



Analysis of Variability and Trends in Graded Daily Precipitation in Finland, 1908-2008

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As the fundamental design parameter for dam safety and flood risk assessments, precipitation plays a vital role in the planning and management of sustainable water resources. Hence, this study aimed at evaluating century-long (1908-2008) variability and trends in daily precipitation observed at three meteorological stations in southern (Kaisaniemi), central (Kajaani) and northern (Sodankylä) Finland. Such daily precipitation records were primarily classified into six grades, including very light ($0 \text{ mm} < \text{daily precipitation} \leq 1 \text{ mm}$), light ($1 \text{ mm} < \text{daily precipitation} \leq 5 \text{ mm}$), moderate ($5 \text{ mm} < \text{daily precipitation} \leq 10 \text{ mm}$), heavy ($10 \text{ mm} < \text{daily precipitation} \leq 15 \text{ mm}$), very heavy ($15 \text{ mm} < \text{daily precipitation} \leq 20 \text{ mm}$), and extreme (daily precipitation $> 20 \text{ mm}$). The Mann-Kendall non parametric test was used to determine statistically significant ($p < 0.05$) trends in intensity and frequency of such graded daily precipitation. In average, most intense daily precipitation was determined at the Kaisaniemi station in southern Finland. At this station, however, very light and light precipitation showed the lowest frequency, but other graded daily precipitation were mostly frequent. At all three stations studied, the intensity of very light precipitation significantly declined during the past 100 years, while its frequency increased. The highest rates of such decreases and increases in intensity and frequency of very light daily precipitation were found at the Sodankylä stations in northern Finland, respectively, but the lowest rates at the Kaisaniemi station in the south. At the Kajaani station in central Finland, the intensity of light precipitation decreased, but very heavy precipitation intensified. At this station, however, number of both moderate and heavy precipitation events increased over time. Such results are useful for developing adaptation and mitigation strategies to achieve proper planning and management of water resources in the Boreal environment of Finland.

Keywords: daily precipitation, frequency, intensity, trend analysis, Finland