

# Dynamics of the ENSO impact on the tropical upwelling

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The impact of El Niño-Southern Oscillation (ENSO) on the tropical upwelling in the Upper Troposphere/Lower Stratosphere (UTLS) region is here investigated. Three configurations of the coupled model EC-ERTH3.1 have been used to assess the importance of a well resolved stratosphere in the ENSO-tropical upwelling relationship, i.e. L91 with top at 0.01hPa (FREE-HT), L62 with top at 5hPa (FREE-LT), and L91 with nudged stratosphere to climatology from 10hPa and upwards (NUDG). Model simulations are compared to JRA-55 and NCEP-NCAR reanalyses, yielding overall similar results. Our targets are the signal on temperature anomalies and changes in the upwelling of the Brewer-Dobson circulation (BDC). Results show that the three simulations capture the ENSO-related zonal-mean temperature anomaly signal, characterized by tropical warming in the UT and cooling in the LS during positive phases of ENSO. However, the NUDG run shows an unrealistic cooling in the LS consistent with an overestimated upwelling in that region. In the longitude-latitude plane, the ENSO-related temperature anomalies show strong zonal asymmetries. While diabatic heating occurs over the tropical Pacific, compensated diabatic coolings appear in the tropical Atlantic and in the Indo-Pacific region. The associated structures are tightly linked to the ENSO-induced, both local and remote, Gill-type responses, which extent well into the LS. Changes in wave activity crossing the UTLS are further assessed to investigate the changes in the BDC.

Key words: ENSO, upwelling, Brewer-Dobson circulation, teleconnections.