WHY MODELLERS WANT YOUR DATA

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Abstract

Assessing dosimetric impact to human populations (as well as to ecosystems) due to radionuclides in the environment, for example following atmospheric releases from nuclear accidents, is based, when it is modelled, on simulations of multi-media transfers in the environment. Such operational models are based on numerous parameters, all the more numerous that there are many transfer processes, and many chemical elements, even in the simplest and most parsimonious approaches (e.g. with empirical equilibrium-based parameters: partition coefficients, concentration ratios, transfer factors…). Scarcity of related data is well known to be one of the major sources of uncertainty (Hinton et al, 2013). Beyond acquisition of new data, let us ask a methodological question: how to take as much information as possible from all existing data to better parameterize the transfer models? Our proposal is that radioecology may benefit from applying modern and advanced statistical methods for (re-) evaluating existing data. Thus, modellers can offer a "second life" to data, by further exploiting them in meta-analyses. This can be done using values available in publications but is usually more effective from direct use of underlying raw data and associated information.

This is illustrated through the characterisation of uncertainties relative to dry interception of radionuclides by leafy vegetables (Sy et al., in revision). The data collection focused on dry interception by the leaves of crops, more specifically, pasture grass and vegetables, measured at harvest after a dry deposit of radionuclides (whatever their physical form) and with a short deposition-harvest delay (2 days maximum). Thirty-one data were extracted from 2 scientific papers (Chamberlain and Garland, 1991; Watterson and Nicholson, 1996) and 114 were extracted from IRSN reports associated with published papers. The direct use of the IRSN reports ("grey literature") rather than of the corresponding publications enabled the access to raw data, whereas in most cases only averages and standard deviations are available in publications. A Bayesian meta-analysis was performed to analyse the uncertainty about a model of the intercepted fraction as a function of biomass, given the collected data. It results in a more robust deterministic estimation of the parameter, in this case the interception fraction. Moreover, the subsequent probability distributions can be directly used as input in impact assessment models to propagate parametric uncertainty.

Similar works are on-going for other parameters of the foliar pathway, wet interception, and field losses (weathering), and parameters characterizing the transfer to animal products.