EPS Meteograms

Introduction

The EPS Meteogram (EPSgram) is a probabilistic interpretation of the forecasts from the Ensemble Prediction System (EPS) for a given location. It displays the time evolution of the distribution of several athmospheric and wave parameters in the ensemble forecasts (currently made of 50 members, each starting from slightly perturbed initial conditions) for up to a maximum of 15 days.

The EPSgrams come in three flavours: detailed atmospheric and wave forecasts out to 10 days and an extended range EPSgram for atmospheric parameters only out to 15 days.

The 10-day EPSgrams provide information every 6 hours (for wind and wave direction only daily) throughout the first 10 days of the 15-day forecast period. The unperturbed control forecast and the high resolution deterministic forecast are also shown with a red and blue line, respectively.

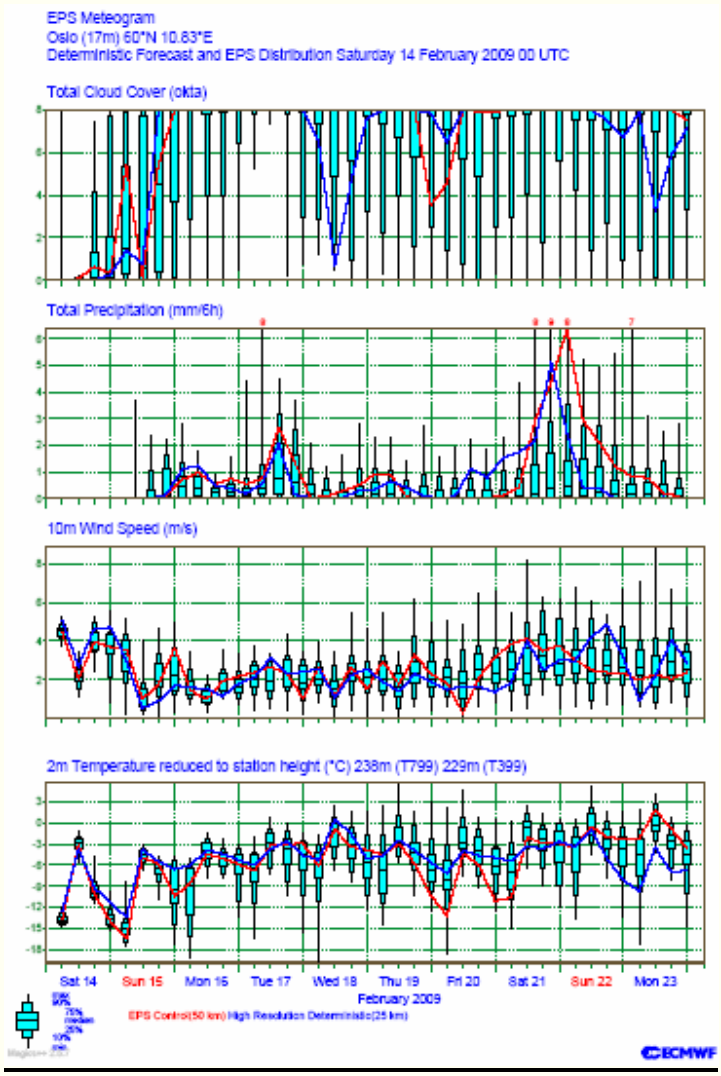
The extended range EPSgram, as a complement to the 10-day version, is specifically designed to provide guidance for the 10 to 15 day range. It displays daily evolution of the meteorological parameters for the whole 15-day forecast period.

The parameters included in the EPSgrams are total cloud cover, total precipitation, 10m wind, 2m temperature and significant wave height, mean wave direction and mean wave period for the waves.

Interpretation of the EPS Meteograms

The title section gives the name (unless overwritten by the user) and height of the chosen location, and the co-ordinates of the EPS grid point used (see “Data” section below).

The EPS forecast distribution at each forecast range is represented by a box-and whiskers plot showing the median (short horizontal line), the 25th and 75th percentiles (wide vertical box), 10th and 90th percentiles (narrower boxes) and the minimum and maximum values (vertical lines), or by a wind rose diagram (for wind and wave direction).



10-day EPS Meteograms

For each step, the forecast distributions are created for the following parameters of the 50 EPS members:

- **Total cloud cover**: instantaneous forecast value, in oktas (eights (1/8) of the sky covered by cloud).
- **Total precipitation**: accumulated precipitation (sum of convective and large scale) over the six hour period preceding the relevant forecast time step, in mm. E.g. for forecast step 72 the precipitation is accumulated between T+66 and T+72. A scaling is applied to the precipitation Y-axis to avoid the undesirable effect of large extreme values stretching the scale so much that the information on smaller amounts cannot be resolved. The largest 6-hourly maxima are shown at the top as red numbers if the scaling is necessary. By default the control and the high resolution forecasts are always plotted on the diagram regardless of any scaling.

- **10m wind speed**: Instantaneous forecast value, in m/s.
- **2m temperature**: Instantaneous forecast value, in degrees C. The model orography can differ significantly from the station height, which necessitates some temperature correction. The forecast temperature is adjusted by 6.5 degrees C per 1000 metres difference between the station height and the model orography. The heights from both the EPS (T399) and deterministic (T799) models are displayed in the title as an indication of the heights used for the temperature correction.
- **10m wind direction**: the daily distribution is created by taking each 6 hourly forecast for the day (altogether 200 direction values per day, made up as follows: 50 members * 4 forecast steps at 06-12-18-24 UTC) and allocating it to the relevant octant (e.g. the octant between -22.5 and +22.5 degrees shows northerly wind). The area of an octant is proportional to the probability of that wind direction (i.e. to the proportion of forecasts falling in that octant). To aid visualisation each rose is scaled to the size of the most populated octant. Thus, the scaling is different for each day of the forecast. The exact probability of each octant is indicated by shading, obtained using a continuous colour scale from light to dark.
- **Significant wave height**: Instantaneous forecast value in m. The significant wave height is estimated from the zero-moment of the wave frequency spectrum (4 times the square root of it), hence it is an estimate for the mean of the highest one-third of the waves.
- **Mean wave direction**: The mean wave direction is the mean direction of propagation of the waves, based on the weighted average of the wave spectrum (the directions are shown using the oceanographic convention, meaning that it shows the direction towards which waves are propagating, e.g. zero means propagation towards the north). The instantaneous distribution is shown for the 12 hour forecast and all subsequent forecasts every 24 hours. The distribution rose for the wave direction is created similarly to the wind direction (please refer to wind direction for further details). Furthermore, each octant is coloured based on the distribution of significant wave height associated with each mean wave direction (see colour scale in the upper right corner). The coloured areas in each octant correspond to the fractional number of ensemble members with significant wave heights in each range specified by the coloured ruler. The straight red and blue lines are the mean direction of the control and deterministic forecasts.
- **Mean wave period**: Instantanous forecast values in seconds. The mean period presented here corresponds to the mean period derived from the minus-one moment of the frequency wave spectrum. It is also known as the energy period as it gives more weight to the low frequency energy containing swell than to the high frequency waves.

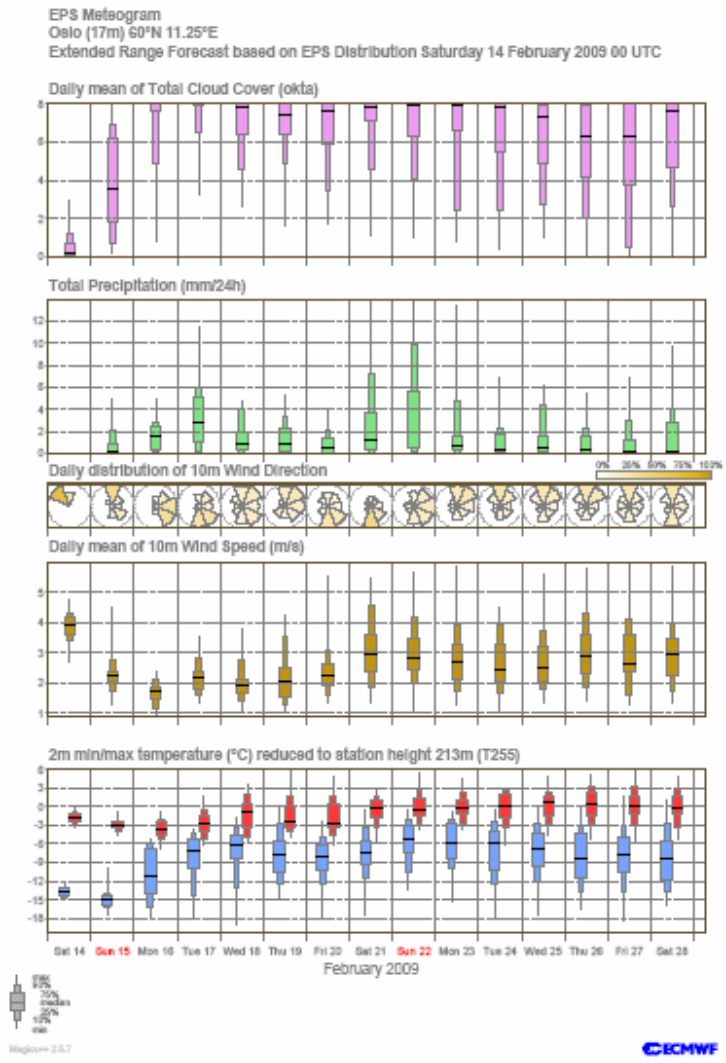
Extended range EPS Meteogram

The extended range EPSgram displays the EPS probability distribution for each calendar day, from 00 UTC to 00 UTC. Thus, only 14 daily distributions are generated for the 12 UTC forecast (the first and last 12 hours are excluded).

The daily values of the forecast distributions are created using the following procedure for each of the

50 members of the EPS:

- **Total cloud cover**: (in oktas) and 10m wind speed (in m/s): 24-hour mean values, computed as the arithmetic mean of the four forecast steps at 06-12-18-24 UTC.
- **10m wind speed** (in m/s): 24-hour mean values, computed as the arithmetic mean of the four forecast steps at 06-12-18-24 UTC.
- **Total precipitation**: 24-hour accumulations for the period 00 UTC to 00 UTC (sum of convective and large scale, in mm).
- **2m minimum and maximum temperature**: 2m minimum and maximum temperature: for 24-hour period as post-processed by the model using all forecast steps (in degrees C). The forecast temperature is adjusted by 6.5 degrees C per 1000 metres difference between the station height and the EPS model orography (on T255 resolution for the whole 15 day range). The height from the EPS is displayed in the title.
- **10m wind direction**: please refer to the 10-day EPSgram for description.



Data

The 10-day atmospheric EPSgram and the wind part of the wave EPSgram are based on the original EPS resolution (T399). The high resolution deterministic model, plotted on the diagram is also interpolated onto the same EPS grid (meteorological fields and also the model orography).

The diagrams for wave parameters are based on the original resolutions of both the EPS wave model (~110km) and the high resolution deterministic model (~40km).

To provide a consistent product throghout the 15-day forecast period covered by the variable resolution system, the extended range EPSgram is generated using a daily time frequency and at T255 resolution throughout the whole forecast range. Therefore the fields from the first 10 days (originally on the T399 grid) are interpolated onto the T255 grid.

When creating the EPSgrams for a specific location, the four surrounding grid points are considered. For the EPSgram with atmospheric variables only, the nearest land point is selected, or if only sea points are available, the nearest one is used - this situation will be noted in the EPSgram's title section with the words 'EPS sea point'. However, for the wave EPSgram (all parameters including the atmospheric wind) if sea points are available then always the nearest one is considered (as according to the respective model's land-sea mask). If there is no available sea point then only wind data will be plotted from the nearest land point, and the wave diagrams will be empty.

The altitude information for the station location (if applicable) is extracted from the 30 arc second global topography (GTOPO30) dataset, located at http://edcdaac.usgs.gov/gtopo30/