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On the growth of the subtropical dipole mode in the South Atlantic

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Using observational data and outputs from an ocean general circulation model, the generation of the subtropical dipole mode in the South Atlantic is investigated. The subtropical dipole mode is the most dominant mode of interannual variability in the South Atlantic and its sea surface temperature (SST) anomaly shows a dipole pattern oriented in the northeast-southwest direction. Both positive and negative SST anomaly poles start to grow from austral spring, reach their peaks during summer, and decay during fall. To examine the evolution of these SST anomaly poles, the mixed-layer heat balance is calculated. The positive (negative) SST anomaly pole develops because the warming of the mixed-layer by the climatological shortwave radiation is enhanced (suppressed) by the thinner (thicker) mixed-layer than normal. This mixed-layer thickness anomaly is due to the suppressed (enhanced) latent heat flux loss associated with the variations in the subtropical high. This result is in contrast to the previous studies, which suggested that the latent heat flux anomalies directly cause the SST anomalies. The present study demonstrates that the interannual variations in the mixed-layer thickness play an important role in the growth of the subtropical dipole mode.