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Study of vertical distribution of temperature anomalies in the subtropical troposphere over Canary Islands

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The vertical distribution of temperature in the lower subtropical troposphere shows layers with high stability as result of different physical phenomena: inversion associated to the top of the marine boundary layer, trade wind inversion layer, 0ºC inversion layer, and inversion temperature observed during African air mass intrusions.

The main anomalies in the vertical distribution of temperature typically occur, over the subtropical ocean, between 1000 and 700 mb and have an important role in the local weather system and climate. CFAD (Countered Frequency by Altitude Diagram) for lapse rate shows a double structure in this pressure interval, with an enhanced stability at 900 and 800 mb levels. This double inversion temperature structure in the lower troposphere has not been well studied. It shows other significant features that suggest several physical mechanisms may be involved in its formation. Moreover, inspection of individual soundings reveals occurrence of temperature and specific humidity perturbations near the 0ºC level, associated directly and indirectly with melting process within stratiform rain regions. However, due to the low frequency of precipitation in the Canary Islands, the perturbations at 0ºC level are almost indiscernible in the mean. Another feature in the vertical distribution of temperature is related to enhanced stability layers observed around 500 mb during the summer time; these layers are related with the top of the Saharan Air Layer (SAL).

The goal of this study has been to analyze and characterize the seasonal variation of the different temperature inversions and the physical mechanisms associated with each inversion. For that, a set of 26 years of rawinsonde data at Tenerife Island has been used, analyzing the several inversion temperature layers found in each individual vertical profile.