ERAHUMED DSS

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Preface

This is a Quarto book.

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1 Introduction

This is a book created from markdown and executable code.

See Martínez-Megías et al. (2024) for additional info.

Part I

Technical description

2 Hydrological Balance

This chapter describes the calculation of quantities related to hydrological balance. There are two levels of modeling involved:

- "Global" balance, *i.e.* the balance of the Albufera Lake. This step involves a reduced set of assumptions, and really boils down to the calculation of the lake's daily total inflow, from its measured outflows and precipitation/evapotranspiration levels, and from the measured water level changes.
- "Local" balance, that is the hydrological balance of rice paddy clusters in the Albufera National Park. This step uses the output of the global balance calculations, and involves a much wider set of assumptions about how the draining and irrigation of rice paddies is managed, to approximate as closely as possible the ideal water levels required by sowing, fertilization, *etc.* during the year.

2.1 Global balance of the Albufera Lake

This modeling layer computes the total daily inflow to the Albufera Lake, from the measured outflows and precipitation/evapotranspiration levels, together with the measured water level changes. The relevant equation expressing the hydrological balance is:

$$\text{Inflow} + \text{Outflow} = \text{Volume Change} - \text{Rain} + \text{Evapotranspiration} \tag{2.1}$$

where the unknown is Inflow. The subsections that follow explain in detail how the various volume terms appearing in Equation 2.1 are actually obtained from measured quantities.

2.1.1 Volume Change term

The lake volume change is obtained from the measured water height change, assuming volume and height are related through a linear storage curve:

$$\text{Volume} = a + b \cdot \text{Height} \tag{2.2}$$

The default values used for a and b are discussed in Appendix Section A.4.

2.1.2 Rain and Evapotranspiration terms

The volume changes due to precipitation and evapotranspiration are also assumed to be linearly related to the corresponding measured water levels (usually expressed in mm):

$$\begin{aligned}\mathrm{Rain}(\mathrm{m}^3) &= \alpha \cdot \mathrm{Rain}(\mathrm{mm})\\ \mathrm{Evapotranspiration}(\mathrm{m}^3) &= \beta \cdot \mathrm{Evapotranspiration}(\mathrm{mm})\end{aligned}$$

The default values used by the software α and β are discussed in Appendix Section A.4.

2.1.3 Outflow term

There lake is assumed to have two types of outflows: estuaries (*golas*) and enclosed marhslands (*tancats*).

2.2 Local balance of rice paddy clusters

Part II

User Manual

3 The ERAHUMED DSS User Interface

4 The {erahumed} R package

References

Martínez-Megías, Claudia, Alba Arenas-Sánchez, Diana Manjarrés-López, Sandra Pérez, Yolanda Soriano, Yolanda Picó, and Andreu Rico. 2024. "Pharmaceutical and Pesticide Mixtures in a Mediterranean Coastal Wetland: Comparison of Sampling Methods, Ecological Risks, and Removal by a Constructed Wetland." *Environmental Science and Pollution Research* 31 (10): 14593–609.

A Input Data

A.1 Albufera Lake Hydrological Balance

A.2 Precipitation and Evapotranspiration

A.3 Albufera Rice Paddies Management

A.4 Storage Curve and P-ETP Surface Values