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Cloud-scale modelling of the impact of deep convection on the fate of oceanic bromoform in the troposphere: a case study over the west coast of Borneo

Paul D. Hamer[1,2], Virginie Marécal[2], Ryan Hossaini[3], Michel Pirre[4,☆], Gisèle Krysztofiak[4], Franziska Ziska[5], Andreas Engel[6], Stephan Sala[6], Timo Keber[6], Harald Bönisch[6], Elliot Atlas[7], Kirstin Krüger[8], Martyn Chipperfield[9], Valery Catoire[4], Azizan A. Samah[10,11], Marcel Dorf[12], Phang Siew Moi[11], Hans Schlager[13], and Klaus Pfeilsticker[14]

[1]Norwegian Institute for Air Research (NILU), Kjeller, Norway
[2]Centre National de Recherches Météorologiques, Université de Toulouse, Météo-France, CNRS, Toulouse, France
[3]Lancaster Environment Centre, Lancaster University, Lancaster, LA1 4YQ, UK
[4]Laboratoire de Physique et Chimie de l'Environnement et de l'Espace, CNRS and University of Orléans, UMR7328, Orléans, France
[5]GEOMAR Helmholtz Centre for Ocean Research Kiel, Kiel, Germany
[6]Institute for Atmospheric and Environmental Sciences, University of Frankfurt, Altenhöferallee 1, 60438 Frankfurt, Germany
[7]University of Miami, 4600 Rickenbacker Causeway, Miami, FL 33149, USA
[8]Department of Geosciences, University of Oslo, Postboks 1022, Blindern, 0315 Oslo, Norway
[9]School of Earth and Environment, University of Leeds, Leeds, UK
[10]National Antarctic Research Centre, University of Malaya, Kuala Lumpur 50603, Malaysia
[11]Institute of Ocean and Earth Sciences, University of Malaya, 50603 Kuala Lumpur, Malaysia
[12]Department of Atmospheric Chemistry, Max Planck Institute for Chemistry, Mainz, Germany
[13]Institut für Physik der Atmosphäre, Deutsches Zentrum für Luft- und Raumfahrt (DLR), Atmosphärische Spurenstoffe, Münchner Straße 20, 82234 Oberpfaffenhofen-Wessling, Germany
[14]Institute of Environmental Physics, Ruprecht-Karls-Universität Heidelberg, Im Neuenheimer Feld 229, 69120 Heidelberg, Germany
☆retired

Correspondence: Paul D. Hamer (paul.hamer@nilu.no)

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Abstract. This paper presents a modelling study on the fate of $CHBr_3$ and its product gases in the troposphere within the context of tropical deep convection. A cloud-scale case study was conducted along the west coast of Borneo, where several deep convective systems were triggered on the afternoon and early evening of 19 November 2011. These systems were sampled by the Falcon aircraft during the field campaign of the SHIVA project and analysed using a simulation with the cloud-resolving meteorological model C-CATT-BRAMS at 2×2 km resolution that represents the emissions, transport by large-scale flow, convection, photochemistry, and washout of $CHBr_3$ and its product gases (PGs). We find that simulated $CHBr_3$ mixing ratios and the observed values in the boundary layer and the outflow of the convective systems agree. However, the model underestimates the background $CHBr_3$ mixing ratios in the upper troposphere, which suggests a missing source at the regional scale. An analysis of the simulated chemical speciation of bromine within and around each simulated convective system during the mature convective stage reveals that $> 85\,\%$ of the bromine derived from $CHBr_3$ and its PGs is transported vertically to the point of convective detrainment in the form of $CHBr_3$ and that the remaining small fraction is in the form of organic PGs, principally insoluble brominated carbonyls produced from the photo-oxidation of