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- Recent Final Revised Papers
- Volumes and Issues**
- Special Issues
- Library Search
- Title and Author Search

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Submission

Review

Production

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[Volumes and Issues](#) [Contents of Issue 9](#) [Special Issue](#)

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CUACE/Dust – an integrated system of observation and modeling systems for operational dust forecasting in Asia

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Abstract. An integrated sand and dust storm (SDS) forecasting system – CUACE/Dust (Chinese Unified Atmospheric Chemistry Environment for Dust) has been developed, which consists of a comprehensive dust aerosol module with emission, dry/wet depositions and other atmospheric dynamic processes, and a data assimilation system (DAS) using observational data from the CMA (China Meteorological Administration) ground dust monitoring network and retrieved dust information from a Chinese geostationary satellite – FY-2C. This is the first time that a combination of surface network observations and satellite retrievals of the dust aerosol has been successfully used in the real time operational forecasts in East Asia through a DAS. During its application for the operational SDS forecasts in East Asia for spring 2006, this system captured the major 31 SDS episodes observed by both surface and satellite observations. Analysis shows that the seasonal mean threat score (TS) for 0–24 h forecast over the East Asia in spring 2006 increased from 0.22 to 0.31 by using the DAS, a 41% enhancement. The time series of the forecasted dust concentrations for a number of representative stations for the whole spring 2006 were also evaluated against the surface PM₁₀ monitoring data, showing a very good agreement in terms of the SDS timing and magnitudes near source regions where dust aerosols dominate. This is a summary paper for a special issue of ACP featuring the development and results of the forecasting system.

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