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Definition of a drought index to improve disaster preparedness and to support decision making process

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Drought is a natural hazard which causes impacts on food security, human health, economy and the environment. In many regions of the world climate change will exacerbate frequency and severity of droughts. An improvement of drought monitoring and risk management capacities is therefore necessary. Although many drought indexes have been already developed and proposed, few of them aimed at optimising the capability of drought monitoring and risk management by using only remote sensed and globally available data. These would allow the transferability over countries of any model built on them. Moreover, the drought indexes should convert meteorological and remote-sensing information into effective tools for drought preparedness and mitigation in order to support decision makers and stakeholders' choices. The index here proposed combines together a widely used meteorological drought index, the Standardized Precipitation Index (SPI), and a remote-sensing drought index, the Vegetation Health Index (VHI). The SPI has been considered as recommended by the World Meteorological Organization to identify drought periods. VHI has been selected for its ability to identify drought impacts on the ground, since it measures vegetation stress and accounts for temperature effects too. SPI is computed starting from the precipitation taken from the Climate Hazard Group InfraRed Precipitation (CHIRP) data archive, which has daily temporal resolution, global spatial coverage and 5° spatial resolution. The index is updated with a weekly time-step. VHI is provided by the Centre for Satellite Applications and Research with weekly temporal resolution and 4 km spatial resolution. Since both the indexes have normal distribution, they are combined using a bivariate normal distribution function, which is then standardized in order to obtain an index with 0 mean, positive values indicating wet periods and negative values standing for dry periods. Haiti is selected as case study to test the new index. The Receiver Operating Characteristic (ROC) curve is employed in the validation process. Drought events identified by the new index are compared with historical events registered in the island. Text based information are retrieved from reports of various sources (the Haitian Government, NGOs working in Haiti, FAO and others). Results are good compared with the available literature. In addition, the approach here proposed can be easily implemented over the entire globe at country-scale, since both the datasets used have global coverage; there is no need of ground-based information, because the index is based on remote-sensing data and the index can be updated in near-real time, having both the datasets a short latency period. We show in this work a tool that can provide stakeholders and decision-makers useful indications to introduce appropriate drought preparedness and mitigation measures.