Introduction

This Fourth ESF SEDIFLUX Science Meeting and First I.A.G./A.I.G. SEDIBUD Workshop builds on three previous ESF SEDIFLUX Science Meetings held in Sauðarkrokur (Iceland) in June 2004, Clermont-Ferrand (France) in January 2005 and Durham (UK) in December 2005.

The theme of this Meeting is "Source-to-Sink-Fluxes and Sediment Budgets in Cold Environments". The Meeting will be split between scientific paper and poster presentations and workshop discussions focussed on the principle working groups of SEDIFLUX. The key aims of SEDIFLUX and SEDIBUD are to provide a framework for integrated, multidisciplinary research on sediment fluxes, sediment transfers, sediment budgets and climate change and to foster discussion, exchange and research collaboration between researchers in Europe and worldwide.

This Meeting will address the key aim of SEDIFLUX and SEDIBUD to discuss Sedimentary Source-to-Sink-Fluxes and Sediment Budgets in Cold Environments. Of special interest will be the discussion of consequences of climate change, temporal and spatial scale issues, source-to-sink correlations, exogenous-endogenous interactions, and of the potential to bridge among different geo-scientific fields as well as among geo- bio- and social sciences.

Central issues of the Meeting will be the discussion and further development of the SEDIFLUX Handbook, the development of further ideas to continue and to extend the scientific activities, which were started within SEDIFLUX within the I.A.G./A.I.G. Working Group SEDIBUD (definition of key test sites, etc.), and the development of contacts and collaborations between earth scientists in Europe and North America.

Scientific summary

Changes in climate have a major impact on Earth`s surface systems, especially in high-latitude and high-altitude cold environments. Such changes have a major impact on sediment transfer processes. However, until now quantitative analysis of sediment transfers have largely been confined to other climatic zones, therefore a properly integrated study of source-to-sink sediment fluxes and sediment budgets in cold environments is long overdue.

There is a wide range of high-latitude and high-altitude cold environments that need to be studied, from high arctic/Antarctic to subarctic/subantarctic, alpine and upland sites. This provides a great opportunity to investigate relationships between climate, vegetation cover and sedimentary transfer processes across a diverse range of cold environments, with the ability to model the effects of climate change and related vegetation cover adjustments through space-for-time substitution. There is now broad agreement among climatologists that global warming is occurring, the subject of the Science Meeting is therefore of vital interest for the whole world.

Climate change affects Earth surface systems all over the world but with arguable the greatest impact in high-latitude and high-altitude cold environments. In these areas climate change shapes earth surface processes not just by altering vegetation and human activities but also through its impact on frost penetration and duration within the ground surface layers. Climate change also exerts a strong control on cryospheric systems, influencing the nature and extent of glaciers and ice sheets, and the extent and severity of glacial and paraglacial processes. Changes within the cryosphere have major knock-on effects on glacifluvial, aeolian and marine sediment transfer systems. All of these factors influence patterns of erosion, transport and deposition of sediments. However it is a major challenge to develop a better understanding of how these factors combine to affect sedimentary transfer processes and sediment budgets in cold environments. As a starting point our baseline knowledge of the sedimentary transfer processes operating within our current climate and under given vegetation cover, as a basis for predicting the consequences of future climate changes and related vegetation cover changes needs to be extended. Only when we have these reliable models will we have fuller understanding. It is therefore necessary to collect and compare data from different cold environments, and use this to assess a range of models and approaches for researching the relationships between climate change, vegetation cover and sediment fluxes.

The primary aim is to provide an integrated quantitative analysis of sediment transfers, nutrient fluxes and sediment budgets across a range of key cold environments. Such an analysis has so far been lacking. The major focus is on the impact on sediment transfer processes in response to a variety of

climate change scenarios at a scale, which incorporates sediment flux processes from source to sink. In order to perform a fully integrated study of source to sink sediment fluxes and sediment budgets in cold environments, the Science Meeting analyses the key components of weathering, chemical denudation, erosion, aeolian processes, mass movements, fluvial transfers/transport, glacial sediment transfers, and sedimentation in lakes and coastal areas. Bringing these different weathering, erosion, transfer and sedimentation processes into one integrated study requires collaboration between a variety of specialists working on the respective subjects. The Science Meeting is bringing together both leading and young scientists in these fields, and creating a unified approach that will take the research forward within the specific focus of climate change impact on the Earth surface. One of the great strengths is the wide variety of scientific fields being harnessed, including physical geography, Quaternary geology, geology, oceanography, limnology, civil engineering, ecology, biodiversity research, social sciences. The Meeting is also considering the impact of human activity on the environmental sites being studied and how this might relate to climate change.