Center for Environmental Systems Research

UNIKASSEL VERSITÄT

Kharaa

Kharaa river basin, Mongolia

MoMo Integrated Water Resources Management Mongolia

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Basin characteristics

River Basin:	Kharaa river basin
Operation (from… to…):	Since 1990, still in operation
Gauge coordinates / Gauge datum:	105°54'E; 49° 32'N / 674 m.a.s.l.
Catchment area:	14,500 km²
Elevation range:	656- 2518 m.a.s.l.
Basin type:	Mountainous
Climatic parameters:	Precipitation and temperature
Land use:	59% grassland/ pasture, 28% forest, 7% arable land, 4% fallow, 2% riparian area
Soils:	-
Geology:	-
Hydrogeology:	-
Characteristic water discharges: (Q_{min}, Q_{mean}, Q_{max})	0.0 m³/s, 14.6 m³/s, 75.5 m³/s

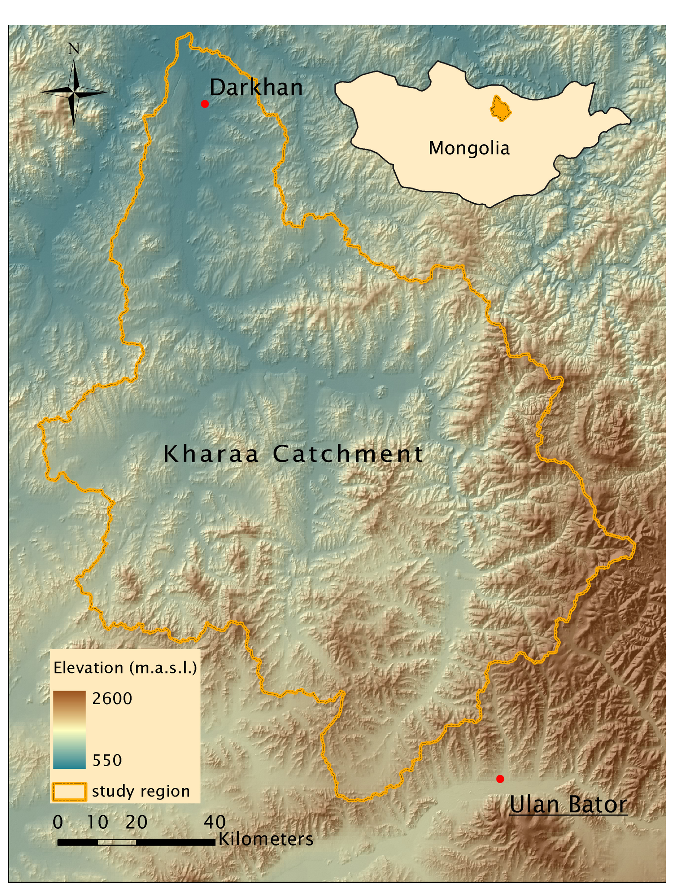
Instrumentation and data

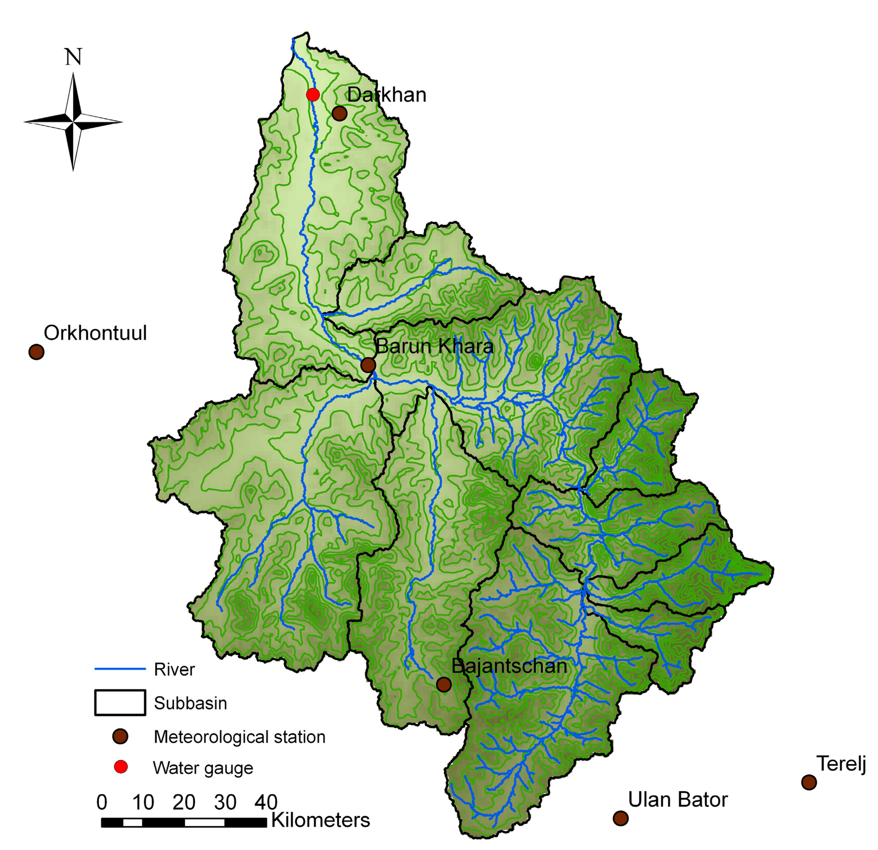
Measured hydrological parameters	Measuring period	Temporal resolution	Number of stations
Air temperature	1986 - 2002	Daily	6
Precipitation	1986 - 2002	Daily	6
River runoff	1990 - 2002	Daily	1

Applied models

1. HBV-D (resolution: small scaled subbasins)
2. TRAIN (resolution: 1 x 1 km)
3. WaterGAP (resolution: 0.5°)

Map of the research basin





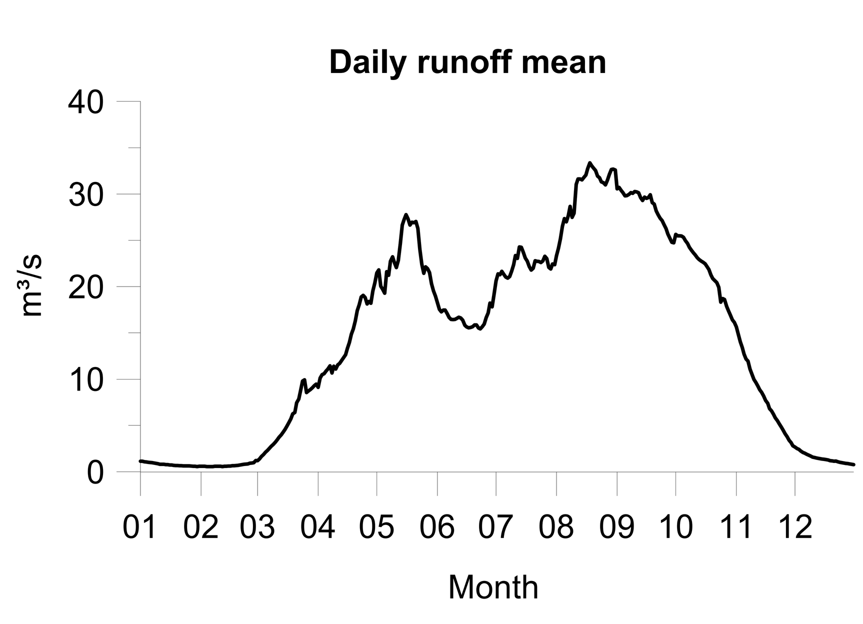
Main scientific results

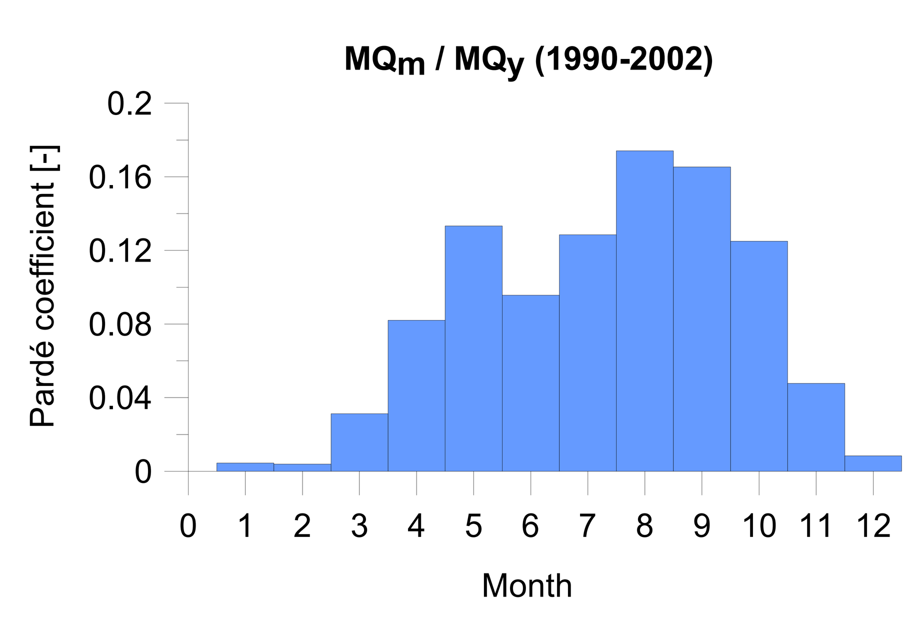
1. Causes of observed runoff decrease:
A drastic decrease of runoff was in the middle 1990s observed in the basin. The data in the region is scarce but the causes of the decrease could be investigated by applying the HBV-D model. The idea was that, if the observed runoff decrease could be simulated, it would indicate that it would be due to climate variability. If instead HBV-D would be unable to simulate the runoff decrease by delivering a runoff of the same magnitude as the earlier years, the decrease would be harder to justify with climate variability. An explanation of the runoff decrease could then be due to hydrological changes at the measurement site or increased water exploitation in Kharaa, e.g. from the mining activities in the basin.
The observed runoff decrease could be simulated. That indicates that the decrease is due to climate variation and not due to hydrological changes at the measurement site or an increased water exploitation.

2. HBV-D parameter uncertainty:
To assess the parameter uncertainty of the HBV-D model a Monte Carlo analysis was performed with a high amount of parameter combinations where the parameters had been randomized within stated intervals. The well performing parameter settings had a variation that was low compared to the observed runoff. Hence, the runoff could be simulated with an acceptable uncertainty of the parameters.

3. Runoff prediction in ungauged subbasins:
The runoff contribution from each sub-basin was quantified and it was investigated whether the simulated low flows coincided with the occasionally observed dry out of some specific watercourses. The simulated runoff for an average year was computed and the uncertainty was estimated by the simulated maximum and minimum monthly average for each specific month during the time period 1990-2002. The runoff within the ungauged subbasins were simulated as valuable knowledge for the establishing of a monitoring system.

Mean hydrograph / Pardé flow regime





Key references for the basin

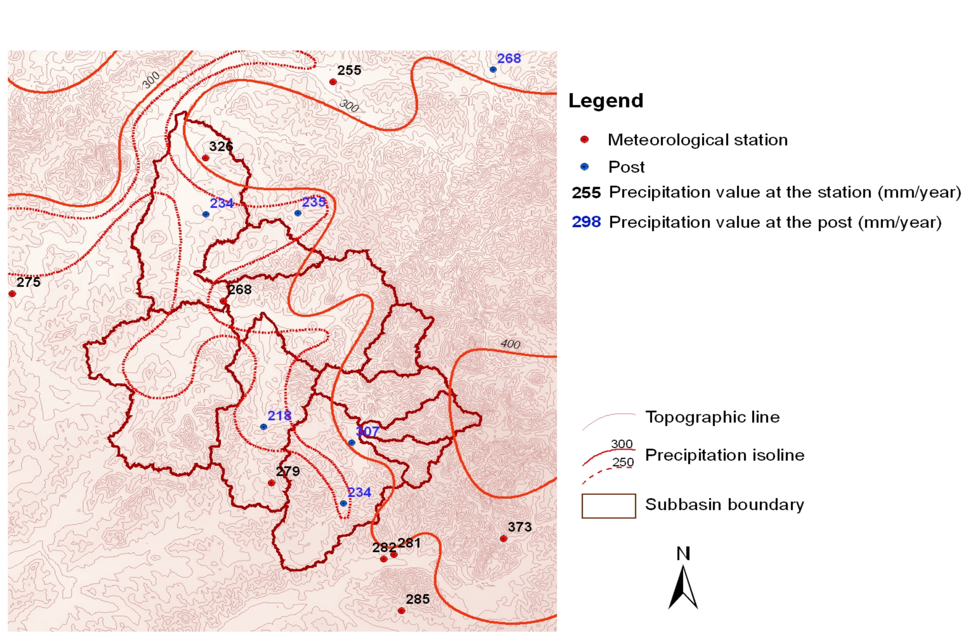
Damba, E (ed.) (1986). *Regional Scheme of the complex usage and protection of the Waterresources in the Selenge river basin, Atlas* (translated from Russian). Ulaanbaatar, Mongolia.

Menzel, L., aus der Beek, T., Törnros, T., Wimmer, F. and Gomboo, D. (2008). Hydrological impact of climate and land-use change – results from the MoMo project In: Basandorj, B. and Oyunbaatar, D. (Eds.): International Conference "Uncertainties in water resource management: causes, technologies and consequences". *IHP Technical Documents in Hydrology No. 1*, UNESCO Office, Jakarta, 15 – 20.

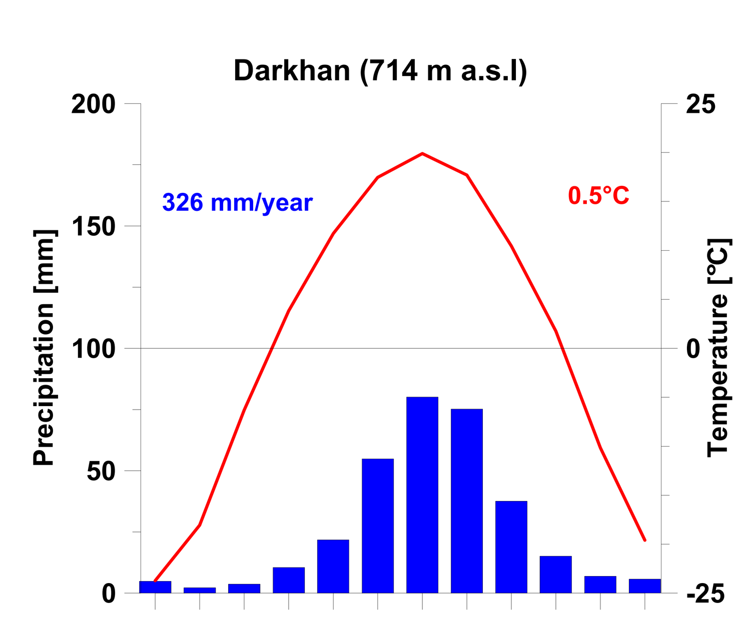
Wimmer, F., Schlaffer, S., aus der Beek, T. and Menzel, L. (2009). Distributed modelling of climate change impacts on snow sublimation in northern Mongolia. *Advances in Geosciences*, (in press).

Special basin characteristics

Precipitation isohyets



Climate diagram



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