**2 Years Long Range Temperature Forecasts for Northeastern Germany**

Marco Radke, Waren (Müritz)/Berlin

**Summary.** Since March 1996 long range forecasts for monthly temperature anomalies are issued on the basis of the procedure described in RADKE (1996) and published three-monthly in *Wetterkarte, Amtsblatt des DWD* (a publication of the National German Weather Service). In this article the forecast skills are investigated and compared to the results one year ago.

# 1 Verification Procedure

The parameters for verification are already discussed in detail in RADKE (1997). This and several other articels are available on the InterNet via *http://surf.to/meteomara*. The following is a short summary:

As a first evaluation of the forecasts the $BIAS$ may be taken into account. It describes whether the forecast predicts too warm ($BIAS < 0$) or too cold ($BIAS > 0$) in average. Another simple parameter is the "hit ratio", the ratio of the number of forecasts with less than $1.5\,K$ forecast error to the total number of forecasts. To estimate the forecast skill, the own predictions are related to a reference. In case of longe range forecasts this is the climatological mean, i.e. an anomaly of $0\,K$. The forecast skill is described by the Reduction of Variance ($RV$). It applies $RV = 1$ for a perfect forecast; $RV = 0...1$, if the forecast is better than the reference, i.e. there is a forecast skill; and $RV < 0$, if the forecast is worse than the reference. Because long range forecasts mainly focus on predicting whether to expect a positive or negative temperature anomaly, the forecast skill of the tendency prediction is interesting as well. That is the purpose of the $RV_T$-value, that behaves like the $RV$-value.

# 2 Results

As the $BIAS$ values in table 1 show, the forecast method predicts too cold in average. This is mainly caused by the extremly warm last winter. One year ago the forecasts for the third and forth month were still too warm.

While all $RV$–values were still negative one year ago, at the moment all are positive, i.e. there is a proven forecast skill for the value of the monthly temperature anomaly forecast, and that for all six months ahead. This surprisingly good result is caused mainly by the great winter forecast 1997/98, where all months were clearly better than the reference climate. This applies especially for February, that was more than $5\,K$ too warm. Figure 1 shows an untypical progression of the $RV$-values with the forecast time: there is a secondary maximum in the forth month and still high values in the third and fifth

| months ahead | 1. | 2. | 3. | 4. | 5. | 6. |
|---|---|---|---|---|---|---|
| number of forecasts | 24 | 23 | 22 | 21 | 20 | 19 |
| hit ratio /% | 71 | 66 | 55 | 62 | 65 | 63 |
| $BIAS/K$ | +0.46 | +0.66 | +0.41 | +0.57 | +0.54 | +0.69 |
| $RV$-value | **+0.19** | **+0.05** | **+0.08** | **+0.13** | **+0.10** | **+0.07** |
| $RV_T$-value | **+0.47** | **+0.22** | −0.06 | ±0.00 | ±0.00 | −0.14 |

Table 1: Verification results for the every month

month. In general one expects a constant decreasing of this parameter with the time, like it is almost the case with the $RV_T$-values.

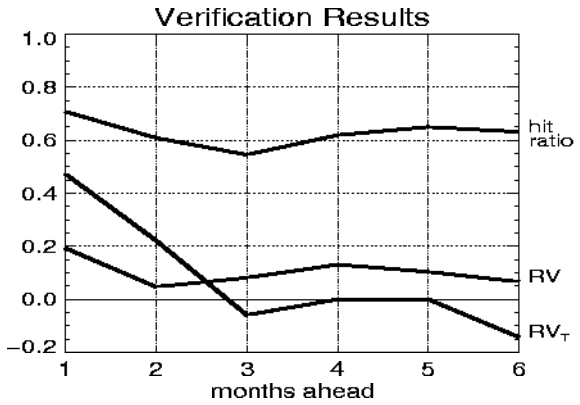


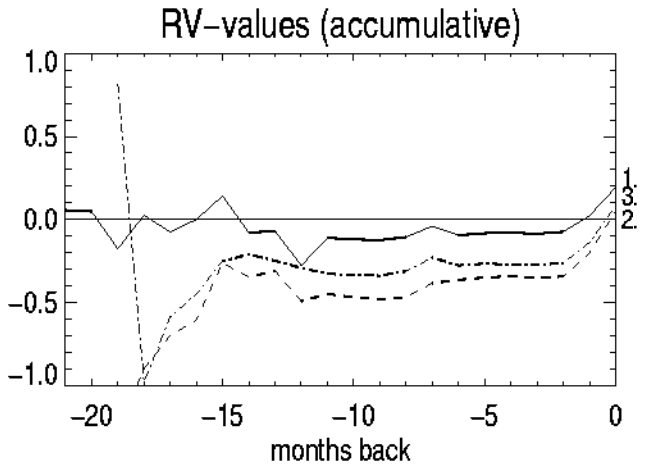

Figure 1: Verification parameters in dependence of forecast time

Unexpected as well is the fact that the $RV$-values are higher than the $RV_T$-values from the 3rd month on. That is the forecast of the anomaly value is better than the one of the sign of it. This is caused by small anomalies of the monthly temperature that occured more often in the last time. So in case of a forecast of $+1\,K$ and an observation of $0.4\,K$ the error of the value is evaluated as $0.6\,K$ but the error for the sign as 1.

In figures 2 and 3 the time-accumulated progression of the $RV$- and $RV_T$-values since May 1996 for every month ahead is shown. Clearly recognizable is the positive influence of the last winter causing the fast rising of the data at the end. A figure of the 12-months-mean values was turned down because the significance of the $RV$- and $RV_T$-values with the present low total number of forecasts is very problematic.

## 3 Summary

The good results of the prediction method are mainly caused by the very good winter forecast. A forecast skill for predicting the value of the anomaly is proven for all months



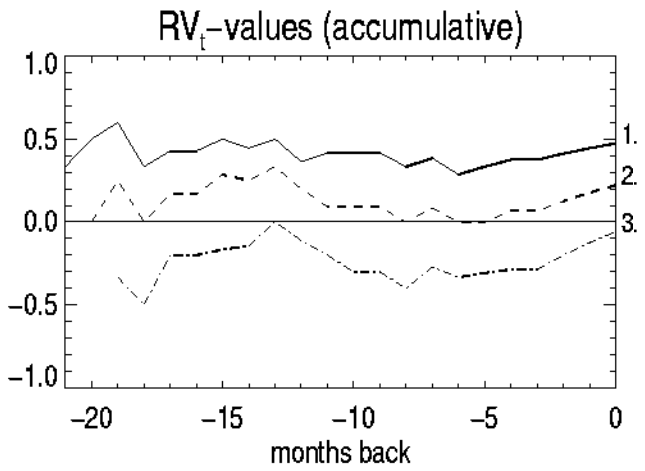
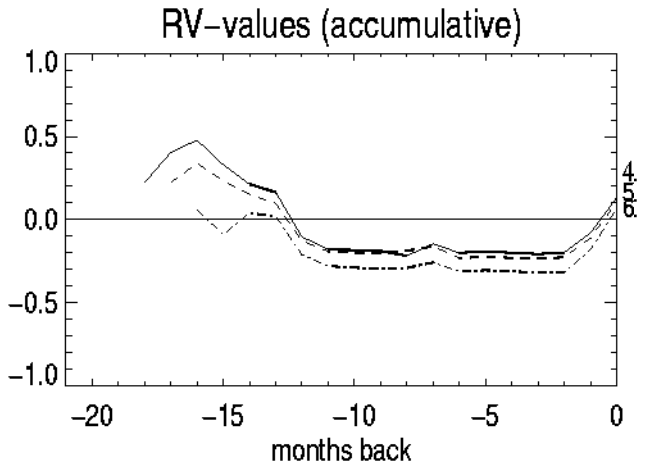




Figure 2: Time-accumulated progression of the $RV$- and $RV_T$-values for the forecast of the 1st, 2nd und 3rd month



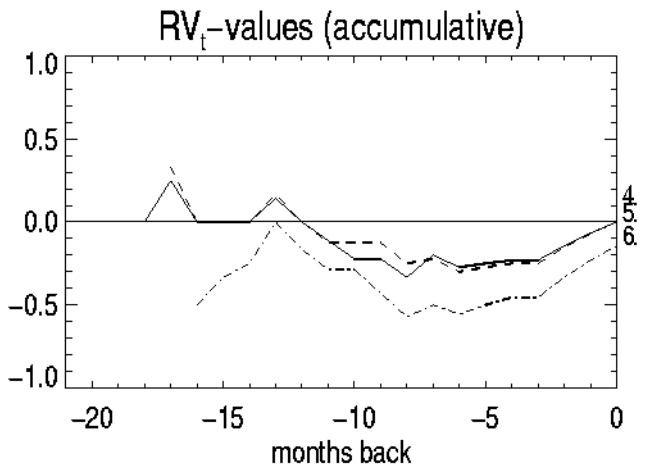




Figure 3: Time-accumulated progression of the $RV$- and $RV_T$-values for the forecast of the 4th, 5th und 6th month

and concerning the sign of it for the first and second month. A monthly update of the verication data is available on the InteNet via *http://surf.to/meteomara.*

## References


[1] Radke, M., 1996: Statistische Beziehungen zwischen Anomalien der Monatsmitteltemperaturen in Zentral-Mecklenburg. *Beilage 68/1996 zur Wetterkarte, Amtsblatt des DWD vom 03.04.1996,* **94/1996.**

[2] Radke, M., 1997: 1 Year Long Range Temperature Forecasts for Northeastern Germany. *http://surf.to/meteomara* (also in German as *Beilage zur Wetterkarte, Amtsblatt des DWD.)*

[3] Radke, M., 1998: Ein Verfahren zur Langfrist-Prognose von Monatstemperatur-Anomalien und Winterprognose 1997/98. *http://surf.to/meteomara (Skript zum Vortrag im Meteorologischen Kolloquium der Freien Universität Berlin).*