The first version of BETR-Global 2.0 was developed and tested in Visual Basic for Applications (MacLeod et al., 2011). A new algorithm for tracking chemical mass transfer fluxes throughout the simulation has been added. Some of the chemical fate process descriptions have been modified. Environmental databases that describe global atmospheric and oceanic flows, including nomenclature of its 288 model regions, have been updated. MacLeod et al. (2011) developed and tested global fate model implemented in Visual Basic for Applications (MacLeod et al., 2011). BETR-Research was developed by re-implementing BETR-Global 2.0 in the Python programming language. The purpose of this re-implemented version was to create a more flexible modeling platform using BETR-Global’s model structure and taking advantage of efficient numerical packages in Python. In recent years, BETR-Research model source code has gone through several important modifications that led to the new version: BETR-Research 3.0.

**Main New Features in BETR-Research 3.0**

- BETR-Research 3.0 can run global model simulations in spatial resolutions of 15°×15°, 7.5°×7.5° and 3.75°×3.75°.
- Environmental datasets that describe global atmospheric and oceanic flows, and climate properties have been updated; and now interannual variability can be accounted for.
- Some of the chemical fate process descriptions have been modified.
- A new algorithm for tracking chemical mass transfer fluxes throughout the simulation has been added.
- A fast differential equation solver library to be used in dynamic model simulations has been integrated to the model code.
- There are options for quantifying the contribution of secondary emissions to atmospheric concentrations.

**OBJECTIVE**

We demonstrate BETR-Research 3.0 by simulating the global distribution of two polychlorinated biphenyls (PCB28 and PCB153). This model application was used to verify the implementation and new process descriptions in the new version, and to establish that the high-resolution environmental data set is ready for use in future BETR-Research global modeling studies.

**Global-Scale Multimedia Chemical Fate Modeling in High Spatial Resolution**

The global distribution of PCB28 and PCB153 have been simulated by BETR-Research 3.0. The seasonal variation in the estimated emissions of PCBs were incorporated by considering the temperature dependence of the primary passive volatilization sources (main emission sources) by assuming that the strength of the primary passive volatilization process is proportional to the vapor pressure of the PCB congener (Lamont et al., 2009). The seasonal variation in the estimated emissions of PCBs were incorporated by considering the temperature dependence of the primary passive volatilization sources (main emission sources) by assuming that the strength of the primary passive volatilization process is proportional to the vapor pressure of the PCB congener (Lamont et al., 2009). The seasonal variation in the estimated emissions of PCBs were incorporated by considering the temperature dependence of the primary passive volatilization sources (main emission sources) by assuming that the strength of the primary passive volatilization process is proportional to the vapor pressure of the PCB congener (Lamont et al., 2009).

**Comparison of Base Resolution and High Resolution Simulation Results**

The global distribution of PCB28 and PCB153 have been simulated by BETR-Research 3.0. The PCB emission estimates were obtained through Breivik et al.’s (2007) study that provides spatially resolved annual atmospheric emission estimates for PCBs on a 1°×1° grid between 1930 and 2100. The emission estimate data sets were downloaded from http://www.nilu.no/projects/global/global32.htm. The seasonal variation in the estimated emissions of PCBs were incorporated by considering the temperature dependence of the primary passive volatilization sources (main emission sources) by assuming that the strength of the primary passive volatilization process is proportional to the vapor pressure of the PCB congener (Lamont et al., 2009). The seasonal variation in the estimated emissions of PCBs were incorporated by considering the temperature dependence of the primary passive volatilization sources (main emission sources) by assuming that the strength of the primary passive volatilization process is proportional to the vapor pressure of the PCB congener (Lamont et al., 2009). The seasonal variation in the estimated emissions of PCBs were incorporated by considering the temperature dependence of the primary passive volatilization sources (main emission sources) by assuming that the strength of the primary passive volatilization process is proportional to the vapor pressure of the PCB congener (Lamont et al., 2009). The seasonal variation in the estimated emissions of PCBs were incorporated by considering the temperature dependence of the primary passive volatilization sources (main emission sources) by assuming that the strength of the primary passive volatilization process is proportional to the vapor pressure of the PCB congener (Lamont et al., 2009).

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