Statistica Sinica **29** (2019), 1083-1084

Foreword

Big Data in Environmental Studies

Population growth and economic development create severe challenges for the finite resources on Earth. Thus, there is an urgent need to study and better understand our environment. Statistics can significantly contribute to this endeavor. The goal of this special issue, *Big Data in Environmental Studies*, is to encourage more statisticians to participate in modeling and analyzing spatio-temporal data, in particular big data.

There are eight articles in this special issue that cover a wide range of theory and applications. Kleiber, Nychka and Bandyopadhyay consider a model for multivariate spatial data applied to the study of minimum and maximum temperature for the western United States. Jeong et al. employ a Tukey g-and-h transformation of autoregressive processes to develop an efficient and feasible approach to quantity uncertainty in the calculation of global monthly wind energy. Shirota, Gelfand and Banerjee use the Dirichlet processes within a Bayesian approach to model spatial joint species distributions; they demonstrate their approach by modeling the presence-absence measurements of 639 tree species at 662 locations in the Cape Floristic Region of South Africa. Taylor-Rodrigues et al. propose spatial factor models for large high-dimensional spatial data. They use a two-stage modeling strategy to generate coverage maps of forest variables over a large region of boreal forests in Alaska.

Deb and Tsay consider space-time interaction and demonstrate its importance by analyzing weekly measurements of fine particulate matter ($PM_{2.5}$) at 66 monitoring stations in Taiwan from January 2006 to December 2015. Li and Sun propose a new estimation procedure, based on local-polynomial fitting, to approximate a class of nonstationary Matèrn covariance functions of spatial processes. Chu, Zhu and Wang consider the semi-parametric modeling of spatio-temporal covariance functions that are nonseparable and nonstationary. The properties of the proposed statistics are derived, and the authors illustrate the usefulness of their approach by considering the precipitation data from 259 stations in Colorado. Finally, Sahoo, Guinness and Reich propose a test for checking isotropy on a sphere using spherical harmonic functions and apply their test to a near-surface air temperature data set.

Enjoy reading and keep our environment clean and safe.

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