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A methodology is presented that can be used for examining the relationship between teleconnections and extreme precipitation.

For this analysis, the frequency of extreme precipitation days in the Mediterranean basin is correlated with various indices such as those for the North Atlantic Oscillation (NAO) and El Nino/Southern Oscillation (ENSO). To evaluate dynamical processes, the teleconnection indices are also correlated with the frequency of extreme dynamic tropopause pressure and precipitable water days. The results suggest that wave breaking and large amplitude moisture transports (atmospheric rivers) are linked to the extreme precipitation events. With regard to North America, these findings suggest that wave breaking and perhaps atmospheric rivers associated with the MJO, PNA, and the NAO are linked to extreme precipitation events.

The relationship between tropical convection, the Pacific/North American (PNA) and NAO patterns, and possible connections to extreme events is examined. It is found that an active MJO phase 6,7,8 (Wheeler and Hendon 2004) is followed by the PNA+ and NAO- and an active MJO phase 2,3,4 if followed by the PNA- and NAO+. The link between the PNA+/NAO- (PNA-/NAO+) appears to occur through the stratosphere, i.e., the PNA+ (PNA-) constructively (destructively) interferes with the climatological stationary wave, leading to enhanced (reduced) vertical wave activity propagation, the excitation of the stratospheric NAO- (NAO+) which drives the tropospheric NAO- (NAO+). When the MJO is not active, different forms of anomalous tropical convection are followed either by the PNA- and NAO- or the PNA+ and NAO+, and the stratospheric polar vortex is not altered. These results suggest that both MJO and non-MJO tropical convection, and the state of the stratosphere may provide use information for the predictability of extreme events.

It is shown that an active MJO and an active ENSO, in various combinations of phases, can lead to large changes in the frequency of occurrence of the top and bottom terciles of 2m temperature. An analogous methodology is suggested for extreme events.

Lastly, topics for future research on extreme events are discussed.