Reconstructing former glacial extent of the NE Tibetan Plateau combining remote sensing and field data of glacial geology

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Abstract

The Tibetan Plateau (TP) is a key global topographic feature, with regional and global climatic significance. Still, the paleogeography of the plateau is elusive, with constrained glacial reconstructions.

Introduction and background

The Tibetan Plateau is a key global topographic feature, with regional and global climatic significance. Still, the paleogeography of the plateau is elusive, with constrained glacial reconstructions.

The Bayan Har Shan in the NE corner of the plateau is characterized by an extensive low-relief plateau surface at ~4300 m a.s.l. with mountain blocks rising 1000-2000 m higher and steep fluvial valleys along the plateau surface margins (Stroeven et al. in press). These widely different paleo-glacial configurations have been proposed for this area.

Methods

Two main methods have been used to record the glacial geology:

1. Remote sensing: enabling extensive and complete coverage mapping of large- and medium-scale glacial landforms
2. Field studies: enabling detailed point observations of glacial deposits

Field studies

Field investigations of glacial deposits have been performed 2005, 2006 and 2007. To identify glacial deposits, and distinguish glacial from non-glacial deposits, we have used the presence of robust glacial indices. We have mapped the occurrence of glacial deposits and we have recorded areas with an absence of glacial indices.

Results

Glacial landforms occur frequently in elevated mountain areas, but are absent in extensive low-lying plateau areas. There is a noteworthy lack of small- and medium-scale glacial landforms, such as glacial lineation swarms, ribbed moraines and eskers.

Glacial deposits occur frequently in elevated mountain areas marked by a glacial imprint, but also some distance outside mapped glacial landforms, in an absence of large-scale glacial geomorphology. Still, in low-lying plateau areas there is an absence of glacial deposits.

Conclusions

- Alpine style glaciation ranging from cirque glaciers to valley glacier networks is evident from the glacial geomorphology.
- Blockfield cap glaciation, presumably pre-dating more restricted glaciations) with valley glaciers rises towards the highest mountain blocks, is indicated by glacial deposits distributed some distance outside large- and medium-scale glacial landforms.
- There is no support for ice sheet glaciation, neither a plateau-scale ice sheet nor a regional Huang He ice sheet.
- The most extensive glaciation is recorded in point form only by field observations of glacial deposits, indicating insignificant erosion by the most extensive former surficial cap.

References


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