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Cloud model simulation of dynamical processes atop pyrocumulonimbus

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Significant number of fire events occurring globally from recent satellite observations has alerted the scientific community that fire may play an important role in the global climate and atmospheric chemical processes that is larger than previously thought. A notable example is the fire event in Russia in 2010. It is therefore of importance to understand how these fire events transport materials to various parts of the atmosphere. This paper will focus on the cloud top process of pyrocumulonimbus which is a deep convective cloud either induced or enhanced by the ground fire.

We will use a three-dimensional nonhydrostatic cloud model to simulate the cumulonimbus development using soundings derived from observed fire events. Our focus will be on the dynamics so no chemical transport will be studied but the distributions of an inert tracer will be used as a surrogate to represent the possible distribution of non-reactive species (such as CO) in and around the pyroCb. We will compare the profiles of the tracer with that of water substance to understand the role of condensation in the transport process. We will also show the cross-tropopause transport of these species and identify cloud top features that may be useful for remote sensing studies.