Evaluation of Seven Different Atmospheric Reanalysis Products in the Arctic

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Purpose of the study
To intercompare Reanalysis products in order to see which are most reliable, to determine the amount of variability between the products, and point to where they can be improved.

Time interval
1980-2009, 30 years

Conclusions:
Compared to observations, the best models are
• For temperature: ERA-I, CFSR, and MERRA
• For radiative flux: CFSR, ERA-I, MERRA
• For precipitation: JRA-25, MERRA, ERA-I

Some models show considerable differences from the ensemble median in both radiative fluxes and precipitation.

The trends also vary considerably between the models, often even differing in sign.
• The temperature trends are more consistent, since temperature is assimilated.
• The vertical structure of the temperature trends is different between the models.
• The spatial patterns in the trends also show significant differences
• Annual precipitation trends show considerable variability spatially and between the models

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• Comparisons to Observations
Comparison of the 2-m air temperature measured at land stations with the estimates from the models. a) station locations; b) mean difference by month; and c) anomaly correlations, where variability between stations has been removed. Data are from the Climate Research Unit, University of East Anglia.

• Seasonal Intercomparisons
Each set of maps shows the median of all seven reanalysis products in the upper left and then anomalies from the median of each product.

• Trends, 1980-2009
Temperature trends north of 70N at different levels for each month up to 150 mb. Contour interval is 0.3 C/decade. The solid green line is the 99% confidence limit.

Comparisons of the monthly precipitation to the model estimates. a) map of the station locations; b) bias of each model expressed as a fraction of the observed precipitation; and c) the anomaly correlation. Data are from the GPCC Full Data Reanalysis Version 5.