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Compound drought and heatwave events in the eastern part of the Baltic Sea region

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Both droughts and heatwaves cause negative impact on human health, agriculture, economy and other areas while occurring separately. However, in recent years the impact of these phenomena acting together has been increasingly analysed as it was found that such events, called compound drought and heatwave events (CHDE), may induce even more damage. The aim of this research is to identify droughts, heatwaves and CDHE in the eastern part of the Baltic Sea region during the summer months (June-August) from 1950 to 2022 and to assess their frequency and intensity. For the purpose to identify droughts the 1-month Standard Precipitation Index (SPI) values calculated for each day were used. Droughts were distinguished if the SPI values were lower than -1 for at least five or more days in a row and this condition was met in at least one third of the study area. Heatwaves were defined as a period of five or more consecutive days when daily maximum air temperature (T_{max}) was higher than 90th percentile of T_{max} of the study period (1951–2022) for each summer day (on a 5-day moving average) and for one or more days covered at least one third of the study area. Daily T_{max} data as well as precipitation data that was needed to calculate SPI were obtained from European Centre of Medium-range Weather Forecast ERA-5 reanalysis dataset with a spatial resolution of 0.25° x 0.25°. CDHE events were defined as time periods when heatwave occurs during the drought period. Study showed that the number of heatwaves in the study area since 1950 increased significantly (by 1.25 per decade). The number of droughts during investigation period slightly decreased. The majority of droughts were identified in 1990's when dry periods were recorded during six summers in a row (from 1992 to 1997). In total, 19 CDHE during the summer months were distinguished, while a lot of them occurred during 1990's (5 events). As a consequence, statistically significant increase of such events during the study period was not observed. CHDE of the highest intensity was found in 1994 while the longest CDHE occurred in 2022 and lasted for 19 days (from August 11th to August 29th).