

Precipitation regime variations in the Black Sea coastal area and regional climate change over the last 30 years

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The Black Sea and Caucasus Mountain is the region with a wide range of extreme weather and climate events. For example, the extreme flood in coastal town Krymsk in 2012 was the deadliest meteorological disaster in Europe since the 1970s. Hence, the main purpose of our work is to select some key features of climate changes in the Black Sea coastal region focusing on precipitation characteristics and try to give a physical interpretation of these processes. We analyzed local station data, reanalysis and satellite products. Observations and reanalysis data showed a rather strong positive temperature trends, especially in summer. Mean daily precipitation and its intensity, however, exhibited a weak decrease.

Changes in temperature and precipitation are closely connected with changes in the atmospheric water cycle and dynamics. There are significant positive trends of moisture content in summer, especially over the Black Sea. Also, some regions experienced a more than doubling of convective available potential energy (CAPE) at last 30 years. But these changes have not been accompanied by precipitation amount or intensity increase. This suggests complex processes in precipitation regime.

A possible explanation of these results is related to changes in atmospheric circulation. We found significant trends of moisture flux divergence over the Black Sea. It suggests that the air convergence was decreasing in the analyzed coastal region over the last 30 years. Furthermore, the intensity of vertical movements decreased. Thus, the precipitation regime stability can be attributed to the changes of the atmospheric circulation characteristics, particularly large-scale overturning cells.

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