

ESF COMPLETED NETWORK

FINAL REPORT

Guidelines for Network Chairs

Within two months of the completion date of the Network, the Chair must submit a **Final Report**. (Report size: two to three A4 pages maximum). It should indicate the activities completed, results achieved and dissemination undertaken (reports, publications, websites etc.) together with any views or recommendations from the Network on the further development of the topic. Completed Networks will be subject to evaluation. The Final Report and other relevant material will be reviewed and considered by the relevant Scientific Standing Committee.

Content and structure of the Final Report

1. Network title

SEDIFLUX – Sedimentary source-to-sink fluxes in cold environments

2. Convenor

Assoc. Professor Dr. Achim A. Beylich, Geological Survey of Norway, Landscape & Climate group, Leiv Eirikssons vei 39, NO-7491 Trondheim, Norway. Phone: +47 73 904117, Fax: +47 73 921620; Email: achim.beylich@ngu.no, <http://www.ngu.no/landscape>

3. Network Budget

85000 €

4. Duration

01.04 – 12.06

5. Summary of Network Activities

Meetings:

- First SEDIFLUX Steering Committee Meeting in Reykjavik, June 17th, 2004
- First SEDIFLUX Science Meeting in Sauðárkrókur, Iceland, June 18th-21st, 2004, see <http://www.nnv.is>
- Second SEDIFLUX Steering Committee Meeting in Clermont-Ferrand, January 19th, 2005
- Second SEDIFLUX Science Meeting in Clermont-Ferrand, January 20th – 22nd, 2005, information: samuel.etienne@lettres.univ-bpclermont.fr
- EUCOP II, June 12th – 16th, 2005, Potsdam, Germany: Conference Session 05: "Hydrology and Sediment Fluxes in Permafrost Regions", Organized in Association with ESF SEDIFLUX; Session Co-chairs: Achim A. Beylich & Bernd Etzelmüller, see: <http://www.awi-potsdam.de/EUCOP/>
- Third SEDIFLUX Steering Committee Meeting in Durham, UK, December 16th, 2005.
- Third SEDIFLUX Science Meeting in Durham, UK, December 16th – 19th, 2006, see <http://www.geography.dur.ac.uk/conf/tssm>
- Fourth SEDIFLUX Steering Committee Meeting Meeting in Trondheim, Norway, October 29th, 2006.

- Fourth SEDIFLUX Science Meeting & First Workshop of I.A.G./A.I.G. SEDIBUD, in Trondheim, Norway, October 29th – November 02nd, 2006, see http://www.ngu.no/sediflux/sciencemeeting_index.html

Dissemination and Publications:

- SEDIFLUX Newsletter (2004A, 2004B, 2005A, 2005B, 2005C, 2006A, 2006B, 2006C)
- SEDIFLUX Poster
- SEDIFLUX Flyer
- SEDIFLUX Introduction (Power Point)
- SEDIFLUX Main Website (<http://www.ngu.no/sediflux>)
- ESF SEDIFLUX Website (<http://www.esf.org/sediflux>)
- Local Websites (Uppsala, Sauðárkrókur, Clermont-Ferrand, Durham, Trondheim: see links at websites mentioned above)
- Publications and Reports (see below under 6.)

Development of the ESF SEDIFLUX Database and ESF SEDIFLUX Webpage:

- Collection of material for the SEDIFLUX Projects, Test Sites and Members Database (see Form Sheets in SEDIFLUX Newsletters 2004A and 2004B and new Call in Newsletter 2006C)
- See <http://www.ngu.no/sediflux>

Proposals related to SEDIFLUX:

- IPY: Expression of Intent SEDIFLUX (EoI no. 816): Included and endorsed within the IPY Full Proposal IPY BIPOMAC (ID no. 130) and linked to the IPY Full Proposals IPY TSP (ID no. 50), IPY ANTPAS (ID no. 33), IPY ARCTIC-HYDRA (ID no. 104), IPY KINNVIKA (ID no. 58), IPY ACCO-Net (ID no. 90), IPY SEA0 (ID no. 317) and IPY APEX (ID no. 39)
- IPY: Expression of Intent DYNAFLUX (EoI no. 402): Included and endorsed within the IPY Full Proposal IPY BIPOMAC (ID no. 130) and linked to the IPY Full Proposal IPY TSP (ID no. 50)
- International Association of Geomorphologists (I.A.G./A.I.G.) Working Group Proposal SEDIBUD (Sediment Budgets in Cold Environments): Approved on September 10th, 2005 (<http://www.geomorph.org>, <http://www.geomorph.org/wg/wgsb.html>)
- ESF Research Networking Programme Proposal DYNACOLD (Dynamics and Landscape Formation in Cold Environments) (submitted to ESF)
- EU FP7 Marie-Curie ITN Proposal DYNAFLUX (Dynamics, Fluxes, Stability and Succession in Cold Environments) (in preparation, submission to EC before May 07th, 2007)

6. Publications

Beylich, A.A. (Ed.) (2006): SEDIFLUX - Sedimentary Source-to-Sink-Fluxes in Cold Environments. First ESF SEDIFLUX Science Meeting, Saudarkrokur, Iceland. *Geomorphology* **80** (1-2). 146pp.

Beylich, A.A. (Ed.) (2006): Fourth ESF SEDIFLUX Science Meeting & First Workshop of I.A.G./A.I.G. SEDIBUD: Source-to-Sink-Fluxes and Sediment Budgets in Cold Environments. October 29th-November 02nd, 2006, Trondheim, Norway. *NGF Abstracts and Proceedings of the Geological Society of Norway*, **4**, 2006. 85pp.

Beylich, A.A. (Ed.) (2006): Fourth ESF SEDIFLUX Science Meeting & First Workshop of I.A.G./A.I.G. SEDIBUD. *NGU Report 2006.069*. 2006. 85pp.

Beylich, A.A. & the SEDIBUD Team (2006): The I.A.G./A.I.G. Working Group SEDIBUD – Sediment Budgets in Cold Environments: Introduction and overview. *NGF Abstracts and Proceedings of the Geological Society of Norway*, **4**: 26-27.

Beylich, A.A. and the SEDIFLUX Team (2005): SEDIFLUX: A European Science Foundation (ESF) Network. *Sixth International Conference on Geomorphology, September 7-11, 2005, Zaragoza (Spain)*. *Abstracts Volume*: 19.

Beylich, A.A. and the SEDIFLUX Team (2005): The European Science Foundation (ESF) Network SEDIFLUX. *ICARP II, Conference Material* (CD).

Beylich, A.A. & the SEDIFLUX Team (2006): The European Science Foundation (ESF) Network Sedimentary Source-to-Sink-Fluxes in Cold Environments (SEDIFLUX). 1st TOPONORGE Workshop, Geological Survey of Norway (NGU), Trondheim, 6.-7. March 2006. *NGF Abstracts and Proceedings of the Geological Society of Norway*, **1**: 8.

Beylich, A.A., Etienne, S., Eitzmüller, B., Gordeev, V.V., Käyhkö, J., Rachold, V., Russell, A.J., Schmidt, K.-H., Sæmundsson, P., Tweed, F.S. & J. Warburton (2006): The European Science Foundation (ESF) Network SEDIFLUX – An introduction and overview. In: Beylich, A.A. (Ed.): SEDIFLUX. Sedimentary Source-to-Sink-Fluxes in Cold Environments. Special Issue. *Geomorphology* **80** (1-2): 3-7.

Beylich, A.A., Etienne, S., Eitzmüller, B., Gordeev, V.V., Käyhkö, J., Lantuit, H., Russell, A.J., Sæmundsson, Th., Schmidt, K.-H., Tweed, F.S. & J. Warburton (2006): The European Science Foundation (ESF) Network – Sedimentary Source-to-Sink-Fluxes in Cold Environments - (SEDIFLUX, 2004-2006). *NGF Abstracts and Proceedings of the Geological Society of Norway*, **4**: 24-25.

Beylich, A.A., Etienne, S., Eitzmüller, B., Gordeev, V.V., Käyhkö, J., Rachold, V., Russell, A.J., Schmidt, K.-H., Sæmundsson, P., Tweed, F.S. & J. Warburton (2005): Sedimentary Source-to-Sink-Fluxes in Cold Environments – Information on the European Science Foundation (ESF) Network SEDIFLUX. *Zeitschrift für Geomorphologie N.F., Suppl.-Vol.* **138**: 229-234.

Beylich, A.A., Etienne, S., Eitzmüller, B., Gordeev, V.V., Käyhkö, J., Rachold, V., Russell, A.J., Schmidt, K.-H., Sæmundsson, P., Tweed, F.S., & J. Warburton (2005): Sedimentary Source-to-Sink-Fluxes in Cold Environments (SEDIFLUX): An Interdisciplinary ESF Network. *HeadWater2005, Conference Papers* (CD). Bergen.

Beylich, A.A., Etienne, S., Eitzmüller, B., Gordeev, V.V., Käyhkö, J., Rachold, V., Russell, A.J., Schmidt, K.-H., Sæmundsson, P., Tweed, F.S. & J. Warburton (2005): The European Science Foundation (ESF) Network SEDIFLUX: Sedimentary Source-to-Sink-Fluxes in Cold Environments (2004 – 2006) – Introduction. *EUCOP II Programme and Abstracts*: 92-93.

- Beylich, A.A., Etienne, S., Etzelmüller, B., Gordeev, V.V., Käyhkö, J., Rachold, V., Russell, A.J., Schmidt, K.-H., Sæmundsson, P., Tweed, F.S. & J. Warburton (2004):** Information on the European Science Foundation (ESF) Network: Sedimentary Source-to-Sink-Fluxes in Cold Environments (SEDIFLUX). *Geophysical Research Abstracts*, **6**, 06798, 2004.
- Beylich, A.A., Etienne, S., Etzelmüller, B., Gordeev, V.V., Käyhkö, J., Rachold, V., Russell, A.J., Schmidt, K.-H., Sæmundsson, P., Tweed, F.S. & J. Warburton (2005):** The European Science Foundation (ESF) Network SEDIFLUX: Sedimentary Source-to-Sink-Fluxes in Cold Environments. *NGF Abstracts and Proceedings*, no. 1, 2005: 11-12.
- Beylich, A.A., Etienne, S., Etzelmüller, B., Gordeev, V.V., Käyhkö, J., Rachold, V., Russell, A.J., Schmidt, K.-H., Sæmundsson, P., Tweed, F.S. & J. Warburton (2004):** The ESF Network SEDIFLUX: "Sedimentary Source-to-Sink-Fluxes in Cold Environments" – an introduction. Náttúrustofa Norðurlands vestra. NNV-2004-003. June 2004, 27-28.
- Beylich, A.A., Sæmundsson, P., Decaulne, A. & O. Sandberg (Eds.) (2004) :** First Science Meeting of the European Science Foundation ESF – Network SEDIFLUX. Sauðárkrókur, Iceland, June 18th – 21st, 2004. - Extended Abstracts of Science Meeting Contributions. Náttúrustofa Norðurlands vestra. NNV-2004-003. 103 pp. (<http://www.nnv.is/skrar/AbstractVolume-pdfversion.pdf>)
- Etienne, S. (Ed.) (2005):** Shifting Lands. New insights into periglacial geomorphology. 2nd ESF Network SEDIFLUX meeting 20-22nd January 2005, Clermont-Ferrand *Seteun Geoenvironment Series*, Clermont-Ferrand, 126 pp.
- Etienne, S. (Ed.) (2006):** New insights into periglacial geomorphology: the SEDIFLUX International meeting "Shifting lands" (Clermont-Ferrand, January 20-22, 2005). *Géomorphologie. Relief, Processus, Environment* **3**, 2006.
- Etienne, S. (2005):** Shifting lands, conférence internationale sur la géomorphologie periglaciaire, Clermont-Ferrand, 20-22 Janvier 2005. *Environnements périglaciaires*, **12**, 2005: 5-7.
- Gordeev, V.V. (2005):** The first workshop on the project "The European Science Foundation Network: Sedimentary Source-to-Sink-Fluxes in Cold Environments" (19-21 June, 2004, Saudarkrokur, Iceland). *Geomorphology*, *NI (January-February)*, pp. 109-110 (in Russian).
- Mercier, D. & S. Etienne (Eds.):** Paraglacial geomorphology: processes and paraglacial context. *Geomorphology* (in press).
- Slaymaker, O. (2004):** Report on the First Science Meeting of the European Science Foundation Network SEDIFLUX held in Iceland from June 18 – June 21, 2004. *International Association of Geomorphologists Newsletter* No. 21 (3/2004) (<http://www.geomorph.org>)
- Tweed, F.S. (2005):** Report on the first SEDIFLUX Science Meeting in Sauðárkrókur, Iceland, June 2004. *Jökull*, **54**: 85-86.
- Tweed, F.S. (2006):** Sediment budgets and rates of sediment transfer across cold environments in Europe – the third SEDIFLUX Science Meeting, held at Durham University, UK, December 16th – 19th, 2005. *Geophemer* no. **98**, Autumn 2006: 35-36.
- Warburton, J. (Ed.) (2005):** Sediment budgets and rates of sediment transfer across cold environments in Europe. European Science Foundation – 3rd SEDIFLUX Science Meeting. December 16-19th 2005, Durham University, UK. Abstract Volume. 31pp.
- Warburton, J. (Ed.) (2007):** Sediment budgets and rates of sediment transfers across cold environments in Europe. *Geografiska Annaler*, A, Special Issue (2007/1).

Warburton, J. (2007): Sediment budgets and rates of sediment transfer across cold environments in Europe: a commentary. *Geografiska Annaler*, A, Special Issue (2007/1).

Special Issues of the Journals Norsk Geografisk Tidsskrift-Norwegian Journal of Geography and Zeitschrift für Geomorphologie arising from the Fourth ESF SEDIFLUX Science Meeting in Trondheim, Norway, October 29th-November 02nd, 2006 (http://www.ngu.no/sediflux/sciencemeeting_index.html) are in preparation (Ed. A.A. Beylich (et al.)), deadline for paper submissions is March 01st, 2007.

SEDIFLUX Website: <http://www.ngu.no/sediflux>; see Newsletters, etc. (see below 5.) available there.

7. Other outputs

SEDIFLUX Manual

(see also below 10., and see preliminary draft version of the Manual available at <http://www.geomorph.org/wg/wgsb.html>). A First Edition of the SEDIFLUX Manual will be available at the Second IAG/AIG SEDIBUD Workshop in Abisko, Sweden, September 15th-19th, 2007, see more information at <http://www.geomorph.org/wg/wgsb.html>

8. Benefits derived from this collaboration at the European level

The ESF's SEDIFLUX project has evolved into a coordinated multinational effort to monitor the changing structure of landforms in high latitudes and altitudes.

It is too early yet to expect significant results, for monitoring sediment fluxes is a long-term exercise requiring patient and consistent observations over years and even decades. But the momentum generated by SEDIFLUX is ensuring that the monitoring systems are in place to collect the required data, not just in northern Europe and the Alps, but also in other polar or mountainous regions with similar climates, for example in arctic Canada and northern Siberia.

SEDIFLUX was in a sense overdue, given the importance of studying the likely impact of projected climate change on the land structure of polar environments. There is strong synergy with ITEX, whose objective is to determine the relationship between climate and the circumpolar plant species. Clearly the impact of climate on plant species would be mediated partly through changes in land structure brought about by sediment movements.

Against this background, the main achievements of SEDIFLUX so far have been in establishing a sustainable framework for long-term research. Initial key test sites were defined where monitoring campaigns with unified approaches and standardized methods are carried out. Such methods will enable landscape evolution to be interpreted consistently, leading to a more accurate model relating changes in climate to geomorphology (the study of landform structure and processes). The factors determining the evolution of landforms include the rates of sediment flux and of denudation. Sediment in turn needs to be analysed in terms of its different constituent parts, which can be broken down in terms of size, source and chemical composition. It includes boulders at the top end of the scale down to fine silt, embracing sands, clays, calcium carbonates, heavy metals, and silica.

SEDIFLUX has laid the groundwork for further research after the programme ended in December 2006. In fact SEDIFLUX will live on through the SEDIBUD programme set up by the International Association of Geomorphologists (IAG/AIG), a scientific, non-governmental and non-profit organisation, whose principal objectives are development and promotion of geomorphology as a science through international co-operation and dissemination of knowledge.

SEDIFLUX has been successful in forging the necessary collaboration between scientists in different disciplines, for example between geomorphologists and bioscientists; between hydrologists and ecologists; and between physical geographers and geologists. For example biologists have studied the establishment of pioneering vegetation in land that has only recently become free of ice cover during the summer through deglaciation, helping to stabilise the landscape.

Such interdisciplinary collaborations at the European level are necessary not just to assemble appropriate scientific skills but also to develop the expertise in organising such a major long-term project. Lessons have been learnt from some of the other disciplines (biology, ecology) within which major projects are more common.

With the experience gained from SEDIFLUX the global geomorphology community has all the tools in place to conduct major research into the likely impact of climate change on sensitive polar and alpine regions.

9. Future plans/proposals for development of the Network science

Large proposals related to SEDIFLUX (see also at <http://www.ngu.no/sediflux>; "Proposals related to SEDIFLUX"):

- IPY: Expression of Intent SEDIFLUX (EoI no. 816): Included and endorsed within the IPY Full Proposal IPY BIPOMAC (ID no. 130) and linked to the IPY Full Proposals IPY TSP (ID no. 50), IPY ANTPAS (ID no. 33), IPY ARCTIC-HYDRA (ID no. 104), IPY KINNVIKA (ID no. 58), IPY ACCO-Net (ID no. 90), IPY SEAO (ID no. 317) and IPY APEX (ID no. 39)
- IPY: Expression of Intent DYNAFLUX (EoI no. 402): Included and endorsed within the IPY Full Proposal IPY BIPOMAC (ID no. 130) and linked to the IPY Full Proposal IPY TSP (ID no. 50)
- International Association of Geomorphologists (I.A.G./A.I.G.) Working Group Proposal SEDIBUD (Sediment Budgets in Cold Environments):
Approved on September 10th, 2005 (<http://www.geomorph.org>, <http://www.geomorph.org/wg/wgsb.html>)
- ESF Research Networking Programme Proposal DYNACOLD (Dynamics and Landscape Formation in Cold Environments) (submitted to ESF)
- EU FP7 Marie-Curie RTN Proposal DYNAFLUX (Dynamics, Fluxes, Stability and Succession in Cold Environments) (in preparation, submission to EC before May 07th, 2007)

Future plans:

See below 10., and see activities described at <http://www.geomorph.org/wg/wgsb.html>

10. Brief outline of scientific achievements

Polar and mountainous regions are among the most sensitive regions to climate change. The ESF SEDIFLUX network is analysing the impact of climate change on landforms in high-latitude and high-altitude cold environments, via the mobilisation, movement and deposition of sediments by slope processes, rivers, glaciers, coastal processes and wind.

SEDIFLUX has over the last years evolved into a coordinated multidisciplinary and multinational effort to monitor the changing structure of landforms in cold environments and has led to a series of coordinated research initiatives. The efforts conducted within the SEDIFLUX Network were urgently needed, given the critical importance of studying the impact of projected climate change on the land structure of such sensitive environments. There is especially strong synergy with the International Tundra Experiment (ITEX), whose focus is to determine the relationship between changing climate and circumpolar plant species. The impact of climate on plant species would be mediated partly through changes in land structure brought about by sediment transfers.

SEDIFLUX has established a sustainable framework for long-term research to coordinate multinational, interdisciplinary monitoring networks, a first in the field of geomorphology. SEDIFLUX is now providing the basis for further research. One of the major outcomes produced by the SEDIFLUX group will be the SEDIFLUX Manual (a preliminary draft of the SEDIFLUX Manual is available at <http://www.geomorph.org/wg/wgsb.html>), which will provide guidelines and protocols for monitoring and sediment budget studies in selected globally distributed cold environment key test catchments. These long-term monitoring campaigns will apply unified approaches and standardized methods to generate comparable datasets from different cold environments for the development of a metadata database and for modelling the impact of climate change on sediment transfers and sediment budgets. SEDIFLUX will continue and be extended through the SEDIBUD programme (<http://www.geomorph.org/wg/wgsb.html>) set up by the International Association of Geomorphologists (IAG/AIG). All SEDIFLUX members – more than 300 from 35 countries worldwide - are participating now in the SEDIBUD programme. With the experience gained from SEDIFLUX the global geomorphology community has now the framework and all tools in place to carry out major multidisciplinary research into the impact of climate change on sensitive high-latitude and high-altitude cold environments worldwide.

Signature and date:

Date:

Please return to:

Isabelle May

European Science Foundation

1 quai Lezay-Marnésia, 67080 Strasbourg Cedex, France

E-mail: Networks@esf.org - Tel: + 33 (0) 3 88 76 71 46 - Fax: + 33 (0) 3 88 37 05 32