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‹ Back to results | 1 of 1

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The history of rainfall data time-resolution in a wide variety of geographical areas (Article)

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Abstract

View references (62)

Collected rainfall records by gauges lead to key forcings in most hydrological studies. Depending on sensor type and recording systems, such data are characterized by different time-resolutions (or temporal aggregations), t_a. We present an historical analysis of the time-evolution of t_a based on a large database of rain gauge networks operative in many study areas. Globally, t_a data were collected for 25,423 rain gauge stations across 32 geographic areas, with larger contributions from Australia, USA, Italy and Spain. For very old networks early recordings were manual with coarse time-resolution, typically daily or sometimes monthly. With a few exceptions, mechanical recordings on paper rolls began in the first half of the 20th century, typically with t_a of 1 h or 30 min. Digital registrations started only during the last three decades of the 20th century. This short period limits investigations that require long time-series of sub-daily rainfall data, e.g, analyses of the effects of climate change on short-duration (sub-hourly) heavy rainfall. In addition, in the areas with rainfall data characterized for many years by coarse time-resolutions, annual maximum rainfall depths of short duration can be potentially underestimated and their use would produce errors in the results of successive applications. Currently, only 50% of the stations provide useful data at any time-resolution, that practically means t_a = 1 min. However, a significant reduction of these issues can be obtained through the information content of the present database. Finally, we suggest an integration of the database by including additional rain gauge networks to enhance its usefulness particularly in a comparative analysis of the effects of climate change on extreme rainfalls of short duration available in different locations. © 2020 Elsevier B.V.

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Topic: TRMM | Precipitation Measurement | Rain Gages

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Back to results | 1 of 1

Top of page