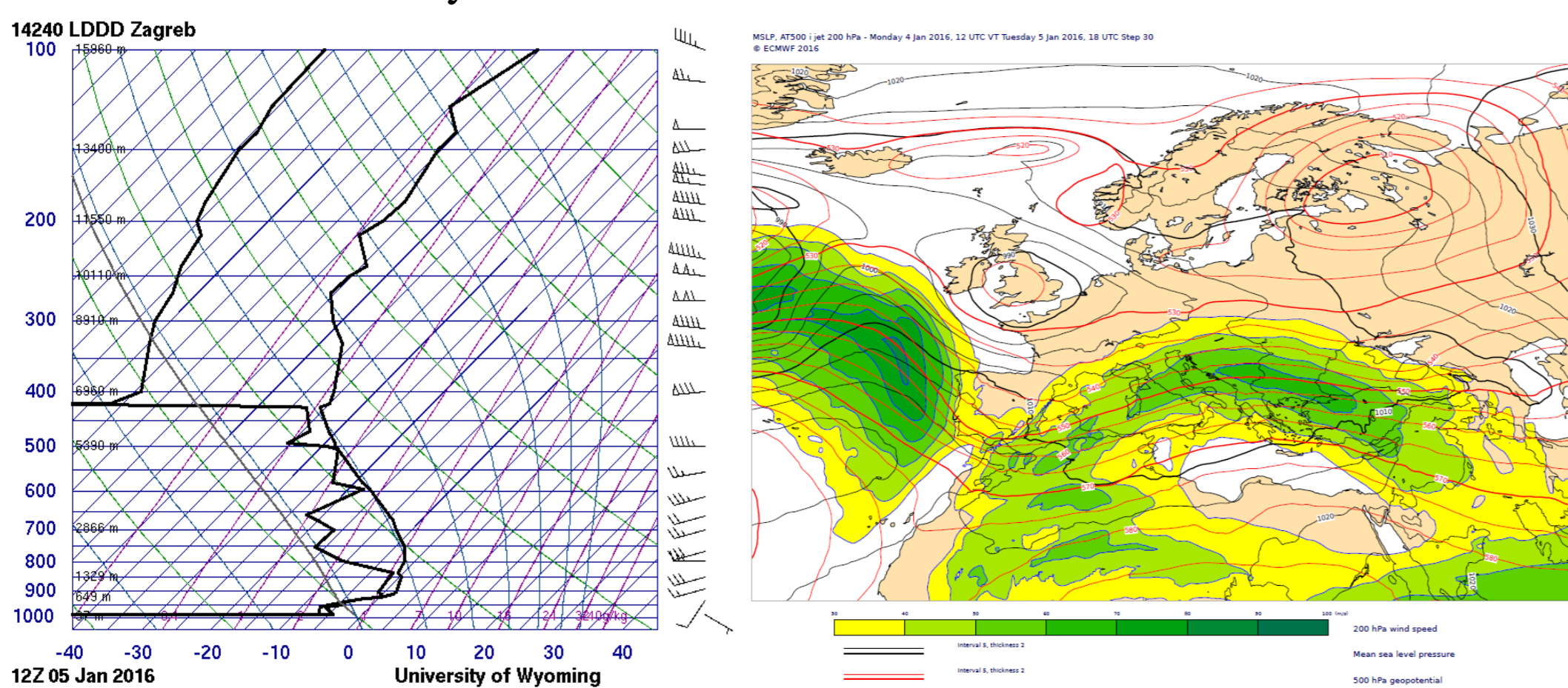


Summary

A case of January 5, 2016 freezing rain in inland Croatia is shown through an overview of ECMWF forecast products. The focus is on the precipitation type product which has performed well in this case. The signal of freezing rain appeared 7 days in advance, and was rather consistent throughout the remaining period.

Case overview

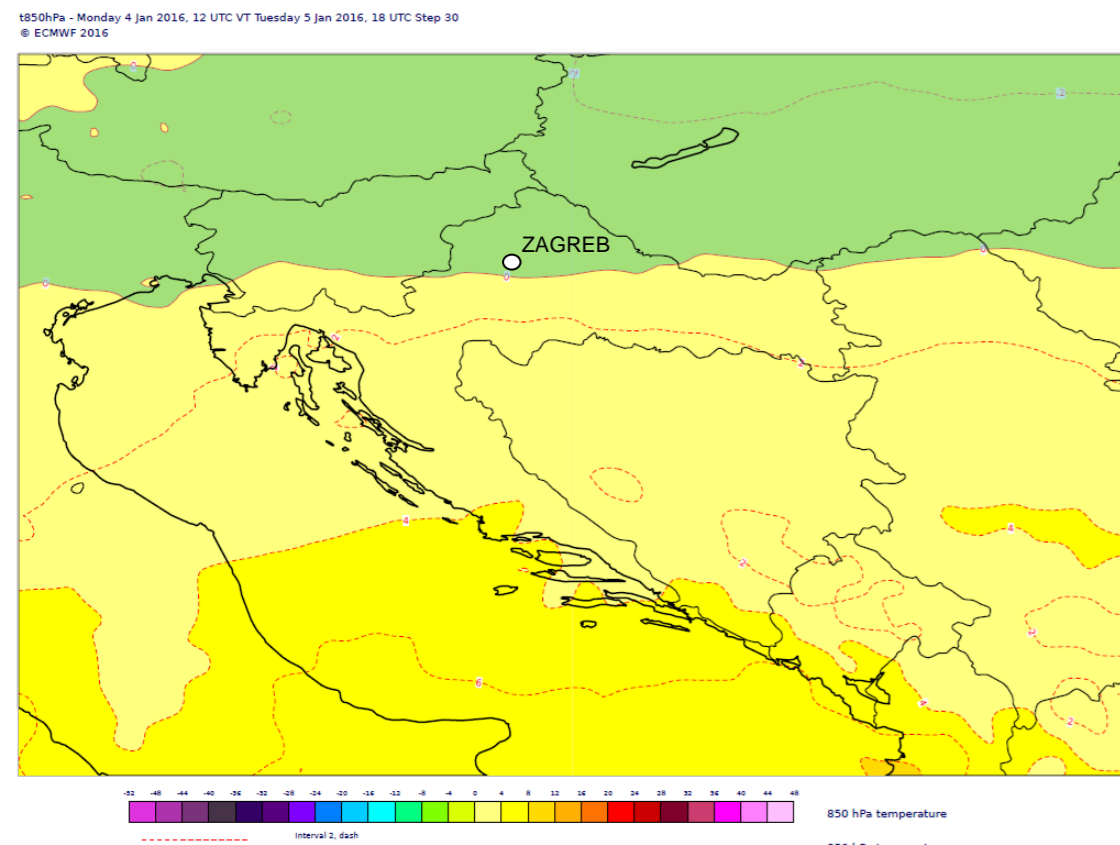
After a snowfall episodes, in the day preceding the event, a ridge of Siberian high strengthened in the lower levels bringing even colder air from the north. At the same time an upper-level trough, with cut-off residing over the UK, descended into Mediterranean, placing Croatia on the leading side of the trough under south-westerly flow. On January 5, 00 UTC, a shallow cyclone that formed in the gulf of Genoa headed east. Later that day warm front formed along the Croatian coastline. In conjunction with the cyclone, warm and humid air advection started in the 750 - 925 hPa layer.



Zagreb sounding for January 5, 12UTC

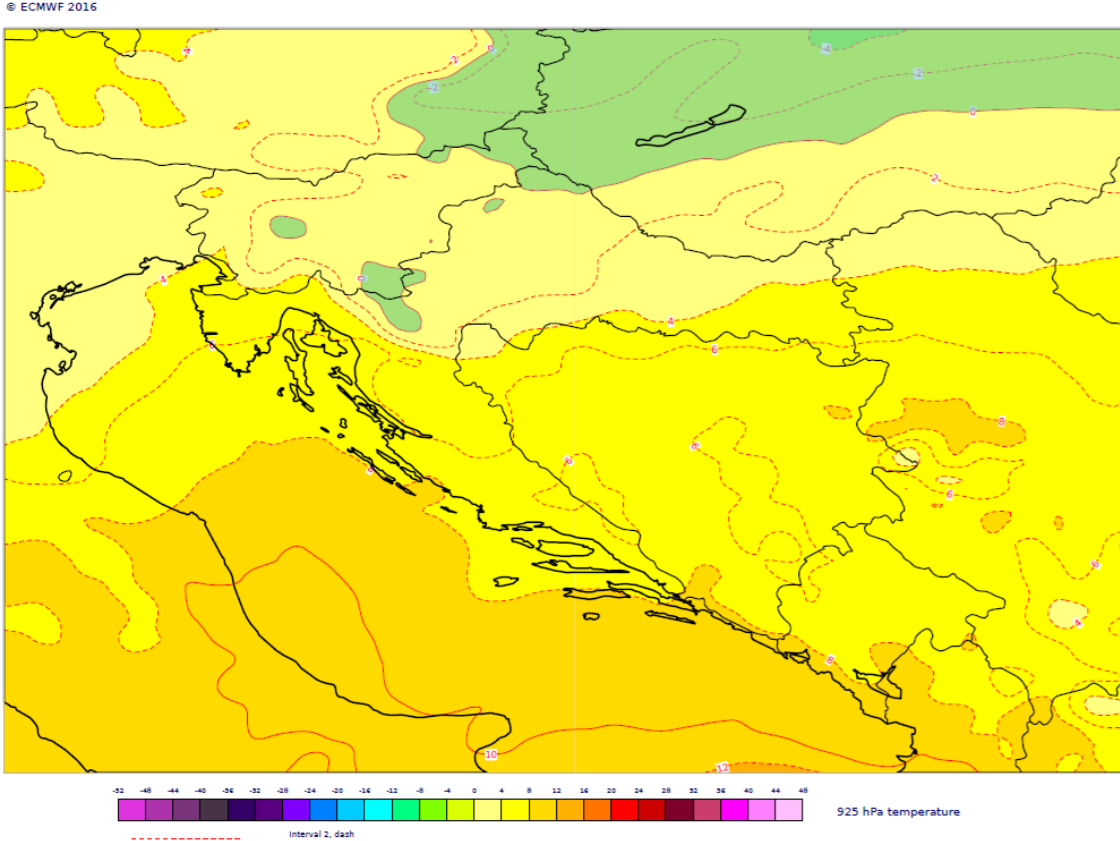
ECMWF forecast: MSLP, AT500, 200hPa jet for January 5, 18 UTC

ECMWF products



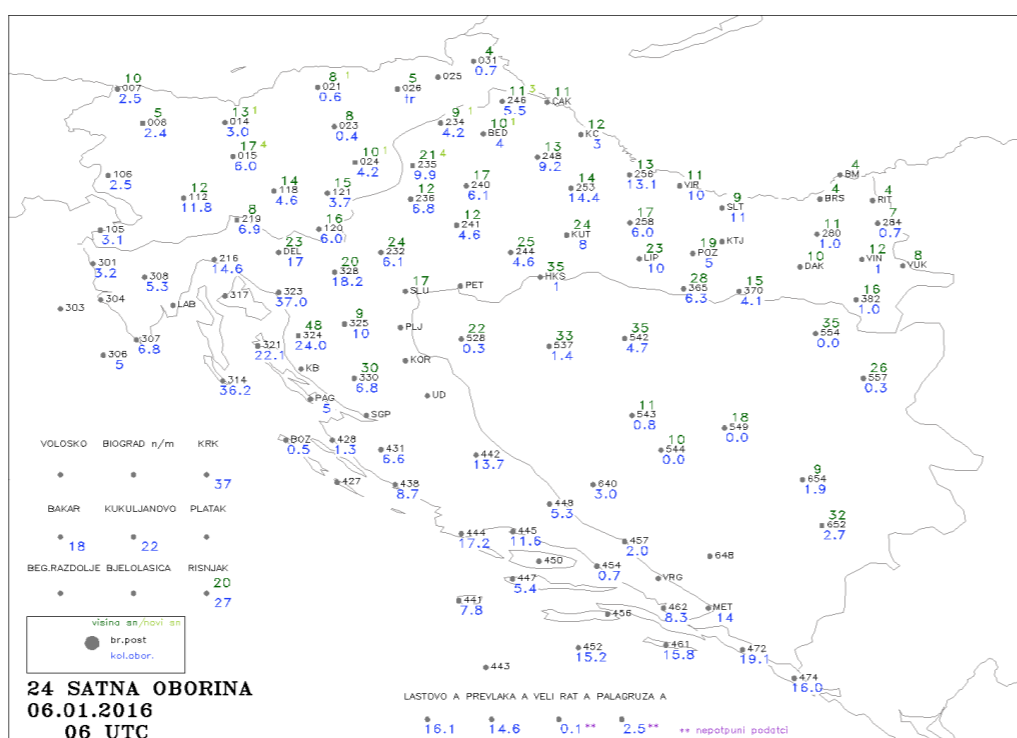
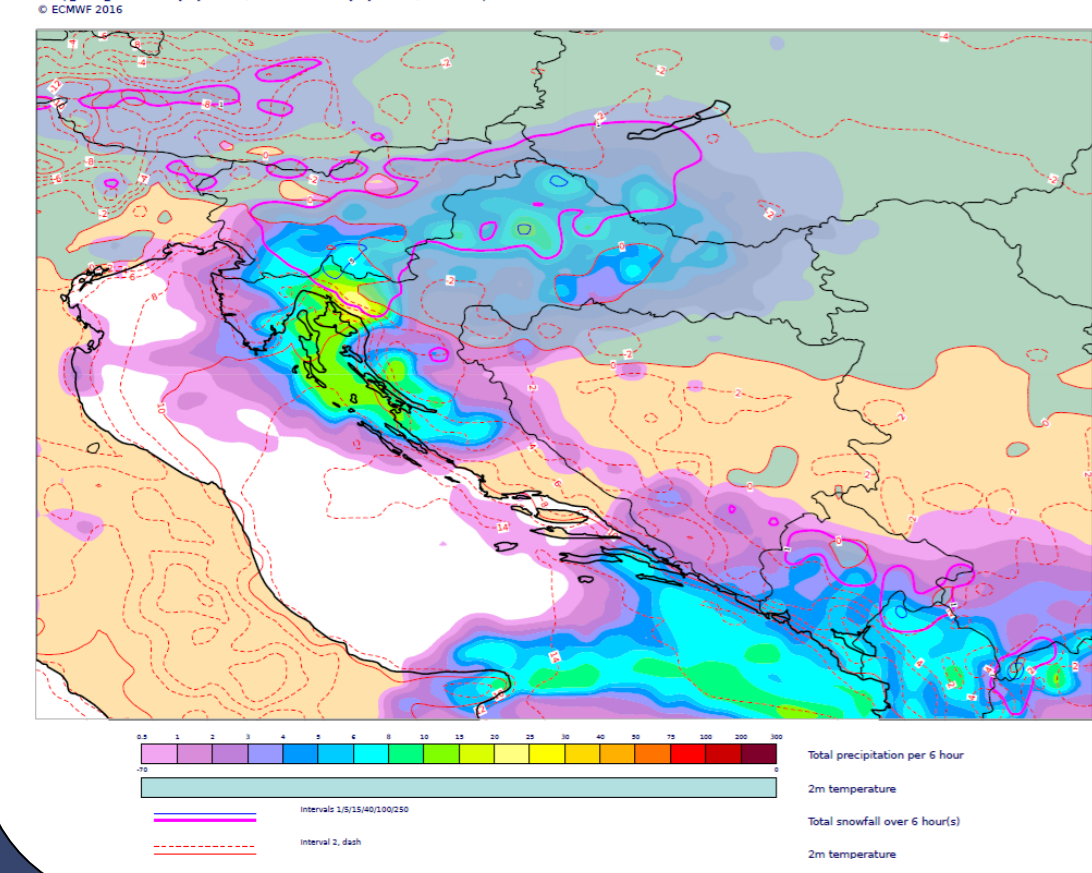
The T925 hPa and T850 hPa forecast for January 5, 12UTC. (January 4, 12 UTC run).

In comparison to the Zagreb sounding: $T_{850} = 0,4^{\circ}\text{C}$, $T_{925} = -2,1^{\circ}\text{C}$; the warm upper level layer was well forecasted, although the warm layer was just above the 925hPa.

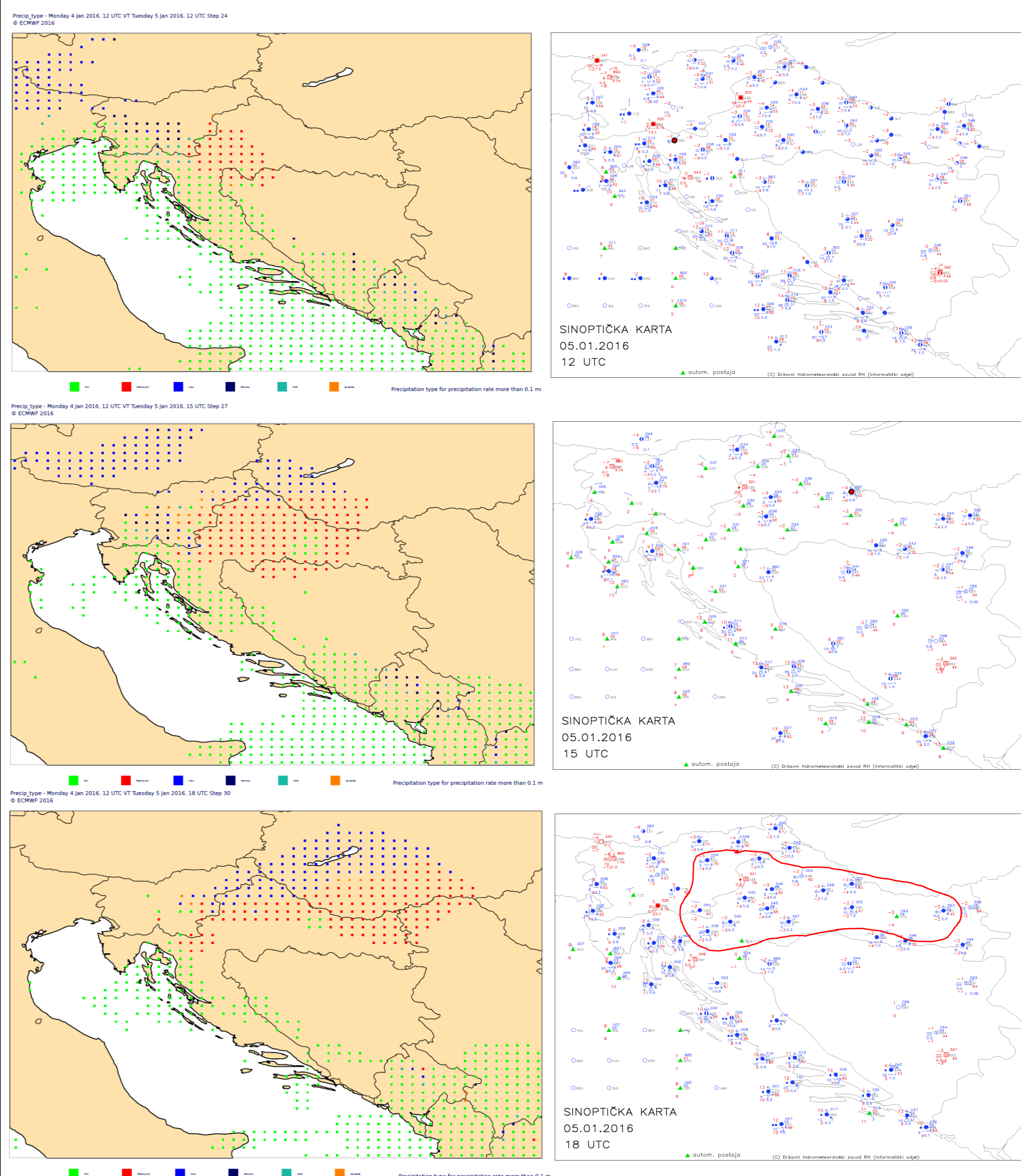


Total precipitation and snowfall per 6 hours up to 18 UTC, with 2m temperature.

Below zero surface temperatures were forecasted for the inlands. Together with the upper level warm advection, the freezing rain was forecasted in the most of the area. Only for the northern parts, with weaker warm advection the snow was forecasted.



Precipitation type product



Precipitation type forecast, January 5, 12 and 15, and 18 UTC. (January 4, 12 UTC run)
The product indicated freezing rain phenomenon several days in advance. For the northern parts of Croatia snow was predicted, but the forecast was false. The precipitation start was not forecasted well, it started almost 6 hours later than predicted, around 17 UTC, and lasted until the next morning.



Conclusions

Freezing rain is one of the most difficult events to forecast. The smallest variations in temperature (tenths of a degree) can mean the difference between rain, freezing rain, sleet or snow. In this case the ECMWF precipitation type product performed very well, and was noticed up to 7 days in advance. Considering that this weather event falls in very narrow bands, usually not more than 50 km, the performance of the ECMWF model was very good. The total amount of precipitation recorded in the central parts of Croatia was 5 to 10 mm, locally even up to 14 mm, giving around a 1 cm thick ice. Because of the timely warnings, and a small amount of rain, no severe consequences due to freezing rain event happened.