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Paleoenvironmental and climatic changes in Altai Krai of Russia during the past 1700 years: Insights from the sedimentary feature, elemental geochemistry and pollen record

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A 64-cm long core from Zolotoe Lake (51°51'28.74"N, 80°15'59.16"E) located in the ribbon forest of the Kulundinsky plain of the West Siberian Lowland of Russia has been dated with AMS 14C dating on sediment total organic carbon (TOC) samples, and 210Pb and 137Cs dating. A clear sharp peak in the 137Cs profile corresponding to 1964 CE appeared at the 12-14 cm depth. The 210Pb profile demonstrates exponential decay from the surface down to about 19 cm depth, with relatively unchanged levels below 19 cm, indicating no excess 210Pb. Currently, AMS 14C dates of six samples in the core show: 1) strong nuclear bomb 14C signal (Fm = 1.0787); 2) 145⊠145 Cal yr BP at 22-24 cm; and 3) 1690⊠135 Cal yr BP at 62-64 cm; 4) all dates are in good stratigraphic order. Measurements of TN, TOC and C/N, as well as elemental concentrations in 0.5N HCl leach and Aqua Regia dissolution fractions measured by ICP-OES, and pollen assembles, have been done. Based on sediment features and geochemical data, we classify five zones of the studied core: I (200-440 CE), fine grey sediments: The lake was relatively small and low productivity but high salinity, shown by low TOC%, high C/N and Sr/Ca, Mg and Na contents. II (440-980 CE), dark grey slit: The lake expanded and deepened with decreasing salinity indicated by decreasing C/N, Sr/Ca, Sr, Mg and Na contents. At the end of this zone when was the beginning of the Medieval Warm Period (WMP), the lake became a large and stable lake with increasing productivity, reflected by rising TOC, AL Ca and Sr contents. III (980-1800 CE), dark brown sandy slit: Lake Zolotoe during the first half of this zone expanded further and deepened with increased productivity but decreased salinity reflected by increased TOC, reduced Sr/Ca, C/N, AL Mg and Na contents. High AL Ca and Sr contents might be resulted from increased productivity. However, the lake during the second half seemed remained stable with low salinity but high productivity during the Little Ice Age. IV (1800-1970 CE), light brown muddy clay: During this period, both TOC and C/N decreased, indicating reduced productivity. The sharp decrease in AL Ca and Sr reflected decrease in productivity from 1940 to 1970, perhaps attributed to a cooling temperature. V (1970-2022 CE), brownish fine mud: The lake became fresh and stable with recovered productivity. Human impact may influence the lake sedimentation.

Student Submission

No

Primary authors: MITWALLY, Eslam Mohamed Ali; Dr NIGAMATZYANOVA, Gulnara (Laboratory of Paleoclimatology, Paleoecology, Paleomagnetism, Department of Zoology and General Biology, Kazan (Volga region) Federal University, Kazan 420008, Russia); Dr SHEN, Tzu-Tsen (Department of Geosciences, National Taiwan University, Taipei 10617, Taiwan, ROC); Dr STRAKHOVENKO, Vera (Sobolev Institute of Geology and Mineralogy Siberian Branch Russian Academy of Sciences, 630090 Novosibirsk, Russia)

Co-authors: Prof. LI, Hong-Chun (Department of Geosciences, National Taiwan University, Taipei 10617,

Taiwan, ROC); Dr FROLOVA, Larisa (Laboratory of Paleoclimatology, Paleoecology, Paleomagnetism, Department of Zoology and General Biology, Kazan (Volga region) Federal University, Kazan 420008, Russia)

Presenters: MITWALLY, Eslam Mohamed Ali; Prof. LI, Hong-Chun (Department of Geosciences, National Taiwan University, Taipei 10617, Taiwan, ROC)

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