Ensemble Kalman Filter: The Movie
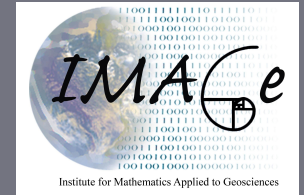
Douglas Nychka,
National Center for Atmospheric Research.
www.image.ucar.edu/~nychka

The main idea

An ensemble is a *sample* useful for approximating the continuous distribution including covariances among variables.

In fact it allows us to assimilate observations sequentially using a simple algorithm (*The Machine*) — even when the observations are all taken at the same time.

The movie will be Groundhog Day ...
We will assimilate a vector of observations collected on the same day sequentially.

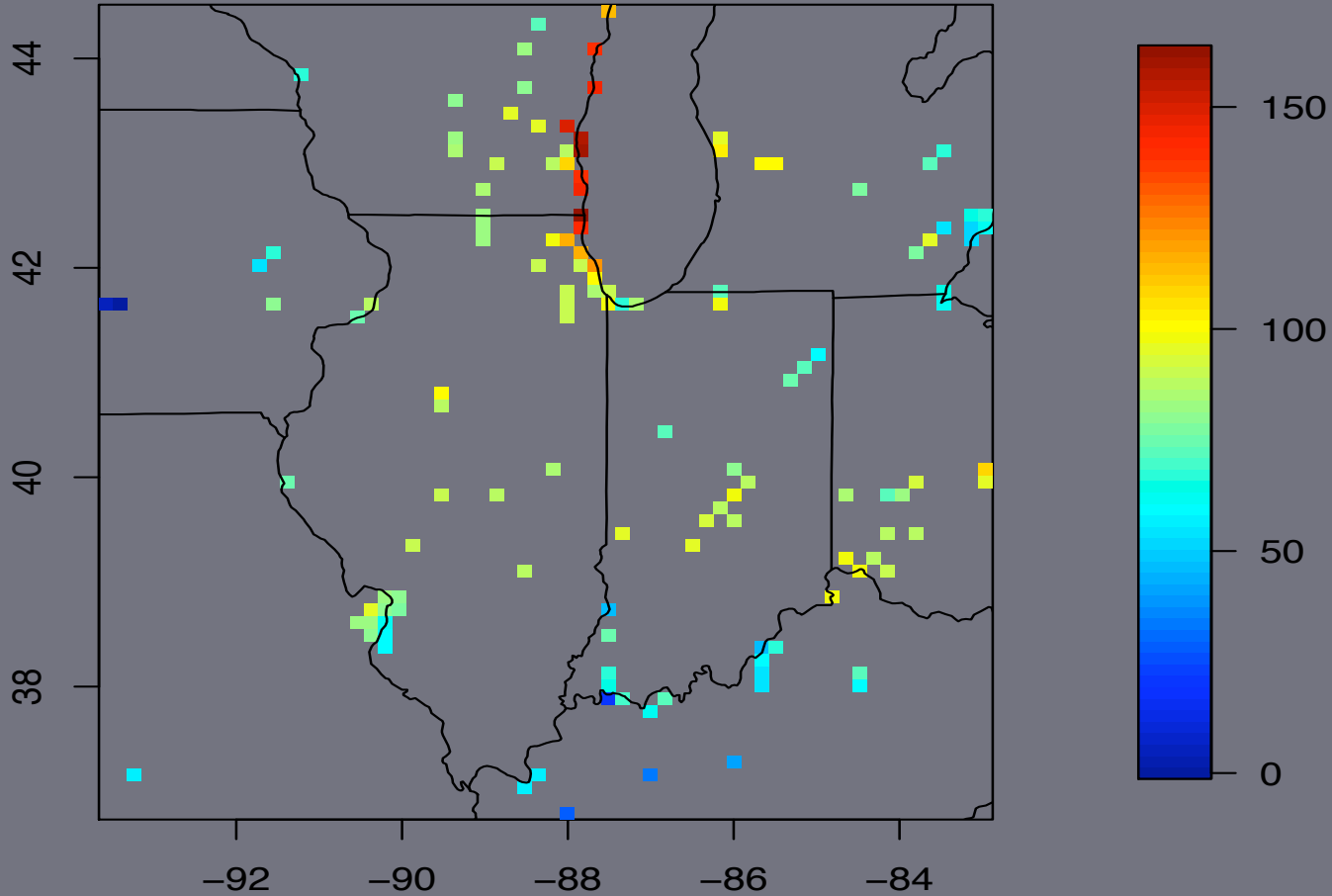# My most persausive argument for ensembles.
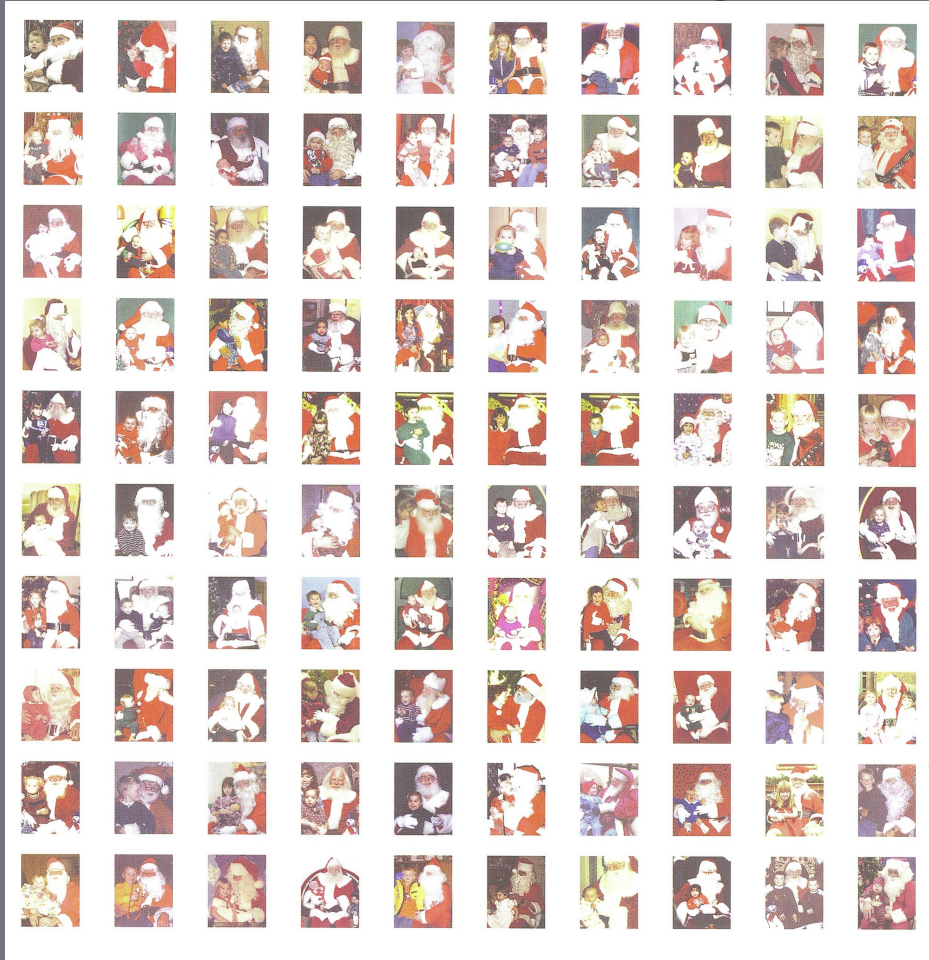
Some Santas

The mean Santa

Don't send your Xmas letter to SANTA !

Observed surface ozone, June 19, 1987

Goal: Estimate the surface!

The statistical ingredients for the PRIOR

For 1987 summer ozone season we have a PRIOR for the ozone field over this region — essentially a summer "climatology".

PRIOR:
 Based on data analysis, ozone is (roughly) multivariate normal with a mean around 60PPB a variance from 10 to 25 PPB and a correlation range of about 300 miles.

This is only our guess and will be modified as we assimilate observations.

A different explanation: the Machine

Generate a 100 member ensemble from the prior. These are random fields consistent with the ozone summer 1987 "climatology".

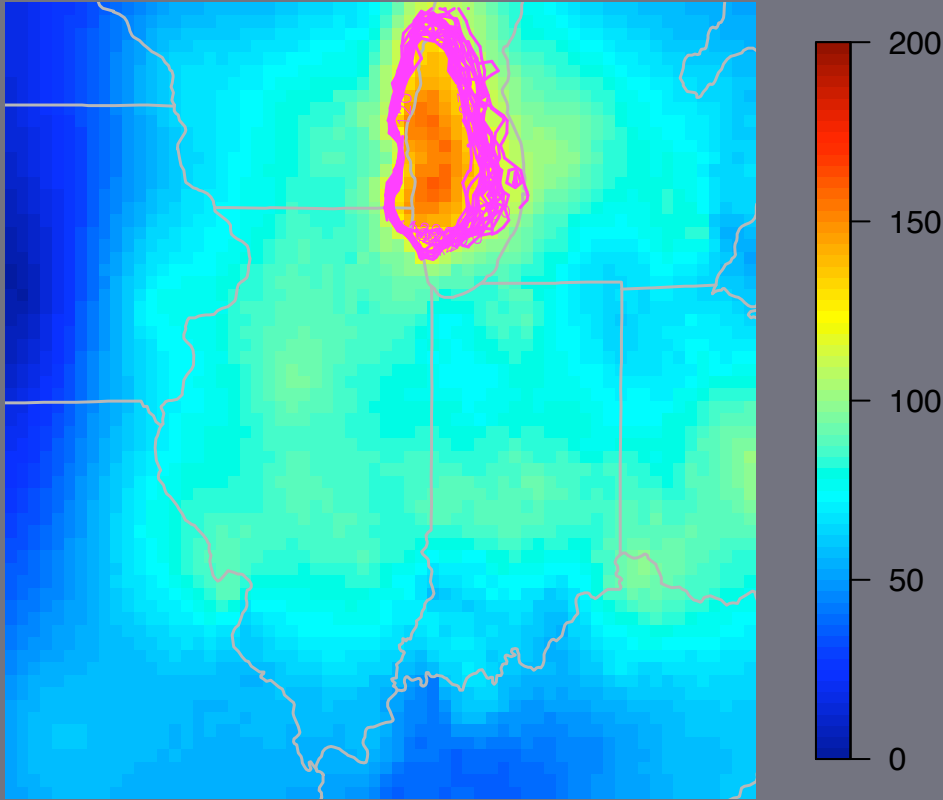*The first 8 members of initial ensemble fields*
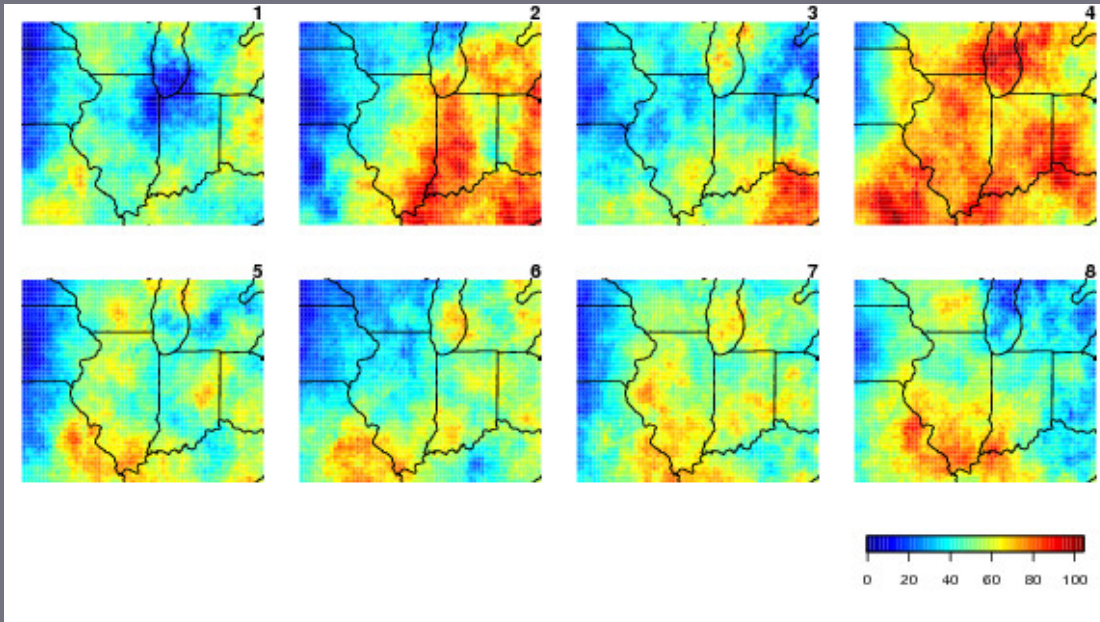
Welcome to the Machine

Now the main attraction ...

An inference: Where does ozone exceed 120PPB

Find the ensemble contours at 120PPB.

Thank you!