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Short-range ensemble predictions based on convection perturbations in the Eta Model for the Serra do Mar region in Brazil

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The Southeast Brazil, in the coastal and mountain region called Serra do Mar, between Sao Paulo and Rio de Janeiro, is subject to frequent events of landslides and floods. The Eta Model has been producing good quality forecasts over South America at about 40-km horizontal resolution. For that type of hazards, however, more detailed and probabilistic information on the risks should be provided with the forecasts. Thus, a short-range ensemble prediction system (SREPS) based on the Eta Model is being constructed. Ensemble members derived from perturbed initial and lateral boundary conditions did not provide enough spread for the forecasts. Members with model physics perturbation are being included and tested. The objective of this work is to construct more members for the Eta SREPS by adding physics perturbed members. The Eta Model is configured at 10-km resolution and 38 layers in the vertical. The domain covered is most of Southeast Brazil, centered over the Serra do Mar region. The constructed members comprise variations of the cumulus parameterization Betts-Miller-Janjic (BMJ) and Kain-Fritsch (KF) schemes. Three members were constructed from the BMJ scheme by varying the deficit of saturation pressure profile over land and sea, and 2 members of the KF scheme were included using the standard KF and a momentum flux added to KF scheme version. One of the runs with BMJ scheme is the control run as it was used for the initial condition perturbation SREPS. The forecasts were tested for 6 cases of South America Convergence Zone (SACZ) events. The SACZ is a common summer season feature of Southern Hemisphere that causes persistent rain for a few days over the Southeast Brazil and it frequently organizes over Serra do Mar region. These events are particularly interesting because of the persistent rains that can accumulate large amounts and cause generalized landslides and death. With respect to precipitation, the KF scheme versions have shown to be able to reach the larger precipitation peaks of the events. On the other hand, for predicted 850-hPa temperature, the KF scheme versions produce positive bias and BMJ versions produce negative bias. Therefore, the ensemble mean forecast of 850-hPa temperature of this SREPS exhibits smaller error than the control member. Specific humidity shows smaller bias in the KF scheme. In general, the ensemble mean produced forecasts closer to the observations than the control run.