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The role of Angola-Benguela Current System in coastal temperature bias in Southeast Atlantic

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In most of the Coupled GCMs, even those with data assimilation, there is a strong warm SST bias core approximately located at 17o-18oS west of the African coast, and a warm SST bias band further to the south along coast. In this study, we analyzed the formation of these two bias regions by comparing HYCOM, SODA, NCEP/CFSR datasets and two ROMS simulations with the same configurations, lateral boundary conditions but different surface forcing. The results show that these along shore warm bias regions are due to different mechanisms. The warm bias core at 17o-18oS is due to incorrect southward shift of the Angola-Benguela (AB) front and the overshooting of the Angola warm current, which is possibly caused by the local negative wind stress curl. While the along coast warm bias band in the south is caused by the subsurface transport of an equatorial warm bias. The along coast subsurface temperature profiles revealed that largest temperature bias is at subsurface, which is actually originated in the equatorial Atlantic. As the simulated thermocline is too diffused in most of models, the warmer surface water in equatorial Atlantic is mixed downward to the subsurface, and carried southward by the Angola current. South of the AB front, the Angola current subducts and forms an undercurrent beneath the surface northward Benguela current. Then the warm bias in the undercurrent is brought to the surface by local coastal upwelling and wind induced mixing. It is proved that a stronger local wind, which induces a stronger upwelling and mixing, does not necessarily results in colder SST along the coast. This indicates the warm bias band is more a remotely forced phenomenon rather than a local one.