LETTERS TO THE EDITOR

On »Forecasting with the Barotropic Model»

Dear Sir,

The recent article by BOLIN (1955) contains among other results also a series of four 48-hour forecasts made by O. Haug and obtained, as it is said, by the use of Fjørtoft's "graphical" method. The actual procedure is, however, not explained. Reference is merely made to two articles by the author (FJØRTOFT, 1952, 1955). From information given me after the appearance of Bolin's article it is clear that the method used by Haug is different from the method developed in the above mentioned articles. It is similar to the method proposed in the most recent article but differs in one important respect.

There might be different numerical approaches to one and the same problem which in the limit approach the true solution. Any such method, however, suffers from certain deficiencies which necessarily lead to errors and the various causes to these errors are not very easy to separate. It is therefore useful to compare integration results obtained by different methods but it is also clear that a detailed discussion of the results is very necessary. I have prepared 48-hour forecasts using the method developed in my most recent article for some of the maps from which numerical forecasts with BESK have been done and were reported by Bolin. In view of table 2 in Bolin's article it seems to me important to ask permission from the editor to get the results from these forecasts published, asking simultaneously the reader to excuse that the discussion is deferred to a later occasion. In the first line of the table below the correlation coefficient r between computed and observed 48-hour height changes is given together with the mean absolute error as obtained graphically. The second line shows the corresponding values obtained numerically with BESK. The verification was done for an area denoted as "large" in Bolin's article and the values for the numerical forecasts are therefore somewhat different from those reported by Bolin. The table shows that there is no significant difference, on an average, in the results obtained graphically and numerically in these three cases. Further comparisons of this kind will be made.

	Sept. 26—28		Sept. 27—29		Sept. 28—30	
	r	ε	r	ε	r	ε
Fjørtoft	0.82	46 m	0.71	51 m	0.78	52 m
BESK	0.83	44 m	0.53	69 m	0.80	59 m

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Dear Sir,

In TELLUS, Vol 7, BERGTHORSSON, DÖÖS, et al (1955) report a series of numerical forecasts made on the Swedish computer BESK and compared with subjective forecasts made for the same dates by conventional methods. By way of verification, the authors list correlation coefficients between forecast and observed 500mb height changes over a selected area and also subjective grades assigned to the prognoses by a board of five meteorologists.

It is of interest to note that the correlation *between* the two sets of verification scores is only +0.35 evaluated by O. Haug, Det Norske Meteorologiske Institutt). This may not be so surprising, since the first measure (the correlation) describes the success in predicting a 500mb pattern after having started from a given pattern, whereas the subjective grade more nearly defines the closeness of agreement between the prognosis and the observed chart.

The purpose of this note, however, is to point out the implications of a 2-way distribution of these verification scores, which is given below in Table 1. The table classiffies the scores of the 24h, 48h, and 72h numerical prognoses and the 24h and 48h scores of the conventional, subjective progs. The subjective scores are from 5 to 1, with 5 standing for best agreement between predicted and observed. The specification of class intervals conforms to the simple frequency rule:

		SUBJECTIVE SCORES				
		5	4	3	2	1
CORRELATION COEFFICIENT	$r > +0.80$	18	15	4	0	0
	0.70 — 0.80	10	19	17	5	1
	0.46 — 0.69	6	13	16	8	4
	0.25 — 0.45	1	5	5	5	1
	$r < +0.25$	4	1	7	2	1

Table 1. Contingency table, correlation coefficients vs subjective scores. 168 cases.

that is, the intervals are chosen so as to make approximately equal the frequency totals of Row 1 and Column 1, Row 2 and Column 2, and so on.

It is apparent from inspecting Table 1 that the sample is skewed. The total of frequencies on either side of the upper-left-to-lower-right diagonal are approximately equal, which is an outcome of the way in which class intervals have been specified. Looking, however, at the extremes of the distribution (the lower left and upper right corners of the table as shown by the diagonal lines), it is seen that there are more prognoses for which the correlation was very low and the subjective score very high, than vice versa. In 4 cases, for example, the progs were given a top score yet they showed a correlation of height change of less then +0.25. At the other extreme, on the other hand, there were no cases when the correlation was above +0.80 and the forecasts were graded below a 3.

Clearly, the low correlation *between* the sets of verifications (+0.35) is attributable to the dispersion of frequencies in Table 1. It is also suggested, however, that this low correlation is due more to those cases in which the height change correlation was very low but the score was very high, than to those cases in which the height change correlation was very high and the score low.

The implication here is of some interest, namely, that although the correlation between forecast and observed height changes may be criticized as a measure of prognostic accuracy, or prognostic value, it does tend to act as a lower limit as far as concerns measuring the similarity between the prog and the observed chart. Thus the similarity tends to be at least as good as is indicated by the correlation coefficient and in fact may be much better.

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REFERENCES

BERGTHORSSON, P., DÖÖS, B. R., FRYKLUND, HAUG, O., LINDQUIST, R., 1955: Routine Forecasting With the Barotropic Model, *Tellus* **7**, pp. 272—274.

ERRATA

Volume 7, number 4.

Page	Column	Line	Should read
466	2	eq. (29)	$\frac{D_1 f}{dt} = \mathbf{v}_2 \nabla_h f + \mathbf{v}_\alpha \cdot \nabla_h f$
469	1	eq. (47)	$-A(\psi, s) = \ldots$
472	1	eq. (69)	$2\Omega_z \frac{\partial \psi}{\partial z} - g \ln \vartheta = k(z, t)$
472	2	6 from bottom	$\nabla_h \times \mathbf{v}_\alpha \mathbf{k} = 0$