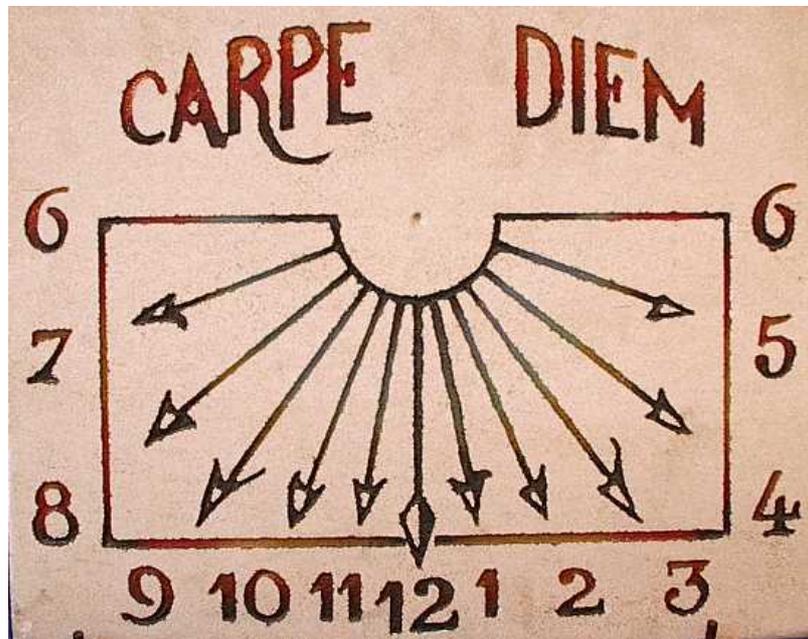


CARPE DIEM

Critical Assessment of available Radar Precipitation Estimation techniques and Development of Innovative approaches for Environmental Management



Contract N° EVG1-CT-2001-00045

**2nd Report of the Technical Steering
Committee (TSC)**

1 Introduction

The CARPE DIEM Technical Steering Committee (TSC) held its second meeting in the framework of the CARPE DIEM/MUSIC joint workshop with End Users and the 4th CARPE DIEM project Meeting, 26-28 May 2003 in Düsseldorf-Neuss, Germany, i.e., at about mid-term of the project. The TSC's task is to review the planning and progress of the project. The present report is the second deliverable requested of the TSC and contains its view on CARPE DIEM based on the project proposal (Description of Work), the first annual report, as well as the contributions to the 4th project Meeting. This 2nd TSC report is written as an update of and with reference to the 1st TSC report.

2 Summary

It is with pleasure that the TSC acknowledges the good progress that was reported in the individual modules or work packages of CARPE DIEM. While recognizing the difficulties involved in reaching the overall goal of the project, the TSC wishes to express some concern about the integration of these modules, especially NWP-driven QPF with river flow and flood forecasting, including measures of uncertainty. As clearly stated in the 1st TSC report, the overall project goal is deemed too ambitious to be entirely solved during the project period. Therefore, the TSC recommends developing a plan for integration and addressing the issues that are likely to need follow-up efforts.

3 Current status

3.1 *Milestones and deliverables*

The milestones and deliverables are accounted for in the 1st-Year Annual Report of the project and have been formally acknowledged by the TSC. Most are on or ahead of schedule with the following exceptions. Climatology of variations in Z-R at different spatial and temporal scales of model input obtained by Φ_{DP} method experienced some delay due to ongoing refurbishment of the radar system. We have been assured that addressing the problem of data collection and making up the time lost is a priority for the forthcoming year. Basic End-Users requirements, was delayed due to an enlargement of the End-User panel. This delay has no effect on the project, because the first draft of the End-User requirements has been completed in time to provide useful information.

3.2 *Major achievements*

3.2.1 Working Area 1: Hydrology

As the working area Hydrology is essentially profiting of the achievements of the other project areas, major achievements could be expected towards the completion of the project. The activities in this Working Area were indeed expected to start from month 13.

However, some of the issues raised in the first TSC report should be tackled early enough to guarantee a successful application. It can be remarked, both from the annual report and from the presentations at the first workshop, that the issues mentioned in the first TSC report have been in the meantime only partially faced, discussed and eventually solved.

Specifically, the choice of the case study catchments was made. A large river basin in Sweden and a small-mesoscale river basin in Ireland have been declared as target of the investigation concerned with the improvement of flood forecasts. Similarly the choice of the rainfall-runoff (R-R) modelling system has been made. A physically based distributed R-R model has been chosen to simulate the response of the Irish basin, whereas a semi-distributed R-R model has been selected to model the Swedish large river system. This, together with the announcement at the workshop that the data collection was progressing rapidly, is encouraging and appreciated by the TSC.

However, the concern that was addressed in the 1st TSC report with respect to the inconsistency between the NWP predictions scale and the R-R model scale has not been addressed to a point that can be considered solved. Although this may not be a problem for the large river basin, it is a crucial point for the Irish basin and may have some effect on achieving the milestone indicated for month 24 and concerned with the “*first results on flood forecasting improvements*”. A proper strategy to integrate the different rainfall measurements and/or prediction should be developed to account for a space-time desegregation methodology and possibly solve the scale inconsistency. In this respect the workshop, carried out jointly with the MUSIC EU-project, showed the possibility of developing synergies with the partners and the objectives of that project, which the TSC strongly suggests to explore further.

Little has been presented at the workshop also about the issue of detecting wetness state of catchments other than by model simulation. This issue, already addressed in the 1st TSC report is crucial when quantifying the improvement on flood forecasting, as it should be possible to exclude that for some events a lack of improvement comes from a wrong initial condition of the model rather than from a wrong rainfall prediction.

3.2.2 Working Area 2: Radar

Significant progress has been achieved in all aspects of radar related studies. Examples include dealiasing Doppler velocities, work on extraction of winds from Doppler radars, and effective use of vertical reflectivity profiles near the radar to correct for the effects of beam overshooting and broadening at distant range. This last is probably the first real time correction scheme of the vertical profile of reflectivity (VPR) in a radar network. Results from dual polarization radar measurements are promising and a model to predict the effects of anomalous propagation is impressive.

The TSC is anxious to see results of comparison between three different available techniques to pre-process, retrieve, and assimilate radar radial wind information. Also it anticipates much activity in the retrieval of dual Doppler winds.

3.2.3 Working Area 3: NWP and Data Assimilation

In this Working Area some achievements have been obtained as illustrated by the Annual Report and by sectoral reports. An example is the development of Doppler radar wind data assimilation for the HIRLAM 3D-Var. Similarly, activities in Workpackage 7 showed progress and the TSC appreciates that an effort is currently being done to achieve the milestone in due time. If a criticism can be done, this is related to the integration of the NWP predictions in a consistent flood forecasting scheme.

4 End user involvement

According to the milestone list in month 18 the “End User Assessment” document was due. The workshop was indeed used to prepare the basis for such document. However, a significant gap was rather evident during the discussion and the presentation of the end user communities represented at the meeting.

The simple question ‘what are the requirements of end user?’ appears to need more refinement. The end user community often has a simplistic view of the problem, which can be misleading and can lead to ill-posed objectives that the project cannot achieve. The CARPE DIEM and MUSIC project coordinators were assigned to design a questionnaire addressed to the end users needs. Experiences made in the framework of the CALJET experiment in the US suggest, that establishing a working link to the end users may involve detailed interviewing which in turn may require some specific knowledge on the end user’s particular business. For CALJET a specialised societal impact scientist was addressing this issue.

The TSC intends to point out the need to overcome such gap as soon as possible by a more active participation of the end user. In this sense the TSC believes, in agreement with some of the project scientific partners, that education and training of end users and decision makers can play an important role. During the workshop discussion it was discussed whether the implementation of a simulation game can be useful to highlight to the end user the benefits and the limitation of flood forecasting procedures. This could help them in formulating requests that are realistically achievable. Main goal should be the understanding of several important issues, among which the lead-time of forecasts (curiously, some end user believe to be an apriori choice) and the uncertainty concepts as well as the meaning of probabilistic predictions play a major role. Setting up and performing such training may be reached in the course of the project and should be handled accordingly.

5 Comment on the workshop

5.1 Organization

This CARPE DIEM mid-term event was organized to embrace the 4th project meeting, the 2nd meeting of the TSC, a MUSIC project meeting, and a joint CARPE DIEM/MUSIC workshop with end users. As such, the progress reports of the CARPE DIEM WPs received relatively little time as did the discussion on how to integrate the individual project modules towards reaching the overall project goal, and a critical appraisal on the feasibility. In light of the presence of the TSC this weighs even more.

On the other hand, the presence of a reasonably diverse end user groups, and – not least Tobias Fuchs, European Commission Officer of the DG Research – added significant value to the overall meeting.

5.2 Goal vs outcome

The goal of the workshop was certainly well set. The opportunity of exploring synergies between the CARPE-DIEM and MUSIC projects was certainly achieved. However, as anticipated in § 4, the goal of progressing the interaction with the end user was only partially reached. It was indeed shown that there is a significant gap between the scientific community and the end user group. This was not the expected result, but it represents anyway an important outcome, in that it allowed bringing to the forefront the communication and

understanding problems that still exist between theoretical developments and operational set up, thus allowing to take appropriate measures at an early stage of the project.

6 Issues raised in the 1st TSC report

The workshop and project meeting held in May 2003 showed concrete progresses, as already discussed in the above sections of this report. However, the TSC recommendations included in the first report have been partially addressed. The project leader(s) should consider again the concerns raised in the light of the present report and undertake appropriate actions.

7 New issues raised/recommendations

The TSC recognizes that the recommendations issued in the first report still hold to a large extent.

It is worth to mention again that the relation of NWP to a catchment's response time came across in several presentations. That is, direct use of mesoscale or larger scale operational models could be made for large catchments ($> 10'000 \text{ km}^2$) provided that the models are able to resolve the complexity of the precipitation fields. It was argued that for such cases the discharge could be fairly well predicted.

Conversely, it was clear that NWPs are not ready for very small catchments and urban areas; for these situations rapid radar measurements combined with gauges are needed. It was not clear to the TSC how floods and runoffs will be predicted in intermediate catchments (100s km^2 to tens of thousands) with response times from a fraction of hour to several hours. It is our opinion that to extend lead time well beyond the response time of the catchments, radar and gauge observations need to be assimilated into mesoscale (even storm scale) numerical "models". These "models" could be as simple as extrapolation of reflectivity cells in space/time to prediction of the evolution of precipitation patterns over the catchment area. These patterns would then be the forcing functions for distributed hydrological models. Alternatively, more complex procedures can be imported by developing a synergy with the MUSIC EU-project and thus provide a tool to integrate NWP prediction, and radar and raingauge measurements.

In addition, the new issue of the interaction between the scientific partners of the project and the end user was raised in the workshop. The recommendations, in line with the discussion held during the workshop, are illustrated in the above sections. The TSC recognizes the importance of this issue for a successful implementation of the project results and therefore strongly recommends undertaking the appropriate actions in the shortest time possible.

8 Final Remarks

In summary, the TSC continues to think that CARPE DIEM is very ambitious yielding a clear community added value once the goals are reached. The integration of hydrological modelling, radars, and NWP modelling is still to be developed, particularly with respect to specification and propagation of uncertainty and space-time scales consistency. The interaction of the scientific project partners with the end users was worth while but still needs more attention as detailed herein.