

has been documented for many regions but remain under-reported

ins is the main centre of glaciation in Siberia about 1500 glaciers (~900 km²) according to the assessment conducted in the 1950s-1960s (Glaciers of the USSR, 1974; 1977)

ives of the study are to evaluate changes in glaciers in the North and South Chuya Ridges of since mid-20th century; to relate these changes to regional climate; and to discuss future projections

Methods

9/2004 (Fig. 2 - 4) was used to [manually] map the extent of glaciers using software

Glaciers in the mid-20th century, derived from the aerial photographs and the Catalogue of Glaciers (1974; 1977)

Re-mapped data was assessed by re-mapping the extent of 20 glaciers using the original aerial photographs from August 1952 (Fig 3 b). An average difference between the published and re-mapped areas for 1952 was 5%. The published values exceeded the

26 glaciers (with individual areas >0.5 km²) between 1952 and 2004. Glaciers < 0.5 km² were not included because of the potentially large variation of their 1952 areas published in the Catalogue of Glaciers (1974; 1977)

Temperature data obtained from the Akkem and Kara-Tyurek stations (Fig. 1)

Future projections have been derived using PRECIS modelling system (a regional climate model with 25 km resolution (Jones *et al.*, 2004))

Glacier and climate change

Re-mapped area of 253 km² were mapped on the 2004 ASTER image. Including glaciers < 0.5 km²) declined by 82 km² since 1952. The number increased by 19 (from 238) due to their fragmentation (Fig. 4)

63 glaciers (>0.5 km²) declined from 284 km² to 228 km². This is a significant reduction. A comparison of the published and re-mapped test glacier area might be overestimated by ~ 5%. However, the measured values are consistent with the results of an assessment of glacier change in the North and Gombo, 2007)

The function of glacier size is illustrated by Fig. 5

North aspect: east-facing glaciers lost 41% (highest) while west-facing (lowest) of their area

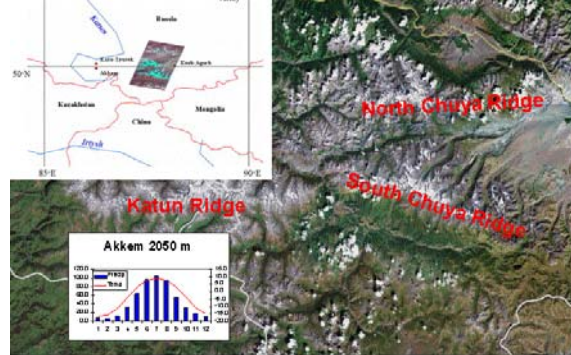


Fig. 1. Location and the study area and precipitation shown for the study area. Note that over the precipitation in October.

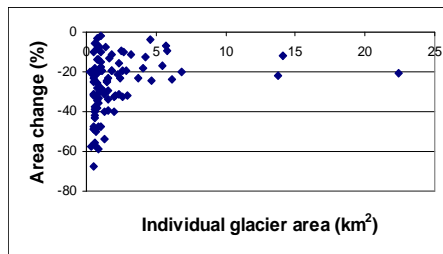
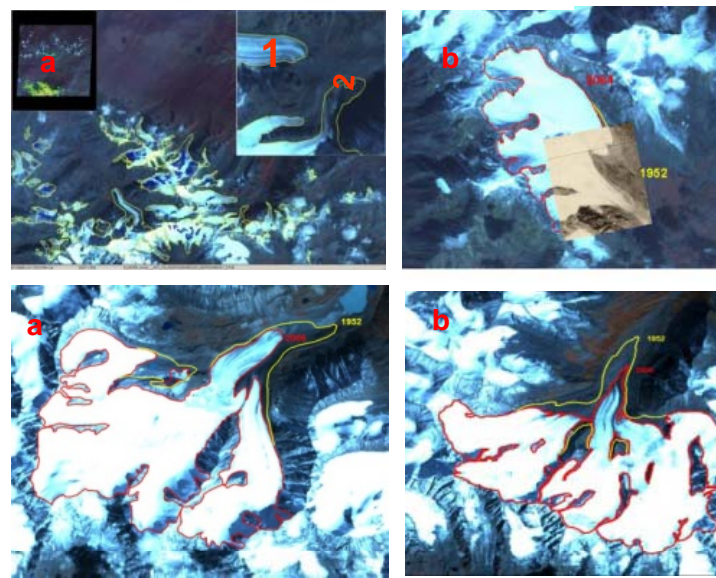


Fig. 5. Change in glacier area as a function of glacier size

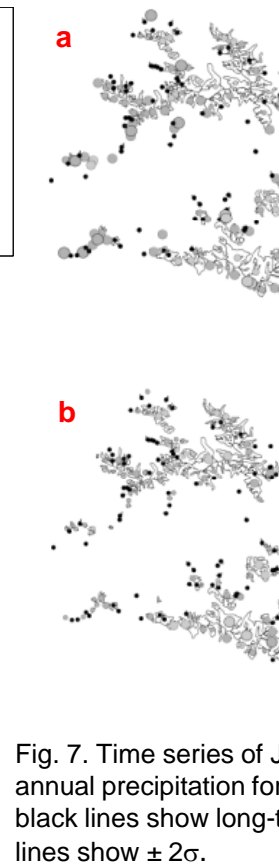
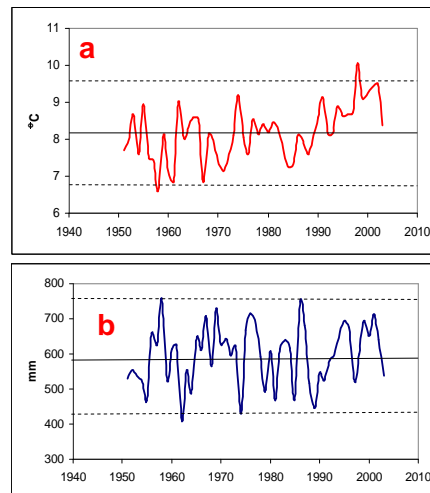


Fig. 7. Time series of annual precipitation for the study area. Black lines show long-term trends and dashed lines show $\pm 2\sigma$.

Future Climate Projections

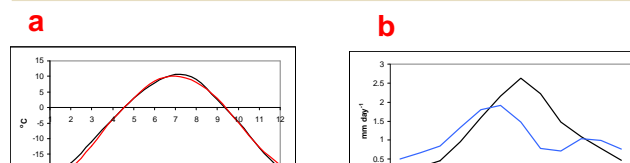


Fig. 8. Future climate projections. (a) annual temperature and (b) annual precipitation.