

Snow in Northern Eurasia

EU-INTAS 03-51-5296

Meinhard Breiling

A progress report delivered at EU-ERASMUS SOKRATES Exchange
at the Swedish University of Agricultural Sciences SLU Alnarp on:
Nov. 14th, 2005

M. Breiling, TU Wien, Sokrates/Erasmus exchange SLU Alnarp, Nov. 14th, 2005

INTAS Project 03-51-5296
Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia

Structure of Presentation

- Part 1
 - Introduction to Snow
- Part 2
 - Project description
- Part 3
 - Outlook and joint participation with SLU or Swedish institutions in follow up projects and Discussion

M. Breiling, TU Wien, Sokrates/Erasmus exchange SLU Alnarp, Nov. 14th, 2005

INTAS Project 03-51-5296
Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia

Snowflake




Source: www.snowflake.com

M. Breiling, TU Wien, Sokrates/Erasmus exchange SLU Alnarp, Nov. 14th, 2005

INTAS Project 03-51-5296
Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia

Snowflakes




Source: www.snowflake.com

M. Breiling, TU Wien, Sokrates/Erasmus exchange SLU Alnarp, Nov. 14th, 2005

INTAS Project 03-51-5296
Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia

New Snow



M. Breiling, TU Wien, Sokrates/Erasmus exchange SLU Alnarp, Nov. 14th, 2005

INTAS Project 03-51-5296
Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia

Old Snow




M. Breiling, TU Wien, Sokrates/Erasmus exchange SLU Alnarp, Nov. 14th, 2005

INTAS Project 03-51-5296
Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia

INIAS

Transformed Snow




M. Breiling, TU Wien,
Sokrates/Erasmus exchange SLU
Ainarp, Nov. 14th, 2005

INIAS Project 03-51-5266

Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia.

INIAS

Snow in Garden



M. Breiling, TU Wien,
Sokrates/Erasmus exchange SLU
Ainarp, Nov. 14th, 2005

INIAS Project 03-51-5266

Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia.

INIAS

Snow changes Life Style



M. Breiling, TU Wien,
Sokrates/Erasmus exchange SLU
Ainarp, Nov. 14th, 2005

INIAS Project 03-51-5266

Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia.



Snow Landscape

INIAS

Larger Snow Landscape



M. Breiling, TU Wien,
Sokrates/Erasmus exchange SLU
Ainarp, Nov. 14th, 2005

INIAS Project 03-51-5266

Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia.

INIAS

Siberian River in April in Intermediate Snow Landscape



M. Breiling, TU Wien,
Sokrates/Erasmus exchange SLU
Ainarp, Nov. 14th, 2005

INIAS Project 03-51-5266

Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia.

Snow is Good or Bad Depending on Socio-economic Circumstances and Interests




M. Breiling, TU Wien,
Sokrates/Erasmus exchange SLU
Ainarp, Nov. 14th, 2005

INFAS Project 03-51-5296

Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia.

In Austria Snow is




M. Breiling, TU Wien,
Sokrates/Erasmus exchange SLU
Ainarp, Nov. 14th, 2005

INFAS Project 03-51-5296

Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia.

..... Most Important for National Income...




M. Breiling, TU Wien,
Sokrates/Erasmus exchange SLU
Ainarp, Nov. 14th, 2005

INFAS Project 03-51-5296

Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia.

Including Risks of Avalanches



M. Breiling, TU Wien,
Sokrates/Erasmus exchange SLU
Ainarp, Nov. 14th, 2005

INFAS Project 03-51-5296

Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia.

Snow Influences the River Run-Off Pattern




M. Breiling, TU Wien,
Sokrates/Erasmus exchange SLU
Ainarp, Nov. 14th, 2005

INFAS Project 03-51-5296

Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia.

Snow Landscape Gunma (1)



M. Breiling, TU Wien,
Sokrates/Erasmus exchange SLU
Ainarp, Nov. 14th, 2005

INFAS Project 03-51-5296

Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia.



Contemporary Use of Snow Landscape: Skiing

EUROPEAN UNION INTAS

Is Skiing a Sustainable Use?

M. Breiling, TU Wien, Sokrates/Erasmus exchange SLU Alnarp, Nov. 14th, 2005

INTAS Project 03-51-5296

Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia.

EUROPEAN UNION INTAS

Snow is Major Factor of Change and Variation in Landscape: Tree Zvenigorod

M. Breiling, TU Wien, Sokrates/Erasmus exchange SLU Alnarp, Nov. 14th, 2005

INTAS Project 03-51-5296

Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia.

EUROPEAN UNION INTAS

Snow a Domain of Natural Scientists: Few Studies on Environmental Psychology and More Social Science Topics

M. Breiling, TU Wien, Sokrates/Erasmus exchange SLU Alnarp, Nov. 14th, 2005

INTAS Project 03-51-5296

Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia.

EUROPEAN UNION INTAS

My Steps into the Topic "Snow"

- Landscape Plan of Naßfeld ski resort in Austria (1985)
- Diploma work about tourist planning in Norway and Austria (1987)
- Ph.D. integrated approach to future of periphery mountain region (1993)
- Alnarp: consultancy work for Austrian ministries (1997)
 - Relevance of climate change for winter tourism and skiing
- Japan: supervising of M.Sc. and Ph.D. thesis (1999, 2004)
 - Climate change impacts on rural economy of Japan
- EU INTAS project, call 2003, coordinator

M. Breiling, TU Wien, Sokrates/Erasmus exchange SLU Alnarp, Nov. 14th, 2005

INTAS Project 03-51-5296

Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia.

EUROPEAN UNION INTAS

Project Outline

- EU INTAS 03-51-5296
 - Duration May 2004 to April 2007
 - Volume € 200,000
 - 75% for former USSR teams
 - 25% for European Union teams and partners
 - In total 10 working years of 7 teams with 32 members contributing

M. Breiling, TU Wien, Sokrates/Erasmus exchange SLU Alnarp, Nov. 14th, 2005

INTAS Project 03-51-5296

Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia.

Team Outline

- 7 teams with 32 members
 - Russia Hydro-meteorological Centre
 - Climate Modelling Division
 - Institute of Geography Russian Academy of Sciences
 - Snow, Ice & Polar Region Research
 - Moscow State University
 - Landscape Division, Avalanche and Disaster Mitigation Lab
 - Cryosphere Lab
 - Uzbekistan Academy of Sciences
 - Geology Lab
 - Slovak Academy of Sciences
 - Dep. of Hydrology, Liptovský Mikuláš
 - WSL
 - SLF, Schnee und Lawinenforschung Davos, Schweiz
 - TU Wien
 - Dep. for Urban Planning and Landscape Architecture

M. Breiling, TU Wien, Sokrates/Erasmus exchange SLU, Ainarp, Nov. 14th, 2005

INTAS Project 03-51-5296
Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia

What happened so far?

- Proposal written in June 2003
- Start in May 2004
- Project website at www.landscape.tuwien.ac.at/intas
- First Workshop in Oct. 2004 in Kaprun, Austria
- Conference TTL in Vienna in Nov. 2004
- 1st Progress Report, Apr. 2004
- Second Workshop in Oct. 2005 in Zvenigorod, Russia
- In between administration

M. Breiling, TU Wien, Sokrates/Erasmus exchange SLU, Ainarp, Nov. 14th, 2005

INTAS Project 03-51-5296
Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia

Project Meeting Zvenigorod



M. Breiling, TU Wien, Sokrates/Erasmus exchange SLU, Ainarp, Nov. 14th, 2005

INTAS Project 03-51-5296
Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia

Aims of Project

- Project divided into 7 tasks
 - 1 to 5 related primarily to natural properties
 - Snow observations
 - Snow classification
 - Snow parametrization
 - Models based on snow
 - Szenarios of change
 - 6 to 7 related primarily to cultural relevance
 - Disasters
 - Economic Impacts

M. Breiling, TU Wien, Sokrates/Erasmus exchange SLU, Ainarp, Nov. 14th, 2005

INTAS Project 03-51-5296
Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia

Task Outline: 1- 2

- Snow data base
 - Physical properties of vertical structure of snow
 - Records of observational data, 1300 snow stations in former USSR
 - Specific field campaigns
 - » Available from previous expeditions
 - » Particular for this project
 - Metereological data of former USSR
 - » Problem closing of measurement stations
 - » General available period 1950 to 1990
 - » Some stations since 1930 and partly after 1990
 - Hydrological data of major river beds in former USSR
 - Construction of snow classification
 - Spatial
 - Regional interpolation of snow cover, where we do not find measurement stations
 - Temporal
 - Height and kind of snow cover at a certain time of snow season

M. Breiling, TU Wien, Sokrates/Erasmus exchange SLU, Ainarp, Nov. 14th, 2005

INTAS Project 03-51-5296
Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia

Task Outline: 3 - 4

- Parameterization schemes
 - For snow cover stratigraphy in climate and hydrological models
 - Stratigraphy
 - » Snow physics rather complicated
 - » Many layers and continuous interactions like heat transfer and modification of snow properties
 - » Few models e.g. in Switzerland with up to 300 snow layers -> too complex
 - » Very common only snow height or water equivalent -> too simple
 - Control model runs
 - Climate models
 - Snow (and clouds) considered as main sources for errors in models
 - » Major improvement to climate models if snow can be predicted better
 - Hydrological models
 - Run off patterns widely depend on snow
 - » The more North we come in global scale and the higher we climb in regional scale, the more dominant is snow height

M. Breiling, TU Wien, Sokrates/Erasmus exchange SLU, Ainarp, Nov. 14th, 2005

INTAS Project 03-51-5296
Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Eurasia

Task Outline: 5-6

- Experiments with Climate & Hydrological Models
 - Change of mean hydro-thermal regime
 - Temperature
 - Precipitation
 - Change of extreme hydro-thermal regime
 - Amplitude of temperature distribution
 - Increase of drought and extreme precipitation
- Disasters in relation to snow
 - Avalanches
 - Hundreds of avalanches every season
 - » Only relevant if in populated areas
 - » And only if they cause damage
 - In 2000, there was a debris- and mudflow in Caucasus
 - 1000 year event

M. Breiling, TU Wien, Sokrates/Erasmus exchange SLU, Alnarp, Nov. 14th, 2005

INTAS Project 03-51-5296
Influence on snow vertical structure on hydrothermal regime and snow-related economical aspects in Northern Eurasia

Task Outline: 7

- Economic impacts related to snow (My particular task)
 - Why is snow important?
 - Snow is in a direct relation to land use!
 - » Snow and winter tourism (is my most prominent example)
 - » Traffic and transport
 - » Agriculture and irrigation
 - » Electricity production
 - » Urban services: removal of snow in winter
 - » Others
 - Where is snow important?
 - Snow is not important all over Northern Eurasia!
 - Snow is important during particular periods in the year!
 - » Different regions have different snow situations
 - » Sensitivity to economic impacts is different
 - What are likely economic impacts if snow cover changes?
 - Winners & Losers
 - Two major aspects of this task
 - Describe relevance of snow according to oblast structure
 - Bring examples where snow is relevant and quantify possible costs

M. Breiling, TU Wien, Sokrates/Erasmus exchange SLU, Alnarp, Nov. 14th, 2005

INTAS Project 03-51-5296
Influence on snow vertical structure on hydrothermal regime and snow-related economical aspects in Northern Eurasia


Snow Intelligenza: Halftime Zvenigorod



M. Breiling, TU Wien, Sokrates/Erasmus exchange SLU, Alnarp, Nov. 14th, 2005

INTAS Project 03-51-5296
Influence on snow vertical structure on hydrothermal regime and snow-related economical aspects in Northern Eurasia

Project Area: Former U.S.S.R



M. Breiling, TU Wien, Sokrates/Erasmus exchange SLU, Alnarp, Nov. 14th, 2005

INTAS Project 03-51-5296
Influence on snow vertical structure on hydrothermal regime and snow-related economical aspects in Northern Eurasia

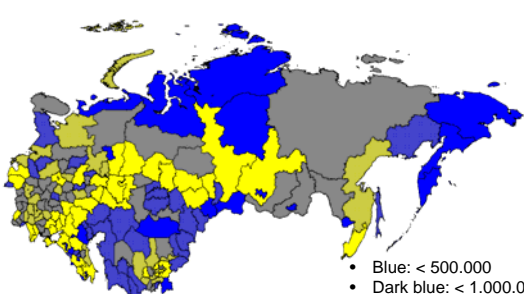
Project Area: Northern Eurasia



M. Breiling, TU Wien, Sokrates/Erasmus exchange SLU, Alnarp, Nov. 14th, 2005

INTAS Project 03-51-5296
Influence on snow vertical structure on hydrothermal regime and snow-related economical aspects in Northern Eurasia

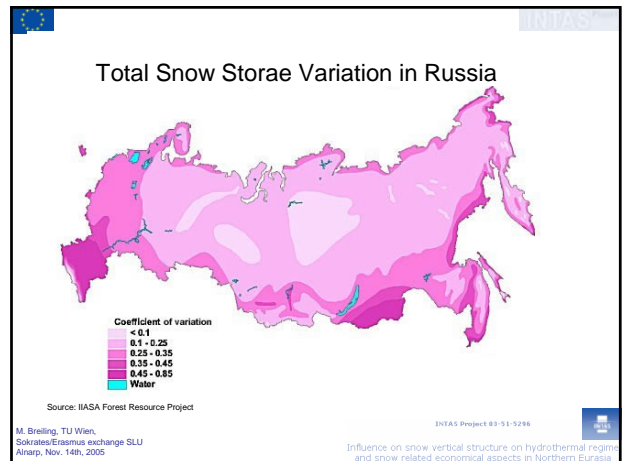
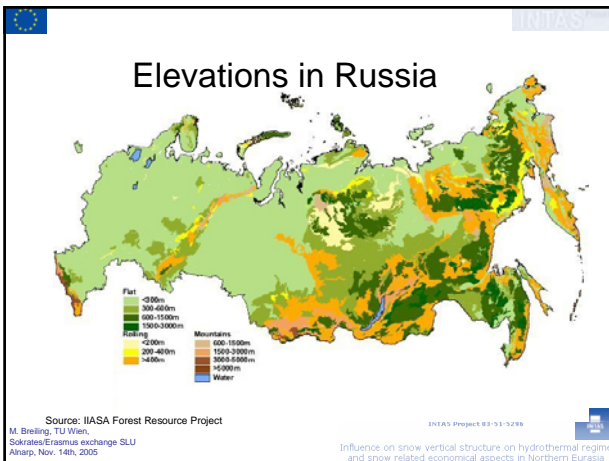
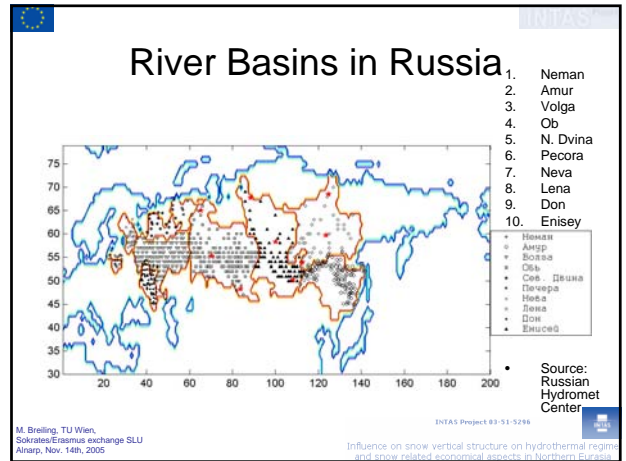
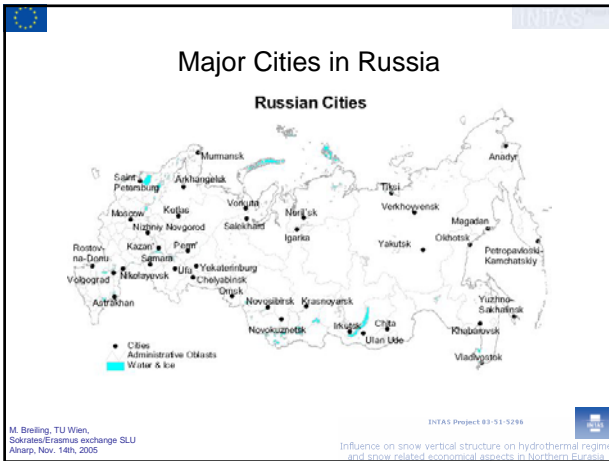
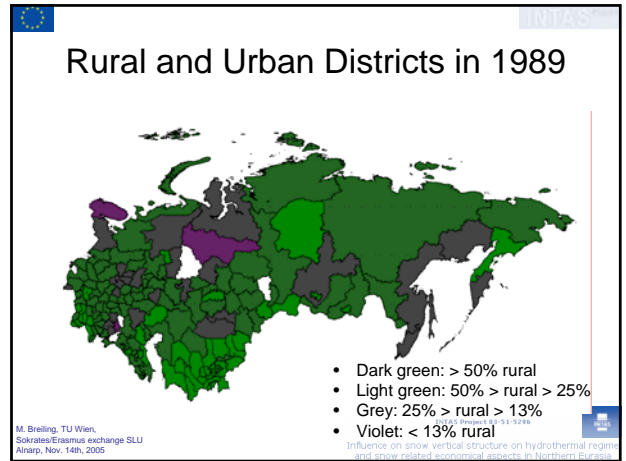
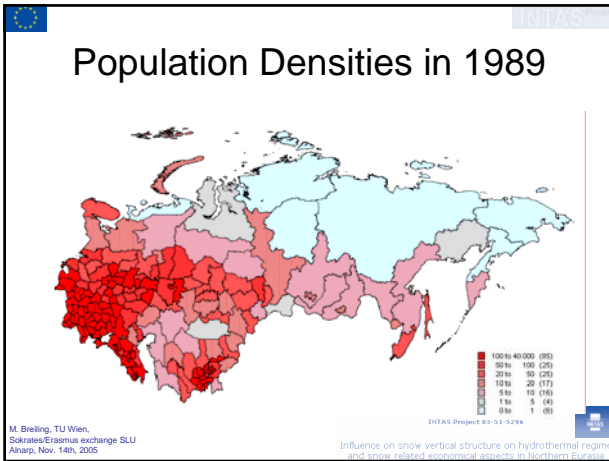
Number of Inhabitants in 1989

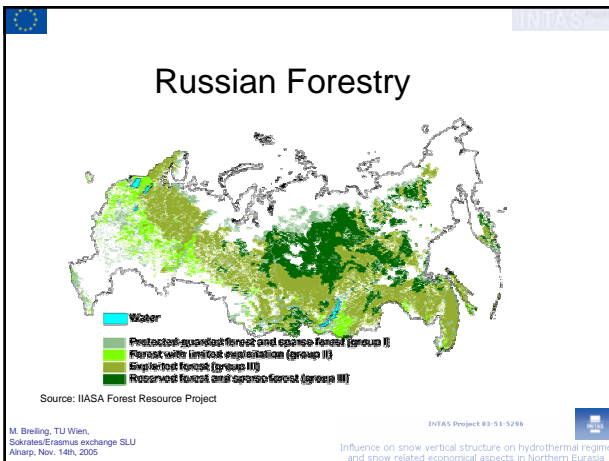
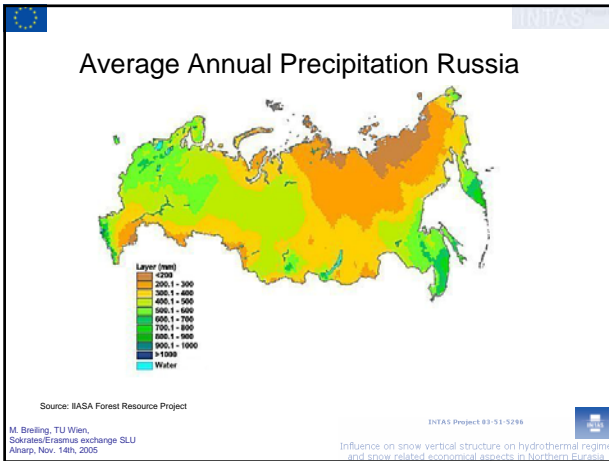
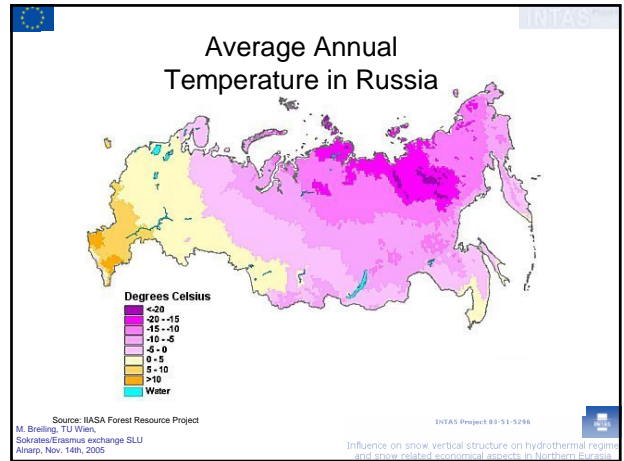
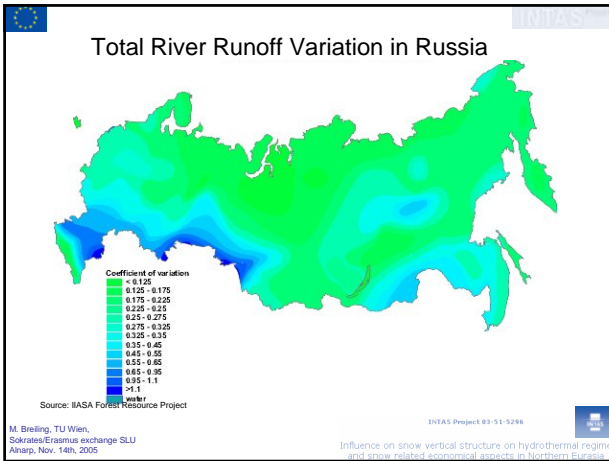


- Blue: < 500.000
- Dark blue: < 1.000.000
- Grey: < 1.500.000
- Olive: < 2.000.000
- Yellow: > 2.000.000

M. Breiling, TU Wien, Sokrates/Erasmus exchange SLU, Alnarp, Nov. 14th, 2005

INTAS Project 03-51-5296
Influence on snow vertical structure on hydrothermal regime and snow-related economical aspects in Northern Eurasia





Specific Part of Economic Impacts

- Assessment of economic impacts depend on data
 - Reliable data about income and costs of economic activities
 - Particular local or regional problem context
 - Assessment of the role of snow and parameterization of the economic impact of snow

M. Breiling, TU Wien, Sokrates/Erasmus exchange SLU, Ainarp, Nov. 14th, 2005

INIAS Project 03-51-5296

Influence on snow vertical structure on hydrothermal regime and snow-related economical aspects in Northern Eurasia

INTEGRATION

Candidates for Inclusion

- Skiing areas near large cities
- Snow removal Moscow
- Disasters in Uzbekistan and Caucasus region
 - Avalanches
 - Debris flow and likelihood of return of “1000 year event” in nearer future
- Irrigation in Uzbekistan and Caucasus
- Traffic and Transportation in Particular Climate Windows
 - Transportation on frozen rivers
 - Oil pipelines

M. Breiling, TU Wien, Sokrates/Erasmus exchange SLU Alnarp, Nov. 14th, 2005

 INTAS Project 03-51-5298
 Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Europe

INTEGRATION

Continuation after 2007

- Strategy to collect new snow related “topics” and further elaborate existing ones
 - www.snowfuture.com
- Establishment of TTL, Technology.Tourism.Landscape co-operation centre in Vienna
 - <http://ttl.tuwien.ac.at>
- Aim of this visit: try to interest one or several researchers in Alnarp/Lund to join
 - E.g. environmental psychology “miljöpsykologi” in connection with snow.
 - Connect existing programs here with snow topic

M. Breiling, TU Wien, Sokrates/Erasmus exchange SLU Alnarp, Nov. 14th, 2005

 INTAS Project 03-51-5298
 Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Europe

INTEGRATION

Diskussion eller Välkommen åter på 16:e nov. om EU Vattendirektiv och Donauområde



M. Breiling, TU Wien, Sokrates/Erasmus exchange SLU Alnarp, Nov. 14th, 2005

 INTAS Project 03-51-5298
 Influence on snow vertical structure on hydrothermal regime and snow related economical aspects in Northern Europe