EMS Annual Meeting Abstracts
Vol. 16, EMS2019-340-1, 2019

Summer warm days/night along the Italian Peninsula and their relationship with Circulation Types

roberto vallorani (1,2), giorgio bartolini (2), giulio betti (1,2), alfonso crisci (1), daniele grifoni (1,2), maurizio iannuccilli (1), alessandro messeri (3), gianni messeri (1,2), marco morabito (1), tommaso torrigiani (2), and bernardo gozzini (2)

(1) Institute of Biometeorology of the National Research Council (IBIMET-CNR) - Florence, Italy, (2) Laboratory of Monitoring and Environmental Modelling for the Sustainable Development (LaMMA consortium) - Sesto Fiorentino - Florence, Italy, (3) Faculty of Agriculture - University of Florence, Italy

The climate change is affecting Mediterranean Basin more than ever. A recent study of the European Union Science Hub (JRC) showed that average temperatures in the Mediterranean region have already risen by 1.4°C since the pre-industrial era, 0.4°C more than the global average. The increased frequency and intensity of heat waves during summer, especially in the central-eastern and southeastern European cities, has a relevant impact on the health system and may lead to an increase in heat-related deaths with the greatest impact on urban populations, particularly the elderly and the ill. This study is firstly focused on trend analysis of summer warm days/night (days with maximum and minimum temperature higher than the 90th percentile of the daily distribution, i.e. TX90x and TN90p) and the warm spell duration index (WSDI) for 12 weather stations representative for the main cities along Italian Peninsula between 1979 and 2017. A nine circulation type classification (SAN09), specifically computed for surface temperature around Italian peninsula, is used to study the relationship between summer temperature extremes on regional scale and the frequency variations of atmospheric circulation types (CTs). SAN09 was achieved in a previous study through the COST733class-1.2 software package, by applying the SANDRA classification method to the daily geopotential height at 500hPa derived from the NCEP/NCAR Reanalysis-2 gridded dataset between 1979 and 2015. Either the minimum or the maximum temperature extremes show positive significant trends for more than a half of the stations, especially for the northern ones and for June. In addition, breakpoints often occur from the early 2000s, mainly for TX90p, and the frequency of summer WSDI mostly increases on northern Italy. Four CTs are the most frequent during summer (CT3, CT4, CT7 and CT9) and generally the African high (CT7) effectively contributes to temperature extremes all over Italy. The Azores high (CT4) mainly produces minimum temperature extremes (TN90p) on southern-central Italy and maximum temperature extremes (TX90p) on southern Italy. Azores high with lower values of geopotential height (CT3) is only effective on producing minimum temperature extremes on the majority of the cities of southern Italy. These results reflect the spatial and temporal varying response under different CTs due to its complex topography, latitudinal extension and its interaction with Mediterranean Sea. Seasonal trends in temperature extremes induced by African high (CT7) can be only partly explained by its increase in frequency, but rather by changing within type properties induced by other long-term climatic factors.