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# Climate changes of the central Japanese Alpine area deduced from a modern analog method applied to the pollen compositio

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Among the various proxies of paleoclimate used in the world, the modern analog method (Polygon 1.5) for pollen composition proposed by Nakagawa et al. (2003) is an excellent way to estimate meteorological factors such as annual temperatures (degree) or precipitation (mm/y) in the Japanese islands. We tried to convert the pollen data taken from the lakes or morass in central Japan over several to a few tens thousands years ago using Polygon 1.5. The major data source is the pollen composition analyzed on the NJ88 core from Lake Nojiri.

Lake Nojiri at the northernmost part of Nagano Prefecture is an oligotrophic lake ( 4.6km2), surrounded by the cool-temperate deciduous broadleaved trees. Annual mean temperature is 9.2 degree, and annual precipitation is 1262 mm (AMeDAS: Shimanomachi, AD1979-2010). A scientific boring core named NJ88 was taken at 28 m deep off Biwa-jima in Lake Nojiri, and is composed homogenous silty clay with many thin layers of marker tephra, which enable age estimation of the core. The base of NJ88 core analysis is as old as 72 ka, and the time resolution analysis is about 80 year on average.

The reconstructed annual temperature in 72˜60 ka, is about 2.2 ˜ 5.0 degree, suggesting very cold climate in MIS 4. That in 60˜30 ka varies from 2.7 to 12 degree, showing general coolness with many abrupt warm intervals in MIS 3. The annual temperature in 30 - 15 ka is constantly as low as 2.7 degree, corresponding to the LGM of the coldest climate. During 15 to 11 ka, annual temperature shows a quick warming, that is, from 3.0 to 13 degree. Climate in 11 - 3 ka, is temperate. On the one hand, the reconstructed annual precipitation has a similar tendency to the temperate various. Reconstructed temperature and precipitation of the Holocene are almost same with the modern observation at Shinanomachi.

The temporal changes of TOC and TN amount analyzed on the NJ88 and NJ95 cores in Lake Nojiri, which imply winter temperature via biological productivity, show good correspondence to the reconstructed annual temperature both in orbital and millennial scales.

Climate parameters calculated from reconstructed data are also useful. For example, the temperature difference (Tyar) between the warmest month (MTWA) and the coldest month (MTCO) shows a negative relationship with annual and summer precipitation, r=-63 and -0.96 respectively, implying power balance of Siberian and Pacific air masses.

Paleoclimate reconstruction will be reported also for the pollen data from Lake Aoki, Lake Kizaki and Oahara morass.

Keywords: Polygon, Lake Nojiri, modern analog, paleoclimate