Glaciers and Climate Change in Iceland: outlook in the beginning of the 21st century

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Glaciers cover 11% of Iceland

They are rapidly shrinking

20 years of precipitation on Iceland
Evaluation of Glacier Evolution

**Acquisition of basic data:**
- Glacier geometry: surface and bedrock
- Glacier mass balance
- Ice dynamics
- Glacio-meteorology
- Drainage of meltwater

**Modeling:**
- Mass balance
- Ice dynamics
- Glacier response to climate

Firnline

Ablation area

Runoff

Accumulation area

Ice flow
1995-2007: 10 m
80 km³

Mass balance

accelerating volume loss

Vatnajökull
Approach:
Field observations & modelling $\Rightarrow$ prediction given climate scenarios
Climate change scenario for Icelandic highland
Predicted response to CE climate change scenario

Model responses shown for three Icelandic glaciers: Vatnajökull, Langjökull and Hofsjökull

Note:
Volumes and areas are normalized to present day values
Specific runoff is from the present day glacier covered area
Year: 2000
Consequences of climate change

- Glaciers disappear in 100-200 yrs
- Discharge from glaciers increases over next 50 yrs and then decreases
- Seasonal rhythm in discharge changes, some rivers disappear
- River discharge = precipitation
- Changes in sediment load of rivers
Research Program on Glacial Changes in the Himalaya and the Consequences for the Economic and Social Development of India

Proposal initiated by the President of Iceland
HE Ólafur Ragnar Grímsson

Indus, Ganges, Brahmaputra
Research Steps toward Prediction of Glacial Changes

1. Collecting required basic field data
2. Develop glaciers models
   – mass balance
   – physical flow dynamics
3. Combine mass balance and flow models and run for different climate scenarios
4. Prediction, analyses of consequences and adaptation

- Requires education and training of young scientists, and constructive political reactions
Consequences of Himalayan Glaciers Disappearing in 40-70 years

- **Hydrology**
  - Flood hazards, outburst floods
  - Seasonal changes in river discharge, drinking water, irrigation
  - Drought
  - Changing design criteria of bridges and hydropower plants

- **Regional planning and development, adaptation, mitigation**
  - Agriculture, food production
  - Transport
  - Tourism

- **Impact on ecological systems, human health**