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# Statistical distributions of long-term water quality time series and its relationship with climate elasticity

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We are in the age of big data. It is also true for environmental science and hydrology. Many fundamental questions on statistical characteristics of long-term surface water quality observations are still far from well-understanding at this stage. e.g. How probability distribution of surface water quality changes with changing decades? How probability distribution deviates from one site to another site, and one watershed to another watershed? Any relationship exist between the distribution of water quality parameters and climate drivers? ... Therefore, this paper conduct a global scale investigation on above questions based on 16 big rivers. We examines the existence of decade trends, evaluation of the best fitted trends and distribution types, and also the evaluation of water quality deterioration at various catchment scales. Moreover, to evaluate the fundamental statistical characteristics of non-parametric elasticity estimators and to improve our understanding that how the distributions of 'point' deviation, $\left(\frac{WQ_t-\overline{WQ}}{T_t-\overline{T}}\frac{\overline{T}}{\overline{WQ}}\right)$ and $\left(\frac{WQ_t-\overline{WQ}}{P_t-\overline{P}}\frac{\overline{P}}{\overline{WQ}}\right)$, reflect the real response of water quality to climate drivers. Some work is still in progress.