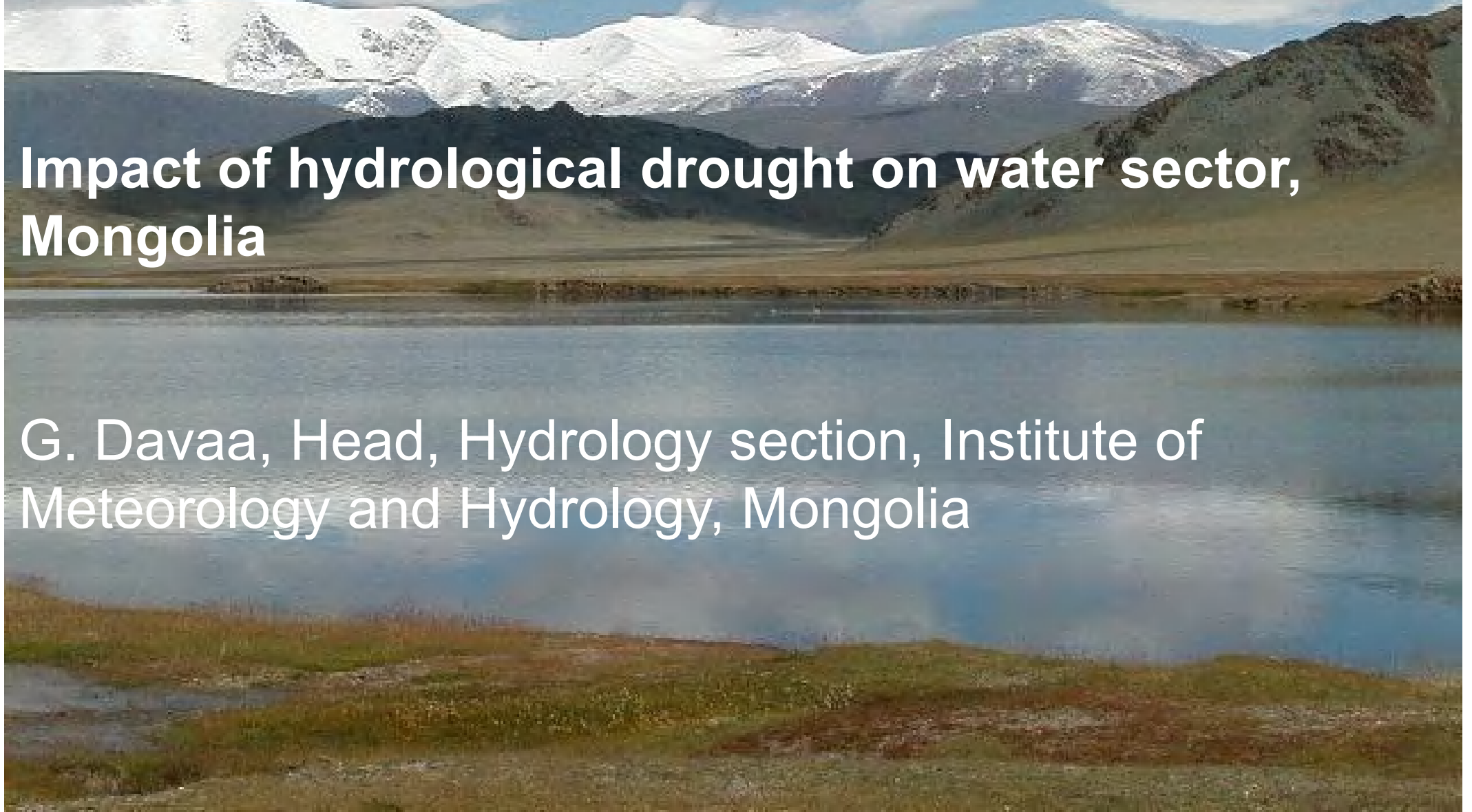


The 7th International Coordination Group Meeting
GEOSs Asian Water Cycle Initiative, Tokyo, Japan, 5-6
Oct., 2010

**Impact of hydrological drought on water sector,
Mongolia**

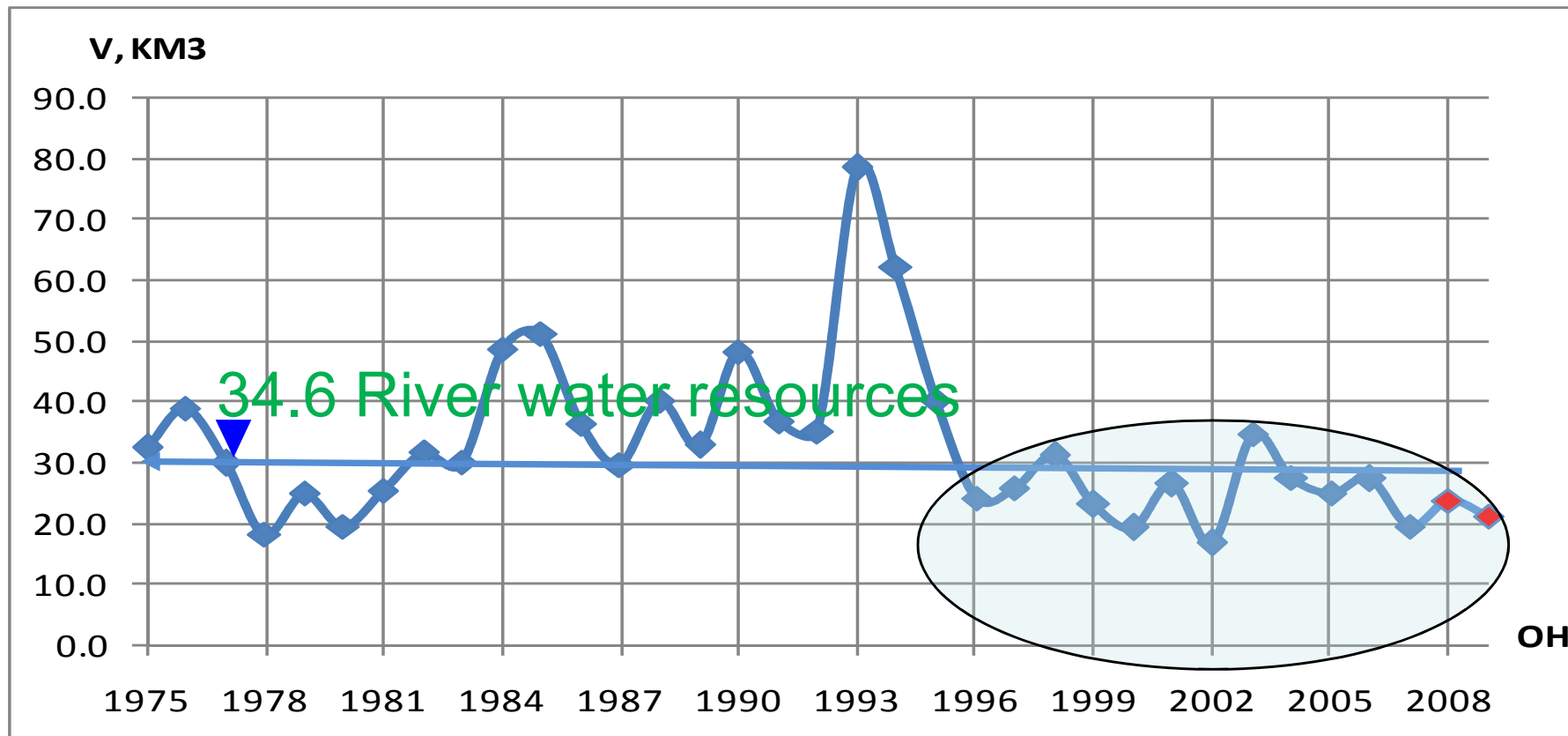
G. Davaa, Head, Hydrology section, Institute of
Meteorology and Hydrology, Mongolia



Content

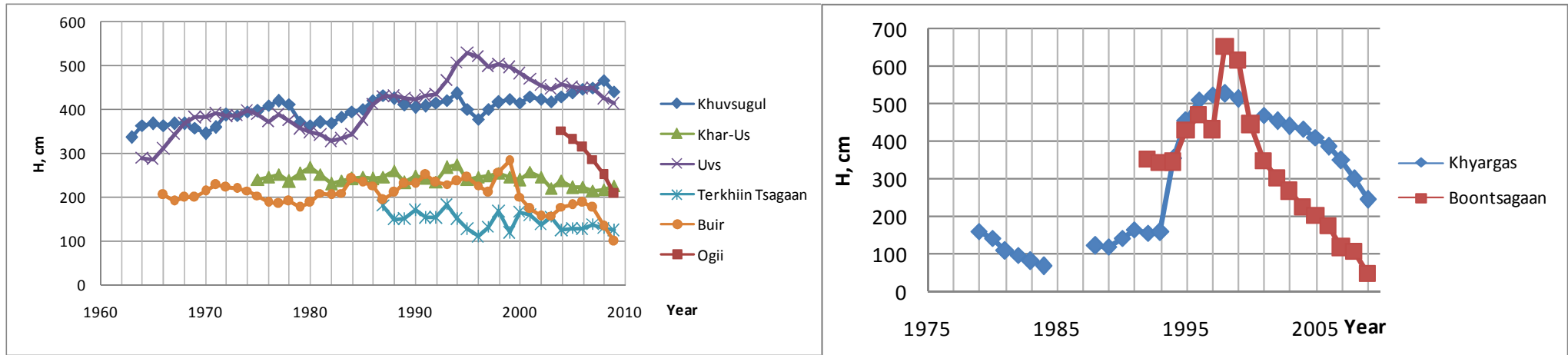
- Current water resources situation in the country
- Hydrological changes
- Towards adaptation to climate and environmental changes
- Current situation of data collection in the Selbe river basin

Current variability of total river water resources



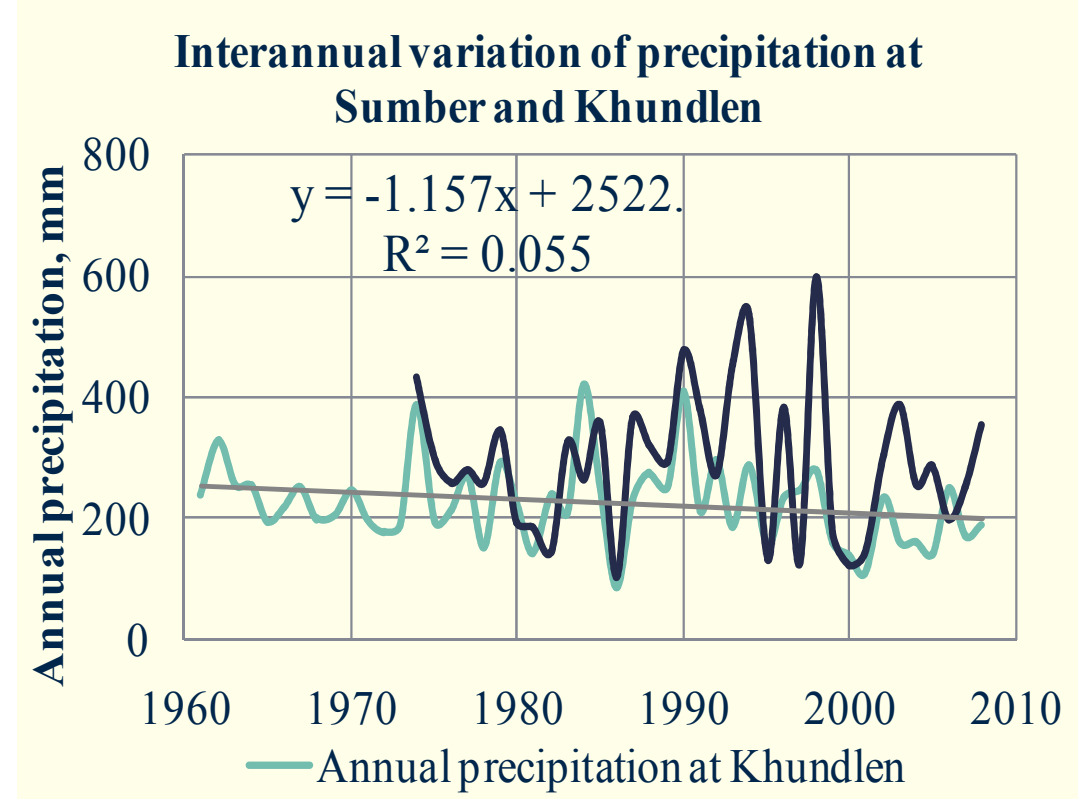
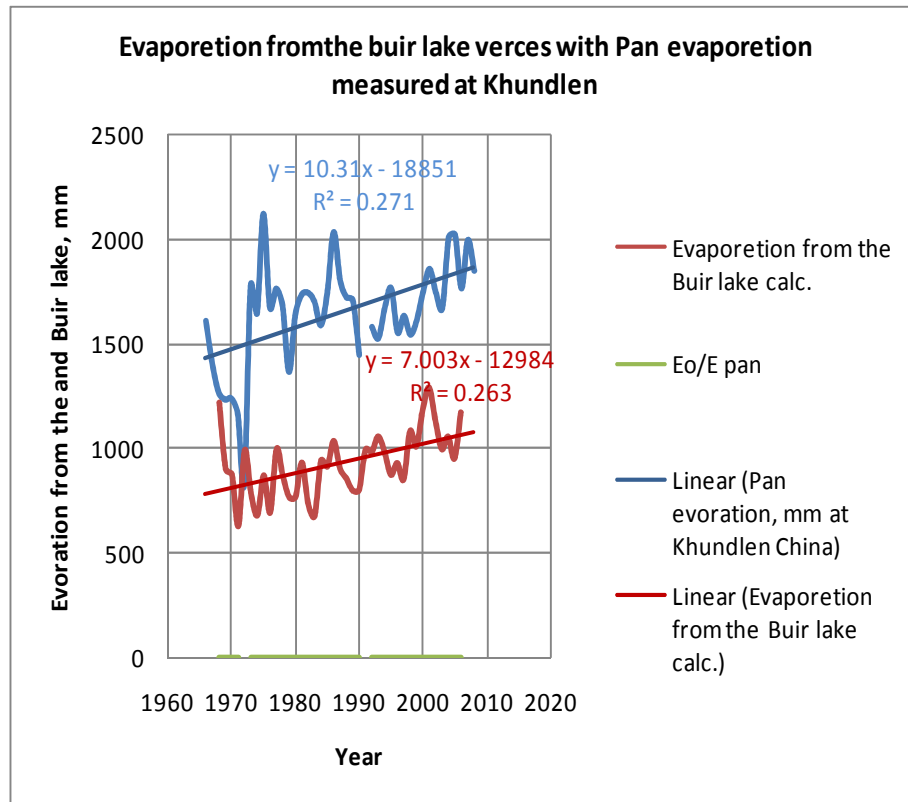
23.1 and 21.1 cub. km of river water resources formed in 2008 and 2009 in the country. These are less by 33.3, 39.0 percents than its average (34.6). Severe droughts occurred in 2002, 2007 and summer of 2009 and severe cold and snowy winter followed in 2009-2010 caused huge loss in agriculture (*9.7 million heads of livestock loss*).

Lake water level variation



Annual average of water level: in lakes fed by glaciers and permafrost increases in mountainous area (Huvsgul), in lakes in forest area (Terkhiin Tsagaan lake) dropped by **- 42** cm since 2000, steppe zone $dH = - 144$ cm (Ugii, since 2004) and $- 183$ cm (Buir, since 1999), Gobi desert lakes $dH = -281$ cm (Khyargas, since 1998) and $- 609$ cm (Boontsagaan, since 1998) till the 2009.

Tendency of evaporation and precipitation



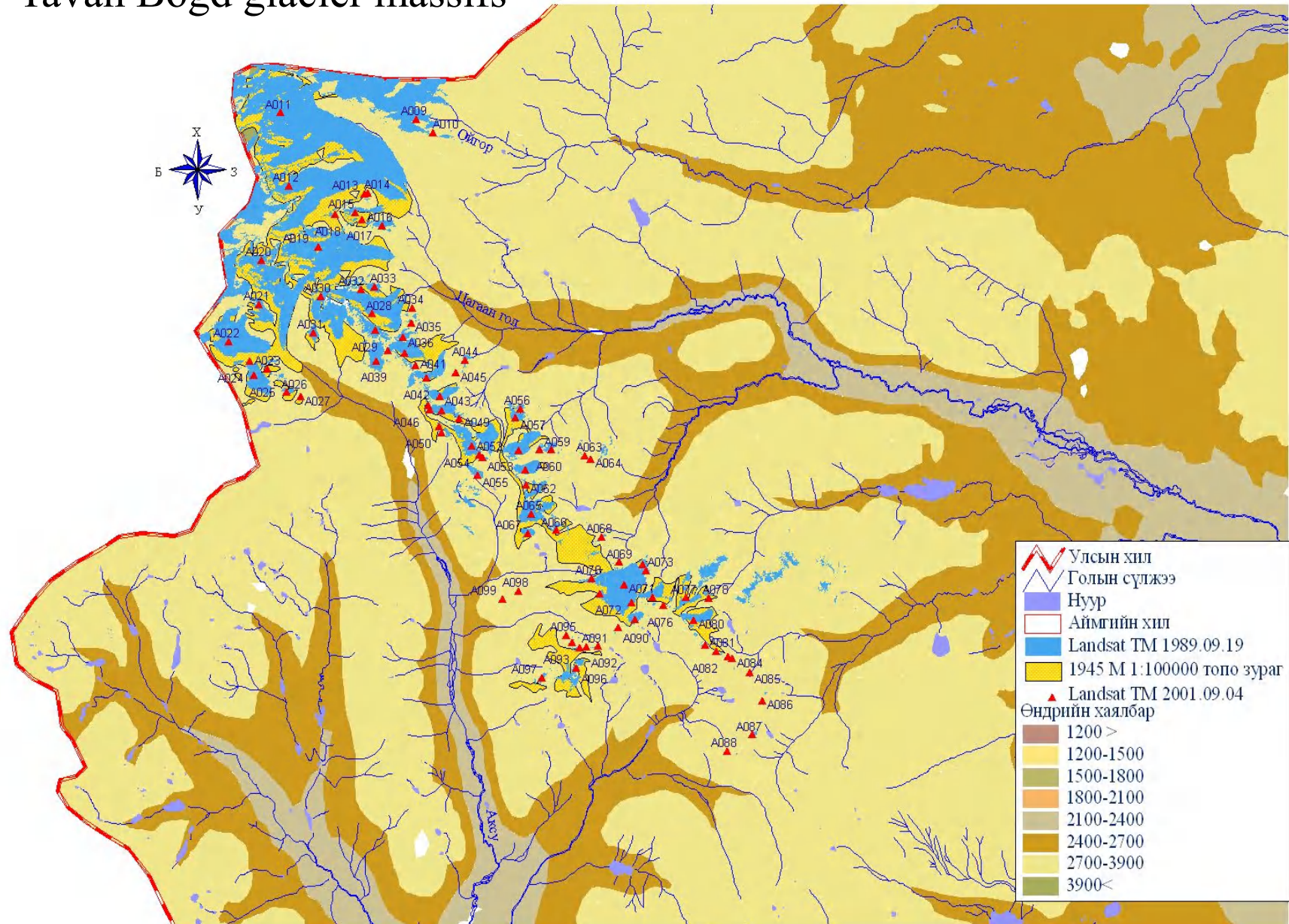
$dP = -1.1 \text{ mm/year}$ or 53 mm/48 years
 $dE = 7 \text{ mm/year}$ or 287 mm/48 years

Changes in lake area and number of lakes

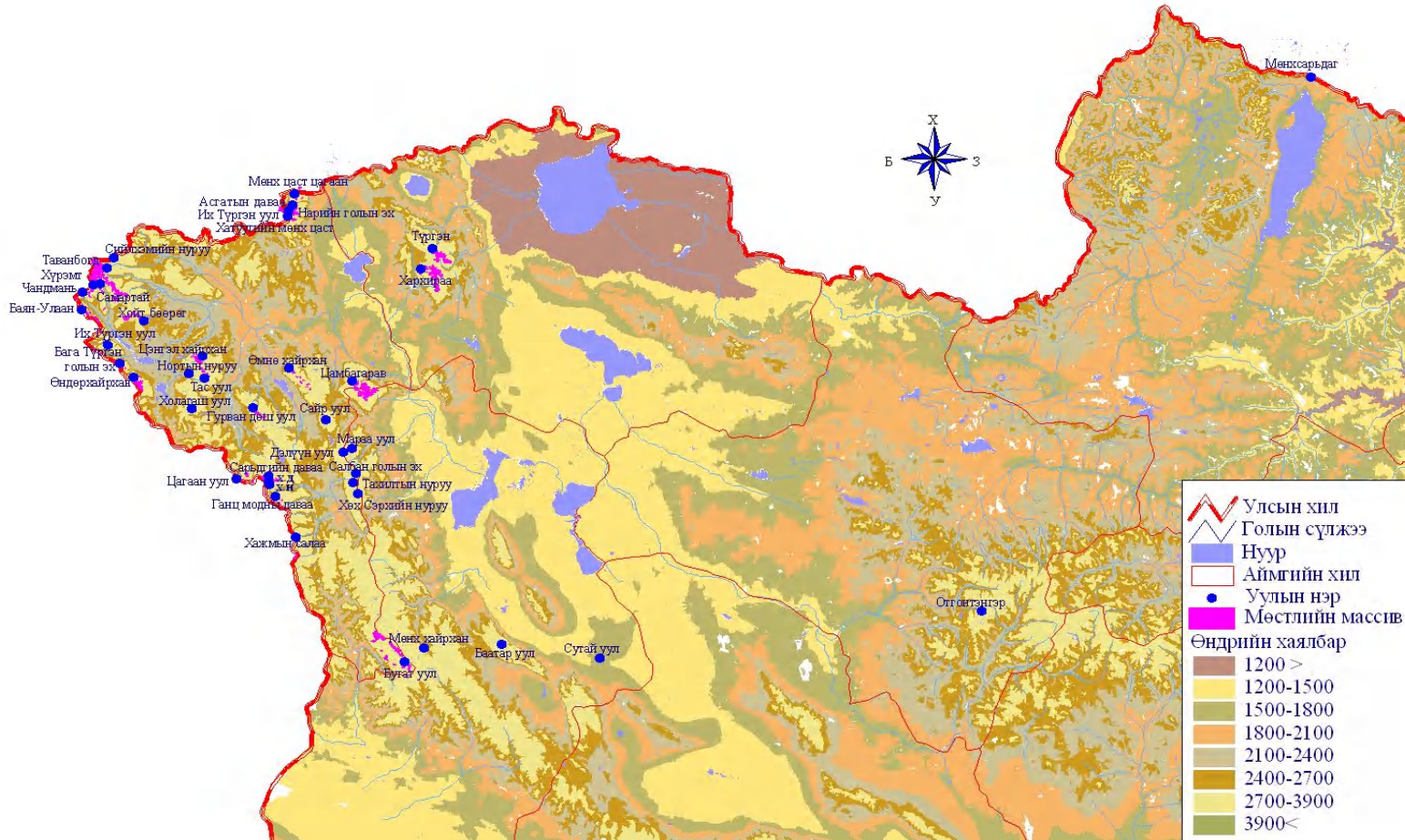
Size of lake	Size of lake area	Landsat ETM (2000-2002)		Topographic map, scaled S1:100000 (1940th)		Difference of lake area, sq.km	Difference of number of lakes
		Number of lakes	Sum of lake area, sq. km	Number of lakes	Sum of lake area, sq. km		
Large	>1000	4	8815.214	4	8801.343	13.7	0
Big	≥500.0-<1000.0	2	1196.1	2	1192.3	3.8	0
Moderately big	≥100.0-<500.0	9	1913.55	8	1812.8	100.8	1
Medium	≥50.0-<100.0	11	760.62	12	851.8	-91.2	-1
moderately medium	≥20.0-<50.0	9	256.421	9	254.8	2	0
small	≥10.0-<20.0	30	419.23	29	383.4	36	1
Moderately small	≥5.0-<10.0	71	489.38	75	444.6	45	-4
Very small	≥1.0-<5.0	239	556.01	287	531.2	25	-48
Extremely small	≥0.1-<1.0	1710	531.355	3399	964.4	-433	-1689
Natural lagoon	0.1>	3081	96.79	1391	114.6	-18	1690
Total		5166	15034.70	5216	15372.07	-373.37	-50

Glacier area variations

Tavan Bogd glacier massifs



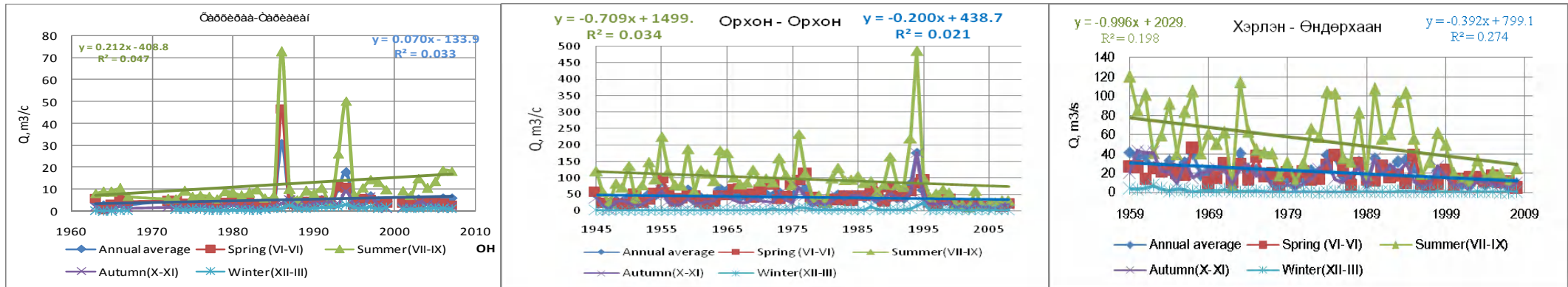
Glacier massifs distributed in the Altay Mts.



Æè ÷: Õ.Ä- Õàèððùí ààààà, Õ. Í- Õàèððùí íóðóó àÿæ òÿìÿäëÿá.

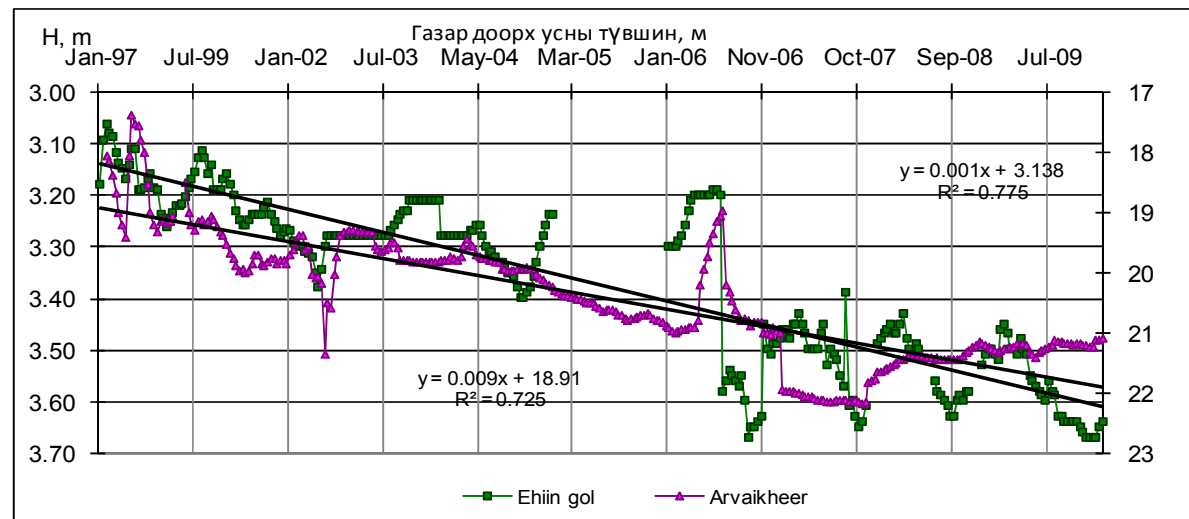
Analysis of areal changes of glaciers shows that glacier area decreased by 12.3 % in the period from 1940th till 1989-1992 and by 9.8 % in the period from 1989-1992 till 1999-2002, totally 22 % in last 60 years.

Current river flow changes



There are 4 types of changes: 1. Runoff has been increasing trend in all seasons, and years (rivers draining from glaciers and permafrost zones). 2. Runoff has increasing trend in autumn, winter period (permafrost zones). 3. Runoff has increasing trend in only in winter (down stream site of bigger rivers). 4. Runoff has decreasing trend in all seasons and years (rivers flowing in steppe, desert steppe zones).

Shallow ground water level



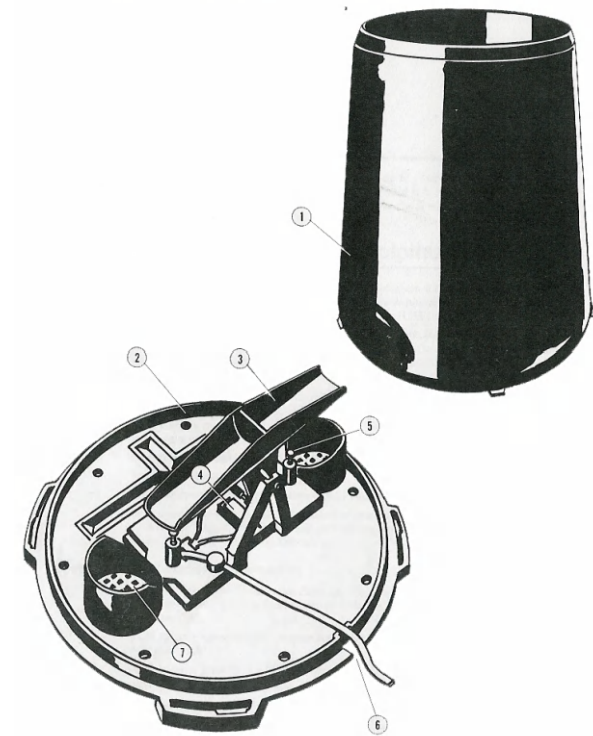
Forest steppe: $dH = -0.50$ m (Moren),
 Steppe: $dH = -3.0$ m (Arvaikheer)
 Gobi desert: $dH = -0.55$ m (Ekhiin gol)

Reference Basin: Water balance studies which started since 1998 have continued in 2010 (during the warm period from April to October)

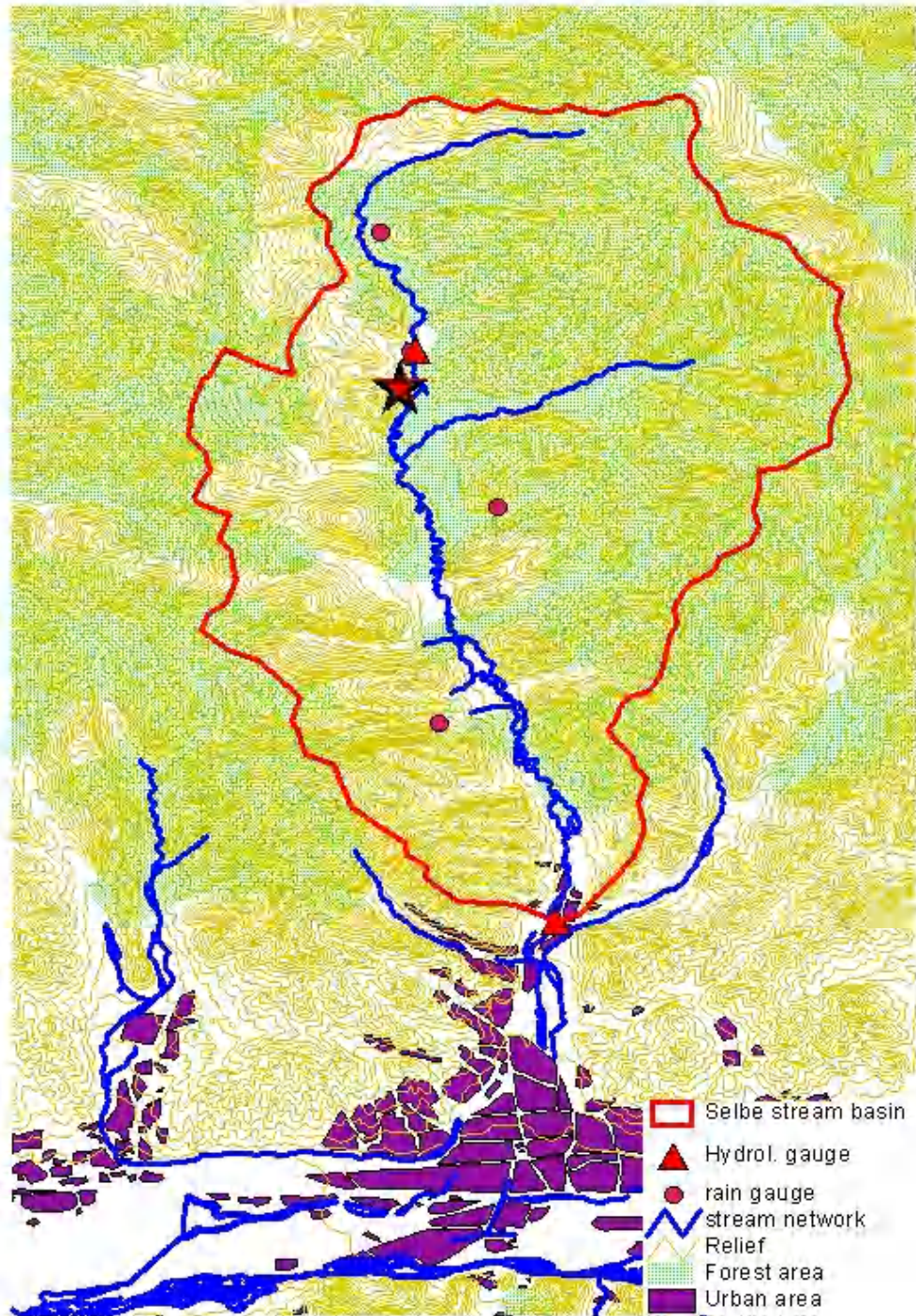
The water balance survey include following components:

1. Water level and discharge at upstream and downstream stations as Selbe-Sanzai, Selbe-Dambadarjaa
2. Rainfall gauges at 4 sites: Bagabayan, Bayanbulag, Yargait, Dambadarjaa
3. Soil moisture sampling from above 4 sites
4. Meteorological elements by AWS at Sanzai sites
5. Estimation of evapotranspiration by different methods
6. Water quality sampling and basin cover changes

Тунадас хэмжигч



DAVIS

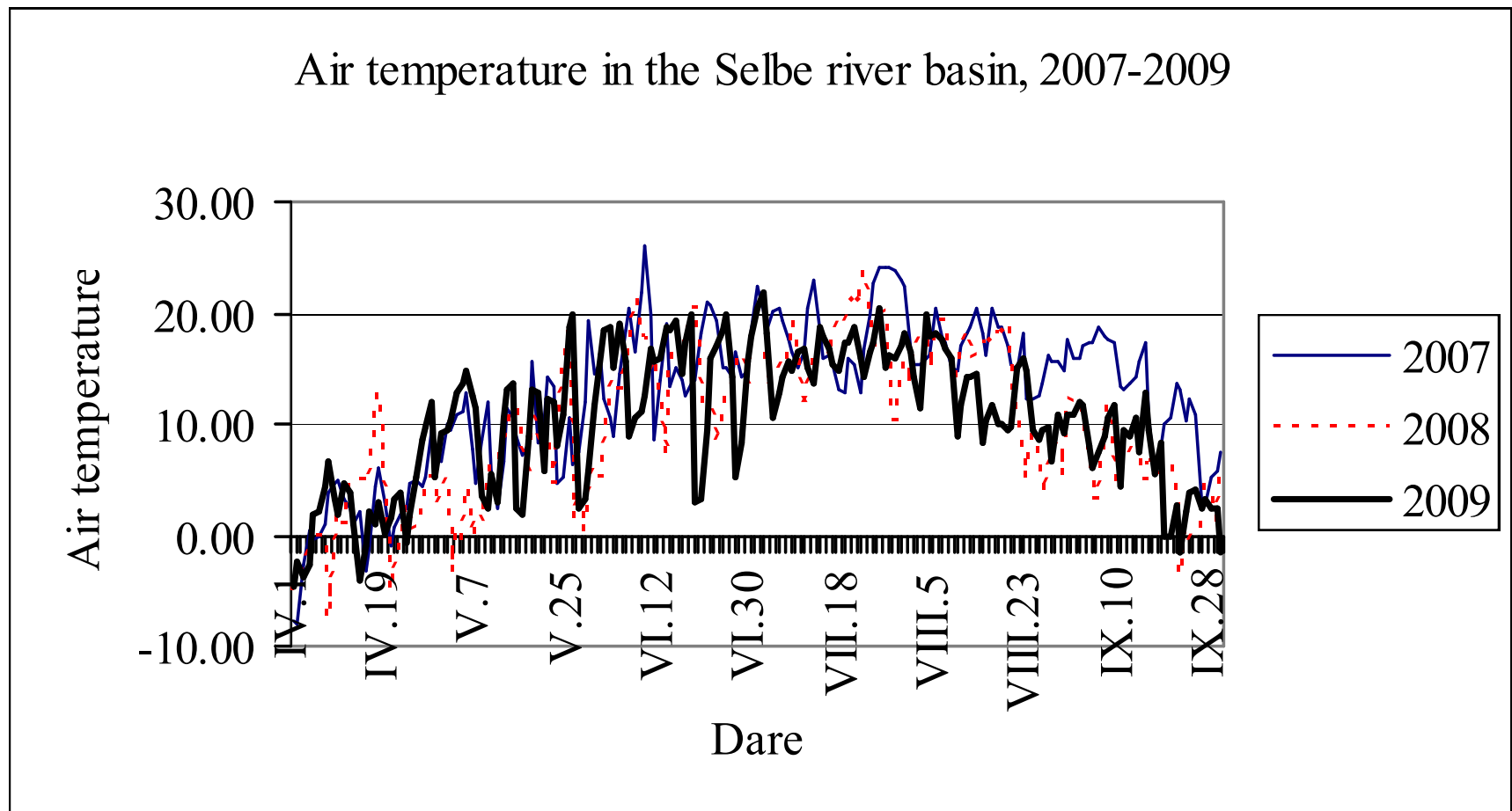


Location of measurement sites in the Selbe river basin

1. Climate and meteorological elements



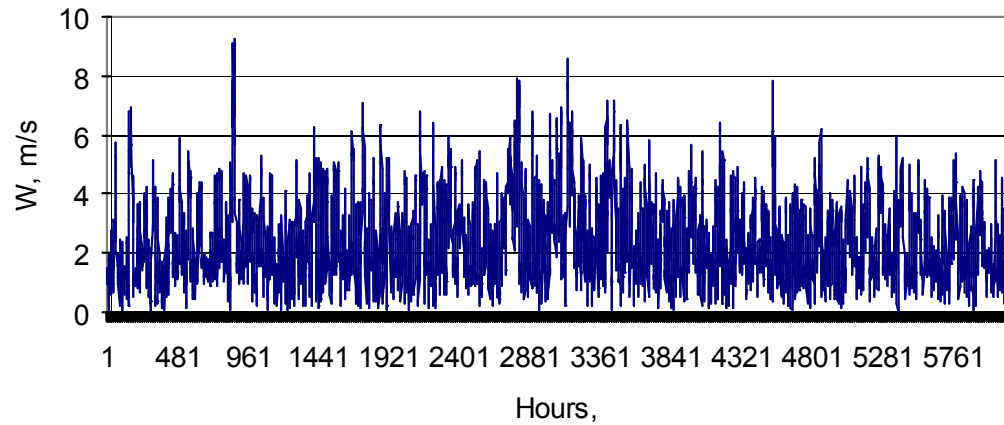
AWS in the Selbe river basin (cooperation between IMH and Japan IHP)



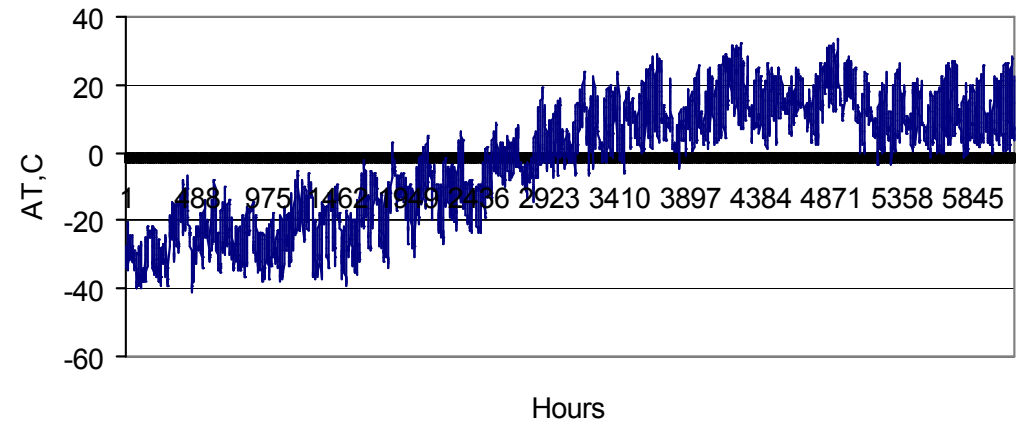
**Mean air temperature during warm period 10.3-12.6 oC,
Mean air humidity 58.3 %
Wind speed-2.11 m/sec**

Meteorological elements in the Selbe river basin in 2010.Sept

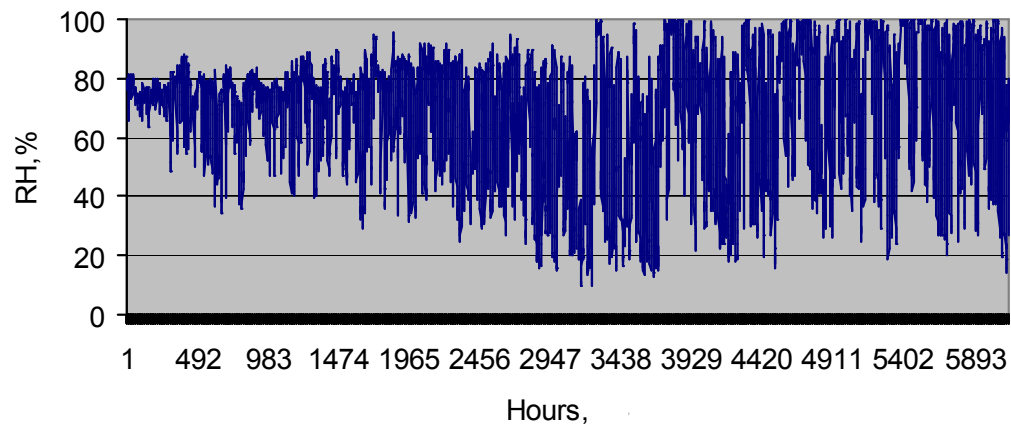
Hourly Wind Speed at Sanzai AWS, 2010
(m/s)



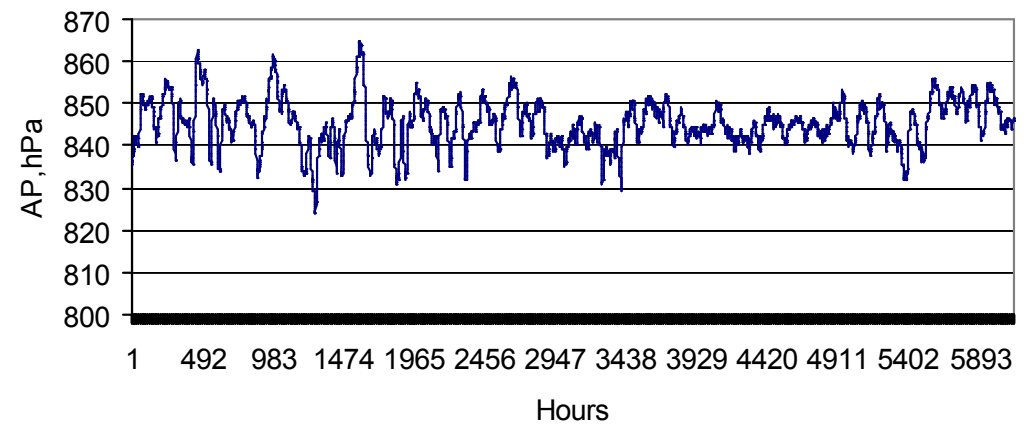
Air Temperature at Sanzai AWS, 2010
(°C)



Relative Humidity at Sanzai AWS, 2010.Sept
(%)



Air Pressure at Sanzai AWS, 2010.Sept
(hPa)



Adaptation to climate change

- ❖ **National Water program has been endorsed by the Government: Intensification of Environment Monitoring (extension and modernization of observational network, modeling, remote sensing, data integration and regional cooperation and etc.)**
- ❖ **Implementation of Projects and Use of Clean Development mechanisms**
- ❖ **Integrated River Basin Management (at basin and national level, coping with desertification)**
- ❖ **Storage and regulation of glacier melting water in mountainous regions**
- ❖ **Protection of runoff formation zones through protected area network extension and improving legislative basis and its implementation, monitoring (law on Protection of runoff formation zones: where restricted mining activities)**
- ❖ **Weather modification (rain generator, etc)**
- ❖ **National strategy for adaptation to climate change**

AWCI- related activities

Planning adaptations to climate change – a process

- ❖ **Climate change assessment in regional scale (Reg. CM,)**
- ❖ **Climate change and adaptation – Flood (data analysis, modeling)**
- ❖ **Climate change and adaptation – Drought (data analysis, modeling)**
- ❖ **Climate change and adaptation – Water quality (monitoring and report)**
- ❖ **Climate change and adaptation – Snow-Glacier-GLOF –Data collection, monitoring- modeling**

- ❖ **Regional co-operation: IRBM (natural, social, economical systems) – scenarios development- modeling –assessment- planning (sharing experiences, technology transfer and etc.) - Altay Mts. glacier monitoring (among countries Russia, China, Kazakhstan and Mongolia.**
- ❖ **Capacity building: Training packages (hydrological, meteorological forecasting capacity, modeling and assessment making skills)**

A landscape photograph showing a calm lake in the foreground, reflecting the sky. In the background, there are rolling hills and mountains, with a prominent snow-capped peak. The sky is blue with some light clouds. The text "Thank you" is overlaid in a large, blue, sans-serif font, slanted slightly to the right.

Thank you