

## Edo-period lead smelting at Tateyama: Pb isotope evidence from Midagahara peat sediment, Mt. Tateyama

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The studied Midagahara areas are between ~1600 and ~1900 m in elevation, Mt. Tateyama. The Midagahara wetland became part of the Ramsar Convention on Wetlands of International Importance, especially as a Waterfowl Habitat in 2012. Midagahara Peat sediment was formed during the Holocene, and thus it will be an ideal archive for recording anthropogenic influence and Holocene climate.

We collected the peat core, named MDG-OWK12, from the Midagahara wetland in 2012. The peat core was about 60 cm long, and is intercalated with K-Ah tephra (~7300 BP yr) at ~51 cm core depth. Age model for the core was constructed by eleven <sup>14</sup>C dates of total organic carbon and the K-Ah tephra. The sediments were subsampled at 0.5 cm thick, and we analyzed major and minor elements for all subsamples and Pb isotopes for 40 samples. Further, we also measured Pb isotopes of dust samples collected from Mt. Tateyama and Toyama city, slag samples collected from Kamegai and Hachibuse Mountain, and *Athyrium yokoscense* from Kamegai and Hachibuse Mountain. Pb isotopes were measured by a MC-ICP-MS (Neptune Plus, Thermo Fisher) at RIHN.

We found the peat sediments are marked by two intervals with high Pb contents (> 50 μg/g). The <sup>206</sup>Pb/<sup>204</sup>Pb ratios in the upper interval (0–6.5 cm depth) with high Pb contents ranged from 18.0530 to 18.3393. The upper part of the peat sediments was almost identical to the <sup>206</sup>Pb/<sup>204</sup>Pb ratio of dust samples collected from Mt. Tateyama and Toyama city. Given the similar higher Pb contents are documented from all over the world, the upper interval with high Pb contents should be the anthropogenic Pb pollution by a global usage of coal, oil, and leaded gasoline from 20th century. In contrast, the lower interval with high Pb content (up to 450 μg/g) was observed during the Edo period, and not found globally. The <sup>206</sup>Pb/<sup>204</sup>Pb ratios during this period were very uniform (<sup>206</sup>Pb/<sup>204</sup>Pb = 18.3083±0.0146), suggesting a single source for Pb.

In Toyama, there were Au-Pb mine at Kamegai and Hachibuse Mountain, which are located ~17 km west from the Midagahara wetland. These mines were operated from AD ~1600 year since the Edo period. We found that the <sup>206</sup>Pb/<sup>204</sup>Pb ratio of slag sample collected at Kamegai was almost identical with that of peat sediments during the Edo-period. This finding highlights the high Pb contents of the peat formed at the Edo period should be attributed to Pb pollution due to lead smelting at Kamegai area.

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