

MINUTES OF CLOUD-NET FIRST WORKSHOP

19-20 Nov 2001, Dept of Meteorology, U of Reading, UK.

Present: Jacques Pelon, Alain Protat (IPSL); Jean-Marcel Piriou (MeteoFrance); Andre van Lammeren, David Donovan (KNMI); John Goddard (RCRU); E Brand, C Wrench, J Eastment (RCRU - 19 Nov only); Damian Wilson (Met Office); Herman Russchenberg (TUD); Robin Hogan, Anthony Illingworth (co-ordinator.), Ewan O'Connor, Malcolm Brooks, Marion Mittermaier, Richard Forbes, Dominique Bouniol (U of Reading). Pekka Ravila (Vaisala), Adrian Tomkins (ECMWF).

1. GENERAL REMARKS

1.1 AJI summarised the project objectives and deliverables and reviewed progress since the kick off meeting on 9 May 2001. Several factors have combined to delay progress:

- i) Hardware problems with the radars at Palaiseau (which has been returned to Canada for repair) and Chilbolton which has lost sensitivity (a new tube is being acquired).
- ii) The KNMI HIRLAM model is being currently modified and archiving will not be possible until the new year.
- iii) Various project personnel are taking up their position in the next month - including the position of co-ordinator (NG) at Reading which will be filled from 3 Dec.

This means that the two year observations period, scheduled to start on 1 October 2001 is not in full operation. Accordingly, it was decided to request from the Commission permission for a 6 month no cost extension to the contract.

ACTION 1.1 AJI: Request 6 month no-cost extension from the Commission.

1.2 The Commission requires a three monthly report on the progress of the project.

ACTION 1.2 Work Package Reports be provided by the appropriate managers at three monthly intervals to the co-ordinator at the end of December, March, June and September. For WP 1,2 and 3 which have now started length should be 4-6 pages.

WP1: Exploit Existing Cloud Data Sets - CNRS - JP

WP2: Operate /Cloud Remote Sensing Stations - CCRLC- JG.

WP3. Development of Retrieval Algorithms KNMI - AL

WP4. Compare Retrieved Cloud Profiles with Values in Operational Models - UR - AI.

WP5. Definition of instruments and algorithms for GCOS. KNMI - AL

1.3 Finance and Personnel.

Clarification of the financial arrangements has been supplied by our research office. As described in Article 2 -4 of the contract, partners will have to submit annual statement on form E1 through the co-ordinator. This includes a schedule of the staff by name and the hours worked.

ACTION 1.3 All partners to keep a record, on a weekly basis of the working time charged to each work package by each member of staff.

ACTION 1.4 All partners to inform the co-ordinator every three months (end Dec, Mar..) of the staff employed and detail the time spent on each work package.

(For year one the total staff man-years in the budget are for each partner: UR - 1.5;

CLRC- 0.32, IPSL - 6; KNMI - 1.2; TUD - 0.7, UKMO - 0.0, Vaisala - 0.1.

2. DATA ARCHIVING.

Following a discussion it was decided that the data would be stored at three separate ftp/www sites at Reading (for Chilbolton) where there would be links to the sites at KNMI and IPSL. It was decided that no useful purpose was served by making uncalibrated level 0 data available, so only level 1 data will be placed on the site.

ACTION 2.1 RH (UR) to place his definition of NetCDF formats for data on the web and invite comments from KNMI/IPSL.

ACTION 2.2. AL (KNMI) to forward the naming convention used for variables in the CLIWA-NET campaign to RH with suggestions for names of any new variables. The CLIWA-NET naming is an abbreviated form of those used for the ARM data set.

3. MODEL ARCHIVING:

Following discussion it was decided that all the model data will be hosted at Reading and would be stored for the single grid box above the three observational sites for the four models ECMWF, MeteoFrance, Met Office and Hirlam. RH (UR) tabled a document with a list of suggested variables to be archived from the ecmwf model. It was suggested that the TOA radiances should also be included. Because of differences in the models the lists of variables to be archived for each model could not be identical.

ACTION 3.1 RH (UR) to suggest an updated list of variables and to circulate it to those responsible for the other models and together to come up with an agreed list of variables for each model.

4. REVIEW OF DELIVERABLES.

4.0 Publicity Brochure . Inputs received OK for end of December.

4.1a Kick off workshop report. - Done

b Recommendation for data gathering:

KNMI and Chilbolton are gathering data 7days/week 24h/day. It is vital that IPSL come up with a data gathering strategy to conform with the contract ('at least one week in every month over a period of two years' as a minimum).

ACTION 4.1 JP (IPSL). Define data gathering strategy.

4.2 Existing data sets:

'To organise the existing data into a format accessible by other partners'

ACTION 4.2 IPSL To complete this action by the end of December.

and

'Initial Analysis'

ACTION 4.3 UR To organise the reports given at this meeting into a report by end of December .

4.3 Initial Algorithm Recommendations.

ACTION 4.4 UR From Action 4.3 and workshop report to produce this initial document by the end of January 2002.

4.4 User Requirements Document.

ACTION 4.5 Those responsible for the four models (DW (UKMO), AT (ECMWF) and J-MP (Meteo France) and AL (KNMI)) to produce their contributions to this document by the end of December 2001.

4.5 Cloudnet WEB SITE.

This has been set up and is being developed - see actions 2 and 3.

The other deliverables are not due until To+18.

SUMMARY OF THE PRESENTATIONS AT THE MEETING

A fuller account will be provided in the work package reports which constitute the workshop report in a separate document.

5. REVIEW OF INSTRUMENTATION AND CALIBRATION ISSUES

5.1 Lidar Auto-calibration technique.

E O'Connor (UR) presented a new auto-calibration technique for the lidar which can be used every time there is thick stratocumulus. It was agreed that this is a good method of operational calibration.

5.2 Multiple scattering in lidars.

D Donovan (KNMI) gave a short talk on multiple scattering problems with lidars. There are two extreme situations: i) Narrow beam, small particles - no problem ii) Broad beam, large particles - multiple scattering leads to a halving of the expected attenuation. Multiple scattering will be a problem for the 10mrad RVM lidar at Cabauw, less so for the 1mrad lidar at Palaiseau, and less so again (typically 10% error) for the 0.53mrad ceilometers at Chilbolton at Cabauw. The problem should be absent for the 0.1mrad UV Raman lidar at Chilbolton.

In theory, a multiple field of view lidar can exploit the multiple scattering and provide extra information. It was decided that this technique was not mature, and should not be further explored in the context of cloudnet and the specification for a cloud observing stations.

5.3 Calibration of 94GHz cloud radar.

R Hogan (UR) described a new method of calibration which relies on the fact that due to Mie scattering the value of Z in light rain is constant at about 15dBZ. Traditionally, researchers have relied on a link budget - but this can be in error by 3 or 5dB. At Chilbolton a lengthy calibration chain by comparison with a 35GHz, and then a 3GHz radar absolutely calibrated using polarisation redundancy in rain has been used. The new method is stand alone and simple and can be done for one month's data. It has revealed that the 'old' 94GHz EIK design from CPI Canada loses about 20dB of power after two years operation. Sensitivity at 1km range for a 30sec average is about -32dBZ rather than -52dBZ. This is a new finding and has serious implications for users of

this tube world wide, and future spaceborne missions, which currently assume that the power remains constant. The 94GHz radar purchased at Palaiseau has the old tube design. The new tube being acquired at Chilbolton uses a new cathode design incorporating tantalum which CPI claim should give much improved performance. The power will be monitored carefully monitored.

ACTION 5.1 A.P. (IPSL) Ascertain if the radar (Palaiseau) design incorporates a coupler to monitor the power output of the EIK.

6 STATUS OF THE INSTRUMENTS.

6.1 Status of Instruments at Chilbolton.

JG (RCRU) reported that the ceilometer and 94GHz radar (with reduced sensitivity - see 2.3) are observing 24h/day and 7 days a week.

The UV lidar (a non core instrument) is still under active development. The elastic channel usually has more sensitivity than the ceilometer but occasionally does not identify clouds seen by the ceilometer. First results of water vapour via the RAMAN channel were shown. AT (ECMWF) pointed out that sub-grid scale variations in humidity are important in cloud parameterisation schemes.

ACTION 6.1 JG (RCRU) to report on the ability of the UV lidar to see small scale fluctuations in humidity.

CW (RCRU) reported on comparisons of lwp from 22.4 and 28.8GHz radiometers (2.3deg beam and 10 sec average) and Larkhill sondes ascents. 39.5Ghz should be ready in 4/5 weeks, 78.5GHz is planned. The ESTEC MRF three frequency radiometer is not very stable.

6.2 Status of instruments at Cabauw.

The 35GHz cloud radar from Degreanne has been accepted. The CLIWA-NET CCN and BBC campaigns were described. Since 3 October the TARA (TUD) 3GHz radar, the 35GHz radar and the ceilometer have been operating continuously. Comparison with the MIRACLE GKSS 94GHz radar during the BBC campaign reveals that 6dB must be added to the new 35GHz radar. For the future as part of the 'CESAR' programme further instruments will be deployed from Nov 2002 onwards such as aerosol equipment, raman lidars and a 22 channel radiometer (U Bonn) which should give eight points on a vertical humidity profile.

6.3 Status of Instruments at Palaiseau.

The lidar operating at 1064/607/532nm with 15m resolution and 10s resolution had been operated about twice a week for a few hours on each occasion since 3 October. The modulator on the RASTA 94GHz radar failed this summer and the unit is back in Canada with the manufacturers. The 5GHz radar has not been operated.

ACTION 6.2 IPSL to produce an observational plan to conform with the original proposal. (See Action 4.1).

6.4 Future plans at Vaisala (PR).

Status of current ceilometers reviewed. There is a requirement for instruments for measuring the height of the boundary layer, cloud type recognition, and for detecting the onset of cloud/fog formation. Several ceilometers separation several km or so, can be used to identify time-height series of clouds. Cb clouds can be identified by the sudden change in cloud base altitude. A rapid response instrument helps for this. Vaisala have acquired Radian who manufacture the MMCR range of cloud radars which are standard for the ARM sites (Oklahoma, Canadian Arctic, and two in Pacific)

ACTION 6.3 PR to provide user requirement from industry's point of view.

7 STATUS AND DEVELOPMENT OF FUTURE MODELS.

7.1 AT (ECMWF). Separate prognostic variables for cloud condensate (phase diagnosed via temperature) and cloud fraction. Highlighted the requirement for knowing sub grid scale fluctuations in temperature and humidity. These pdfs could be incorporated into the model. They are related to fractional cloud cover.

7.2 DW (Met Office) Prognostic variables: ice and liquid water content. Cloud fraction is diagnosed. Stress the requirement of ice water content for validation. Would also like the ice concentration - to check current parameterisation scheme. March 2002 new dynamics but no changes in cloud physics, but radiation scheme improved. Later a new cloud physics scheme may be introduced. Stress again want iwc plus idea of errors in retrieved quantities.

7.3 J-M P (MeteoFrance) 4d-var since 2000. In 2007 model resolution will be 2.5km. Currently clouds are diagnosed from $q(\text{vapour})$ - if it exceeds $q(\text{sat})$ - produces clouds and ppn. Prognostic cloud variables within a year or so.

7.4 AL (KNMI). 55km now operational, 11km pre-operational. Also regional area climate model available (RACMOL). Cloud details described at KO meeting.

8 INSTRUMENT RETRIEVALS/ALGORITHMS/MODEL COMPARISONS.

8.1 DD (KNMI) - Ice Particle Size Retrievals.

Radar lidar retrievals described. Results of Re of ice versus temp for different IWC for the ARM data set. Use bimodal ice spectra in retrieval - but discussion on if this needs to be represented in models.

8.2 JP (IPSL) - Ice Particle Size Retrievals.

Carl 99 and Carl 2000 ice particle size and iwc retrievals described. Again observations show that ice spectra are bimodal. Should this be in the models or not?

8.3 EO'C (UR) - Drizzle in Stratocumulus.

This is very widespread. Doppler cloud radar and lidar used to characterise drizzle size, velocity, liquid water flux, and time constant for cloud liquid water lifetime. Forecasting of stratocumulus formation and persistence is a big problems for all the models.

8.4. MB (UR) Fractional Cloud Overlap.

Observed cloud fraction values are higher if defined by area than by volume (typically 5% bias). Further methods of parameterising the change from maximum to random overlap for vertically continuous clouds was presented. Dependence of parameter on shear etc.

8.5 RH (UR) Ice cloud variability.

PDFs of sub-grid scale variability of ice water content presented. Also vertical overlap of ice cloud inhomogeneity was derived. Effect of wind shear on PDF and vertical overlap were presented.

8.6 HR (TUD) Water cloud retrievals.

Combined lidar and radar backscatter at cloud base were used to characterise the amount of drizzle within a cloud and means of deriving cloud (and degree of sub-adiabicity) and drizzle water content proposed.

8.7 Final Discussion on User Requirements (DW- UKMO).

Stress that lwc and iwc are needed to validate current climate models. To model physics parameterisation schemes also want to know Re and N. It is essential that errors be provided with these retrievals. A discussion on the need for ice terminal velocities as a function of IWC and its importance in ice cloud lifetime ensued.

9. Date of Next Meeting: 27-28 May in Paris.

ACTIONS

- 1.1 AI (UR)
- 1.2 WP Package managers JP (IPSL), JG (RCRU), AL (KNMI).
- 1.3 All partners
- 1.4 All partners
- 2.1 RH (UR)
- 2.2 AL (KNMI)
- 3.1 RH (UR)
- 4.1 JP (IPSL)
- 4.2 JP (IPSL)
- 4.3 AI (UR)
- 4.4 AI (UR)
- 4.5 DW (UKMO), AT (ECMWF), J-M P (MFr), AL (KNMI).
- 5.1 AP (IPSL)
- 6.1 JG(RCRU)
- 6.2 JP (IPSL)
- 6.3 PR (Vaisala)

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