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Water and Thermal Regime of the Orkhon River Valley

(in case-Ugii lake)

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In this paper presented experimental monitoring results of water regime and solar radiation balance of lake Ugii, as a representative lake of the Mongolian Steppe Region and Orkhon river valley at ones. This research was carried out by the Institute of Geography, Mongolian Academy of Sciences from 1987 to 1992. Discussed importance in future, running such research programs, recommendations and maintenance policies.

The lake Ugii is located in the Orkhon river basins, and it is a 26^{th} large lake among the 3500 lakes of Mongolia, with surface area of more than 0.1 km^2. Altitude of the lake is 1332.4 m, surface area is 25.7 km^2, length is 7.4 km, mean width is 3.5 km and maximum depth is 15.3 m (fig. 1).

Morphological measurements of this lake, firstly were carried in 1964, and completed bathymetrical and sediment distribution maps (J. Tserensodnom, 1964). Since that, these maps several times have been adjusted (J. Tserensodnom, Ts. Sugar, 1980, Ts. Sugar, Z. Sanjmyatav, D. V. Sevastyanov, N. Batnasan, D. Tybshinjargal and O. Tserev, 1987, 1988, 1990 and 1991). According to these measurements, total water volume at long-term mean lake level is defined as 0.706 km^3.

Our investigation results shows that annual precipitation amount is quite variable for different years, and its long-term mean is 200 mm. About 70 % of annual precipitation is occurring from May to August (28.8-64.5 mm) and its maximum is in August (fig. 2).

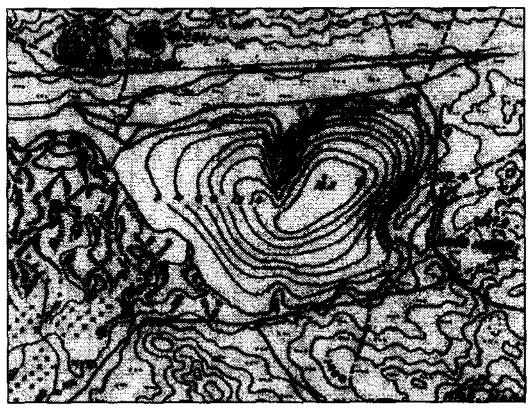

Figure 1. Lake Ugii which is situated in the Orkhon river valley.

Determined water balance of this lake during the investigation period. According to this, precipitation to the lake surface is calculated as 235 mm, surface water inflow 129.7 mm, ground water inflow 317.5 mm and outflow by river water is 118.3 mm. Open water evaporation is calculated as 562.5 mm/year, using some measurements, carried out by warmer period in the lake. For instance, open water evaporation is

Table 1. Water balance components of Ugii lake (ii).

Imput			Output		dispersion
Surface runoff Is	Ground water flow Iss	Precipitation P	Evaporation E	Outflow Os	Ds
129.7	317.5	235	562.5	118.3	-21.4

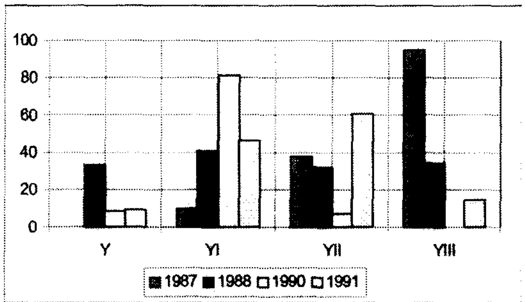

Figure 2. Summer season precipitation rate near by Ugii lake (mm).

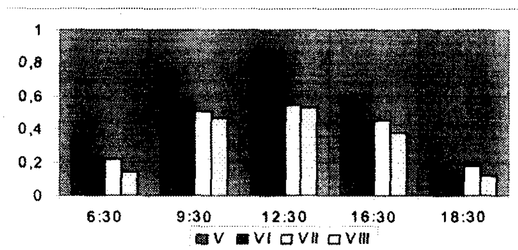

Figure 3. Income radiation rate during the summer season 1986-1991 yr.

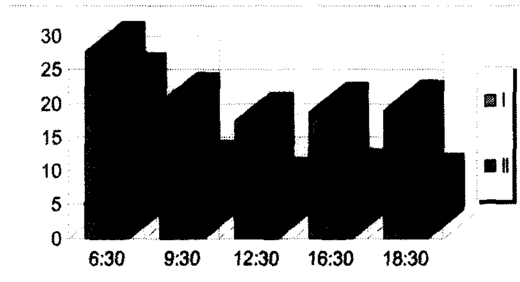

Figure 4. daily albedo rate (%) I- at land surface II- at lake surface.

Table 2. Radiation balance rate at lake, during the summer season ìÄæ/ì^2.

Year	YI	YII	YIII
1987	248	510	382
1988	396	455	457
1990	445		

measured in September, 1992 as 0.401-3.82 mm/day and 41.4 mm/month (Table 1).

Solar radiation amount entering into the lake surface is deferent in time, defending of the weather condition (fig. 3, 4).

Solar radiation balance of this lake in June is 248-445 mJ/m^2, in July is 455-510 mJ/m^2, and in August is 382-457 mJ/m^2 (Table 2). Radiation balance value in the lake is 1.0-1.5 times more than in the lake shorelines.

Lake water masse accumulated heat from May to mid of August, after which continuously loosing and entered into the winter regime in November (fig. 5, 6).

Conclusion

The fresh water lakes or aquatic systems are very sensitive indicator for environmental changes in regional and local level. The comparative studies can predict following negative effects:

1. In the past 60 years, average annual temperature has increased by approximately 0.7°C, soil moisture, energy supply has been

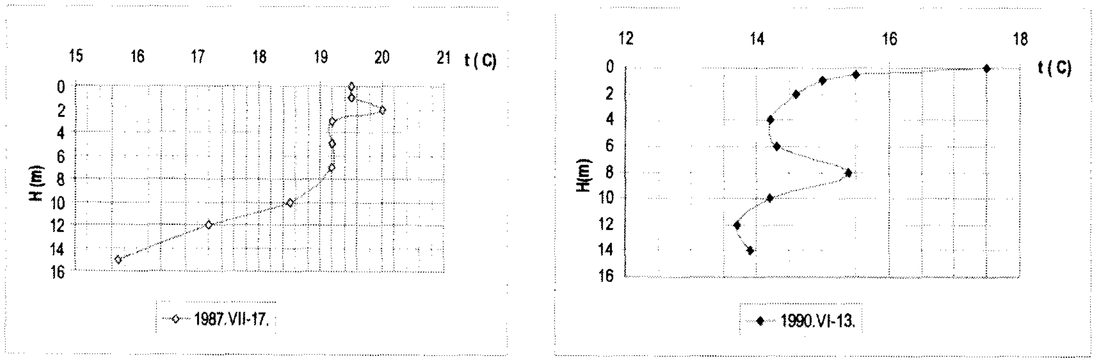

Figure 5. temperature regime of the water masses in lake during summer.

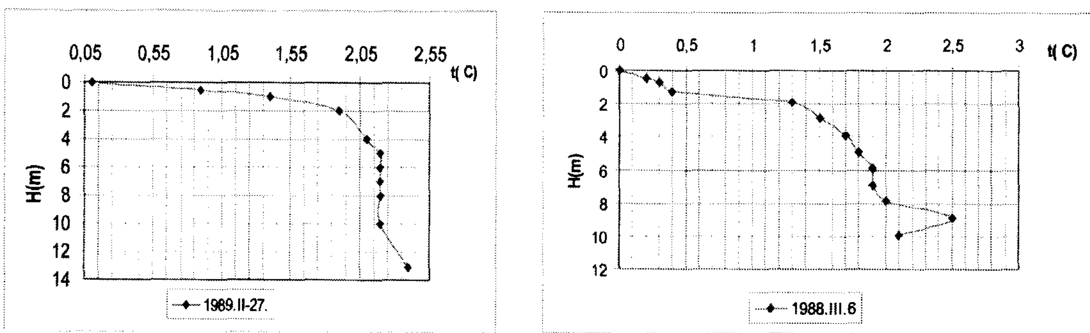

Figure 6. temperature regime of the water masses in lake during winter.

changing and habitat of plants and animals is getting unsuitable for their life. Because of warming, temperature of cold seasons has been increasing by 3°C from December to February and in warm seasons from June to August temperature has been decreasing by 0.5°C. This affects biodiversity largely. Suitable days for plant growing have reduced from 120 to 100, thus limits usual plant growing ability.

2. Drought frequency have been increasing by climate change impact, plants have lost self rehabilitation, plant cover have been growing thing and vegetation cover have been degrading, animals abundance decreasing by moving to farther places because of non-sufficient pasture and dying there, by hunting or catching by predators. In some parts of region desertification rate had activated because of climate change.

References

J. Tserensodnom, D. V. Sevastyanov, N. Batnasan, & others. Water regime and solar radiation balance of lakes in the Mongolian Steppe region. International conference on Central Asian Ecosystems. 5-7 september, 2000, Ulaanbaatar.

D. Tyvshinjargal., O. Tserev The micro-climate and thermal balance features of the Lake-Ugii.

(Mongolia). Proceeding for 40-th anniversary on graduate students of Geology of Mongolian Technical University, Mongolia-2000, Ulaanbaatar.

I. A. Beresneva, Energy and humidity ratio in the territory of Mongolia Trudii GGO, 1977b, vipusk390.

R. Soja, D. Tyvshinjargal The water cycle of river Baruun Bayan, (Mongolia, Khentei Mountain), Proceeding of conference on problems of Geography and Geomorphology, Poland, Krakov, 1992.

Biogeography of Native Korean Conifers

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Abstract : Out of 660 million hectares of Korean forest area, which covers sixty seven per cent of country, coniferous forest with areas of 273 million hectares (42.4%) forms major forest vegetation, along with mixed forests of conifers and broad-leaved forests (28.8%). However no geographical concern has been placed on the distribution of the Korean conifers.

Present work deals with the species composition, spatio-temporal distribution, and life form of native conifers in the Korean Peninsula, which includes both South and North Koreas. Past distributional of conifers came from both micro- and macro-fossils, and current horizontal and vertical ranges of native conifers are based on numerous flora reports as well as author's field works.

Biogeographical analysis on the species composition of native Korean conifers suggests that the Korean Peninsula harbors 4 families 10 genera 30 species (Table 1).

Earliest Korean conifers, *i.e.*, *Pinus* occurred at central and southern parts of Korea, and dates back to the Cretaceous Period, Mesozoic Era, and then diversified into different species with time, and at present shows extensive distributional range from northern subalpine belts to southern coastal areas. Abies also shows broad distribution and long history of vegetation development, along with conifers, such as *Juniperus, Picea, Larix, Taxus, Thuja* and so on (Table 2).

Early-evolved conifers have achieved higher species diversity, and show at present wider geographical distribution. During the glacial periods, the ranges of cold-tolerant conifers, such as *Pinus, Juniperus, Abies, Picea, Larix, Taxus*, and *Thuja* expanded, on the other hand, those of warmth-tolerant ones, such as *Tsuga* and Cephalotaxus retreated as the climate deteriorated.

Presence of endemic conifers, such as *Abies koreana, Picea koraiensis* var. *koraiensis* and *Picea koraiensis* var. *pungsanensis* on the subalpine belts of Korean mountains may be the result of long-term isolation of conifers on high mountains since the Pleistocene glacial period.

Horizontal and vertical ranges of native Korean conifers are classified into six types, *i.e.*, alpine, subalpine, montane, coastal, insular and disjunctive types, and then subdivided into twelve sub-types (Table 3).

Typical life form of native Korean conifers is evergreen tree, blooms in spring, and fruits ripe in autumn or following autumn. Their oval and elliptical seeds with wing, which is beneficial for dispersal, are common.

Special concern and protection are required for vulnerable species with limited or narrow distributional range, including Korean endemic species, as well as endangered species on high mountain species under rapidly changing environments, such as climate change and environmental degradation and so on.

Further works on the migration, dispersal, genetics, ecology of native Korean conifers are required for the better understanding of the biogeography of conifers.

Table 1. Korean Conifers

Family Names	Genera Names	Species Names
Cephalotaxaceae	*Cephalotaxus*	*Cephalotaxus harringtonia var. nana* *Cephalotaxus koreana*
Cupressaceae	*Juniperus*	*Juniperus chinensis* *Juniperus chinensis var. sargentii* *Juniperus communis var. saxatilis* *Juniperus davurica* *Juniperus rigida* *Juniperus rigida subsp. conferta* *Juniperus rigida subsp. rigida*
	Thuja	*Thuja koraiensis* *Thuja orientalis*
Pinaceae	*Abies*	*Abies holophylla* *Abies koreana* *Abies nephrolepis*
Pinaceae	*Larix*	*Larix gmelinii* *Larix gmelinii var. olgensis*
	Picea	*Picea jezoensis* *Picea koraiensis* *Picea koraiensis var. koraiensis* *Picea koraiensis var. pungsanensis* *Picea shrenkiana*
	Pinus	*Pinus densiflora* *Pinus koraiensis* *Pinus parviflora* *Pinus pumila* *Pinus thunbergii*
	Tsuga	*Tsuga sieboldii*
Taxaceae	*Taxus*	*Taxus cuspidata* *Taxus cuspidata var. cuspidata*
	Torreya	*Torreya nucifera*

Table 2. Occurrence of Korean Conifers During the Geological Times

Ages Trees	Meso.	Cenozoic							
	Cret.	Palae.	Eoce.	Oligo.	Mioc.	Pleist.	Holo.	Pres.	English
Pinus	o				o	o	o	o	Pine
Abies	o				o	o	o	o	Fir
Picea					o	o	o	o	Spruce
Juniperus					o	o	o	o	Junifer
Tsuga					o	o		o	Tsuga
Larix					o	o		o	Larch
Taxus					o	o		o	Yew
Cephalotaxus					o			o	Cephalo.
Thuja						o		o	Thuja
Pinus(Haplo)						o		o	Pine(5 n.)

Table 3. Distributional Pattern of Native Korean Conifers

Macro	Micro	Species Names	Horizontal Range	Vertical R.	No. Spe.
Alpine	North A.	*Ju. c. sax*	North	1,400-2,300m	1
Sub-alpine	Peninsula	*Ju. c. sar* *Picea j.* *Taxus c.*	North-Cheju North-South North-Cheju	700-2,300m 500-2,300m 300-1,950m	3
	Midland & Mid- North	*Pinus pu.* *Thuja k.* *Abies n.* *Larix g.* *Picea k*	North-Midland North-Midland North-South North-Midland North	900-2,540m 700-2,300m 500-2,200m 200-2,300m 450-1,600m	5
	South	*Abies k.*	South-Cheju	500-1,950m	1
Montane	Peninsula	*Pinus k.* *Abies h.* *Pinus d.* *Ju. r. r.* *Ju. c.*	North-South North-Cheju North-Cheju North-South North-South	-1,900m 100-1,500m 100-1,300m 50-1,200m -800m	5
	Midland & South	*Taxus c. c.* *Cephalo. k* *Thuja o.* *Cephalo. h.*	Midland-South Midland-South Midland-South Midland-South	-1,700m 100-1,350m 150-600m -100m	4
	South	*Torreya n.*	South-Cheju	150-700m	1
Coastal	Midland & South	*Pinus t.*	Midland-Cheju	50-700m	1
Insular	West Sea	*Ju. R. c.* *Ju. r.*	Midland Midland	-300m -10m	2
	Ullung	*Pinus pa.* *Tsuga s.*	Ullung Ullung	500-800m 300-800m	2
Disjunct	North	*Larix g. o.* *Picea k. k.* *Picea k. p.* *Ju. d.*	North North North North	1,600m 1,400m 1,300-1,400m 400-1,600m	4
	Mid-Mt.	*Picea s.*	Midland	?	1

* For the full species names, please find the text.