

Spatial Distribution of Soil Contamination by ^{137}Cs and $^{239,240}\text{Pu}$ in the Village of Dolon Near the Semiplatinsk nuclear Test Site : New Information on Traces of The Radioactive Plume From the 29 August 1946 Nuclear Test

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| メタデータ | 言語: eng 出版者: 公開日: 2017-10-05 キーワード (Ja): キーワード (En): 作成者: メールアドレス: 所属: |
| URL | http://hdl.handle.net/2297/16987 |

SPATIAL DISTRIBUTION OF SOIL CONTAMINATION BY ^{137}Cs AND $^{239,240}\text{Pu}$ IN THE VILLAGE OF DOLON NEAR THE SEMIPALATINSK NUCLEAR TEST SITE: NEW INFORMATION ON TRACES OF THE RADIOACTIVE PLUME FROM THE 29 AUGUST 1949 NUCLEAR TEST

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The village of Dolon located about 60 km northeast from the border of the Semipalatinsk Nuclear Test Site in Kazakhstan is one of the most affected inhabited settlements as a result of nuclear tests by the former USSR. Radioactive contamination in Dolon was mainly caused by the first USSR nuclear test on 29 August 1949. As part of the efforts to reconstruct the radiation dose in Dolon, ^{137}Cs and $^{239,240}\text{Pu}$ in soil samples collected from 26 locations in the vicinity of and within the village were measured to determine the width and position of the center-axis of the radioactive plume that passed over the village from the 29 August 1949 nuclear test. Measured soil inventories of ^{137}Cs and $^{239,240}\text{Pu}$ were plotted as a function of the distance from the supposed center-axis of the plume. A clear shape similar to a Gaussian function was observed in their spatial distributions with each maximum around a center-axis.

It was suggested that the plume width that contaminated Dolon was at most 10 km and the real center-axis of the radioactive plume passed 0.7-0.9 km north of the supposed centerline.

A peak-like shape with the maximum near the center-axis was also observed in the spatial distribution of the $^{239,240}\text{Pu}/^{137}\text{Cs}$ activity ratio, which may reflect the fractionation effect between $^{239,240}\text{Pu}$ and ^{137}Cs during the deposition process. These results support the results reported recently by Stepanenko et al.(2006). The data obtained here will provide useful information on the efforts to estimate radiation dose in Dolon as reliably as possible.

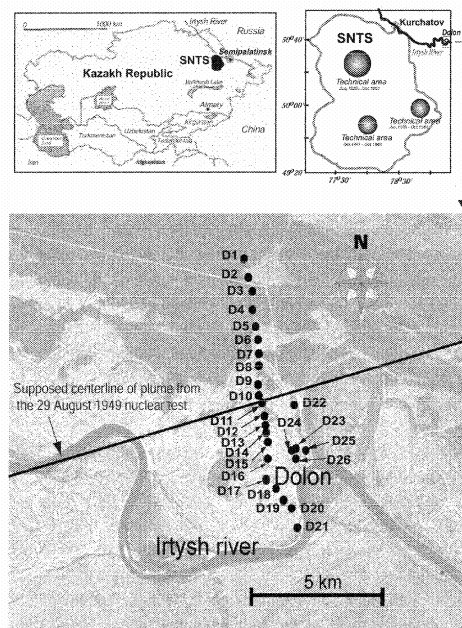


Fig.1 Sampling points of soil in Dolon Village

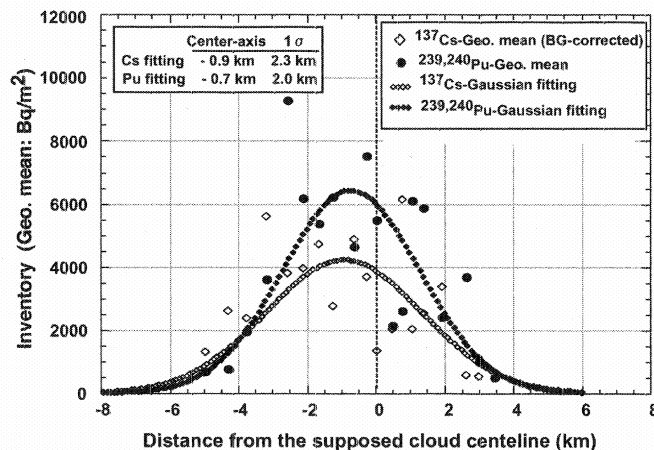


Fig.2 Spatial distributions of geometric means for BG-corrected ^{137}Cs and $^{239,240}\text{Pu}$ inventories in soil samples from 19 locations along the line perpendicularly crossing the supposed centerline.