The 1960s climate shift: climate impact of North Atlantic cooling over Eurasia and North Africa Monsoons

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Motivated by prior modeling and observational considerations, we explore the observed signatures of a possible abrupt summertime climate shift over Eurasia and North Africa during the 1960's. Surface temperature, sea level pressure and precipitation are analyzed using the combined principal component analysis (CPCA) method. The leading principal components over the second half of the 20th century show a monotonic shift clearly dividing two states before and after the 1960's. The corresponding spatial patterns show relative cooling and pressure increase over Eurasia and North Africa, and rainfall reduction over the Sahel, South Asia and East Asia. The Sahel rainfall reduction during the 1960's marks the start of the pronounced Sahel Drought. Our results show that coincident rainfall shift occurred over South Asia and East Asia, and that the rainfall shift of all three regions was related to surface temperature and pressure changes in the interior of Eurasia and North Africa. Local circulation changes suggest the rainfall shift results from regional response of the summer monsoons. A similar CPCA analysis of atmospheric general circulation model simulations forced by 20th century observed forcings shows similar results to the observational analysis, and furthermore suggests that the origins of the climate shift resides in the sea surface temperature changes, in particular over the North Atlantic. This study highlights the possible control of North Atlantic sea surface temperatures over the Eurasian and North African monsoons, mediated through atmospheric teleconnections over continental Eurasia and North Africa.