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Seesaw of Precipitation Variability over Anatolian Peninsula between LGM and Future Projections: A Possible Role of Wind Direction Change

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Turkey is a part of Eastern Mediterranean and located between 36-42° North latitudes and 26-45° East longitudes, where Europe meets Asia. The country, which mostly comprises the Anatolian Peninsula, is unique in terms of geographical position and topography and occupies a region which is highly sensitive to climate change. Considering that the region is prone to drying as a result of climate change, inferences about future precipitation patterns is of value.

Studies conducted by cosmogenic surface dating of boulder moraines revealed that, during Last Glacial Maximum (LGM; 21 Ka), the precipitation at the southwest of Anatolian Peninsula was higher than today, and at the northeast it was lower than today, which implies a regional heterogeneity. On the other hand, future projections of precipitation point out reverse conditions. That is, there will be lower (higher) than today precipitation at the southwest (northeast) of the country. Namely, a seesaw of precipitation variability prevails between cold climate of LGM and warm climate of future.

As a highland located at mid-latitudes, Anatolian Peninsula takes most of the precipitation during winter. What mainly drives the changes in winter precipitation is the changes in atmospheric circulation. Model simulations reveal a southward and northward displacement of polar jet stream and consistent shifts of storm tracks during LGM and in the future respectively. Knowing this fact, we investigated directions of winds which carry precipitation into Anatolian Peninsula, for the sake of explaining the dominant regional mechanism related to abovementioned seesaw pattern of precipitation.

We utilized monthly 850 hPa wind and precipitation data from the outputs of CCSM4.0 model of CMIP5 project and analyzed winds for past (LGM), present time and future conditions. Considering that it produces opposite conditions with comparable magnitudes with LGM, we used the RCP8.5 scenario. We found out that the 850 hPa winds entering from west into the peninsula are becoming more zonal (less tilted) as time passes from LGM to future. In other words, southwesterly winds evolve into westerly ones with a slight clockwise change of wind direction. This change considered together with orography of the peninsula explains the seesaw of precipitation variability over Anatolian Peninsula between cold and warm phases of global climate.