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The Effect of ENSO Activity on Lower Stratospheric Water Vapor and Circulation

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Using the ECMWF reanalysis data, satellite observations from AURA MLS and Oceanic Niño Index (ONI) data, the effects of El Nin˜o and La Nin˜a events on the stratospheric water vapor changes are investigated. Overall, El Nin˜o events tend to moisten the lower stratosphere and La Nin˜a events do an opposite effect on the lower stratosphere. However, it is found that El Nin˜o events are likely to dry the middle stratosphere while La Nin˜a events have a moistening effect on the middle stratosphere. Further analysis showed that QBO tends to increase the magnitude of ENSO water vapor anomalies and enhance longitudinal contrasts of ENSO water vapor anomalies in the middle stratosphere. The effect of La Nin˜a events on the tropical upwelling is more significant than that of El Nin˜o events, particularly in the southern hemisphere tropics where La Nin˜a events can cause a significant 20% increase in the tropical upwelling. El Nin˜o/La Nin˜a events have a more significant effect on the Brewer-Dobson circluation in the northern/southern hemisphere extratropics than in the southern/northern hemisphere extratropics.