Sociedad Peruana de Matemática
Aplicada y Computacional

XV SEMINARIO INTERNACIONAL DE BIOMATEMÁTICA

RESÚMENES

PeC3

Perú 2020

Comité Científico

Eduardo González (Pontificia Universidad Católica de Valparaiso, Chile)
Graciela Canziani (Universidad Nacional del Centro de la Provincia de Buenos Aires, Argentina)
Ignacio Barradas (CIMAT, México)
Roxana López Cruz (Universidad Nacional Mayor de San Marcos, Perú)

Comité Organizador

Roxana López Cruz (SPMAC - UNMSM - ULIMA, Perú)
Stefan Frei (Konstanz University, Alemania)
Thomas Ritcher (PeC3, Alemania)
Emma Cambillo (Universidad Nacional Mayor de San Marcos, Perú)
Mirtha Trejo López (COMAP-Huacho)

Contenido

Presentation

It is extremely pleasant to introduce you the abstracts of the Conferences, Short Courses and Communications of the Twelfth International Seminar on Biomathematics (XV SEMBIOMAT), which in this opportunity is realized in the city of Lima since 11 to 26 September 2020. These abstracts fulfill a preliminary intention, which is to keep the participant informed about the subject- matters of all the papers, with the purpose that each participant realizes his own schedule of participation to the conferences, choosing the subjects of its preference. On the other hand, any participant of the Seminar will have the opportunity to exchange information with the invited lecturers and establishing possibilities of developing joint investigation, pressing the academic, friendly and international bonds necessary to any institution that realizes scientific investigation. We are grateful to the lecturers, who with their participation heighten our event, placing it between the better of Biomathematics events. Finally, our deep gratitude to all the institutions that have supported our event and whose logos, can be distinguished in the material given to all participant. Also we express our gratitude to the anonymous contingent of professors and students who, disinterestedly and without leading emulations, are collaborating for the success of the XV SEMBIOMAT.

THE ORGANIZING COMMITTEE

Es sumamente grato presentar los resúmenes de las Conferencias, Minicurso y Comunicaciones que se expondrán en el *Décimo Segundo Seminario Internacional de Biomatematica* (XV SEMBIOMAT), que se realizará virtualmente desde Perú del 11 al 26 de Setiembre del 2020 (SPMAC). Estos resúmenes cumplen con el propósito preliminar de mantener informado a los participantes sobre las diversas temáticas de cada una de las ponencias, facilitando la elaboración de sus respectivos horarios de asistencia a las conferencias de su preferencia. En cada una de las Plenarias y Conferencias los participantes podrán intercambiar sus inquietudes con todos los Conferencistas invitados, a fin de lograr intercambio de experiencias y establecer posibilidades de desarrollar investigación conjunta, estrechando los vínculos académicos, amistosos e internacionales, necesarios a toda institución que realiza investigación científica. Agradecemos a los Conferencistas, quienes con su participación enaltecen nuestro evento, situándolo entre los mejores de la especialidad de Biomatemática. Finalmente, nuestro profundo agradecimiento a todas las instituciones que nos honran con su auspicio y cuyos logos, se pueden distinguir en el material entregado a cada uno de ustedes. También expresamos nuestra gratitud al contingente anónimo de docentes y alumnos quienes desinteresadamente están colaborando para el éxito del XII SEMBIOMAT.

COMISIÓN ORGANIZADORA

Analysis of shallow lakes dynamics as related to precipitation in the Pampas region based on Landsat imagery

María Laura Maestri y Graciela Ana Canziani
canziani@exa.unicen.edu.ar
Instituto Multidisciplinario sobre Ecosistemas y Desarrollo Sustentable
Universidad Nacional del Centro de la Provincia de Buenos Aires, Tandil, Argentina

Resumen

Shallow lakes in the Pampas are characterized by their high number as well as by frequent variations in their hydrometric level and their surface area, depending on regional rainfall and underground water balance [1],[2]. More than 150,000 shallow lakes of various sizes have been counted in the province of Buenos Aires, with at least 10,500 of them having a surface area above 10 ha [2]. They exhibit changing dynamics (seasonally and annually) without a definite pattern. Preliminary work indicates an inverse relationship between the volume of water retained in a shallow lake and trophic state indicators, linking rainfall and trophic level [3]. Thus, Pampean shallow lakes are not only conditioned by the activities taking place in their surroundings, but they also respond to climatic forces whose dynamic effect has not yet been sufficiently studied. Understanding the dynamics of interactions between climate and shallow lake ecosystems in the Pampas is essential for their conservation and resource utilization, as well as for guaranteeing the provision of ecological services. Hence the interest in linking the variation in water volume in one or more shallow lakes to precipitations over the region since the said variation is linked to nutrient concentrations and plankton abundance conditioning the ecosystem' s food web.

The purpose of this study is to analyze the temporal dynamics of the area of five shallow lakes in different basins of the Buenos Aires province over the period 1984-2015 through the application of satellite image processing tools [4]. Two images per year were selected (Landsat 4 TM, Landsat 5 TM, Landsat 7 ETM+ and Landsat 8 OLI), one corresponding to summer and the other to winter. The evolution of the free water surface of these shallow lakes could be explained using a generalized linear model (GLM) and taking as variables the accumulated precipitation and the number of rainy days over a fixed-length period prior to the capture date of the satellite image. Accumulated precipitation and frequency of rainy days were calculated for three, seven, thirty, ninety, and one hundred and eighty days, as well as for one, two, three, and four years prior to the capture date, respectively. When analyzing the interdecadal precipitation medians, a decrease was observed in all meteorological stations involved (Azul, Benito Juárez, Olavarría and Tres Arroyos). This led to splitting the series of computed lake areas into two consecutive periods: 1984-2000 and 2001-2015.

The areas reconstruction for the five shallow lakes varied in regard to both the explanatory variables and in the reconstruction coefficients when the series were divided into two periods.

In all cases except one, better reconstructions were obtained for the second half. The results regarding the behavior of the shallow lakes in response to antecedent rainfall differed in each of the basins, reflecting the systems characteristics [5]. It may be interpreted that when the area responds to precipitation accumulated over longer periods the underground contribution is important, meaning that the memory of the system prevails, while a significant superficial contribution would explain the shallow lake' s response to precipitation accumulated over short periods, pointing to the importance of runoff.

Referencias

[1] RINGUELET, R.A., *Rasgos principales de las lagunas pampeanas con criterio bioecológico.* Anales CIC, 3, 1962.

[2] DANGAVS, N.V., *Los ambientes acuáticos de la provincia de Buenos Aires* (pgs. 219-236). En: Barrio, R.E., Etcheverry, R.O.; Caballé, M.F.; Llambías, E.J., [Eds.]. *Geología y recursos minerales de la Provincia de Buenos Aires.* Relatorio del XVI Congreso Geológico Argentino, Buenos Aires (Argentina). Universidad Nacional de La Plata. La Plata, 2005.

[3] COLASURDO, V.; DÍAZ, O.; MARINELLI, C.; CEPEDA, R.; GROSMAN, F.; SANZANO, P.; FERRATI, R.; CANZIANI, G.A. . *Aplicación del Indice Trófico IELP en Lagunas Bonaerenses.* I Jornadas Nacionales de Ambiente, Tandil. Vol. I: 151-158, 2012.

[4] MAESTRI, M.L.; CASTETS, F.; BAYALA, M.; CANZIANI, G.A. *Análisis comparativo de cinco métodos de procesamiento para calcular el área de lagunas pampeanas a partir de imágenes satelitales Landsat.* Biología Acuática 33: 1-10, 2019.

[5] CANZIANI G.A.; CASTETS F.; MAESTRI M.L., FERRATI R. *Uso de Imágenes Satelitales para el Estudio de las Lagunas Pampeanas. El Caso de La Barrancosa* (pgs. 77-98). En: Grosman, F.; Sanzano, P.; Bertora, A.[Eds.] *Destino: La Barrancosa. Una invitación a conocer las lagunas pampeanas.* 1a ed.- Tandil: Universidad Nacional del Centro de la Provincia de Buenos Aires, 2019. Libro digital, PDF. ISBN 978-950-658-495-5.