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Subtropical cyclone over the South Atlantic

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In the first week of March 2010, a surface cyclone developed on the coast of Brazil at approximately 19oS. This system showed an anomalous shift to the southwest until it reached the vicinity of the southern coast of the country, where it was absorbed by another cyclonic system and finally started to move to the southeast. This system was responsible for rain and strong winds that caused extensive damage in some coastal regions, such as floods and landslides. The aim of this study is to investigate the synoptic, dynamic and thermodynamic processes related to this cyclonic disturbance. The tridimensional structure of cyclone stages was evaluated through the Cyclone Phase Space (CPS) algorithm. The importance of each term of the vorticity and heat budgets was analyzed in each stage of its life cycle in order to identify the dominant processes responsible for the cyclonic and temperature trends. This analysis was made from a Lagrangian description, which allowed evaluating the average contribution of each term of the equations throughout the atmospheric column and at each stage of the cyclone. The spatial distribution of the terms in different levels of pressure was also evaluated. In the middle troposphere, there was a strong correlation between areas of cloud and areas of greatest diabatic heating, showing the temperature increase due to the effects of the release of latent heat through the condensation of water vapor. In the upper troposphere, it was found some regions where the convective processes could explain the observed vorticity imbalances. For other regions and levels at which there was no direct relationship between the residual fields, it is suggested that convection influences the local variations of vorticity in a more distributed way in the atmospheric column, as well as the divergence associated with the upward movements can be more distributed throughout the troposphere, without being concentrated at only some levels.