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Possible sources of forecast errors generated by the GRAPES model for landfalling tropical cyclones. Part I: initial uncertainties

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This paper investigates the possible sources of errors associated with tropical cyclone (TC) tracks that are forecast using the Global Assimilation and Prediction System (GRAPES). 72 h forecasts associated with sixteen landfalling TCs are studied. The GRAPES forecasts were made using the default initials (from the NCEP-FNL dataset) and the ECMWF initials, and are compared with ECMWF forecasts. Results showed that in most TCs, the GRAPES forecasts are improved when using ECMWF initials compared with the default initials. Compared with the ECMWF initials, the default initials have a lower intensity (based on the geopotential height and wind fields) for TCs and the subtropical high, but a higher intensity for the South Asia high and the monsoon trough, as well as a higher temperature, but lower specific humidity, at the TC centre. Replacement of the geopotential height and wind fields with the ECMWF initials in and around the TC centre at the initial time was found to be the most efficient way to improve the forecasts. In addition, those TCs that showed the greatest improvement in forecast accuracy usually had the largest initial uncertainties in TC intensity and were usually in the intensifying phase. The results demonstrated the importance of the initial intensity for the TC track forecasts made using the GRAPES model and indicate the model is better in describing the intensifying phase than describing the decaying phase of TCs. Finally, the limit of the improvement indicates that the model error associated with the GRAPES forecasts may be the main source of the poor forecasts of landfalling TCs. Thus, further examinations of the model errors are required.