Application and verification of ECMWF products 2011

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1. Summary of major highlights

In autumn 2010 Israel joined ECMWF as a co-operating state. Since then both ECMWF deterministic forecast fields and EPS products became an important tool in IMS operational forecasting.

ECMWF deterministic runs are used by INCA (Integrated Nowcasting through Comprehensive Analysis) together with automatic station data and radar for nowcasting up to 6 hours (*Haiden et. al*. 2011).

The ECMWF long-range forecasts, from weekly anomaly to seasonal (3 months) predictions are the primary source of information for temperature forecasts. For DJF precipitation forecast ECMWF is supporting the IMS statistical scheme.

2. Use and application of products

As weather and electricity consumption are related, EPS monthly and seasonal forecast products are used for the electric company load forecast.

2.1 Post-processing of model output

2.1.1 Statistical adaptation

2.1.2 Physical adaptation

The ECMWF deterministic model output is downscaled to fit the 1 km INCA grid by bilinear interpolation.

2.1.3 Derived fields

2.2 Use of products

The EPS products including wave EPSgrams for the Mediterranean Sea, Extreme forecast index, 10 days EPS Meteograms and 15 days Extended Range Forecast for 51 locations in Israel (Fig. 1) became an important tool in operational duties.

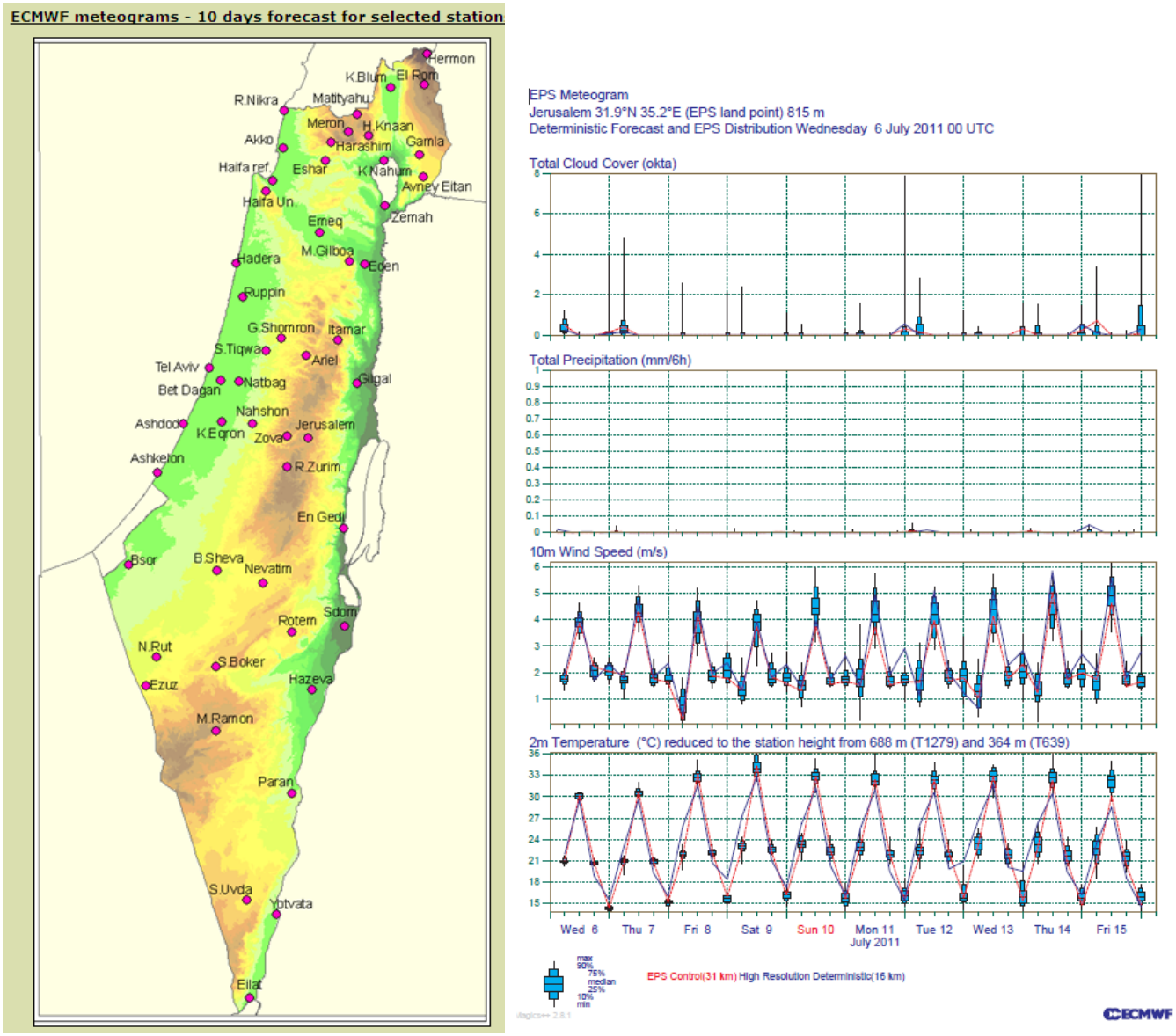

Figure 1 A map of the 51 stations that EPS meteograms are available by a click.

3. Verification of products

3.1 Objective verification

3.1.1 Direct ECMWF verification of weather parameters by national Services is particularly valuable.

Verification of ECMWF was done by utilizing INCA (Integrated Nowcasting through Comprehensive Analysis) high resolution nowcasting system. ECMWF deterministic model output is ingested to INCA by downscaling to the INCA 1 km grid and combined with auto-station observations and radar data. The ECMWF weighting function increases linearly from 0 to 1 in the time interval between +0 and +6.

The statistics: Mean Bias Error (MBE), Mean Absolute Error (MAE) and Root Mean Square error (RMSE) for June 2010 are presented in figures 2–4.

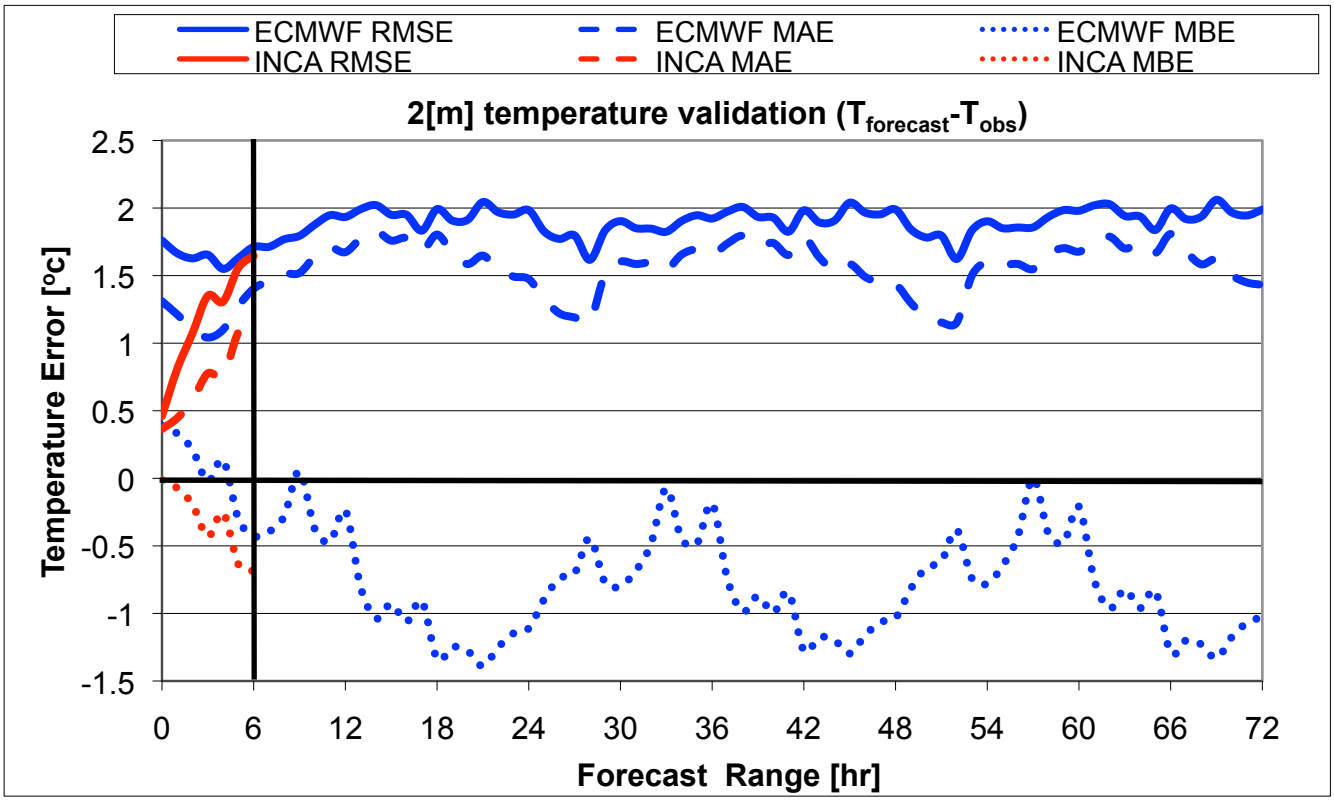

Figure 2 June 2010, 2 m temperature MAE, MBE and RSME for INCA and ECMWF for the 00Z runs as compared to all IMS 88 auto-stations. The vertical black line indicates the 6 hours INCA nowcasting range.

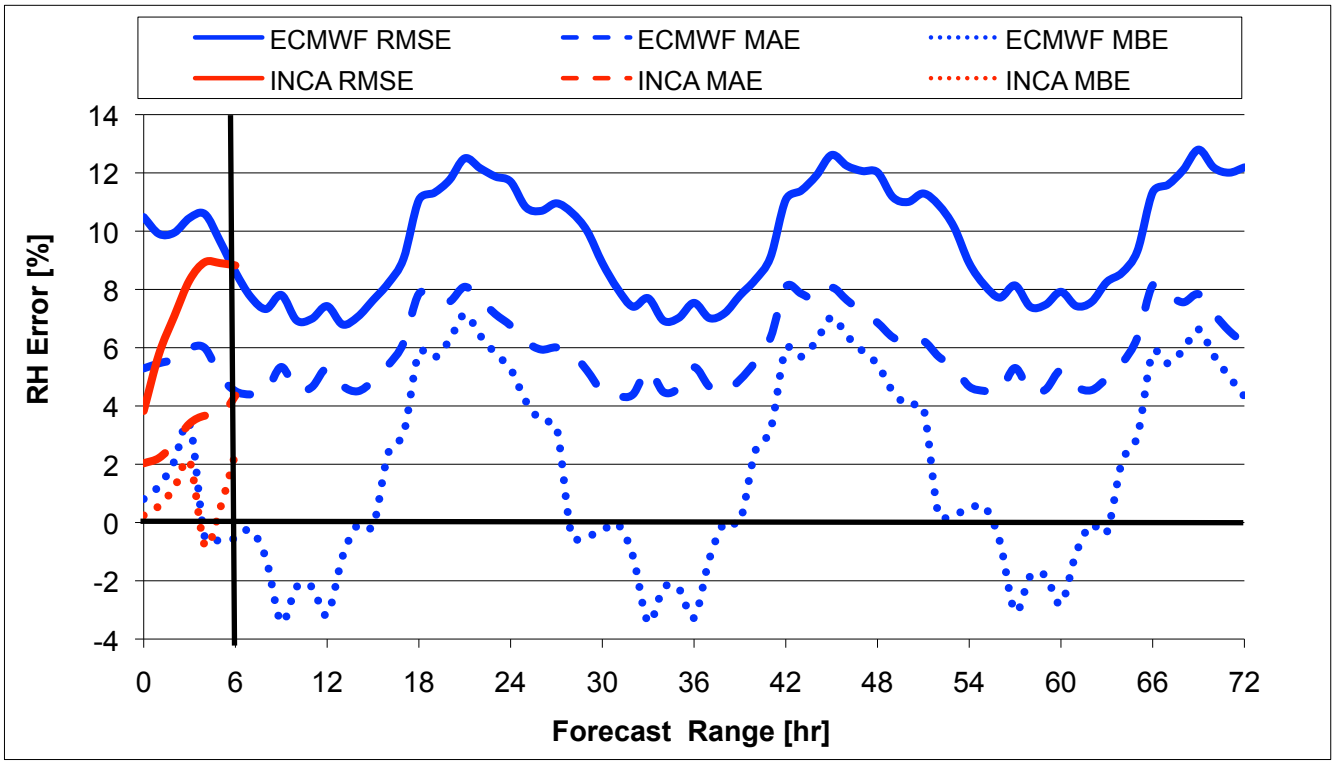

Figure 3 As fig. 2 for Relative Humidity based on 87 auto stations.

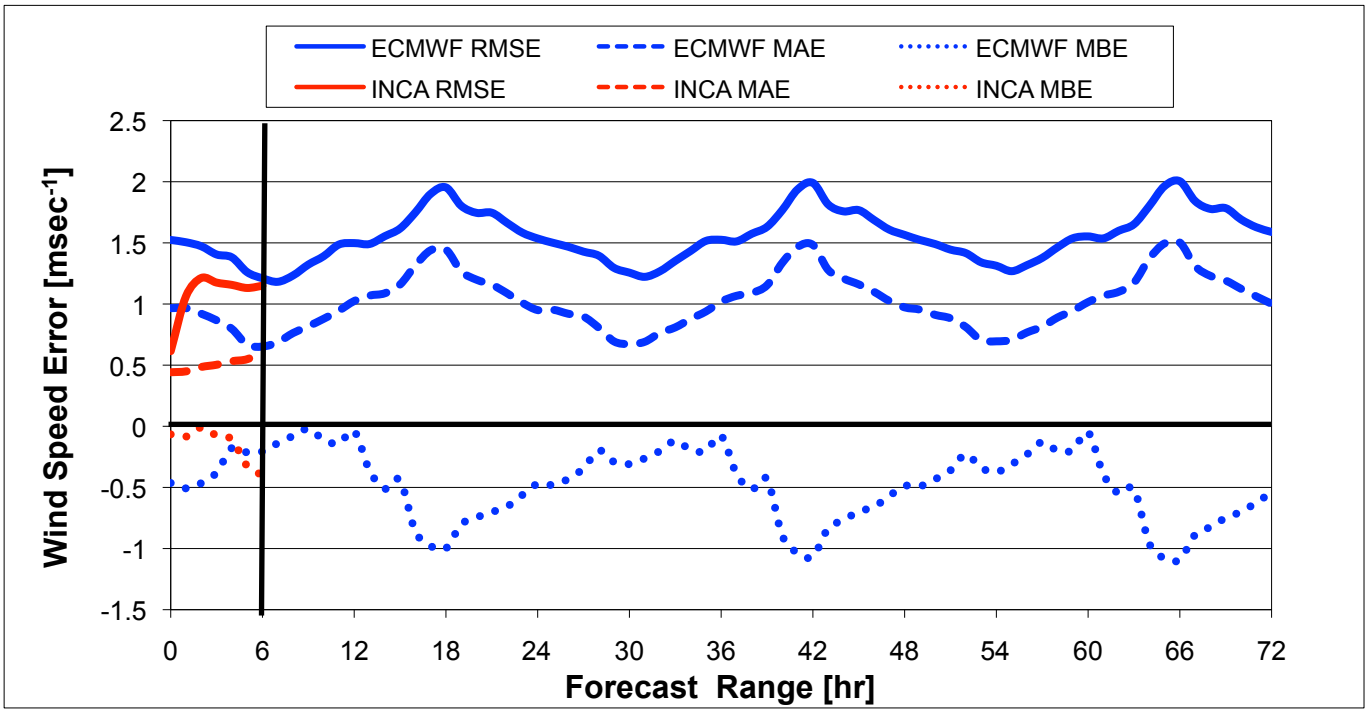

Figure 4 As fig. 2 for wind speed at 10m based on 75 wind auto stations.

From Fig. 2 it can be seen that during the day (+6-12, +30-36, +54-60) there is no systematic bias in temperature forecast. On the other hand, during the night there is an average negative bias that may reach 1.4ºC. During all 72 hours the RMSE was less than 2.1ºC.

From Fig. 3 it can be seen that during the day (+12, +36, +60) there is very small negative (~ -3%) systematic bias in RH. On the other hand, during the evening and night there is an average positive bias of up to 7%. The RMSE reaches 12% in the evening and night and only 7% at the morning hours (+6, +30, +54).

From Fig. 4 it can be seen that during the day there is no systematic bias in wind speed. On the other hand, during the evening (+18,+ 42 and +66) there is an average negative bias as ECMWF underestimates wind velocity by ~1 m s^{-1}. The RMSE reaches 2 m s^{-1} in the evening and only 0.7 m s^{-1} at the morning hours (+6, +30, +54).

3.1.2 ECMWF model output compared to other NWP models

As the IMS joined only recently the ECMWF we do not have comparisons to other models.

3.1.3 Post-processed products

3.2 Subjective verification

3.2.1 Subjective scores (including evaluation of confidence indices when available)

3.2.2 Synoptic studies

4. References to relevant publications

Haiden, T., **A. Kann**, **C. Wittmann**, **G. Pistotnik**, **B. Bica**, **C. Gruber**, 2011: The Integrated Nowcasting through Comprehensive Analysis (INCA) System and Its Validation over the Eastern Alpine Region. *Weather and Forecasting*, **26**, 166–183.