Trends and variability of historical and projected droughts in Taiwan

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This study identifies historical trends and future projections of meteorological drought in Taiwan. Meteorological drought in this work is explained using the standardized precipitation index, non-rainy days and the maximum consecutive non-rainy days. Long-term historical precipitation data (at least 80 years) are collected from 22 stations in Taiwan for this study. Trends and variability of meteorological drought pertaining to 22 individual sites and four water resources regions are investigated. Different thresholds can be set for the standardized precipitation index to indicate different levels of drought, such as mild drought and severe drought. This work identified historical trends of meteorological droughts using statistical trend analysis to find the change point that divides historical time series data into two periods in which significantly different trends can be identified. Analytic results pertaining to the standardized precipitation index, non-rainy days and the maximum consecutive non-rainy days show consistent trends that generally, meteorological drought in northeastern Taiwan shows a decreasing trend in the past century, while that in central and south Taiwan shows an increasing trend. This study projected future meteorological drought using projection data run by six different general circulation models (GCMs) under A2 and B2 scenarios of the Special Report on Emission Scenarios. Two statistical downscaling methods are used to downscale large-grid GCM outputs into local precipitation data of the study stations. One method is the statistical downscaling method developed by the Global Change Research Center in National Taiwan University, and the other is a weather generator model developed in this work. Generally, projection results show various trends and variability of precipitation and meteorological drought subject to GCM outputs and different downscaling methods, indicating local projection data and

results are conditional on GCM outputs and sensitive to downscaling methods, and the development of suitable downscaling methods for Taiwan is necessary.