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# Estimation of the springwater origin of Kushiro-moor using oxygen and hydrogen stable isotopic ratios

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Kushiro-moor is the greatest important moor in Japan with a valuable living thing such as endangered plant and inhabits. The Kushiro-moor has some springs, and then even cold winter, river water does not froze around the spring and Grus japonensis can pass the winter. It is reported that the great portion of moor water derived from spring water. Therefore, in order to preserve moor, a wide water cycle including the catchment of spring was necessary.

The purpose of this study was grasping the water cycle of the Kushiro-moor using oxygen and a hydrogen stable isotope ratio. Flow analysis of the groundwater at the Kushiro area was performed using the 3-dimensional advection diffusion analysis software ,G-TRAN/3D for Dtransu-3D.

There are some catchment areas for springs in the Kushiro-moor from the analyzed results. The springs with -10.0 permil for delta-$^{18}$O along the upper stream of Chiruwatunai river was thought to de derived from areas at the north of 10~20km of the Kushiro-moor estimating from the delta-$^{18}$O distribution. The springs with -8.0 permil for delta-$^{18}$O along the upper stream of Chiruwatunai river was thought to de derived from areas at the southeast of the Kushiro-moor estimating from the delta-$^{18}$O distribution. The springs with -8.5 permil for delta-$^{18}$O near the Kirakotan cape was thought to de derived from the Taro lake area at the east of the Kushiro-moor estimating from the delta-$^{18}$O distribution.

On the other hand, the spring with -7.0 permil for delta-$^{18}$O along the down stream of Chiruwatunai river was found but water with with -7.0 permil for delta-$^{18}$O out side of the Kushiro-moor was not found. However, river water at the south area of the Kushiro-moor does not reach -7.0 permil but show high delta-$^{18}$O values. The groundwater around the Kushiro-moor was estimated to flow into the center of the Kushiro-moor by flow analysis and then west, north and east areas surrounding the Kushiro-moor were thought to be all catchment area for springs. Therefore, the high delta-$^{18}$O spring in the Kushiro-moor also was thought to be derived from area at the south of the Kushiro-moor.

Keywords: Oxygen isotopic ratio, Kushiro-moor, Springwater, Flow analysis