Preface

Scientists whose research involves snow and ice masses are acutely aware that these elements of their systems respond to climate forcing on a range of time scales. The magnitude and direction of the response is of particular concern at present, given international concerns about the effects of the probable trend in global warming. It might seem natural to assume that a warming climate would result in a reduction in snow and ice cover, but this is not necessarily the case. Increased snowfall accompanying an increase in air temperature can lead to an increase in snow and ice cover in some circumstances, at least temporarily. There are also likely changes in the seasonality and magnitude of snow and ice melt. These may have consequences for water supply in arid regions.

The papers in this publication were selected for symposium HS2 held as part of the scientific programme of the International Association of Hydrological Sciences during the XXII General Assembly of the International Union of Geodesy and Geophysics at Birmingham in July 1999. These papers address aspects of the response of the cryosphere to climate forcing. They are divided into four sections:

- **Interactions between climate, snow and permafrost**
  These papers show how the distribution of snow and permafrost responds to a number of climatic parameters. In particular, variations in ocean–atmosphere heat and water vapour transfer are shown to impact on regional snow-cover distribution.

- **Monitoring and modelling snow cover**
  These papers document recent advances in the modelling of processes in snow cover. Variations in runoff from snow cover as a result of climate change are also examined.

- **Ice mass variability**
  These papers address the climatic factors that impact on the accumulation and ablation of ice masses over a range of time scales. They show that there are regional effects in the response of ice mass balance to climate forcing.

- **Chemical processes in the cryosphere**
  These papers outline how the change in snow and ice cover distribution may impact on chemical processes within and beneath the cryosphere. The likely impacts on the source and sink of two greenhouse gases, CO_2 and N_2O are also examined.

This symposium follows a series of related IAHS meetings in the last 10 years, namely: *Snow Cover and Glacier Variations*, a symposium held during the Third IAHS Scientific Assembly at Baltimore, May 1989; *Hydrology in Mountainous Regions. I—Hydrological Measurements; The Water Cycle*, a symposium held at Lausanne, August 1990; *Glaciers–Ocean–Atmosphere Interactions*, a symposium held at St Petersburg, September 1990; *Snow, Hydrology and Forests in High Alpine Areas*, a symposium held during the XX Assembly of the International Union of Geodesy and Geophysics at Vienna, August 1991; *Snow and Glacier Hydrology*, a symposium held at Kathmandu, November 1992; *Snow and Ice Covers: Interactions with the Atmosphere and Ecosystems*, a joint IAMAP/IAHS symposia held at Yokohama, July 1993; *Biogeochemistry of Seasonally Snow-Covered Catchments*, a symposium held during the XXI Assembly of the International Union of Geodesy and Geophysics at Boulder, July 1995.

The editors hope that this work helps to stimulate further research into climatic forcing of snow cover and ice masses.

Principal Convenor and Editor-in-chief:
Martyn Tranter