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Long-term simulation of dissolved ^{90}Sr flux and stream discharge at a small catchment in the Chernobyl Exclusion Zone using ^{90}Sr and water mass balance models

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The strontium 90 (^{90}Sr), which is released into the environment from the Chernobyl accident derived fuel particle, is one the most important radionuclide at the river water system in the Chernobyl Exclusion Zone (CEZ). The main long-term source of exchangeable and available ^{90}Sr in the environment of CEZ is the gradually dissolving micron-size "fuel particles" of the accidental release from the Chernobyl accident (26/04/1986), formed by the mechanical destruction of nuclear fuel. Previous studies have shown that the ^{90}Sr is transported through the stream water as the dissolved phase, and the tight coupling between the dissolved ^{90}Sr concentration and the water discharge rate. Long-term trend of dissolved ^{90}Sr concentration in the river water have been expressed by the exponential models and parametric hydrochemical models. On the other hand, it is necessary to describe the dynamics of ^{90}Sr as the mass-balance equation, for the further understanding of ^{90}Sr in the environment. Therefore, the primary objective is to describe the dynamics of ^{90}Sr in the river water system using ^{90}Sr and water mass balance equations. We used a combination of log-term field observations and hydrological model simulations. The hydrological model comprises a snow model, transpiration model and a watershed hydrologic model. The ^{90}Sr flux model linked the discharge rate via a hydrochemical parameterization scheme. The model was validated against field measurements taken small catchment inside the CEZ. The ?hydrological model, which is forced observed daily precipitation and daily average temperature, reproduced the measured snowdepth and discharge rate well. The agreement of modeled ^{90}Sr concentration and ^{90}Sr flux were scatter compared to that of discharge rate. This is the first to combined the ^{90}Sr mass balance equation and hydrological model to simulate long-term trend of ^{90}Sr flux through the small river from CEZ.