High-resolution forecasts of seasonal precipitation in the eastern Mediterranean: analogues downscaling of global forecasts

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Planning the use of water resources in advance is one of the most important missions in the semi-arid Eastern Mediterranean region. Some relevant areas are characterized by complex topography, land use and coast-lines that lead to strong spatial gradients in the observed seasonal precipitation. Global seasonal forecasts provide partial and incomplete information about the expected precipitation amounts due to their coarse spatial resolution of ∼200 km grid-size. More accurate and useful forecasts require finer spatial resolution on the scale of a few kilometers. We present a statistical downscaling algorithm that relies on: global forecasts, a technique to find past-analogues synoptic-weather patterns, and the connection between those weather scenarios and the local precipitation. The algorithm was validated using the long term NCEP/NCAR global reanalyses (that represent the "true" state of the large scale flow) at 18 selected stations characterized by significant spatial variability in their seasonal precipitation. The validation proved good skill of the algorithm (e.g. correlation between predicted and observed precipitation amounts of ∼0.8). After being validated, the algorithm was then used to downscale operational global-seasonal forecasts issued by NCEP CFS1.0 ensemble during two wet seasons and the results were verified against observations. The verification showed that the method works properly when using operational global forecasts (e.g. correlation between predicted and observed precipitation amounts of ∼0.7), too; and reproduces the differences between the stations in most cases.