



## **Simulations of heavy rainfall events over Serra do Mar in Brazil**

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Four major precipitation events which caused generalized landslides in the Serra do Mar Hills are studied. These hills are located along the coastal region of Southeast Brazil, on the way between Rio de Janeiro and Sao Paulo, two major cities of the country. The Serra do Mar Hills hosts the remains of the native tropical forest, many chemical industries, long gas and chemical pipelines running along the hills, important roadways. These major events occurred in February 1967, January 1985, February 1988 and December 1999. The rainy season of the region starts in December and generally ends in March. The typical total precipitation amount for these cases were about 300 mm accumulated in 3 days, which corresponds approximately to the monthly total amount. The objective of this work is to investigate the causes for the large amount of precipitation by numerical simulations. The study used NCEP/NCAR reanalyses for identifying the atmospheric large scale conditions. High resolution simulations were performed using the Eta Model and the reanalyses data as the initial conditions and lateral boundaries. The large scale conditions were related to the South Atlantic Convergence Zone which remained in the region on average for 4 days. Short-waves approached the SACZ from the south, enhanced the low level convergence. The anticyclonic circulation to the rear of the SACZ produced flow in the direction perpendicular to the hills and the coastline. Sea breeze was strengthened by the anticyclonic circulation and resulted in upward motion over the mountains and the heavy rains. Verifications against surface observations and reanalyses data are shown. The 36-h simulations underestimated the intensity of the rains. Simulations at 10 and 5 km and with 38 and 50 vertical layer resolutions are shown. The increase of vertical resolution showed larger improvement to the simulations. Simulations showed sensitivity to

initial soil moisture.