

Overview of the “*SiriusQuality-BioMa-Irradiance-Component*” folder

1. Content of the “*SiriusQuality-BioMa-Irradiance-Component*” folder

The folder “*SiriusQuality-BioMa-Irradiance-Component*” contains:

- The source code of the *SQ-Phenology BioMa* Component (*SiriusQuality-IrradianceStrategies* and *SiriusQuality-IrradianceDomainClass* folders), see *SQ2_Phenology_component* document
- The BioMa dll which are mandatory to use the component (*BioMa-DLL* folder)
- A console application which provides an example for the use of the component (*SiriusQuality-IrradianceConsole* folder)
- Unit tests for the component (*TestIrradianceComponent* folder)
- A visual studio solution which allows to run the console application and the unit tests (*SiriusQuality-BioMa-Irradiance.sln*)
- A detailed documentation about both the calculation scheme and the equations of the component (*Documentation* folder)

2. How to use the component:

The *SQ_Irradiance_component* can be added to a *BioMa* solution with the *CLIC* tool or be plugged to your model via a wrapper. Here the composition with *CLIC* will not be presented (see instead [BioMa solution documentation](#)). We will first make a quick overview of the component, then we will present the wrapper and finally we will explain how it is used via a console application.

a. Overview of the component

The component (*SiriusQuality-IrradianceComponent*) contains six folders:

- The SiriusQuality-IrradianceDomainClass/*DomainClass* folder. Here can be found:
 - The getter and setter of the states, rates and exogenous (*State.cs*, *Rates.cs*, *Exogenous.cs*)
 - The metadata on the states (*StateVarInfo.cs*, *RatesVarInfo.cs*, *ExogenousVarInfo.cs*)
- The SiriusQuality-IrradianceStrategies/*Strategies* folder where the simple strategies and the composite one (*irradiance.cs*) can be found. The composite strategy allows to call sequentially the simple strategies via its *Estimate* function
- The *API* folder containing the classes for the Application Programming Interface
- An *XML* folder where the xml files used to generate strategies and domain classes with the BioMa tools can be found
- The *obj/Debug* folder containing the dll of the component after having built it and the BioMA dll which are mandatory for the project
- The *bin* folder for binaries

b. Phenology wrapper

The wrapper (*SiriusQuality-IrradianceConsole/IrradianceBioMaWrapper.cs*) makes possible:

- The initial loading of the parameters
- The day by day valorization of the inputs
- The daily call of the component
- And the daily export of the outputs

For these purposes an *irradianceState*, an *irradianceRate* and an *irradianceExogenous* objects are instantiated. These objects are used to valorize inputs and export outputs (via getter). In addition, an object of the composite class is instantiated (*absorbedIrradiance*). It is used to valorize the parameters and call the *Estimate* function of the composite.

The valorization of the parameters is done in the constructor via the *LoadParameters* function. The *Estimate* function can be called everywhere in the code. Its arguments are the values of the input for the current day. Two steps are necessary in the *Estimate* function:

- First the inputs of the day before are valorized
- Finally, the *Estimate* function of the composite class is called

c. Console application

The *SiriusQuality-IrradianceConsole/Program.cs* class can be divided in five parts:

- Inputs that cannot be calculated are grouped in tables. The table counts correspond to the number of days in the simulation
- An object *Wrapper* is instantiated to be able to call the *Estimate* function and export outputs
- Other inputs are calculated and the *Estimate* function of the wrapper is called each day of the simulation. As in the universe of *SiriusQuality3* a while loop is used
- Outputs of the component are called from the wrapper and printed

3. List of the provided libraries

Six libraries are mandatory to be able to run the component. Five of them are part of the BioMa framework and are loaded both in the component and in the console application projects, while *CRA.AgroManagement2014.dll*, *CRA.AgroManagement2014.Impacts.dll* and *CRA.AgroManagement2014.dll* are used for the management of agronomic events (irrigation, fertilization...), *CRA.Core.Preconditions.dll* is used for the test of parameter, input and output values and *CRA.ModelLayer.dll* is dedicated to the generation of domain class and strategies.

When building the *SiriusQuality-IrradianceComponent* project a library called *SiriusQuality-IrradianceDomainClass.dll* and one called *SiriusQuality-IrradianceStrategies.dll* are created. They are loaded in the console application project (and the corresponding include is done on top of the wrapper class).

These six libraries have to be loaded in any project aiming at working with the phenology component. In addition, the component uses the *MathNet.Numerics* package which is already installed but which might need an update.