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ENSO relationship to Summer Rainfall Variability and its Potential Predictability over Arabian Peninsula Region

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Summer seasonal rainfall falls mainly over the south and southwestern parts of the Arabian Peninsula (AP). The relationship between this mean summer seasonal rainfall pattern and El Niño Southern Oscillation (ENSO) is analyzed with the aid of a 15-member ensemble of simulations using the King Abdulaziz University (KAU) Atmospheric Global Climate Model (AGCM). Each simulation is forced with Hadley Sea Surface Temperature (SST) for the period 1980-2015. The southwestern peninsula rainfall is linked towith the SST anomalies in the central-eastern pacific region. This relation is established through an atmospheric teleconnection which shows an upper-level convergence (divergence) anomalies over the southern Arabian Peninsula compensating the central-eastern Pacific region upper-level divergence (convergence) anomalies for the warm (cold) El Niño Southern Oscillaton (ENSO) phase. The upper-level convergence (divergence) over the southern Arabian Peninsula leads to sinking (rising) motion, low-level divergence (convergence) and consequently to reduced (enhanced) rainfall. The correlation coefficient between the observed area-averged Niño3.4 index and athe South Arabian Rainfall Index (SARI) is -0.54. This indicates that AP receives less rainfall during the warm (El Niño) phase, while the opposite happens in the cold (La Niña) El Niño Southern Oscillaton (ENSO) phase. The lower tropospheric cyclonic circulation anomalies strongly modulate the ENSO-related rainfall in the region. Overall, the model shows a 43% potential predictability (PP) for the Southern Arabian Peninsula Rainfall Index (SARI). Further, the predictability during the warm ENSO (El Niño) events is higher than during cold ENSO (La Niña) events. This is not only because of a stronger signal, but also noise reduction contributes to the increase of the regional PP in El Niño compared to that of La Niña years.