The ENIAC Forecasts: A Re-creation

Peter Lynch

University College Dublin, Dublin, Ireland

ABSTRACT

The numerical forecasts made in 1950 using the Electronic Numerical Integrator and Computer (ENIAC) paved the way for the remarkable advances that have been made over the past half-century in weather prediction and climate modeling. We review the circumstances in which the forecasts were made, the nature of the ENIAC machine, and the roles of the people involved. The basis for the forecasts was the barotropic vorticity equation, and the initial data were prepared manually from standard weather charts. Now that the NCEP–NCAR reanalysis extends back to 1948, the initial height fields for the forecasts are readily available in digital form. We describe the reconstruction of the forecasts using reanalyzed data.

Were the ENIAC forecasts any good? To date, no objective verification of the four integrations has been available. A comparison of the original and reconstructed forecasts shows them to be in good agreement. Quantitative verification of the forecasts yields surprising results. On the basis of root-mean-square errors, persistence beats the forecast in three of the four cases. The mean error, or bias, is smaller for persistence in all four cases. However, when S1 scores are compared, all four forecasts show skill and three are substantially better than persistence.

A small modification of the prediction equation, in which the streamfunction replaces the geo-potential height as the prognostic variable, can be implemented without any computational penalty. The modified equation yields slightly improved forecasts in all four cases.