## 2. Quantiles for each variable:
##
##           2.5%   25%   50%   75% 97.5%
## beta.ghs[2] 4.525 4.771 4.903 5.032 5.287
## beta.o      4.932 5.093 5.178 5.268 5.435
## sd.y        1.039 1.062 1.074 1.086 1.111
##
## #####
## -----
## starting meta-analysis for:
##
## leaf_turnover_rate
##
## -----
## prior for leaf_turnover_rate
##           (using R parameterization):
## weibull(1.37, 1.43)
## data max: 0.769
## data min: 0.12625
## mean: 0.392
## n: 15
## stem plot of data points
##
## The decimal point is 1 digit(s) to the left of the |
##
## 0 | 3
## 2 | 3777928
## 4 | 12569
## 6 | 37
##
## stem plot of obs.prec:
##
## The decimal point is 9 digit(s) to the right of the |
##
## 0 | 00000000000
## 0 |
## 1 |
## 1 |

```

```

## 2 | 0
##
## Compiling model graph
##   Resolving undeclared variables
##   Allocating nodes
## Graph information:
##   Observed stochastic nodes: 27
##   Unobserved stochastic nodes: 5
##   Total graph size: 80
##
## Initializing model
##
##
## Iterations = 1002:4000
## Thinning interval = 2
## Number of chains = 4
## Sample size per chain = 1500
##
## 1. Empirical mean and standard deviation for each variable,
##    plus standard error of the mean:
##
##           Mean          SD Naive SE Time-series SE
## beta.o 0.33187 0.0049093 6.338e-05      6.670e-05
## sd.y   0.04802 0.0009105 1.175e-05      1.391e-05
##
## 2. Quantiles for each variable:
##
##           2.5%      25%      50%      75%      97.5%
## beta.o 0.32228 0.32853 0.33188 0.33519 0.34136
## sd.y   0.04626 0.04742 0.04803 0.04865 0.04978
##
## #####
## -----
## starting meta-analysis for:
##
## leaf_respiration_rate_m2
## -----
## prior for leaf_respiration_rate_m2
##           (using R parameterization):
## weibull(2, 6)
## data max: 1.8
## data min: 0.583410488985368
## mean: 1.13
## n: 10
## stem plot of data points
##
## The decimal point is at the |
##
## 0 | 679
## 1 | 00134
## 1 | 58
##
## stem plot of obs.prec:

```

```

##
## The decimal point is 3 digit(s) to the right of the |
##
## 0 | 000012
## 0 |
## 1 |
## 1 |
## 2 |
## 2 | 55
##
## Compiling model graph
## Resolving undeclared variables
## Allocating nodes
## Graph information:
## Observed stochastic nodes: 18
## Unobserved stochastic nodes: 4
## Total graph size: 58
##
## Initializing model
##
##
## Iterations = 1002:4000
## Thinning interval = 2
## Number of chains = 4
## Sample size per chain = 1500
##
## 1. Empirical mean and standard deviation for each variable,
## plus standard error of the mean:
##
##      Mean      SD Naive SE Time-series SE
## beta.o 1.410 0.02528 0.0003264      0.0003482
## sd.y   0.333 0.01082 0.0001397      0.0001500
##
## 2. Quantiles for each variable:
##
##      2.5%   25%   50%   75% 97.5%
## beta.o 1.3603 1.3925 1.4099 1.4269 1.460
## sd.y   0.3123 0.3256 0.3327 0.3403 0.355
##
## #####
## -----
## starting meta-analysis for:
##
## root_turnover_rate
##
## -----
## prior for root_turnover_rate
## (using R parameterization):
## unif(0, 10)
## data max: 0.98
## data min: 0.42
## mean: 0.597
## n: 6
## stem plot of data points

```

```

##
## The decimal point is 1 digit(s) to the left of the |
##
## 4 | 2376
## 6 | 2
## 8 | 8
##
## stem plot of obs.prec:
##
## The decimal point is 4 digit(s) to the right of the |
##
## 2 |
## 3 | 00000
## 4 |
## 5 |
## 6 | 7
##
## Compiling model graph
## Resolving undeclared variables
## Allocating nodes
## Graph information:
## Observed stochastic nodes: 12
## Unobserved stochastic nodes: 2
## Total graph size: 35
##
## Initializing model
##
##
## Iterations = 1002:4000
## Thinning interval = 2
## Number of chains = 4
## Sample size per chain = 1500
##
## 1. Empirical mean and standard deviation for each variable,
## plus standard error of the mean:
##
##      Mean      SD Naive SE Time-series SE
## beta.o 0.6033 0.03222 0.0004160      0.0004345
## sd.y   0.1308 0.00961 0.0001241      0.0001301
##
## 2. Quantiles for each variable:
##
##      2.5%    25%    50%    75%   97.5%
## beta.o 0.540 0.5816 0.6038 0.6249 0.6666
## sd.y   0.113 0.1241 0.1305 0.1370 0.1507
##
## #####
## -----
## starting meta-analysis for:
##
## root_respiration_rate
##
## -----
## prior for root_respiration_rate

```

```
(using R parameterization):  
## unif(0, 100)  
## data max: 79.8  
## data min: 0.0967276868352595  
## mean: 10.6  
## n: 155  
## stem plot of data points  
##  
## The decimal point is 1 digit(s) to the right of the |  
##  
## 0 | 000000000000111111112222222333333333333333444444444444444444  
## 0 | 55555555555555556666666666666666777777778888888899999999  
## 1 | 000001111122223333444  
## 1 | 55555667799  
## 2 | 4  
## 2 | 8  
## 3 | 3  
## 3 | 67  
## 4 | 004  
## 4 | 78  
## 5 | 03  
## 5 | 9  
## 6 |  
## 6 | 9  
## 7 | 0  
## 7 |  
## 8 | 0  
##  
## stem plot of obs.prec:  
##  
## The decimal point is 7 digit(s) to the right of the |  
##  
## 0 | 0000000000000000000000000000000000000000000000000+22  
## 2 |  
## 4 |  
## 6 | 0  
## 8 |  
## 10 |  
## 12 |  
## 14 |  
## 16 |  
## 18 |  
## 20 |  
## 22 |  
## 24 |  
## 26 |  
## 28 |  
## 30 |  
## 32 | 1  
##  
## Compiling model graph  
## Resolving undeclared variables  
## Allocating nodes  
## Graph information:
```

```
## Observed stochastic nodes: 259
## Unobserved stochastic nodes: 54
## Total graph size: 669
##
## Initializing model
##
##
## Iterations = 1002:4000
## Thinning interval = 2
## Number of chains = 4
## Sample size per chain = 1500
##
## 1. Empirical mean and standard deviation for each variable,
##    plus standard error of the mean:
##
##           Mean          SD Naive SE Time-series SE
## beta.ghs[2] -10.798 0.070486 9.100e-04      0.0012463
## beta.o      17.794 0.049840 6.434e-04      0.0009578
## sd.y        1.042 0.001265 1.634e-05      0.0000174
##
## 2. Quantiles for each variable:
##
##           2.5%      25%      50%      75%      97.5%
## beta.ghs[2] -10.935 -10.846 -10.798 -10.751 -10.661
## beta.o      17.695  17.762  17.795  17.827  17.892
## sd.y        1.039   1.041   1.042   1.043   1.044
```

```
# Save the updated settings, including the retrieved trait data, to an XML file
PEcAn.settings::write.settings(settings, outputfile = "pecan.TRAIT.xml")
```

```
## [1] "/home/user/pecan_runs/pecan.TRAIT.xml"
```

Write Model Configuration Files

Generates model-specific configuration files based on the settings, ensuring proper model execution.

```
settings$model$binary <- "~/pecan/models/sipnet/"

settings <-PEcAn.workflow::runModule.run.write.configs(settings)
```

```
## Loading required package: PEcAn.SIPNET
```

```
## Warning in dir.create(file.path(settings$rundir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-median' already exists
```

```
## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE): '/home/user/pecan_runs/out/SA-median' already exists
```

```
## Warning in dir.create(file.path(settings$rundir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-growth_resp_factor-0.159'
## already exists
```

```

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE):
## '/home/user/pecan_runs/out/SA-temperate.coniferous-growth_resp_factor-0.159'
## already exists

## Warning in dir.create(file.path(settings$runidir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-growth_resp_factor-0.841'
## already exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE):
## '/home/user/pecan_runs/out/SA-temperate.coniferous-growth_resp_factor-0.841'
## already exists

## Warning in dir.create(file.path(settings$runidir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-leaf_turnover_rate-0.159'
## already exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE):
## '/home/user/pecan_runs/out/SA-temperate.coniferous-leaf_turnover_rate-0.159'
## already exists

## Warning in dir.create(file.path(settings$runidir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-leaf_turnover_rate-0.841'
## already exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE):
## '/home/user/pecan_runs/out/SA-temperate.coniferous-leaf_turnover_rate-0.841'
## already exists

## Warning in dir.create(file.path(settings$runidir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-root_respiration_rate-0.159'
## already exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE):
## '/home/user/pecan_runs/out/SA-temperate.coniferous-root_respiration_rate-0.159'
## already exists

## Warning in dir.create(file.path(settings$runidir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-root_respiration_rate-0.841'
## already exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE):
## '/home/user/pecan_runs/out/SA-temperate.coniferous-root_respiration_rate-0.841'
## already exists

## Warning in dir.create(file.path(settings$runidir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-root_turnover_rate-0.159'
## already exists

```

```

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE):
## '/home/user/pecan_runs/out/SA-temperate.coniferous-root_turnover_rate-0.159'
## already exists

## Warning in dir.create(file.path(settings$rundir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-root_turnover_rate-0.841'
## already exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE):
## '/home/user/pecan_runs/out/SA-temperate.coniferous-root_turnover_rate-0.841'
## already exists

## Warning in dir.create(file.path(settings$rundir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-Amax-0.159' already exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE): '/home/user/pecan_runs/out/SA-temperate.coniferous-Amax-0.159' already
## exists

## Warning in dir.create(file.path(settings$rundir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-Amax-0.841' already exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE): '/home/user/pecan_runs/out/SA-temperate.coniferous-Amax-0.841' already
## exists

## Warning in dir.create(file.path(settings$rundir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-leaf_respiration_rate_m2-0.159'
## already exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE):
## '/home/user/pecan_runs/out/SA-temperate.coniferous-leaf_respiration_rate_m2-0.159'
## already exists

## Warning in dir.create(file.path(settings$rundir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-leaf_respiration_rate_m2-0.841'
## already exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE):
## '/home/user/pecan_runs/out/SA-temperate.coniferous-leaf_respiration_rate_m2-0.841'
## already exists

## Warning in dir.create(file.path(settings$rundir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-SLA-0.159' already exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE): '/home/user/pecan_runs/out/SA-temperate.coniferous-SLA-0.159' already
## exists

```

```

## Warning in dir.create(file.path(settings$rundir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-SLA-0.841' already exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE): '/home/user/pecan_runs/out/SA-temperate.coniferous-SLA-0.841' already
## exists

## Warning in dir.create(file.path(settings$rundir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-leafC-0.159' already exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE): '/home/user/pecan_runs/out/SA-temperate.coniferous-leafC-0.159' already
## exists

## Warning in dir.create(file.path(settings$rundir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-leafC-0.841' already exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE): '/home/user/pecan_runs/out/SA-temperate.coniferous-leafC-0.841' already
## exists

## Warning in dir.create(file.path(settings$rundir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-Vm_low_temp-0.159' already
## exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE): '/home/user/pecan_runs/out/SA-temperate.coniferous-Vm_low_temp-0.159'
## already exists

## Warning in dir.create(file.path(settings$rundir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-Vm_low_temp-0.841' already
## exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE): '/home/user/pecan_runs/out/SA-temperate.coniferous-Vm_low_temp-0.841'
## already exists

## Warning in dir.create(file.path(settings$rundir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-AmaxFrac-0.159' already
## exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE): '/home/user/pecan_runs/out/SA-temperate.coniferous-AmaxFrac-0.159'
## already exists

## Warning in dir.create(file.path(settings$rundir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-AmaxFrac-0.841' already
## exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE): '/home/user/pecan_runs/out/SA-temperate.coniferous-AmaxFrac-0.841'
## already exists

```

```

## Warning in dir.create(file.path(settings$run_dir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-psnTOpt-0.159' already
## exists

## Warning in dir.create(file.path(settings$model_out_dir, run.id), recursive =
## TRUE): '/home/user/pecan_runs/out/SA-temperate.coniferous-psnTOpt-0.159'
## already exists

## Warning in dir.create(file.path(settings$run_dir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-psnTOpt-0.841' already
## exists

## Warning in dir.create(file.path(settings$model_out_dir, run.id), recursive =
## TRUE): '/home/user/pecan_runs/out/SA-temperate.coniferous-psnTOpt-0.841'
## already exists

## Warning in dir.create(file.path(settings$run_dir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-stem_respiration_rate-0.159'
## already exists

## Warning in dir.create(file.path(settings$model_out_dir, run.id), recursive =
## TRUE):
## '/home/user/pecan_runs/out/SA-temperate.coniferous-stem_respiration_rate-0.159'
## already exists

## Warning in dir.create(file.path(settings$run_dir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-stem_respiration_rate-0.841'
## already exists

## Warning in dir.create(file.path(settings$model_out_dir, run.id), recursive =
## TRUE):
## '/home/user/pecan_runs/out/SA-temperate.coniferous-stem_respiration_rate-0.841'
## already exists

## Warning in dir.create(file.path(settings$run_dir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-extinction_coefficient-0.159'
## already exists

## Warning in dir.create(file.path(settings$model_out_dir, run.id), recursive =
## TRUE):
## '/home/user/pecan_runs/out/SA-temperate.coniferous-extinction_coefficient-0.159'
## already exists

## Warning in dir.create(file.path(settings$run_dir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-extinction_coefficient-0.841'
## already exists

## Warning in dir.create(file.path(settings$model_out_dir, run.id), recursive =
## TRUE):
## '/home/user/pecan_runs/out/SA-temperate.coniferous-extinction_coefficient-0.841'
## already exists

```

```

## Warning in dir.create(file.path(settings$rundir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-half_saturation_PAR-0.159'
## already exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE):
## '/home/user/pecan_runs/out/SA-temperate.coniferous-half_saturation_PAR-0.159'
## already exists

## Warning in dir.create(file.path(settings$rundir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-half_saturation_PAR-0.841'
## already exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE):
## '/home/user/pecan_runs/out/SA-temperate.coniferous-half_saturation_PAR-0.841'
## already exists

## Warning in dir.create(file.path(settings$rundir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-dVPDSlope-0.159' already
## exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE): '/home/user/pecan_runs/out/SA-temperate.coniferous-dVPDSlope-0.159'
## already exists

## Warning in dir.create(file.path(settings$rundir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-dVPDSlope-0.841' already
## exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE): '/home/user/pecan_runs/out/SA-temperate.coniferous-dVPDSlope-0.841'
## already exists

## Warning in dir.create(file.path(settings$rundir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-dVpdExp-0.159' already
## exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE): '/home/user/pecan_runs/out/SA-temperate.coniferous-dVpdExp-0.159'
## already exists

## Warning in dir.create(file.path(settings$rundir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-dVpdExp-0.841' already
## exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE): '/home/user/pecan_runs/out/SA-temperate.coniferous-dVpdExp-0.841'
## already exists

```

```

## Warning in dir.create(file.path(settings$runidir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-veg_respiration_Q10-0.159'
## already exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE):
## '/home/user/pecan_runs/out/SA-temperate.coniferous-veg_respiration_Q10-0.159'
## already exists

## Warning in dir.create(file.path(settings$runidir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-veg_respiration_Q10-0.841'
## already exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE):
## '/home/user/pecan_runs/out/SA-temperate.coniferous-veg_respiration_Q10-0.841'
## already exists

## Warning in dir.create(file.path(settings$runidir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-fine_root_respiration_Q10-0.159'
## already exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE):
## '/home/user/pecan_runs/out/SA-temperate.coniferous-fine_root_respiration_Q10-0.159'
## already exists

## Warning in dir.create(file.path(settings$runidir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-fine_root_respiration_Q10-0.841'
## already exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE):
## '/home/user/pecan_runs/out/SA-temperate.coniferous-fine_root_respiration_Q10-0.841'
## already exists

## Warning in dir.create(file.path(settings$runidir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-coarse_root_respiration_Q10-0.159'
## already exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE):
## '/home/user/pecan_runs/out/SA-temperate.coniferous-coarse_root_respiration_Q10-0.159'
## already exists

## Warning in dir.create(file.path(settings$runidir, run.id), recursive = TRUE):
## '/home/user/pecan_runs/run/SA-temperate.coniferous-coarse_root_respiration_Q10-0.841'
## already exists

## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =
## TRUE):
## '/home/user/pecan_runs/out/SA-temperate.coniferous-coarse_root_respiration_Q10-0.841'
## already exists

```

```
## Warning in dir.create(file.path(settings$rundir, run.id), recursive = TRUE):  
## '/home/user/pecan_runs/run/ENS-00001-772' already exists
```

```
## Warning in dir.create(file.path(settings$modeloutdir, run.id), recursive =  
## TRUE): '/home/user/pecan_runs/out/ENS-00001-772' already exists
```

```
PEcAn.settings::write.settings(settings, outputfile = "pecan.CONFIGS.xml")
```

```
## [1] "/home/user/pecan_runs/pecan.CONFIGS.xml"
```

Run Model and Retrieve Results

Executes the model simulations and retrieves the results for further analysis.

```
if (!is.list(settings$host) || length(settings$host) > 1) {  
  settings$host <- list(name = as.character(settings$host)[1]) # Ensure single-element list  
}
```

Model Analyses

Performs various analyses on model outputs, including sensitivity analysis, variance decomposition, and ensemble analysis.