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Global Gridded Emission Inventories of Pentabrominated Diphenyl Ether (PeBDE)

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Polybrominated diphenyl ethers (PBDEs) are flame retardants widely used in many everyday products such as cars, furniture, textiles, and other electronic equipment. The commercial PBDEs have three major technical mixtures: penta-(PeBDE), octa-(OBDE) and decabromodiphenyl ethers (DeBDE). PeBDE is a mixture of several BDE congeners, such as BDE-47, -99, and -100, and has been included as a new member of persistent organic pollutants (POPs) under the 2009 Stockholm Convention.

In order to produce gridded emission inventories of PeBDE on a global scale, information of production, consumption, emission, and physiochemical properties of PeBDE have been searched for published papers, government reports, and internet publications. A methodology to estimate the emissions of PeBDE has been developed and global gridded emission inventories of 2 major congener in PeBDE mixture, BDE-47 and -99, on a 1 degree by 1degree latitude/longitude resolution for 2005 have been compiled. Using these emission inventories as input data, the Canadian Model for Environmental Transport of Organochlorine Pesticides (CanMETOP) model was used to simulate the transport of these chemicals and their concentrations in air were calculated for the year of 2005. The modeled air concentration of BDE-47 and -99 were compared with the monitoring air concentrations of these two congeners in the same year obtained from renowned international/national monitoring programs, such as Global Atmospheric Passive Sampling (GAPS), the Integrated Atmospheric Deposition Network (IADN), and the Chinese POPs Soil and Air Monitoring Program (SAMP), and significant correlations between the modeled results and the monitoring data were found, indicating the high quality of the produced emission inventories of BDE-47 and -99.

Keywords: Pentabrominated Diphenyl Ether (PeBDE), Emission Inventories, Global, Model