

Review: Population and Cropland

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It is impossible to determine the distribution of chemical emissions exactly where they are emitted on a global level. It will be very useful, however, if emission data based on countries can be distributed among their proper areas instead of the entire nation. In other words, proper surrogate data are needed to allocate the emissions of chemicals.

There are two surrogate datasets currently being distributed by GEIA: gridded global population distribution in 1990 and gridded global cropland rate for 1990. The population dataset has been used for allocating anthropogenic emissions for many species, such as SO_x, NO_x, Greenhouse Gases, reactive chlorines, and heavy metals. The gridded cropland dataset has been the most common surrogate data for allocating chemicals used on agricultural soil, such as pesticides (Li et al. 1996; 1999; 2000; 2001a,b; Li, 1999a, 2001).

It is quite difficult to give a quantitative estimate for the uncertainty of the population data. Nevertheless, three ranks (best, good, and poor) were assigned to each country according to the sources of the data and the size of the country (Li, 1996). These uncertainties will be added to the overall error of the emission data if the population dataset is used as the surrogate.

In comparison to the population data, the gridded cropland dataset has much higher quality, since it was produced from an advanced very high resolution radiometer (AVHRR) global land dataset with 1x1 km resolution (Li, 1999a). The uncertainty due to this dataset is almost ignorable since uncertainty caused by other factors is usually far greater. For example, the pesticide usage data collected to produce the emission inventories vary in quality among different countries and show large spatial and temporal gaps, and linear interpolation has been introduced to fill those data gaps. Obviously, this introduces a high degree of uncertainty into the emission inventories of pesticides (Li 1999a, b; Li et al., 2000).

References

- Li, Y. F., 1996, "*Global Population Distribution Database*", Report to the United Nations Environment Programme under UNEP Sub-Project Number FP/1205-95-12, Canadian Global Emissions Inventory Centre, Atmospheric Environment Service, Environment Canada, 4905 Dufferin St., Downsview, Ontario, M3H 5T4, Canada, March 1996.
- Li, Y.F., 1999a, "*Global gridded technical hexachlorocyclohexane usage inventory using a global cropland as a surrogate*", **J. Geophys. Res.** 104, D19, 23,785-23,797
- Li, Y. F., 1999b, "*Global Technical Hexachlorocyclohexane usage and its contamination consequences in environment: from 1948 to 1997*", **Sci. Total. Environ.** 232, 123-160, **Review Paper.**
- Li, Y.F., 2001, "*Toxaphene in the United States: (1) Usage gridding*", **J. Geophys. Res.** 106, D16, 17,919-17,927.

- Li, Y. F., McMillan, A., and Scholtz, M. T., 1996, "*Global HCH usage with 1°X1° longitude/latitude resolution*", **Environmental Science & Technology**, Vol. 30, 3525-3533.
- Li, Y. F., Cai, D.J., and Singh, A., 1999, "*Historical DDT use trend in China and usage data gridding with 1/4° by 1/6° longitude/latitude resolution*", **Advances in Environmental Research**, 2, 497-506
- Li, Y. F., M. T. Scholdz, and B.J. van Heyst, 2000, "*Global gridded emission inventory of α -hexachlorocyclohexane*", **J. Geophys. Res.**, 105, D5, 6621-6632.
- Li, Y. F., D. J. Cai, Z. J. Shan, and Z. L. Zhu, 2001a, "*Gridded usage inventories of technical hexachlorocyclohexane and lindane for China with 1/6° latitude by 1/4° longitude resolution*" **Archives of Environmental Contamination and Toxicology**, 41, 261-266
- Li, Y.F., Bidleman, T.F., and Barrie, L.A., 2001b, "*Toxaphene in the United States: (2) Emissions and Residues*

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