



InnerSoft - ISBH Water Balance v0.7

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1. - INSTALLATION and ACTIVATION

1.1. - Installation

Run the installer. The app requires Microsoft NET Framework 4.0 installed on your PC. This app is compatible with Windows XP SP3, Windows Vista, 7, 8, 10 and so on...

1.2. - Trial Version

InnerSoft ISBH works initially as limited trial version. You are able to compute the Water Balance, but not to open or save files, or export the outputs to Excel.

1.3. - Activation

In order to use InnerSoft ISBH Full Version, user must purchase a license before activating the product. To purchase InnerSoft ISBH Full Version, you must first contact with us by email

innersoft@itspanish.org

innersoft@gmail.com

You can also call us:

+34 958 09 22 10

You can pay by PayPal at:

<http://isbh.itspanish.org>

Price is 13 dollars.

Once product has been paid, you can activate it. Just enter *Activate Menu* and follow instructions.



The screenshot shows a dialog box titled "Activation - InnerSoft CAD". The text inside reads: "InnerSoft is not Activated. You must get a Request Code and send it by eMail to InnerSoft. Then you will receive an Activation Code." Below this is a button labeled "Get Request Code". Underneath is a text box containing the text "Request Code will appear here." Below that is another text box with the instruction "Paste here the Activation Code that you received from InnerSoft and press 'Enter Activation Code'." This is followed by a third text box with the text "Paste your Activation Code here." At the bottom, there are two buttons: "Enter Activation Code" and "Salir". A final line of text at the bottom of the dialog box says: "Use Windows Clipboard to copy and paste the codes to avoid any errors."

You may have to login to Windows as *Administrator* or have to modify *User Account Control* in order to activate successfully InnerSoft ISBH.

1.4. - License

Registering data is chained to a PC Computer. You will not lose the license when formatting the hard drives or changing Windows S.O., BUT if you make changes of hardware the activation code may turn invalid.

2. - APPLICATION

2.1. - Inputs

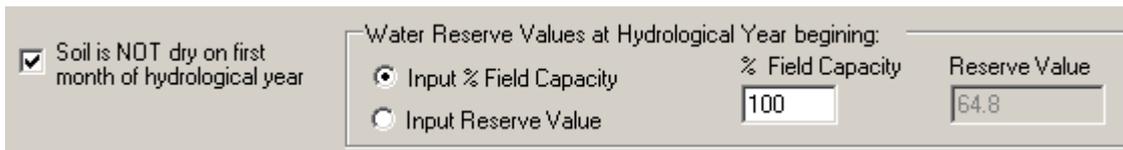
P Precipitation. Precipitation in the form of rain, snow, sleet, hail, etc. makes up the primarily supply of water to the surface. In some very dry locations, water can be supplied by dew and fog.

PE Potential evapotranspiration. Potential evapotranspiration is the amount of water that would be evaporated under an optimal set of conditions, among which is an unlimited supply of water.

Think of potential evapotranspiration of "water need". In other words, it would be the water needed for evaporation and transpiration given the local environmental conditions. One of the most important factors that determine water demand is solar radiation. As energy input increases the demand for water, especially from plants increases. Regardless if there is, or isn't, any water in the soil, a plant still demands water. If it doesn't have access to water, the plant will likely wither and die.

Field Capacity. The maximum amount of water the soil can hold (water holding capacity).

User must check 'Soil is NOT dry on first month of hydrological year' if soil store water on first month of the hydrological year. Then user can set Water Reserve value by inputting % of water reserve referred to Field Capacity. User can also input the Water Reserve value directly in a text box.



The screenshot shows a software interface with a checkbox on the left labeled "Soil is NOT dry on first month of hydrological year" which is checked. To the right, under the heading "Water Reserve Values at Hydrological Year beginning:", there are two radio button options: "Input % Field Capacity" (selected) and "Input Reserve Value". Below these options are two text input fields: the first is labeled "% Field Capacity" and contains the value "100"; the second is labeled "Reserve Value" and contains the value "64.8".

Use Decimal Symbol of your Operating System on data inputs

You can select the first month of hydrological year from the list at right-top window. Month changes will not change data inputs, only month table reference.

Click on 'Compute' button to calculate outputs. You can make changes over data inputs (P and PE) and compute again.

2.2. - Outputs (After Compute)

ST Soil Moisture Storage. Soil moisture storage refers to the amount of water held in the soil at any particular time. The amount of water in the soil depends on soil properties like soil texture and organic matter content. The maximum amount of water the soil can hold is called the field capacity. Fine grain soils have larger field capacities than coarse grain (sandy) soils. Thus, more water is available for actual evapotranspiration from fine soils than coarse soils. The upper limit of soil moisture storage is the field capacity, the lower limit is 0 when the soil has dried out.

DST Change in Soil Moisture Storage. The change in soil moisture storage is the amount of water that is being added to or removed from what is stored. The change in soil moisture storage falls between 0 and the field capacity.

AE Actual evapotranspiration. Evaporation is the phase change from a liquid to a gas releasing water from a wet surface into the air above. Similarly, transpiration is represents a phase change when water is released into the air by plants. Evapotranspiration is the combined transfer of water into the air by evaporation and transpiration. Actual evapotranspiration is the amount of water delivered to the air from these two processes. Actual evapotranspiration is an output of water that is dependent on moisture availability, temperature and humidity. Think of actual evapotranspiration as "water use", that is, water that is actually evaporating and transpiring given the environmental conditions of a place. Actual evapotranspiration increases as temperature increases, as long as there is water to evaporate and for plants to transpire. The amount of evapotranspiration also depends on how much water is available, which depends on the field capacity of soils. In other words, if there is no water, no evaporation or transpiration can occur.

S Surplus. Surplus water occurs when P exceeds PE and the soil is at its field capacity (saturated). That is, we have more water than we actually need to use given the environmental conditions at a place. The surplus water cannot be added to the soil because the soil is at its field capacity so it runs off the surface. Surplus runoff often ends up in nearby streams causing stream discharge to increase. A knowledge of surplus runoff can help forecast potential flooding of nearby streams.

D Deficit. A soil moisture deficit occurs when the demand for water exceeds that which is actually available. In other words, deficits occur when potential evapotranspiration exceeds actual evapotranspiration ($PE > AE$). Recalling that PE is water demand and AE is actual water use (which depends on how much water is really available), if we demand more than we have available we will experience a deficit. But, deficits only occur when the soil is completely dried out. That is, soil moisture storage (ST) must be 0. By knowing the amount of deficit, one can determine how much water is needed from irrigation sources.

P-PE, DST and ST values on TOTAL data column have no physical meaning.

Humidity Index (I_h). For a given station, it is calculated by the formula:

$$I_h = 100 * S / PE$$

Aridity Index (I_a). For a given station, it is calculated by the formula:

$$I_h = 100 * D / PE$$

Thornthwaite Moisture Index (I_m). As used by C. W. Thornthwaite in his 1948 climatic classification: an overall measure of precipitation effectiveness for plant growth that takes into consideration the weighted influence of water surplus and water deficiency as related to water need and as they vary according to season. For a given station, it is calculated by the formula:

$$Im = (100S - 60D)/PE$$

where Im is the moisture index, S the water surplus, D the water deficiency, and PE the water need. The calculation of S and D is made on a normal month-to-month basis, with S being the total surplus from all months having a water surplus, and D the total of all monthly deficiencies; each is represented by the difference between monthly precipitation and monthly potential evapotranspiration (in centimeters or inches). Here PE is the annual potential evapotranspiration.

Table II—Classification of Climates under Thornthwaite's 1948 System
Moisture Categories

<i>Climatic Type</i>	<i>Moisture Index</i>	<i>Seasonal Variation of Moisture Efficiency</i>	<i>Aridity Index</i>
A Perhumid	100 & above	r little or no water deficiency	0–16.7
B ₄ Humid	80 to 100	s moderate summer water deficiency	16.7–33.3
B ₃ Humid	60 to 80	w moderate winter water deficiency	16.7–33.3
B ₂ Humid	40 to 60	s ₂ large summer water deficiency	33.3+
B ₁ Humid	20 to 40	w ₂ large winter water deficiency	33.3+
C ₂ Moist Subhumid	0 to 20		
			<i>Humidity Index</i>
C ₁ Dry Subhumid	–20 to 0	d little or no water surplus	0–10
		s moderate winter water surplus	10–20
D Semiarid	–40 to –20	w moderate summer water surplus	10–20
		s ₂ large winter water surplus	20+
E Arid	–60 to –40	w ₂ large summer water surplus	20+

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File Help

Data Graph

Field Capacity: Soil is NOT dry on first month of hydrological year

Water Reserve Values at Start of Hydrological Year:

Input % Field Capacity % Field Capacity: Reserve Value:

Input Reserve Value

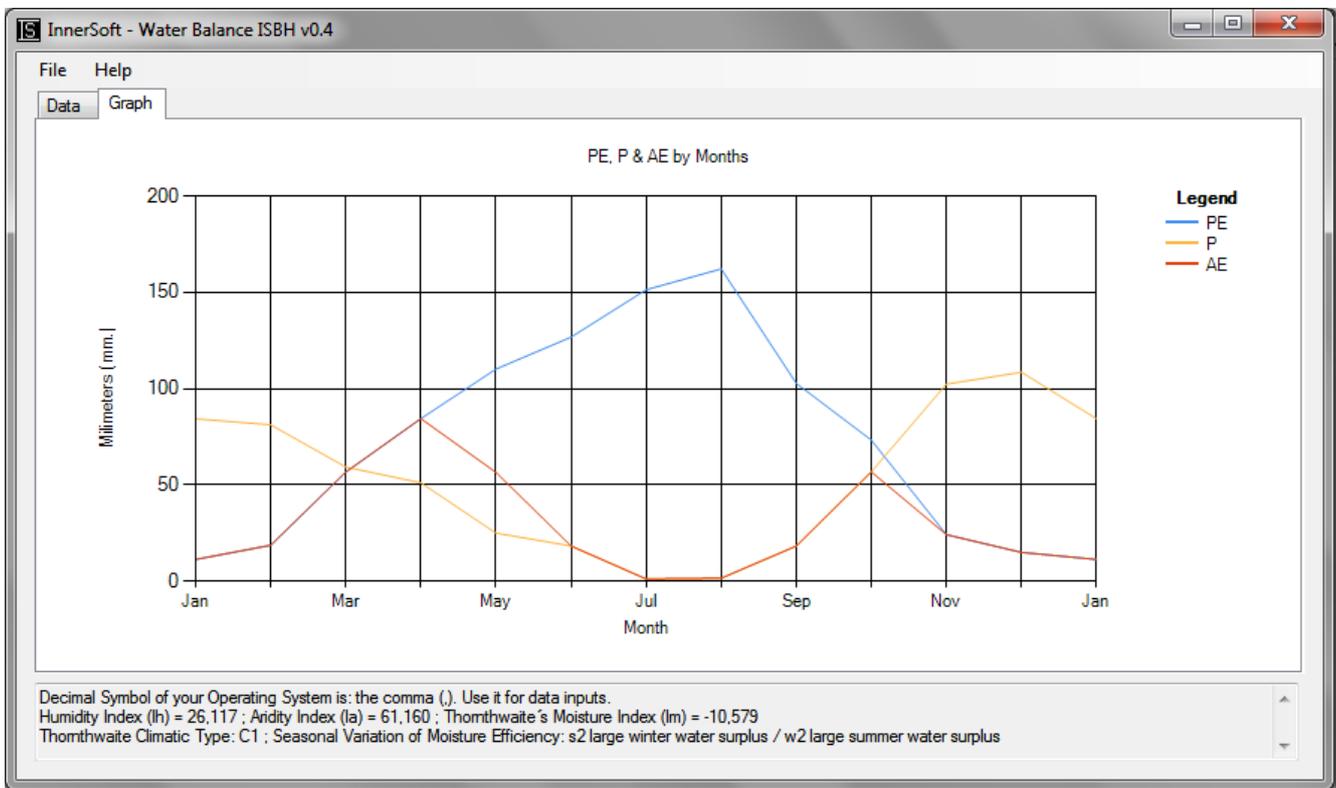
First month of the hydrological year:

User Input Data: P (precipitation) and PE (Potential evapotranspiration)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
P	84,4	81,3	59,4	51,2	25,1	18,4	1,3	1,7	18,4	56,9	102,4	108,6	609,1
PE	11,4	18,8	56,8	84,5	110,2	126,8	151,4	162,2	102,8	73,4	24,3	15,1	937,7
P-PE	73,0	62,5	2,6	-33,3	-85,1	-108,4	-150,1	-160,5	-84,4	-16,5	78,1	93,5	-328,6
ST	64,8	64,8	64,8	31,5	0	0	0	0	0	0	64,8	64,8	355,5
DST	0	0	0	-33,3	-31,5	0	0	0	0	0	64,8	0	0,0
AE	11,4	18,8	56,8	84,5	56,6	18,4	1,3	1,7	18,4	56,9	24,3	15,1	364,2
S	73,0	62,5	2,6	0	0	0	0	0	0	0	13,3	93,5	244,9
D	0	0	0	0	-53,6	-108,4	-150,1	-160,5	-84,4	-16,5	0	0	-573,5

Decimal Symbol of your Operating System is the comma (,). Use it for data inputs.
 Humidity Index (Ih) = 26,117 ; Aridity Index (Ia) = 61,160 ; Thornthwaite's Moisture Index (Im) = -10,579
 Thornthwaite Climatic Type: C1 ; Seasonal Variation of Moisture Efficiency: s2 large winter water surplus / w2 large summer water surplus

The graph is updated when you click on Compute, create a new file, open a file, or change the month.



2.3. - File Menu

New: Set P and PE to zero. Set January as first month of hydrological year. Set Field Capacity to 10. Remove TOTAL data column and output rows.

Open: Open a text file storing inputs, the kind of files that is generated on item 'Save As...'

Save Data As...: Save in a text file the data inputs: P, PE, Field Capacity, first month of hydrological year, % field capacity... It does not store data outputs.

Save Graph As...: Save the graph in a jpg file.

Export to Excel: Export inputs and outputs to a MS Excel file.

Export to XML: Export inputs and outputs to a XML file.

Close: Close the application.

Reference Documents

About CLIMATIC CLASSIFICATION

<http://amsglossary.allenpress.com/glossary/search?id=moisture-index1>

About Water Balance

http://www.uwsp.edu/geo/faculty/ritter/geog101/textbook/hydrosphere/water_balance_1.html

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