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Variability of Central European Summer Precipitation forced by Sea Surface Temperature Gradients

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The amount of summer precipitation in the Alpine Region is found to show no linear trend whatsoever over the last 140 years. However, we found significant low frequency periodicity of the interannual variability summer precipitation which synchronizes with the Atlantic Multidecadal Oscillations periodicity of 50 years with a time lag of 17 years. Analyzing atmospheric circulation characteristics over the Alpine Region revealed a see-saw of enhanced/reduced meridional flow which alters the interannual variability of summer precipitation. The polar jet stream appears as a physical mechanism linking atmosphere and oceanic temperature gradients and the meridional/zonal circulation characteristics. Enhanced meridional flow over the Alps induced by a weak jet is increasing precipitation variability through positive soil moisture precipitation feedbacks on the regional scale, whereas enhanced zonal flow is generating less variability through constant moisture flow from the Atlantic and suppressed feedbacks with the land surface. The lagged response to the Atlantic Multidecadal Oscillation is rooted in the spatially inhomogeneous warming/cooling phases which are subject to distinct sea surface temperature gradient patterns.