JavaSTICS and STICS changes

JavaSTICS-1.5.0 / STICS 10.0.0

Notice: this distribution is a major version either for the graphical interface and tools, or for the model. Previous versions XML files are not usable anymore.
So, XML files structure must be upgraded; see JavaStics user guide for details on using the conversion tools.

Model

- **Improvements**
  - This new version of the model (V10.0.0) has been developed to improve the simulation of perennial crops through several new options :
    - C and N reserves dynamics during the crop cycle and on the long term (code_acti_reserve)
    - Nitrogen demand and dynamic mortality of roots during the crop cycle (code_rootdeposition)
    - Two kinds of roots (code_diff_root) are considered, fine and coarse ones, with different lifespan
    - The effect of photoperiod on biomass and N allocation in the crop (codephot_part)
    - Roots distribution within the soil profile to have a more robust simulation of their density in layers (codedisrac)
  - These options are available and have been parameterised for various perennial crops (Miscanthus x giganteus, Medicago sativa L. and Panicum virgatum)
  - This version of the model also allows :
    - Managing long term simulations of cropping systems including perennial crops.
    - Taking into account rear effet of crop management on biomass through its effects on crop C and N reserves
    - Reproducing the low soil mineral nitrogen content for perennial cropping systems by simulating nitrogen crop uptake and its immobilization by residues (including dead roots)
    - Improving the simulation of soil organic matter for perennial cropping systems and rear effect of perennial crop destruction on the evolution of soil mineral N content (to be confirmed on larger dataset)
  - Some of these new formalisms are also applicable for annual crops (code_rootdeposition and codedisrac). However, using them may require a root parameterization improvement. For now, only the wheat plant file is provided with these news formalisms activated.
- **Documentation**
  - The new STICS book (numeric, now produced with Rmarkdown) is describing in details all the above listed formalisms (html version, available for download on the STICS forge).

    - Input parameters and output variables list (inputs.csv, outputs .csv) attached to new formalisms
    - The JavaSTICS documentation using Rmakdown, incuding information about R packages dedicated to STICS files and simulations management

- **Parameters**
    - Some plant parameters are now attached to varieties parameters
    - New formalisms parameters have been cleaned: removed (useless options) or moved in specific parameters files.

- **Bugs fix in code**
    - Grass simulations chaining
    - Several kind of fertilizers management
    - Automatic irrigation between 2 dates or crop stages
    - Some initialisations (especially for cut crops)

- **Bugs fix in files**
    - Report: table of the soil initial content, units
    - Variables description file (outputs.csv): some units were fixed
    - Parameters descrition file (inputs.csv): some names, units or boundaries were fixed

Interface

- **Improvements**
    - Parameter estimation can now be done using repetitions of the optimization process and the configuration interface has been clearly improved
    - Appearance/ergonomy of the graphical interface (including a theme switch light/dark)
    - Using Java 11 virtual machine.
    - Reactivity
    - Files management
    - Simulations are faster than under the previous interface.
- **Files**
    - New USMs dedicated to Miscanthus simulations (example directory)
    - New version of the Wheat plant file adapted for using the model new options
    - Evolution of XML files structure for including new options, parameters, and options integration for varietal parameters in plant files

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- **Documentation**
  - Input parameters and output variables list (inputs.csv, outputs .csv)

- **Bugs fix in code**
  - Message number related to plant parameters checking
  - Nitrogen plant content calculation (fixing vine case)
  - N content initialization for falling dead leaves
  - Nitrogen plant content for vine
  - Report writing for the climatic simulations chaining case
  - Snow
    - depth days sum re-initialization for climatic chaining
    - up-scaling the variable dimension for storing snow depth days sums

- **Bugs fix in files**
  - Rounding precision fixes in some general parameters values

- **Improvements**
  - The parameter for forcing irrigation at emergence can now be used either for manual or for automatic irrigation calculation
  - New output variables
    - for residues and N plant content management (`QNplantenp, dltaremobilN, restemp`)

  - Some parameters moves into plant pool
  - Stabilization of harvested organs nitrogen content
  - Warning for residues list limitation to 10 in the crop management file
  - Fixing the residue type in case of soil incorporation
  - Increasing of significant digits for output variables (scientific format) either for daily or report files

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Model

- **Documentation**
  - Units for HR_vol
  - New calculation of crop residues incorporation depth into soil
  - Input parameters and output variables list (inputs.csv, outputs .csv)

- **Bugs fix in code**
  - Meteo data recalculation with snow module and wind speed recalculation when simulating intercrop usms
  - Chaining a sole crop usm after an associated crop usm
  - Some tests and variables types
  - Some variables initialization
  - Calculation of root dry matter and IRcarb for surgarbeet
  - Reading *.mod files according to outputs request and files existence
  - Snow depth lasting storage for climatic usms chaining
  - Taking account of the plastic mulch
  - Correction of units for the calculation of the capillary rise

- **Bugs fix in files**
  - Bounds values of **nbinflo** and **stdordebour** in plant files
  - Moving some parameters in DurumWheat_ALLUR.xml plant file
  - Fix nbfeuilplant value to 3 for sugarbeet plant file
  - Moving some parameters of the codazorac option for the plant files proto_sunflower,proto_turmeric and timothy

- **Improvements**
  - Some error messages (in PET calculation, …)
  - Source code cleaning and refactoring
  - New parameter added for fixing mineralization minimum temperature
  - New option added for calculating crop residues incorporation depth into soil
  - New output variables
    - for drainage and leaching at the bottom of each soil layer and under profmes
    - etm/etr and etr/etm ratios
  - new output variables by soil profile
    - Chum, Nhum C_allresidues and N_allresidues

Interface

- **Improvements**
  - Optimization process can be perfomed now on vector parameters (for example, soil parameters attached to soil layers)
  - Correction of the Crespc unit in the inputs.csv file

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Interface

- **Improvements**
  - Access to param_newform.xml has been restored
  - New simulation unit examples for testing snow module use, and new plants (timothy, rice, turmeric)

Parameterization

- Values of parameters associated to unused options have been replaced with -999 values (parameters which have not been calibrated)
- Plant parameters : some of them have been moved:
  - **tgmin** and **nbfeuilplant** : outside of options in « emergence and starting » formalism
  - **tcmin** and **tcmax** : outside of options in « leaves » formalism
  - **vitircarb** and **irmax** : outside of options in « yield formation » formalism
  - **bdilmax** : outside of options in « nitrogen » formalism
- New usm example for the Timothy plant

Model

- **Documentation**
  - Formalisms : snow, mineralization
  - Model performances evaluations

- **Bugs fix**
  - Some variables initializations and tests
  - Conditional tests syntax according to variables types, types conversion for avoiding warnings, unused variables removed
  - Test for chaining an usm over years

- **Improvements**
  - Parameters consistency checks, bounds checks, values checks for activated options (-999 values)
  - New output variables (snow, N, ...) see JavaStics documentation
  - Specific module for projects simulations management
  - Formalisms / parameters
    - New humus mineralization formalism
    - Mixing/distribution of water and nitrogen soil content after a soil tillage
    - New module for producing snow cover: recalculation of minimum and maximum temperature, and precipitations
  - New modules for files management and system operations
  - Errors management (new specific log file)
  - Calculations: avoiding some loops
  - New plant files (timothy, rice, turmeric)

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Interface

- **Bugs fix**
  - Day of year checks for annual or 2 years' crops
  - Parameters optimization process: open variables list, usms selection (over 2)
- **Improvements**
  - Dialog box for exiting confirmation
  - Example scripts for using JavaStics command line
  - New executables for Mac OS platform: Stics model and utilities
  - Updates on OS detection for automatic executables selection (model, utilities)
  - Changing command line interface (from Stics.exe to JavaSticsCmd.exe)
  - Parameters optimization output file changes: lower criterion value and corresponding parameter values, usms list used in the processing

Parameterization

- Updated sunflower and sugarbeet plant files
- Plant parameters files renamed : to distinguish prototypes files, cover crop files and inter crop files

Model

- **Bugs fix**
  - Calculation and controls of output dates for profiles
  - Grass:
    - Cutting management
    - Delayed cutting day calculation (when passing years)
    - Variables initialization over years
    - Seeded grass: restart stage for next year
    - Initialization in successive simulations case
  - Senescence calculation and effect
  - Automatic irrigations calculation based on upvt
  - Variables
  - Report file format
  - Plant density calculation for intercropping
  - Plastic mulch covering use
  - Water and nitrogen stress management

- **Improvements**
  - Parameters consistency checks
  - New output variables
  - Profile file content update
  - Formalisms / parameters
    - Nitrification and denitrification
    - Grass: roots death, cutting decision criterion,
    - Multiple thinning management
    - Multiple fertilizer types management

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Interface

- Climatic variables: bounds set to float, fix for vapor pressure check rule and maximum bound value
- Documentation: default value for CO2

Parameterization

- Parameters documentation fixes (names,definitions, bounds, codes)

Model

- **Bugs fix**
  - Variables names in var.mod file
  - Increasing message variable dimensions
- **Improvements**
  - Extension of optimizable parameters list

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Interface

- command line: adaptations to linux OS
- Stics files management
- climatic dialog for files formatting
- keeping selected input file name for creating new one, or copying it
- sorting parameter files list
- dates bounds for validation in usm run dialog
- confirm popup when exiting Javastics

Parameterization

- plants : vine et durumwheat plant files (special because one file by genotype) are renamed and cleaned
- parameters documentation fixes (names,definitions, bounds, codes)
- Param_new_form: add of parameters for coupling with pathogen models (not actived)

Model

- **Bugs fix**
  - last year simulation for yearly climatic sequence
  - variable names (AZamm(2), Qles), initializations (msrac, irazo,ircarb, Qnplante), type (CO2, real), calculation (qmulch)
  - getting residues of previous crop: test for artificial mulch activation, for all crop management systems
  - growth restarting calculation after harvest
  - dates conversion in report file
  - balance calculations for inter-crops:
    - 2 years crops: stages dates calculations for sowing in bissextile year
    - associated crops: mineralisation calculation, taking into account precipitations before sowing
    - abscission variables indexation
    - irrigations sums
    - leaves exposition: relative area use for previous day dry matter calculation, and in case of dominance inversion

- **Minor fixes**
  - balance informations: intermediate temperature sums, stages
  - tests: cultivars numbers,
  - warnings: profmes==profsol
  - exiting: if incompatible values for codebeso and codeetp
  - calculations: setting ndebdes with nrec value rather than nrecbutoir one when the given stage not reached, masec for strawberries after harvest
  - removing non ascii characters

- **Improvements**

- model execution: exiting code when errors (no more stop), message at the end of successfull execution
- files path management (Record platform compatibility)
- variables
    - co2(n), fco2, fco2s, rendementsec
    - Macsur project
        - cumulatives variables from sowing date to maturity (*_from_plt)
        - water reserves available for plants or for a given depth (SoilAvW, SoilWatM)
        - for optionnal specific outputs in report file
    - Agmip project: stages dates to year days

- model version integration when compiling, getting it from command line
- variables: keeping matuber after harvest (beet), restoring lessiv
- messages: for tracking parameters and codes values (history file), removing useless and french messages
- report file: added location,
- balance file: Sum of Maximal ET (eos+eop) instead of sum of PET, changes for yield formatting
- soil profile file: increasing days numbers

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Interface

- command line: files generation, rotations run
- informations: development stages names in initialization, tables headers content and size
- usm sorting removed for selection in rotations case

Parameterization

- general parameters: updates about some parameters values, parameters names
- plant files parameters updates (rapeseed,ryegrass, mustard)
- parameters documentation fixes (definitions, bounds, codes)
- variables documentation fixes (definitions)

Model

- **Bugs fix**
  - vernalisation management
  - matuber value calculation
  - roots density distribution over profiles (nouvrac)
  - option management for shelter climatic conditions
  - climatic series management with uncomplete years
  - management of residues content (water, nitrogen)
  - senescence process for grass
  - management of PET calculation method and control

- **Improvements**
  - initial development stage in report file
  - new variables in profile (humirac_z et efNrac_z, up to 60 possible dates)
  - new daily output variables (rlj, efnrac_mean, humirac_mean,efda, efNrac)
  - added day in year number to profile file.
  - PET calculating method name in balance file