WP5- NA5: Clouds and aerosol quality-controlled observations
Deliverable D5.4: Joint workshop with modellers to define metrics

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 metrics for judging model performance in correctly representing clouds and aerosol. The cloudnet project is being extended by incorporating new stations within Europe and including aerosol retrievals.

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

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

The existing cloudnet capability was described and the proposed improvements

2. **Skill scores (Hogan, U or Reading).**

Traditional scores for clouds and the mean profiles for cloud fraction, liquid water content and ice water content with values every month, season and year. The next stage is to correctly capture the observed pdf of these values as a function of height within the model.

The next stage is to evaluate the model to represent the right cloud in the right place at the right time. For many years this has been done by a 2X2 contingency table, from which are calculated quantities such as the probability of detection (POD), false alarm rate (FAR), critical success index (CSI), and equitable threat score (ETS). In meteorology the standard metric has been the ETS. However it has recently been realised that ETS is not equitable and that the value depends on the base rate, that is to say the rate of occurrence of the event. The rare the event the lower the ETS. In other words if high clouds occur less frequently than low clouds, then even if high and low clouds are being forecast with equal accuracy, the ETS will be lower for the less frequent high clouds.

Because ETS is flawed it is important to define a new metric which does not have this difficulty.

SEDI (Symmetric Extremal Dependence Index) has the advantage that when the event becomes very rare it tends to a realistic value rather than 1 or 0, so is to be preferred to SEDS (Symmetric Extreme Dependency Score) which is presently implemented. Once a contingency table with numerical values of a, b, c and d, is available then it is a simple matter to compute all the various proposed skill scores and their errors.

Evaluating aerosol representation in models. Aerosols are more widespread than clouds and vary more slowly when compared to clouds. For example the transition from cloud to no-cloud occurs in the space of a few meters, whereas for aerosols there is a gradual increase in aerosol concentration over a much longer distance. Because of this difference, the metric for aerosols is rather more straightforward. It was decided to use simpler metric. The first stage will be to compare the observed backscatter profile with the backscatter forward modelled from the model. The model contains different types of aerosol with different sizes, but the first check of model performance will be just for the observed backscatter profile.

Aerosol metrics. The first stage wil be to get the correct mean profile over days, months, and seasons. As with the clouds the next will be to capture the correct variability of this profiler. The third stage will be to have the correct profile at the correct time. The statistics to gauge this will be the mean bias in the model and the root mean square mean difference for all the individual profilers

3. FINAL REMARKS

A similar meeting in about one year's time would be useful. In the meantime the various researchers would remain in contact via email. The web site would be modified so as to compute and display the various skill scores for the level three data.

ACTION: E O'Connor.

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.