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Software testing a library and RESTful application programming interface for ecological pesticide risk assessment models

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A software library and RESTful application programming interface for ecological pesticide risk assessment models

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Abstract: The Environmental Protection Agency (EPA) registers pesticides for use in the United States under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Before a pesticide can be registered, the EPA must assess whether the pesticide can be used without being harmful to humans or posing unreasonable adverse environmental effects. We present a set of ecological risk assessment models commonly used as part of the FIFRA registration process as a software library available via GitHub (https://github.com/quanted/pram_flask/). These mathematical models predict fate, transport and exposure of pesticides in different media and are designed to be protective of non-target ecological species. Some algorithms in this set have been in use since the 1980s, with a wide range of algorithmic complexity and technical implementation from Fortran executables to Microsoft Excel spreadsheets. We have modernized these models to create an integrated package that shares a common architecture, development patterns and allows for interoperability between model components. This integration is able to leverage relevant spatial information, chemical properties, ecological exposure parameters, pesticide use properties, and effects data in the context of registration decisions. Additionally, we expose the individual models as RESTful application programming interface (API) endpoints to allow for the construction of web-based applications. The open source library and the API combine to enable the spatial scaling of assessments and the construction of efficient decision support systems for regulatory use.

Keywords: risk assessment, interoperability, application programming Interface, pesticides