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Spatio-Temporal Variations in Water Quality of the Chao Phraya River, Thailand, between 1991 and 2008

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ABSTRACT

Spatio-temporal variations in the water quality of the Chao Phraya River, Thailand, were examined, on average-yearly basis, between 1999 and 2008, from 32 surface water stations from the river origin to the delta. Five water quality parameters viz., DO, BOD, TCB, FCB, NH₃-N and water temperature were used in the analysis. Analysis was performed by using the Self Organizing Maps. Four distinct spatially approached clusters were classified, according to the similarity of water quality parameters, while temporal variations of most of the surface water stations were not obviously observed. The worst water quality condition was at the stations near the river delta and highly related to anthropogenic stresses. Result from the correspondence analysis showed that, except for the cluster of the worst water quality, the stations of the remaining three clusters were overlapped. There was no statistical difference in water temperature among clusters but the expected effects from climate change should be a precautionary focus since the will eventually affect the water quality.

KEYWORDS

Surface Water; Self Organizing Maps; Anthropogenic Stresses; Temperature

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References

- [1] Mekong River Commission, " An Assessment of Water Quality in the Lower Mekong Basin," MRC Technical Paper No.19, Mekong River Commission, Vientiane, 2008.
- [2] L. Tudesque, M. Gevrey, G. Grenouillet and S. Lek, " Long-Term Changes in Water Physicochemistry in the Adour-Garonne Hydrographic Network during the Last Three Decades," *Water Research*, Vol. 42, No. 3, 2008, pp. 732-742. doi:10.1016/j.watres.2007.08.001
- [3] O. Altansukh and G. Davaa, " Application of Index Analysis to Evaluate the Water Quality of the Tuul River in Mongolia," *Journal of Water Resource and Protection*, Vol. 3, No. 6, 2011, pp. 398-414. doi:10.4236/jwarp.2011.36050
- [4] A. M. Rabee, B. M. Abdul-Kareem and A. S. Al-Dhamin, " Seasonal Variations of Some Ecological Parameters in Tigris River Water at Baghdad Region, Iraq," *Journal of Water Resource and Protection*, Vol. 3, No. 4, 2011, pp. 262-267. doi:10.4236/jwarp.2011.32011
- [5] V. Simeonov, P. Simeonova, S. Tsakovski and V. Lov- chinov, " Lake Water Monitoring Data Assessment by Multivariate Statistics," *Journal of Water Resource and Protection*, Vol. 2, No. 4, 2010, pp. 353-361. doi:10.4236/jwarp.2010.24041
- [6] N. Ozaki, T. Fukushima, H. Harasawa, T. Kojiri, K. Kawashima and M. Ono, " Statistical Analyses on the Effects of Air Temperature Fluctuations on River Water Qualities," *Hydrological Processes*, Vol. 17, No. 14, 2003, pp. 2837-2853. doi:10.1002/hyp.1437

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- [7] P. K. Naik and D. A. Jay, " Distinguishing Human and Climate Influences on the Columbia River: Changes in Mean Flow and Sediment Transport," *Journal of Hydrology*, Vol. 404, No. 3-4, 2011, pp. 259-277. doi:10.1016/j.jhydrol.2011.04.035
- [8] L. Prathumratana, S. Sthiannopkao and K. W. Kim, " The Relationship of Climatic and Hydrological Parameters to Surface Water Quality in the Lower Mekong River," *Environment International*, Vol. 34, No. 6, 2008, pp. 860- 866. doi:10.1016/j.envint.2007.10.011
- [9] H. A. J. Senhorst and J. J. G. Zwolsman, " Climate Change and Effects on Water Quality a First Impression," *Water Science and Technology*, Vol. 51, No. 5, 2005, pp. 9-53.
- [10] Office of Natural Water Resources Committee of Thailand, " Chapter 16—Chao Phraya River Basin, Thailand," the 1st UN World Water Development Report, *Water for People, Water for Life*, UNESCO, Paris, 2003, pp. 1-16.
- [11] A. Suvarnaraksha, " Biology of Two Keystone Fishes, the Modeling Approaches and Fish Assemblage Patterns in Tropical River Basin: Case Study of Ping River Basin, Thailand," Ph.D. Thesis, Ubon Ratchathani University, Ubon Ratchathani, 2011.
- [12] W. Simachaya, P. Watanamahart, V. Kaewkrajang and A. Yenpiem, " Water Quality Situation in the Chao Phraya Delta," In: *The Chao Phraya Delta, Historical Development, Dynamics and Challenges of Thailand's Rice Bowl*, Bangkok, 12-15 December 2000, pp. 1-21.
- [13] A. A. Bordalo, W. Nilsumranchit and K. Chalermwat, " Water Quality and Uses of the Bangpakong River (Eastern Thailand)," *Water Research*, Vol. 35, No. 15, 2001, pp. 3635-3642. doi:10.1016/S0043-1354(01)00079-3
- [14] T. Kohonen, " Self-Organized Formation of Topologically Correct Feature Maps," *Biological Cybernetics*, Vol. 43, No. 1, 1982, pp. 59-69.
- [15] A. M. Kalteh, P. Hjorth and R. Berndtsson, " Review of the Self Organizing Map (SOM) Approach in Water Resources: Analysis, Modeling and Application," *Environmental Modelling & Software*, Vol. 23, No. 7, 2008, pp. 835-845. doi:10.1016/j.envsoft.2007.10.001
- [16] S. Lek and J. F. Guegan, " Artificial Neural Networks: Application to Ecology and Evolution," Springer Verlag, Berlin, 2000.
- [17] Y. Li, L. Xu and S. Li., " Water Quality Analysis of the Songhua River Basin Using Multivariate Techniques," *Journal of Water Resource and Protection*, Vol. 2, No. 8, 2009, pp. 110-121. doi:10.4236/jwarp.2009.12015
- [18] R Development Core Team, " R: A Language and Environment for Statistical Computing," R Foundation for Statistical Computing, Vienna, 2009.
- [19] P. A. Aguilera, A. G. Frenich, J. A. Torres, H. Castro, J. L. Martinez Vidal and M. Canton, " Application of the Kohonen Neural Network in Coastal Water Management: Methodological Development for the Assessment and Prediction of Water Quality," *Water Research*, Vol. 35, No. 17, 2001, pp. 4053-4062. doi:10.1016/S0043-1354(01)00151-8
- [20] B. Thongdonphum, S. Meksumpun and C. Meksumpun, " Nutrient Loads and Their Impacts on Chlorophyll a in the Mae Klong River and Estuarine Ecosystem: An Approach for Nutrient Criteria Development," *Water Science & Technology*, Vol. 64, No. 1, 2011, pp. 178-188. doi:10.2166/wst.2011.515
- [21] S. Meksumpun and C. Meksumpun, " Integration of Aquatic Ecology and Biological Oceanographic Knowledge for Development of Area-Based Eutrophication Assessment Criteria Leading to Water Resource Remediation and Utilization Management: A Case Study in Tha Chin, the Most Eutrophic River of Thailand," *Water Science & Technology*, Vol. 58, No. 12, 2008, pp. 2303- 2311. doi:10.2166/wst.2008.929
- [22] W. Simachaya, " Water Quality Management in Thailand," Workshop on Environmentally Sound Technology on Water Quality Management UNEP, Mekong River Commission, November 2000.
- [23] C. Pholprasert, " Heavy Metal Pollution in the Chao Phraya River Estuary, Thailand," *Water Research*, Vol. 16, No. 6, 1982, pp. 775-784. doi:10.1016/0043-1354(82)90004-5
- [24] C. Kunacheva, S. Tanaka, S. Fujii, S. Boontanon, C. Mu- sirat and T. Wongwattana, " Determination of Perfluorinated Compounds (PFCs) in Solid and Liquid Phase River Water Samples in Chao Phraya River, Thailand," *Water Science & Technology*, Vol. 64, No. 3, 2011, pp. 684-692. doi:10.2166/wst.2011.686

- [25] C. J. A. Campos and R. A. Cachola, " Faecal Coliforms in Bivalve Harvesting Areas of the Alvor Lagoon (Southern Portugal): Influence of Seasonal Variability and Urban Development," Environmental Monitoring and Assessment, Vol. 133, 2007, pp. 31-41. doi:10.1007/s10661-006-9557-2
- [26] S. Mimamara and C. L. Sales, " Water Quality Management of the Chao Phraya River (a Case Study)," Environmental Technology, Vol. 15, No. 6, 1994, pp. 501-516. doi:10.1080/09593339409385457
- [27] D. Voutsas, E. Manoli, C. Samara, M. Sofoniou and I. Stratis, " A Study of Surface Water Quality in Macedonia, Greece: Speciation of Nitrogen and Phosphorus," Water Air and Soil Pollution, Vol. 129,