

A Nordic Hydrological Conference

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Abstract

The 17th Nordic hydrological conference was arranged in Alta, Norway in August 2-4, 1992. The background and the highlights of this conference are presented.

1. Introduction

There are several reasons for arranging hydrological conferences on a Nordic basis. From a scientific point of view, it would be natural to suggest the similarity of natural conditions as the main reason. This would, however, entail that Denmark is in some extent outside. In fact, there have been few participants from Denmark, except when the conference has been arranged in Denmark. The low number of Finnish participants is probably explained by real or imagined language problems.

The importance of the Nordic language fellowship should not be underestimated. In 1950's and 1960's, only Nordic languages were used as conference languages. After some experiments with English as the conference language, the current praxis was established. The participants can choose between English and a Nordic vernacular; of the national languages, Finnish and Icelandic are not accepted, as not being understood by the majority of participants. During the last six conferences, Finnish, Icelandic and Danish participants have used predominantly English, while a narrow majority of Swedish participants and a clear majority of Norwegian participants have used a vernacular. Participants from the arranging country have mostly preferred the mother tongue, if available. There has been a weak trend towards an increased use of English. The language of the paper and the language of the talk are not necessarily the same. Writing in English and giving the speech in a Nordic language is, for obvious reasons, the more popular combination.

The choice of language is affected by several factors. A Scandinavian participant may choose the vernacular because of the easiness of speaking one's mother tongue. Both a Scandinavian and Finn may choose a Scandinavian language because of the desire of promoting the language fellowship or the vernacular publishing tradition. Those Finns, for whom Swedish is easier than English, are, however, often discouraged by eventual questions in other Scandinavian languages. Many Finnish participants prefer English as it is a foreign language for all participants. Danish is especially difficult to understand for non-Danish participants, a fact that may explain the wide use of English among Danish participants. Courtesy to other participants may entail the use of either English or a vernacular. English is a tempting choice for those who wish to publish an internationally evaluable and distributable paper.

In addition to language, other cultural similarities are used for contrasting the Nordic identity towards the rest of Europe. Similarity of administration as well as the less unequal gender distribution are often mentioned.

The number of papers presented in Alta was 79, which is close to the mean value of the last years. Of the first authors, 60 were male - there is still a long way to an equal gender distribution among hydrologists, even in the Nordic countries. Compared with the gender distribution of the first ten conferences, the situation has, however, changed significantly.

The institutional frameworks for hydrological service and research are rather fundamentally different than similar for the Nordic countries. In Norway and Iceland, hydrology is connected with hydropower, in Sweden with meteorology, in Denmark and Finland with environmental administration. These connections have consequences for the availability of research funds and of data, as well as for the orientation of the research.

An international perspective on the Nordic hydrology was given by the invited guest speaker, James McCulloch (Institute of Hydrology, Wallingford, UK). He pointed out that though there have been many meetings and considerable exchange of personnel between Britain and the Nordic countries, a more natural forum for change of ideas would be the European Geophysical Society (EGS). Traditionally, many of the papers presented in Nordic hydrological conferences have been published in *Nordic Hydrology*. Despite of the merits of *Nordic Hydrology*, citation analysis suggests that *Journal of Hydrology* is the only European journal which is capable to compete with the leading North American journal, *Water Resources Research*. It may also be noted that during the 1991 Copenhagen EGS meeting the *Journal of Hydrology* was adopted as the house journal for the EGS hydrological papers. Some of the recent Nordic research topics that have been internationally acknowledged involve instrumental development of soil moisture devices, acid rain research and the scientific aid to less developed countries which covers water and sanitation techniques.

2. *Climatic change and water resources*

Climatic change has been the theme of a special session in the three last conferences. Contributions to this session have each time been less than the publicity of the matter would suggest. In the Alta conference, the emphasis on water resources may have discouraged some of the hydrologists involved in research on climatic change from contributing to this session. Climatic change was, however, the central topic of another session, Polar Hydrology.

In their keynote lecture (extended abstract only), Lars Gottschalk (University of Oslo, Norway) and Irina Krasovskaia (Hydroconsult AB, Höganäs, Sweden) discussed the problems of hydrological macro-regionalization for the purpose of coupling hydrological processes into climatic models. The same authors also contributed with a statistical study on extreme flood events in different flow regimes, supporting the idea that using subseries of warm, cold, wet and dry years from existing records gives information on the frequencies of extreme events in a changed climate. Discharge time series were also analyzed by two other contributors, while the remaining two papers treated hydropower expectations.

3. *Hydrological processes*

The presentation of hydrological processes was divided into five topics: (i) runoff, (ii) evapotranspiration, (iii) snow, (iv) soil- and groundwater and (v) water quality. In the keynote lecture, Sten Bergström (SMHI=Swedish Meteorological and Hydrological Institute, Norrköping, Sweden) celebrated the 20th anniversary of the HBV model. This relatively simple conceptual model has been used in hydrological forecasting, spillway design, studies of climate change, synoptic water balance mapping, simulations of groundwater response and water quality and simulations in ungauged basins. Several modifications of the HBV model have been proposed and tested during its life time. Today, the HBV model is used in at least 28 countries including all the Nordic countries.

Runoff

The traditional approach to hydrological processes has been a local one. Only recently, the spatial variability of the variables has received more attention. Three of the seven presentations in the runoff sub-session were focused on coping with spatial variability. Elin Langsholt (University of Oslo, Norway) presented a new model in which the process of surface runoff generation is defined in relation to the soil heterogeneity. She concluded that in a heterogeneous field the spatially averaged time to ponding is shorter, the averaged infiltration rate is lower and hence the mean surface runoff is higher in a heterogeneous field. Bredo Erichsen and Lena Tallaksen (Hydro Nova, Oslo, Norway) have studied the variability of water balance components within a catchment in eastern

Norway. The preliminary results indicate that the variability of precipitation inside the catchment is marginal while runoff and evapotranspiration show considerable internal variation.

Evapotranspiration

This sub-session included three lectures, although the importance of evapotranspiration research, especially in connection with climate change, was pointed out in other sessions. The lack of our knowledge of evapotranspiration is due to lack of instruments able to measure evaporation accurately. For this reason, the NOrdic hydrologic-meteorological Pilot EXperiment (NOPEX) was launched in Helsinki in 1991, in order to study the areal evaporation and interaction between land surface and atmosphere, for a better understanding of climatic change. The scientific objectives of the NOPEX project were introduced by Sven Halldin (Uppsala University, Sweden). One of them is to study the regional exchange of heat, water vapour and carbon dioxide and how the contributions of individual fields consisting of different types and ages of forests and agricultural crops, wetlands, lakes and urban areas are made up. Another objective is aimed at improving the understanding of the hydrological and meteorological conditions governing exchange processes on a horizontal scale of 50 to 100 km squared. Because of the relative importance of forest in Nordic countries, the role of forests in soil-vegetation-atmosphere system will be an important part of NOPEX.

Snow

Nivology has traditionally been a strong field of hydrology in the Nordic countries. There were, however, only three presentations in this sub-session. Maja Brandt (SMHI, Norrköping, Sweden) emphasized the significance in estimating the snow storage within a basin accurately for succeeding in spring flood forecasting. In Sweden, two projects with the aim of finding new and better areal snow measurement methods have been carried out. The applied methods are the gamma-ray spectrometry and the air-borne radar measurement systems. The results prove that these methods can be applied to snow monitoring of large areas. Additionally, these studies revealed that manual surface snow surveys often fail to estimate the total areal snowpack and thus are of limited value for updating the HBV model.

Soil- and groundwater

The soil- and groundwater sub-session was the most popular one; it gathered no less than 12 presentations. In recent years, more attention and concern have been given to the problems associated with water transporting contaminants to surface water and groundwater. Accordingly, an understanding of the mechanisms governing the transport and

residence time in the unsaturated zone is important. The problem was illuminated with research on macropore flow and tracer experiments in soil monoliths. Dorthe Wildenschild (Institute of Hydrodynamics and Hydraulic Engineering, Lyngby, Denmark) concluded that besides the early breakthrough and extensive tailing which is associated with macropore flow, a phenomenon of multiple peaks was observed which can be attributed to differences in size, connectivity and tortuosity of the macropore networks within the individual monoliths or air entrapments. The flow distribution was non-uniform across the outflow area and it changed rapidly with time, due to air entrapment. Additionally the dye tracer experiments and successive sectioning showed that a larger number of macropores was active at the top of the monolith than at the bottom.

Water quality

According to a recent authoritative definition, hydrology is a "science that deals with the waters above and below the surface of the Earth, their occurrence, circulation and distribution, both in space and time, their biological, chemical and physical properties, their reaction with their environment, including their relation to the living beings" International Glossary of Hydrology, 2nd Edition, UNESCO/WMO 1992. Traditional hydrology does not include research on the "quality", i.e. the chemical composition of water. In the Alta conference, the session "Hydrological processes" included a sub-session "Water Quality", but traditional hydrology was in some sense applied in every paper. Gert Knutsson (Royal Institute of Technology, Stockholm, Sweden) discussed the origin of water in different runoff situations, using the results of analyzes of water samples in an area sensitive to acidification. The long-term interactions between sediments and groundwater in archipelago were discussed by Björn Sundblad (Studsvik AB, Nyköping, Sweden). There were also three papers on the transport of organic and/or inorganic matter.

4. Multiple use (flerbruk)

This session could also have been called 'applied hydrology'. The contributions were divided into three sub-sessions: Planning, Operation and Environmental Impacts. Of the 15 contributions, no less than 10 had hydropower as a central theme. There were papers on both the environmental impacts and the operational problems. This emphasis is explained by the fact that all except one of these papers came from the arranging country, in which electricity is almost entirely produced by hydropower plants. Flood control was another central theme with three papers. The topics traditionally connected with term 'multiple use' were either absent or had a secondary role.

In his keynote paper, Torkil Jønch-Clausen (Water Quality Institute, Hørsholm, Denmark) discussed the Nordic Freshwater Initiative as a part of the preparation process of the environmental conferences of Dublin and Rio de Janeiro. This initiative was motivated by the experiences of Nordic cooperation projects with developing countries

in Africa, Asia and Latin America. In another general review, Arne Tollan (NVE = Norwegian Water Resources and Energy Administration, Oslo, Norway) gave three characteristics of the ecosystem approach to water management. Firstly, the relevant knowledge of various field, as hydrology, biology, technology, economics, law etc., should be integrated into a synthesis, and decisions should be based on this kind of integrated knowledge. Secondly, a holistic perspective is needed, in which man is considered an actor and not only an economic or technical user. Thirdly, a "multi-media approach" is needed, in which land, water, air and living organism are treated in connection to each other, and this approach should also be geographically comprehensive, treating catchments as a whole.

The influence of watercourse regulation on the local climate was discussed by Per Øyvind Nordli (Norwegian Meteorological Institute, Oslo, Norway). The daily regulation of hydropower plants prevents the formation of ice cover beneath the power stations, thus causing the extensive formation of steam fog along the river valley. High dams, common in Norway, often prevent the drainage of cold air above the power plants. The increased winter discharges promote the formation of a layer of fresh water, and accordingly an ice cover, in fjords. All these effects give as a result a more harsh local climate.

A local topic, the impacts of the hydropower plant in Alta river, was discussed in no less than 7 papers. This hydropower construction project aroused an extensive protest movement by environmental activists and the indigenous Sami people. The power plant was built, but the strenght of the protest movement promoted research as well as the establishment of the Norwegian Sami parliament. The papers treated topics like time distribution of discharge, ice conditions, groundwater and local climate. The general review by Randi Pytte Asvall (NVE, Oslo, Norway) was given as one of the two introductory lectures of the conference.

5. *Observations and data*

During the last years, several efforts have been made to rationalize the hydrometric networks. This work was reviewed by Markku Puupponen (Water and Environment Research Institute, Helsinki, Finland) in his keynote paper. A more technical review on the methods of network design was given by Lars Andreas Roald (NVE, Oslo, Norway). Among the other topics of this session were continuous water quality measurements, the new Norwegian hydrological database, ice reduction of winter discharges, discharge measurements by salt dilution methods, possibilities of using radioactive cesium from nuclear accidents as a tracer, hydrological applications of geographic information systems (GIS), runoff maps, methods of time series analysis and regional variations of precipitation.

6. *Polar hydrology*

This session was dominated by glaciological papers with predominantly climatological interests of knowledge. As a cause of hydrological variations, glaciers have a central role in the hydrology of polar and mountainous areas. In estimating the hydrological effects of climatic changes in these areas, glaciological research is indispensable. Moreover, glaciers are among the most important climatic indicators. These aspects are discussed in the keynote paper by Tómas Jóhannesson and Oddur Sigurðsson (Orkustofnun, Reykjavik, Iceland) as well as three of the contributed papers. Research and monitoring programs were the topics of the other two papers.

7. *Concluding remarks*

The flight connection recommended in the conference circular, an international flight to Oslo and a domestic flight from Oslo to Alta, would have been more expensive than a flight ticket to Baltimore (Maryland, USA) - at least for Finnish participants. Moreover, the hotels in Alta were expensive. The next conference will be held in Faroe Islands, far away from home for almost every potential participant. Saving money is certainly not a reason to participate in a Nordic hydrological conference. If our Maecenas can afford such a luxurious thing, then why not an EGS or AGU (American Geophysical Union) conference? These big conferences have an abundance of hydrological program, not to mention the numerous topics of the other fields of geophysics, while the Nordic conferences usually have two parallel sessions. Why are we intending to travel to Faroe Islands next summer? The answer may be the challenging lingual diversity or the inevitable similarity of research problematics. But it may also be the size of the conference. It is far more easier to establish contacts between colleagues in a small meeting than in a big one. Moreover, the common background, the family-like atmosphere, promotes these contacts that, after all, may be the most useful aspect of a scientific conference. It is likely that the Nordic Hydrological Conference will survive the awakening of EGS hydrology, as well as the exotism boom of conference arrangers.

Reference

Østrem, G. (Editor), 1992: Nordisk Hydrologisk Konferanse 1992, Alta, Norway, 4.-6. August 1992. Oslo, 757 pp.