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Time series stationarity analysis: the case of the Nile

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The Nile river (6700 km long, and over 3 million km2 catchment area), is the longest river of the world encompassing ten countries of North Eastern Africa. It is characterized by relatively small yield (84 billion m3) compared to its catchment area. Its flow is supplied by two different climatic regions: the Equatorial Lakes (White Nile), and the Ethiopian Plateau (Blue Nile and Atbara). The flow of the Nile is characterized by its distinct seasonal as well as annual variability. High intensity of recurrence of wet and dry years has become a norm. This poses increasing challenges to the management of the Nile water resources, both in upstream and downstream areas.

Therefore, the analysis of the time series stationarity of the river flows (in different parts of the Basin) is of high importance. In this study, we first compiled a consistent long-term runoff time series (of about 100 years long) from gauged data at different outlets of main catchments within the Nile Basin. The HYMOS package (WI|delft Hydraulics, The Netherlands), has been used for data processing and analysis. The water balance technique has been used to naturalize the flow at sub-basins outlets. That is to estimate abstractions, and reservoirs storages to obtain long term (natural) flows at key locations. Thereafter, the long term variability of the river flows at those key locations (including total Nile yield) has been computed. The Standard Normal Homogeneity Test (SNHT), as well as other statistical indicators have been applied to identify shifts and/or gradual change of the mean values.

The new understanding of long term flow variability of the Nile and its tributaries is important information needed by riparian countries as well as by the ongoing Nile

Basin Initiative for improved water management and equitable use of the Nile water resources.