

Exploring Complexity with a Function for R: Comin.

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ABSTRACT

In order to facilitate and promote the measurement of complexity for the understanding of a broad range of phenomena, a function for R was developed. The computational aspects of Comin (Complexity and Information Tool) are based on recent work (Gershenson and Fernández, 2012; Fernández et al., 2014).

With Comin function, the formal calculation of information theoretical measures of complexity, emergence, self-organization, homeostasis and autopoiesis is possible.

Comin function is a useful, easy and intuitive tool for studying and evaluating general data and time series, illustrating the dynamical properties related to order, change, self-regulation, and autonomy in complex systems. We describe and demonstrate the main properties of Comin tool, to promote its use among the scientific community.

MEASURES

$$Information = -\sum_i^n P_i \times \log_i P_i$$

$$Emergence = Information$$

$$Self\ organization = 1 - Emergence$$

$$Complexity = 4 \times Emergence \times Self\ organization$$

Arguments of the Comin Function

- it** Input type: 1 <- R Vectors; 2 <- Matrix from other software; 3 <- Matrix from R; 4 <- Vectors extracted
- b** Desired base (Scale): e.g. 2, 10, ..., 2^N
- ld** Local data: used when data are produced in R
- ext** Extension file: 1 <- .csv; 2 <- .txt; 3 <- -spss.
- r** Route: location of data: r <- "C:\\Users\\Cristian\\Downloads"
- f** File Name: f <- "ArticoFQ_Normal.csv"

COMIN SCREENSHOT AND GRAPHICS

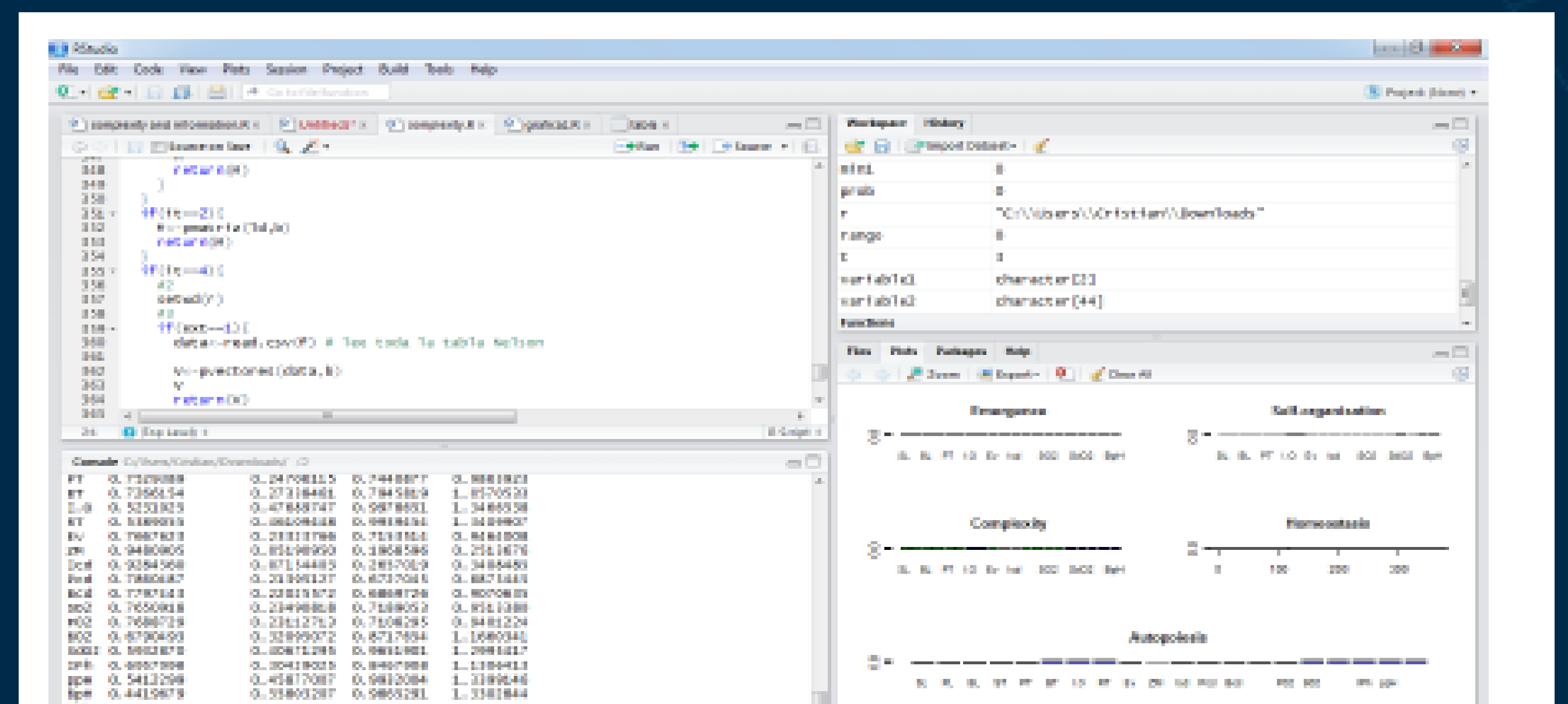


Fig. 1 Comin Screenshot

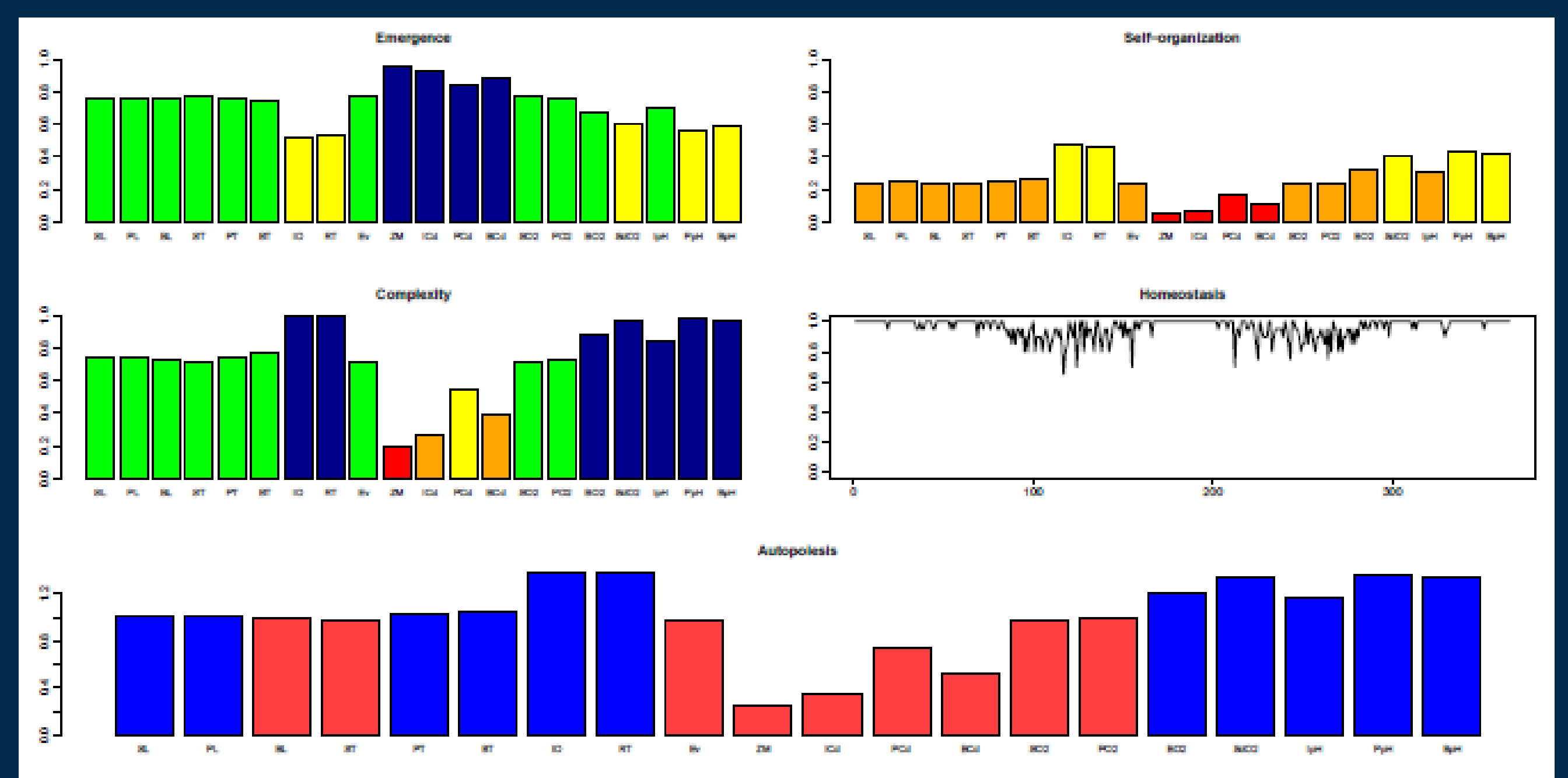


Fig. 2 SECHA Properties for Physicochemical Variables of an Arctic Lake

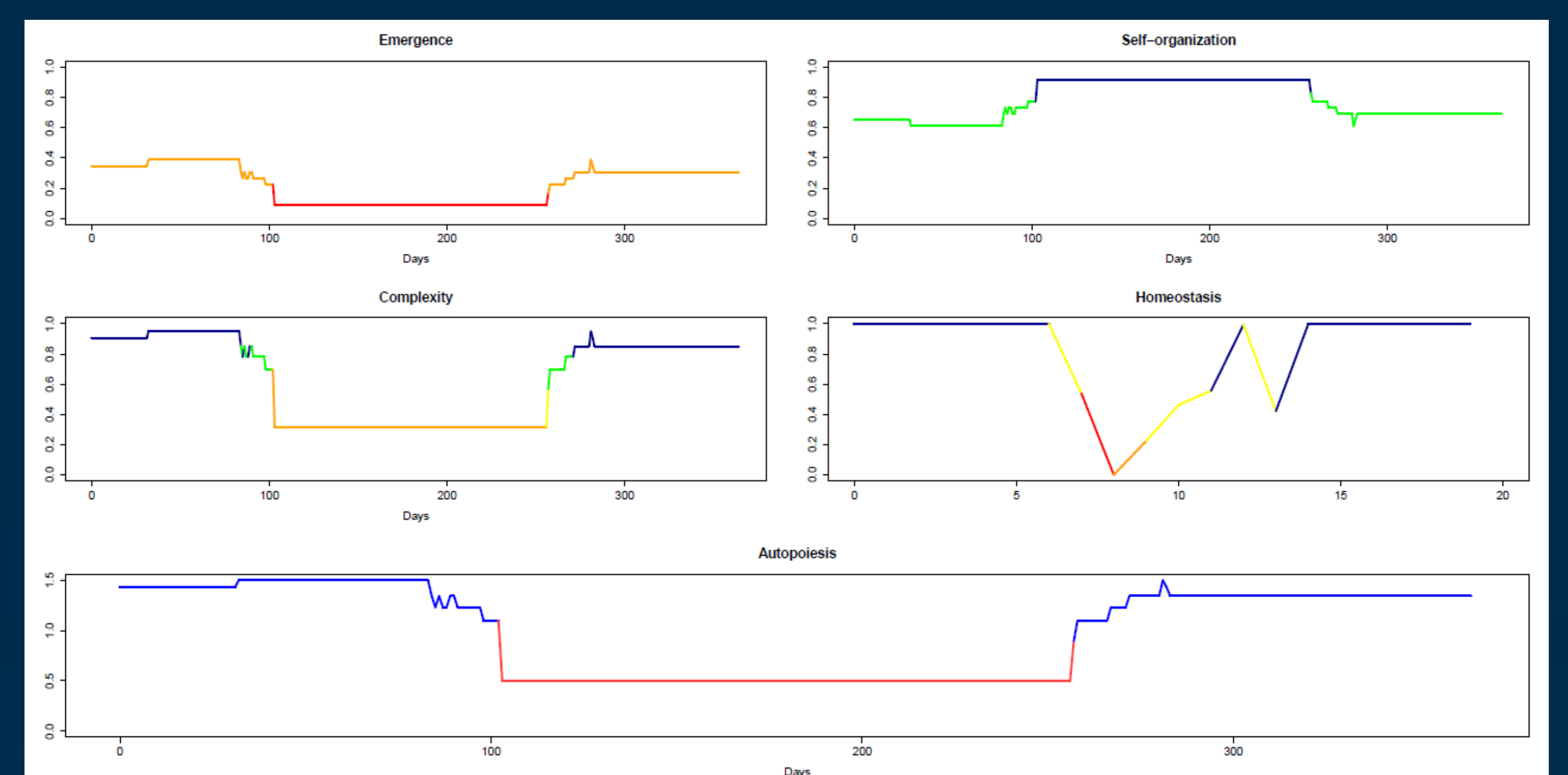


Fig. 3 SECHA Annual Temporal Variation of Physicochemical Variables of an Arctic Lake

Comin URL:



<https://github.com/dlizcano/Comin>

REFERENCES

- Fernández, N., Maldonado, C., and Gershenson, C. (2014). Information measures of complexity, emergence, self-organization, homeostasis, and autopoiesis. In Guided Self-Organization: Inception, M. Prokopenko, (Ed.). Springer. In Press. URL <http://arxiv.org/abs/1304.1842>.
- Gershenson, C. and Fernández, N. (2012). Complexity and information: Measuring emergence, self-organization, and homeostasis at multiple scales. Complexity 18 (2): 29:44. URL <http://dx.doi.org/10.1002/cplx.21424>.

Poster URL



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