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The Chemistry CATT-BRAMS model (CCATT-BRAMS 4.5): a regional atmospheric model system for integrated air quality and weather forecasting and research

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Abstract. Coupled Chemistry Aerosol-Tracer Transport model to the Brazilian developments on the Regional Atmospheric Modeling System (CCATT-BRAMS, version 4.5) is an on-line regional chemical transport model designed for local and regional studies of atmospheric chemistry from the surface to the lower stratosphere suitable both for operational and research purposes. It includes gaseous/aqueous chemistry, photochemistry, scavenging and dry deposition. The CCATT-BRAMS model takes advantage of BRAMS-specific development for the tropics/subtropics as well as the recent availability of preprocessing tools for chemical mechanisms and fast codes for photolysis rates. BRAMS includes state-of-the-art physical parameterizations and dynamic formulations to simulate atmospheric circulations down to the meter. This on-line coupling of meteorology and chemistry allows the system to be used for simultaneous weather and chemical composition forecasts as well as potential feedback between the two. The entire system is made of three preprocessing software tools for user-defined chemical mechanisms, aerosol and trace gas emissions fields and the interpolation of initial and boundary conditions for meteorology and chemistry. In this paper, the model description is provided along with the evaluations performed by using observational data obtained from ground-based stations, instruments aboard aircrafts and retrieval from space remote sensing. The evaluation accounts for model applications at different scales from megacities and the Amazon Basin up to the intercontinental region of the Southern Hemisphere.

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