

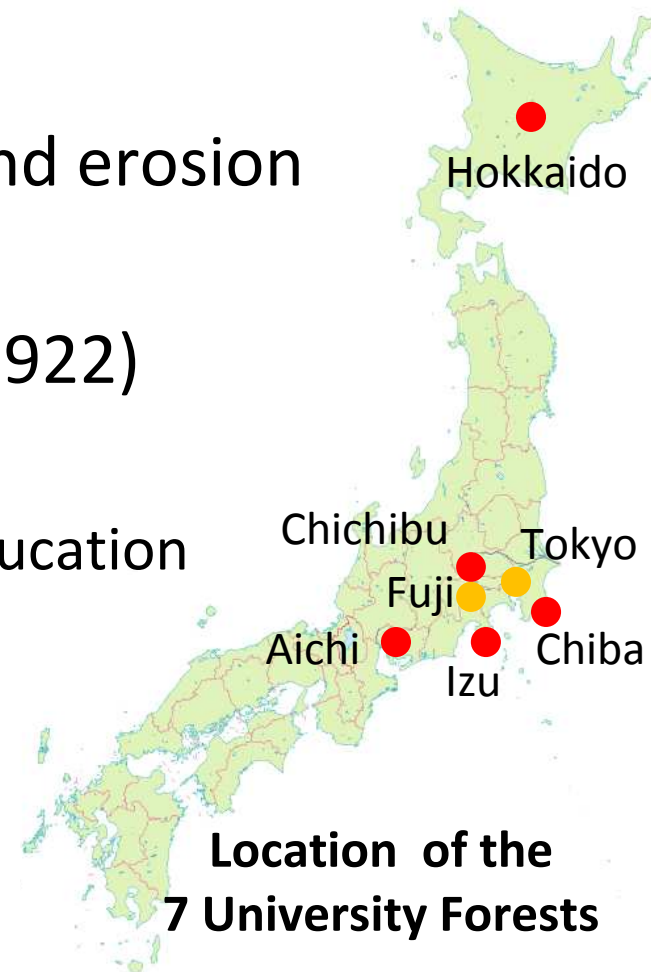
Long-term forest hydrological
research in the University Forest
in Aichi, The University
of Tokyo, Japan

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University Forest in Aichi,
The University of Tokyo

Organization related forest hydrology in the University of Tokyo

- Faculty of Forest Sciences, Graduate School of Agricultural and Life Sciences
 - Laboratory of forest hydrology and erosion control engineering (since 1900)
 - University Forest in Aichi (since 1922)
 - One of the 7 university forests
 - Established for forest hydrology education
 - Other 4 University Forests

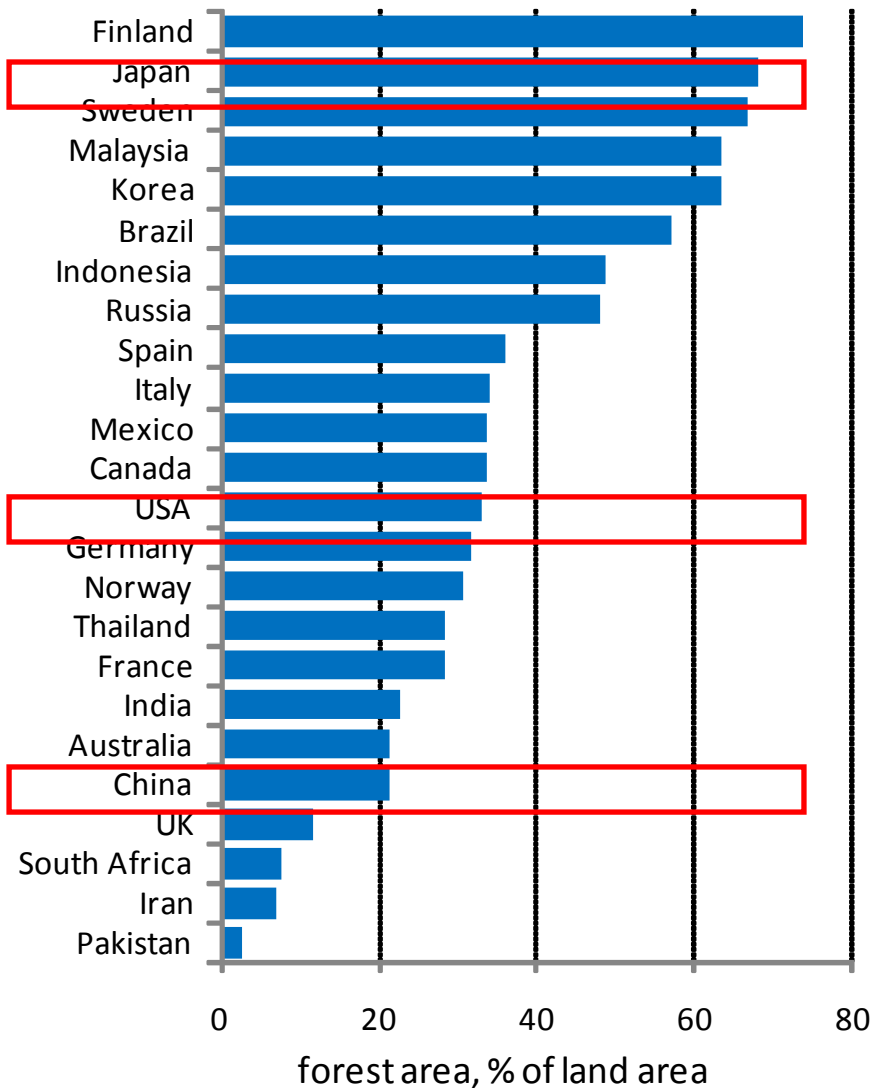


Why forest hydrology in Japan?

- Flood and soil erosion problem from the denuded hills and mountains for more than 1500 years
- Three laws for disaster prevention in the 1890s
 - River law (1896), Sabo law (1897) and Forest law (1897)
- Three major prefectures with denuded mountains
 - Aichi, Shiga and Okayama
 - Weathered granite
 - Pottery manufacturing, Iron making



Forest area in Japan (FAO 2005)



Scientific Understanding of forest Mechanism and Service on water

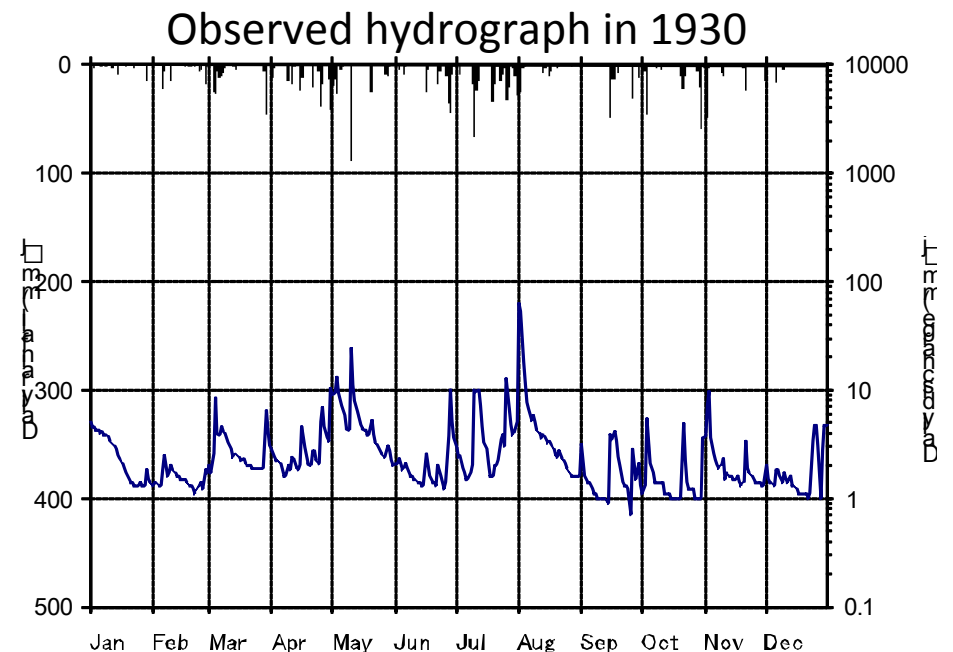
Mechanisms	Services	Flood Mitigation Service	Water Resources Service
Flow stabilization Mechanism (Temporally store water and drain water to the stream slowly)		+	+
Evapotranspiration Mechanism (Temporally store water and return to the atmosphere)		+	-
Combined Mechanism		+	?

Possible impacts of forest increase / growth on water resources

- Annual flow and high flow - decrease
- Low flow – depends
 - Combination of “positive” (flow stabilization) and “negative” (evapotranspiration) mechanisms
- Japanese experience: **Hirata-Yamamoto debate** (1933-36)
 - Water shortage for small irrigation pond after planting pine trees
 - Prof. Hirata said plantation forests increase runoff
 - Local Engineer Mr. Yamamoto said plantation forests decrease runoff
 - 34 research papers were written by them
 - Can be applied in the dry region only ?

Long-term forest hydrological research in the University Forest in Aichi

- To detect the impact of forest growth after the plantation the denuded hills on water balance, low flow and hydrological / biogeochemical processes
- 4 experimental watersheds were established in the 1920s
- Observation was started in 1929; 80 years of data were accumulated

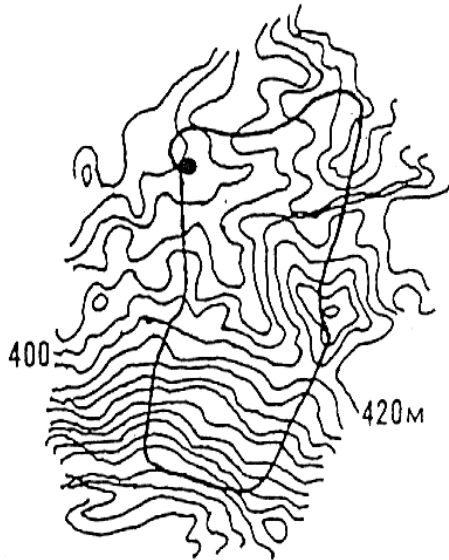


Shirasaka experimental watershed

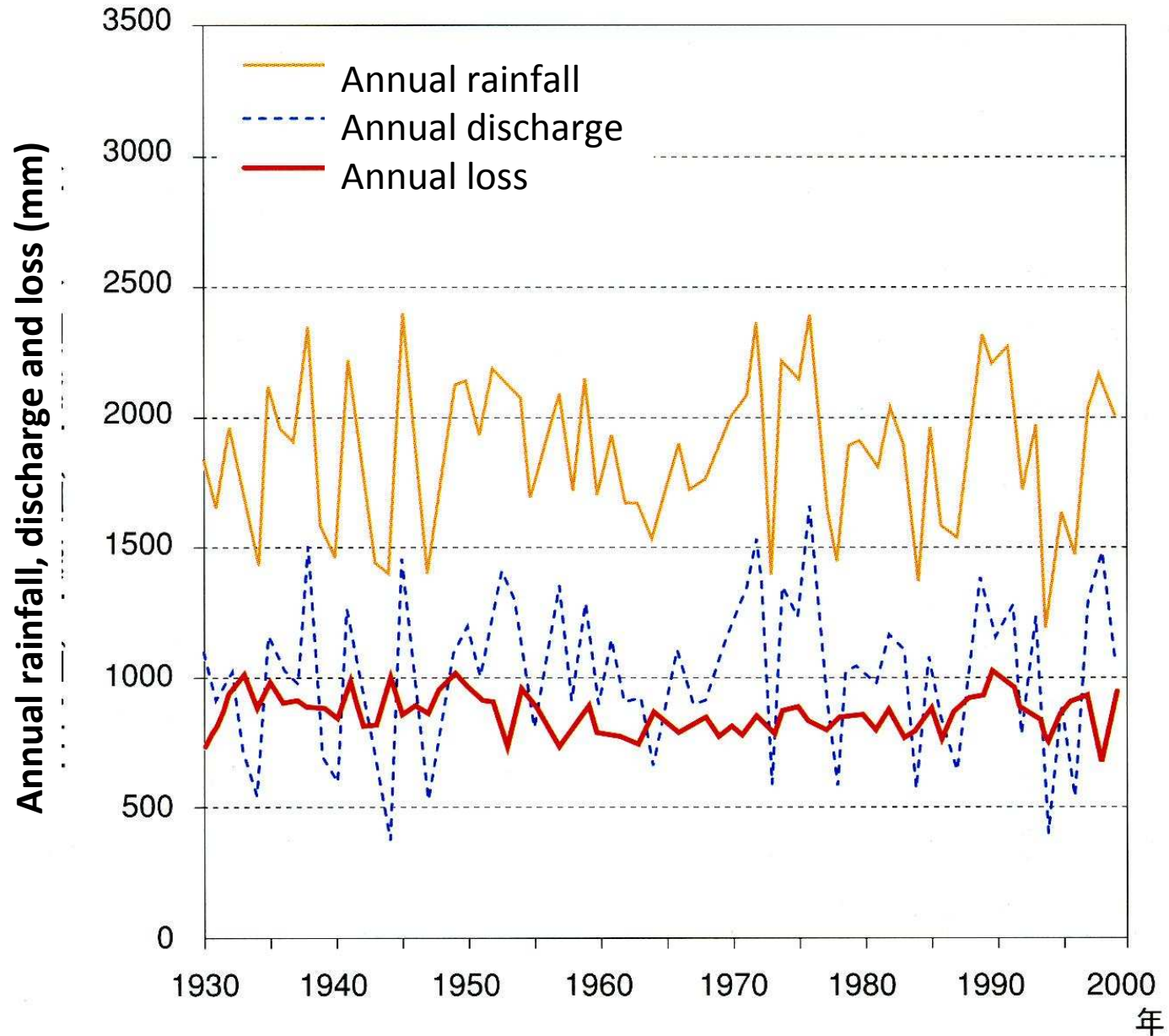
- Data were open at <http://www.uf.a.u-tokyo.ac.jp/aichi/>

0 1km

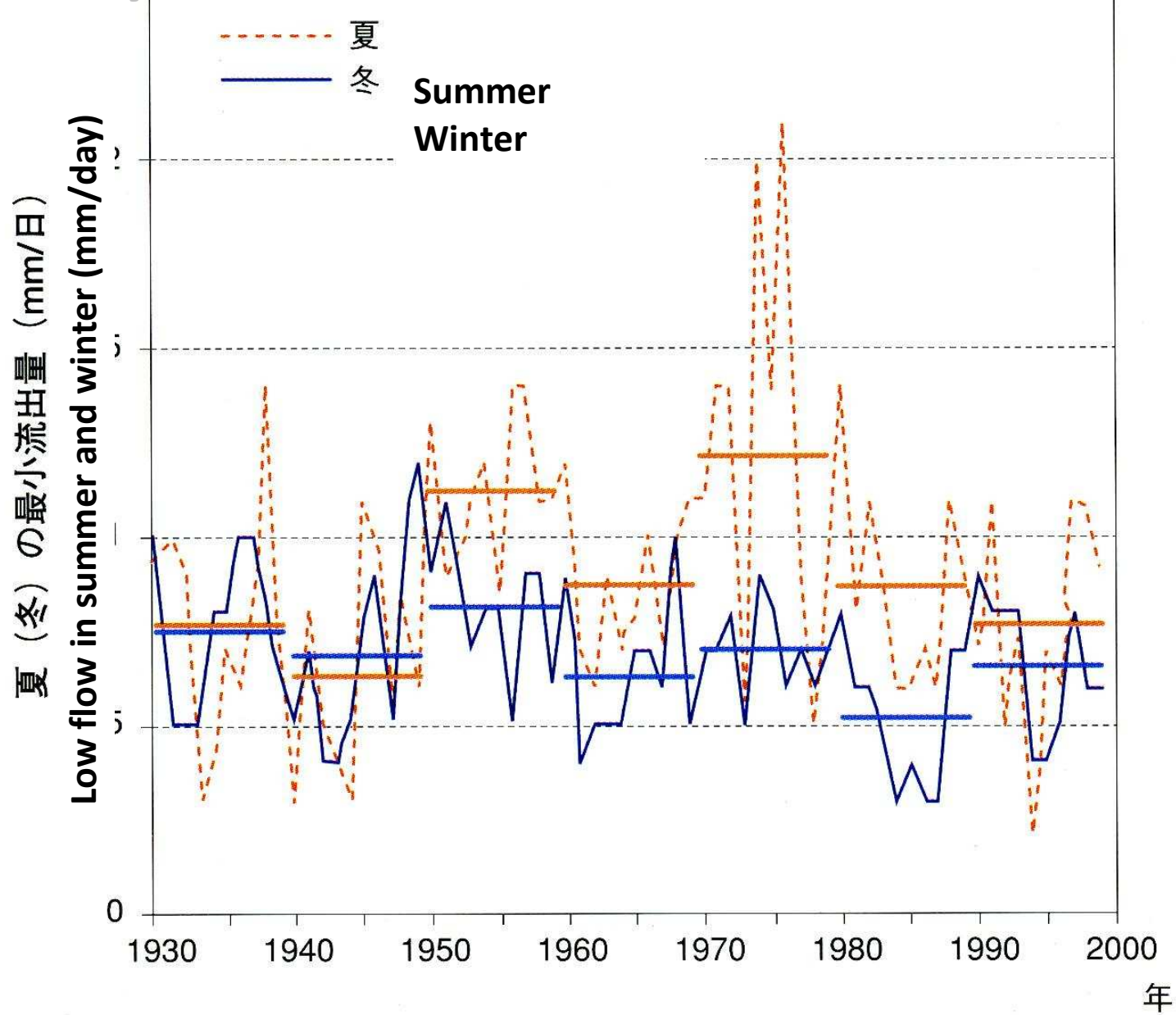
Shirasaka W.S.



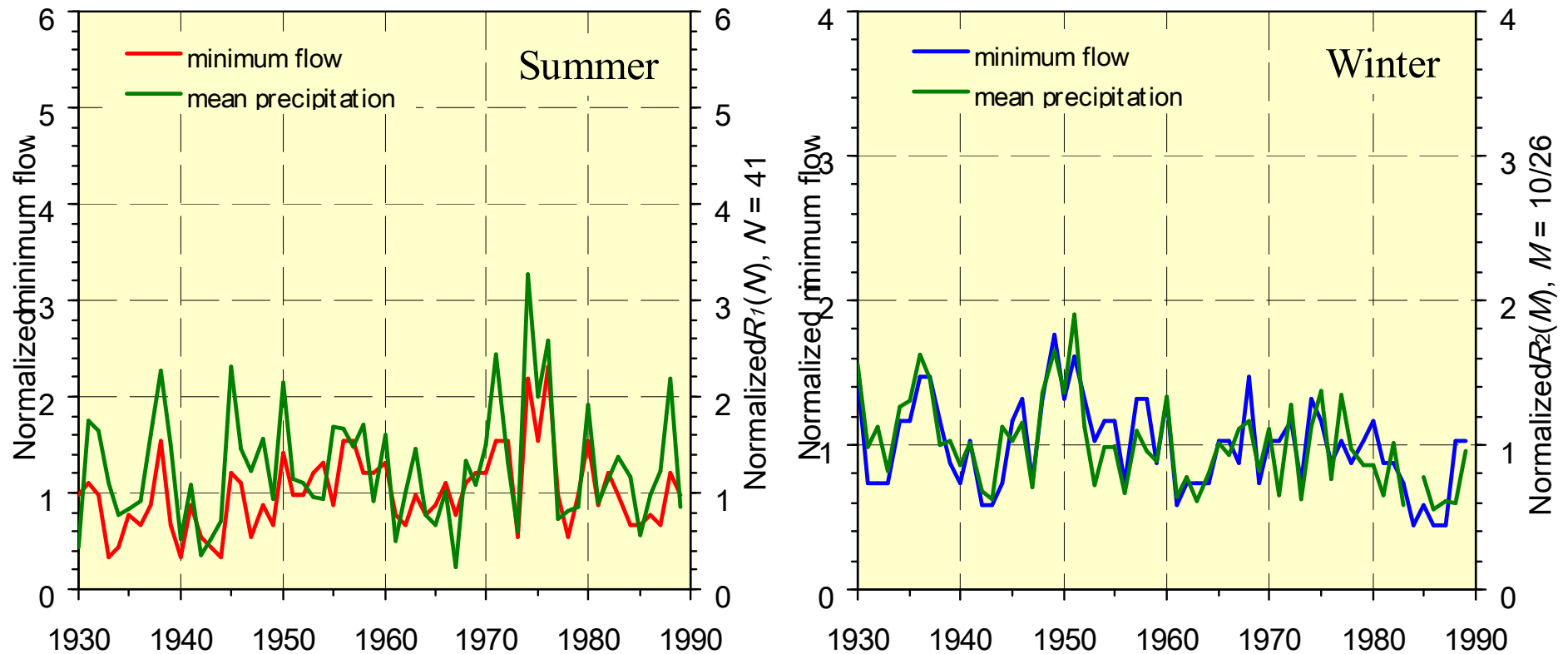
70 years fluctuations of water balance



70 years fluctuations of low flow



Fluctuations of minimum flow and precipitation factors in summer (left) and winter (right)



- Inter-annual fluctuations of low flow in both summer and winter was synchronized with the fluctuations of each precipitation factor

Summary

- To identify impacts of reforestation on water balance, long-term forest hydrological study has been conducted in the University Forest in Aichi for the past 80 years
- 61-year precipitation and discharge data in the Shirasaka Watershed were analyzed
- Although the vegetation has been grown for 60 years in this watershed, the main factors controlling the inter-annual fluctuations of low flow is precipitation, not the vegetation growth
- The precipitation factors, which have a reasonable degree of correlation with the annual low flow, were different in summer and in winter