Glacier mass balance modelling of the Tibetan Plateau
mesh dependence issues

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Outline

• Introduction – Glacial history of the Tibetan Plateau
• The model – a simple PDD mass balance model
• Model results
  - Comparison with modern glaciers
  - Grid resolution variation
  - Grid resolution variation / climate perturbations
• Summary
The model

Simple positive degree day model

Input: 1 km resolution climate data

- mean month temp
- mean month prec
- month accumulation
- month melt
- Mass balance

Temperature

Precipitation

Mass balance
Results

Modelled mass balance – pdd factor 3.0

GLIMS modern glaciers

mm water equivalent

-20000

0

7778

m a.s.l.

0
Grid resolution variation

mm water equivalent

-20000

0
### Grid resolution variation

<table>
<thead>
<tr>
<th>resolution</th>
<th>nr of grids</th>
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</thead>
<tbody>
<tr>
<td>1 km</td>
<td>6617600</td>
</tr>
<tr>
<td>2.5 km</td>
<td>1058816</td>
</tr>
<tr>
<td>5 km</td>
<td>264704</td>
</tr>
<tr>
<td>10 km</td>
<td>66176</td>
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<tr>
<td>20 km</td>
<td>16544</td>
</tr>
<tr>
<td>40 km</td>
<td>4136</td>
</tr>
</tbody>
</table>

![Bar chart showing accumulation area for different spatial resolutions]
Climate perturbations

The figure shows the relationship between temperature decrease and precipitation increase. Each bar represents the percentage of the 20 km square area that accumulates water within 1 km of the area experiencing the temperature decrease (K) or precipitation increase (%).
Climate perturbations

10 K temperature decrease

8000 % precipitation increase
Summary

A simple pdd mass balance model with high resolution WorldClim climate data as input reproduce the accumulation areas of modern glaciers reasonably OK.

Grid resolution effects the accumulation area significantly.
Larger grids $\rightarrow$ smaller accumulation area.
Thanks