WP5- NA5: Clouds and aerosol quality-controlled observations
Deliverable D5.3: Workshop with modellers on variables needed

Time :	28 March 2012
Place :	Dept of Meteorology, University of Reading, UK
Chair:	Anthony Illingworth
Minutes:	Anthony Illingworth and Ewan O'Connor
Appendix 1	List of attendees.

The aim of the working group meeting was to discuss with NWP experts the requirements for evaluating the representation of clouds and aerosol. The cloudnet project is being extended by incorporating new stations within Europe and including aerosol retrievals. For each of the items 1 – 9 below the power point slides are available on the password protected Actris intranet where details of the presentations can be found. Below only major points, decisions and actions are recorded.

1. Introduction. (Illingworth, U of Reading))

1.1 Apologies were received from Ulrika Willen (SMHI) and Roel Neggers (KNMI). They wish to be informed of the outcome of the meeting.

1.2 The existing cloudnet capability was described and the proposed improvements. A list of questions to be resolved was tabled. The capability of the Doppler lidars now being installed at many sites in Europe was outlined. The work being undertaken as part of FP7 ACTRIS project to standardise calibration, format, maintenance and retrieval algorithms of the several hundred European ceilometers was described.

2. Status of cloudnet stations, ceilometers and new retrievals. (O'Connor, FMI and UoR)

2.1 ECMWF to supply model data at different forecast lead times.

2.2 Model statistics are being derived with various vertical resolutions:
- a) At the native model resolution
- b) Every km in height,
- c) For different temperature ranges.

2.3 Cloudnet format to be adapted to record parameters for the 1.5micron Doppler lidars which are being installed widely in Europe**. ACTION EOC.**

2.4 Discussions are ongoing as to the best scan procedure for deriving winds.

2.5 Discussion groups are defining common data formats, calibration procedures and retrieval algorithms. Progress will be reported at the ACTRIS General Assembly in June 2012.

3. Met Office Cloud Evaluation. (C J Morcrette, Met Office)

3.1 For testing the improvement of various cloud schemes, it is preferable to re-run historical data with two versions of the model so that it is easier to identify the specific impact of particular changes in a parameterisation scheme. With the present system when a new version of the model becomes operational there are many changes and it is impossible to quantify the impact of each individual change. It was agreed that it would be easier, initially, to run such a scheme 'manually; depending upon the experience gained then automation might be appropriate at a later date.

4. Cloud and aerosol NWP forward model. (Cox, Met Office).

4.1 The forward model was described. First results were shown comparing the forward model with observations. More comparisons should be available for the 2nd ACTRIS General Assembly in June 2012.

5. Clouds in the ECMWF model (Ahlgrimm, Forbes, ECMWF)

5.1 Various issues with cloud representation were identified. The performance of the model had improved, particularly for low-level temperatures over land, following a change in the representation of supercooled liquid water and its glaciation rate. There is a need for accurate lwp and iwp for thin supercooled single layer clouds. There is a need to stratify clouds in terms of broken or overcast using observed radiation.

6. MACC/ECMWF Aerosol verification using profiling data. (Benedetti, JJ Morcrette, ECMWF)

6.1 Verification using aerosol optical depth has been carried out. Profile data are preferable
using aerosol backscatter, extinction, and (if possible) speciation. Verification metrics could be profiles of bias, RMS or normalised mean bias, fractional gross error and correlations. Ceilometer analysis is planned.

7. Clouds and aerosols in the DWD model (Koehler, DWD).

7.1 COSMO ART will have explicit aerosols in three or four years. Dual moment schemes for volcanic ash were described with examples.

8. SMHI cloud schemes. (Willen – presented by Illingworth)

8.1 RCA and EC-Earth are not run in real time, but historic data would be useful for testing modified cloud/radiation schemes. Improved cloud water/ice in RCA4 compared to RCA3 using ERA interim for validation.

9. Aerosol activites with MOCAGR in Meteo-France (Voitus, El Amraouri, MeteoFrance)

9.1 MOCAGE has four types of aerosol, each with six bins. Examples were shown of validation by PM10 and PM2.5 counts.

9.2 Discuss with ECMWF and UKMO how to implement a forward model. **ACTION Voitus.**

10. General Discussion

10.1 The first point of contact for NWP model data queries should be: ECMWF - Forbes (MACC- Benedetti); Met Office – Morcrette; MeteoFrance – Voitus: DWD – Koehler.:

10.2 A list of ceilometer locations will be supplied so that the model data for the appropriate grid box can be archived, but this will only be done when the ceilometer data is fully calibrated, the format exchange finalised and the number of sites is reasonably stable.

10.3 Extra model information to archive. PPN fraction will be sent to the cloudnet archive from ecmwf, and from other models if available. Boundary layer type will be sent to the archive from various models if it is available, and if it cannot be simply derived from other variables. **ACTION O'CONNOR**

10.4 Boundary layer air motions and sonic flux data. This was judged to be an exciting new data source. In one or two years data should be available at 20 to 30 sites in Europe. Initially it will be archived at a single site for a few months as a trial, and a method of visualising boundary layer classification schemes developed. **ACTION ARRANGE MEETING AT ECMWF FOR MORE DETAILED DISCUSSION (see 12.2)**

10.5 Time series of radiation fluxes at the ground to be made easily visible on the cloudnet site, so that, for example, broken cumulus can easily be distinguished from overcast stratocumulus.

10.6 Classification of model performance by regime is useful for identifying model errors. Modellers to communicate to O'Connor any stratification criteria which are not currently available on the cloudnet site. **ACTION O'CONNOR**.

10.7 Advanced lidars for aerosol speciation. These are available at several Cloudnet sites in Europe. Algorithms for deriving aerosol size (from colour ratio) and lidar ratio (from Raman) are being developed and should be available in a couple of years.

10.8 Ice and liquid cloud particle size and concentration. Algorithms are being developed and tested within the FP7 Actris project. They should be available in a couple of years.

11. FINAL REMARKS

11.1 A similar meeting in about one year's time would be useful.

11.2 Subsequent to the meeting, a smaller focussed group agreed to meet at ECMWF within the next six weeks to define the details of how the boundary layer regimes, velocity scales and dissipations could be diagnosed using Doppler Lidar observations.

1. APPENDIX-1 Participant list

1. Dr Dominique Bouniol, MeteoFrance, Toulouse, F
2. Dr Laaziz El Anraoui, MeteoFrance, Toulouse, F
3. Mr Ulrich Goersdorf, DWD, Germany
4. D Bruce Ingleby, Met Office, Exeter, UK
5. Dr Martin Koehler, DWD, Germany
6. Dr Marion Mittermaier, UK Met Office, Exeter, UK
7. Dr Cyril Morcrette, UK Met Office, Exeter, UK
8. Dr Ewan O'Connor, FMI, Finland.
9. Prof Robin Hogan, Meteorology, Reading, UK
10. Dr Chris Westbrook, Meteorology, Reading, UK
11. Prof Anthony Illingworth, Meteorology, Reading, UK.
12. Dr Jean-Jacques Morcrette, ECWMF, Reading, UK
13. Mr Owen Cox, UK Metoffice, Reading, UK
14. Dr M Ahlgrimm, ECWMF, Reading
15. Fabrice Voitius, MeteoFrance, Toulouse, F.
16. Dr Richard Forbes, ECWMG, Reading, UK
17. Mrs Sue Ballard, MetOffice, Reading, UK.
18. Dr Angela Bennedetti, ECMWF, Reading, UK
19. Dr Cristine Chiu, Meteorology, Reading, UK
20. Dr NatalieHharvery, Meteorology, Reading, UK
21. Dr Anton Beljaars, ECWMF, Reading, UK
22. Dr Malcolm Brookes, Met Office, Exeter, UK
23. Mr Julian Mann, Meteorology, Reading, UK
24. Dr Christian Gaffard, Met Office, Reading, UK
25. Dr Dirk Klugmann, Met Office, Exeter, UK.