



## **Mapping of cesium fallout in Norway from the Chernobyl accident using airborne gamma-ray spectrometry: Validation against ground and in situ measurements and stitching of old and new data**

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Many anthropogenic radio-nuclides were released in the environment after the 1986 Chernobyl accident in Ukraine. Many areas in Ukraine, Russia and European countries received the fallout due to prevailing wind direction after the nuclear accident. Norway and Sweden also received a significant amount of the fallout. Most of short-lived radio-nuclides (including Cs-134, I-131 etc.) disintegrated into stable isotopes however Cs-137 with a half-life period ca. 30 years is still present in significant amount in different areas of Norway.

Airborne gamma-ray spectrometry detects gamma rays emitted from Cs-137 and maps high cesium areas very effectively. A systematic airborne survey in 2011 with 1 km flight line spacing in Jotunheimen, Norway showed high Cs areas with ca. 70 kBq/m<sup>2</sup>. Ground truthing with hand-held measurement and analyses of soil samples in the laboratory from 2012 revealed that airborne measurements underestimated the cesium deposition by a factor close to two. A calibration survey performed in 2015 to recalculate the sensitivity coefficients for cesium and re-processing of the gamma-ray spectra bring the cesium deposition values calculated from airborne measurements very close to the cesium deposition values shown by the ground measurements. An airborne radiation measurement with typical flight height of 60 m and flying speed of 100 km/h has a footprint in the shape of an oval with major and minor axes of 150 m and 120 m, respectively. Therefore, it shows an average deposition from a rather large area in comparison to ground and in situ measurements. Individual soil cores between 2011-2016 report a deposition level ranging from 0 to 1 MBq/m<sup>2</sup>.

Full spectra of gamma-rays from airborne surveys as old as in 90s are recovered and reprocessed with new sensitivity coefficients to match with recently collected airborne data. The old and new airborne surveys data from years 1988-2015 are stitched together to show deposition level of cesium from large areas of Trøndelag and other areas in Norway.