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Notes on final discussion of the Workshop on

"Parametrization of Lakes in Numerical Weather Prediction and Climate Modelling"

18-20 September 2008, St.Petersburg (Zelenogorsk), Russia

Five topics for discussion and formulation of the workshop proposals were raised in the final discussion at 20 September 2008:

1. Publication of the workshop results
2. Obtaining of data for the lake modelling: lake depth database and (satellite) observations
3. Intercomparison of lake models
4. Hot topics in development of lake parametrizations for atmospheric models
5. Organization of the future cooperation between lake modellers for NWP and climate models

1. Publication of the workshop results

The workshop organisers have made a proposal to the journal “Boreal Environment Research” (BER, http://www.borenv.net) to publish a special issue devoted to the lake parametrizations in climate and NWP models, based on results of the present workshop. Decision of the issue was made in the meeting of the editorial board of the journal at 19 September, but the result was not known at the moment of final discussion. However, it can be assumed that the suggestion was accepted. In practice, this would mean:

The special issue will be published if a minimum of 72 journal pages of related articles are accepted, i.e. approximately ten papers. The papers are sent to the journal editors, who will arrange the normal review process. In the discussion, it was suggested that the workshop organisers offer to write a short introduction to the special issue. There is a payment 60 euros per printed page + 500 euros for (possibly several) colour figures in the paper. This fee should be paid by the author's institutes for all manuscripts accepted into publication in the special issue (in regular issues publishing of the first 16 pages is free of charge). BER is an open access journal, which means that the readers can freely download all articles through the journal web site.

Workshop participants are strongly encouraged to send their manuscripts to the journal and find the funding for payment of the publication fee. Preliminary, more than ten participants of the workshop expressed their wish to write a manuscript to the special issue. The workshop organisers will send more detailed information later. The expected deadline for the manuscripts is 31th of January 2009, publication in an issue approximately one year later.

In addition to the BER special issue papers, the workshop presentation files will be made available at the workshop web site at http://netfam.fmi.fi/Lake08 . Authors are requested to check that their contributions will be shown correctly at the site.

Obtaining data for lake modelling

2a. Lake depth database

All lake models require data about lake depths. Ideally, a lake depth database should be global,. gridded with sufficient resolution, with the data and simple interface software freely available for download (e.g. at FLake web site) and further development. Presently, a preliminary lake depth database is available, as described in the presentation by E. Kourzeneva. The main body of data has until now been obtained for European lakes while the lakes of other continents are sparsely represented. In Europe, local data is missing from UK, France, Portugal.

During the workshop discussions, the following recommendations were formulated:
- Additional local data should be added where available
- An indicator of missing data or a quality flag should be added
- For a better global coverage, the method of effective depth described in the presentation by G.Balsamo et al. could be applied for derivation of missing lake depths
- For large lakes, the gridded data might contain several different depths to be available for models that would be able to use this information
- Presently, obtaining reliable lake depths is the most important issue. Later, data related to lake water transparency might be considered. However, the time-dependency of transparency makes its handling more complicated
- Currently, lakes and rivers are not separated. Certain flag could be defined in the database to indicate the rivers.

The following actions were suggested:

1. The question of lake data base should be raised at the European level among the NWP consortia. Jeanette Onvlee, HIRLAM programme manager, will bring the workshop initiative to SRNWP. It is suggested that the main responsible person for the data base will be Ekaterina Kourzeneva from RSHU.

2. Existing data base and software may be provided by Ekaterina to interested workshop participants upon request already now. A plan of the further steps will be drafted by her. The work should be started not later than January 2009 and a working prototype of a global coverage, possibly with a coarser resolution, provided for download till the end of 2009. Needed funding for this work will be sought at the SRNWP level.

3. Contact persons for the data base issue: Ekaterina Kourzeneva (kourzeneva@rshu.ru), Jeanette Onvlee (jeanette.onvlee@knmi.nl), Gerhard Smiatek (gerhard.smiatek@imk.fzk.de), Gianpaolo Balsamo (gianpaolo.balsamo@ecmwf.int), Arkadi Terzhevik (ark1948@list.ru)

2b. LST observations and data assimilation

As described in several presentations, several sources of satellite and in-situ measurements of lake surface temperatures are locally available. These LST measurements represent the necessary starting point for successful lake temperature data assimilation in (operational) NWP models. However, to the knowledge of workshop participants, no unified global or hemispheric real-time satellite measurement data on LST are presently easily available.

An additional important issue are the observations about lake ice coverage and snow on lake ice. Also here, locally received and processed satellite data are available, e.g. those in Finnish Environment Institute (contact mikko.kervinen@environment.fi).

Workshop suggests that a first step towards LST assimilation in NWP models should be a survey of available (satellite)-based data. The workshop organisers and participants could contact local EUMETSAT representatives with initiatives to this organisation to take active role as a provider of real-time satellite data on LST, lake ice and snow, used in the NWP lake data assimilation.

Methods for processing, quality control and assimilation of these data are developed in ECMWF, within HIRLAM and ALADIN and othert NWP consortia. As discussed in the presentation by N. Gustafsson, several approaches from the simple successive correction and optimal interpolation methods to extended Kalman filter are possible. Depending on the model, LST observations should be assimilated to influence more slowly changing, deeper layer lake temperatures. In FLake-based parametrizations, the mean water temperature would be a suitable variable. Assimilation of lake ice and snow on ice observations may benefit of the observation operators and methods developed for processing of sea ice observations.

In Europe, SRNWP surface data assimilation and parametrization expert group will be informed about the recommendations of our workshop related to requirements of observational lake data for NWP.

3. Lake model intercomparison study - LAKEMIP

In the discussion, Viktor Stepanenko presented initial ideas for a lake model intercomparison study, LAKEMIP. Participants of such a comparison could be one-dimensional and bulk models like Hostetler, FLake, Stepanenko and others. The first step would be definition and providing benchmark experimental lake data and atmospheric forcing (observations, reanalysis) data for driving and verification of the lake models. The data should cover deep and shallow lakes on different continents at high and low latitudes, high and low altitude lakes, possibly extreme climatic conditions. Needed parameters would include LST, turbulent heat, moisture and momentum fluxes, screen-level temperature, 10-metre wind etc., to be defined in a LAKEMIP plan. For intercomparison, a formal permission for the use of different models should be obtained where needed.

The workshop supports the idea of intercomparison and suggests that Viktor will be responsible person for LAKEMIP, sending around a preliminary plan for the interested participants. Funding is needed for the study, and possible sources should be investigated. The results could be discussed in a next workshop or EGU/EMS/SRNWP or other suitable meeting

4. Hot topics in development of lake parametrizations for atmospheric models

Important near-future development in lake parametrizations issues were shortly discussed and to main tasks identified:

- FLak e is able to handle lake freezing and melting, but a proper description of snow on ice is missing. In some presentations, lack of snow was assumed to deteriorate the performance of the parametrizations. In future development of the scheme, this issue should be addressed.

- Deep and large lakes may require more advanced parametrization both vertically and horizontally. FLake parametrizations might be formulated in three layers instead of the present bulk approach. A better description of lake depth variations may be necessary to obtain improvements.

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5. Organization of the future cooperation between lake modellers for NWP and climate models

In the workshop, valuabe information, initiatives and suggestions have been made and new contacts created. To continue the cooperation among lake modellers within the NWP and climate modelling communities, some minimal organisation is necessary. The workshop suggests:

1. The next workshop should be arranged in 2010. Sander Tijm and Patrick LeMoigne will contact the leader of SRNWP surface expert group leader Jean-Francois Mafhouf to learn about he possibility of SRNWP to take care of the organisation of this workshop somewhere in an European country.

2. For communication, Arkadi Terzhevik will create a mailing list based on FLake list, adding the workshop participants. For a longer-time solution for the communication, SRNWP coordinator Andras Horanyi will be contacted to learn about the possibilities of SRNWP web site and mailing lists.

3. FLake (http://lakemodel.net) and NetFAM (http://netfam.fmi.fi/Lake08) web sites will be used to store and make available the presentations, notes and other results of the present workshop.