How good is an ensemble at capturing truth?

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Bounding boxes of ensembles

Ensemble forecasting is used as an attempt to account for the uncertainties of observations and model error. An important minimal property that an ensemble should have is that it *capture truth with a high probability.* But what does capturing truth mean? It could mean that truth lies within the convex hull of the ensemble, but in a d-dimensional state space this requires at least $d + 1$ ensemble members. An easily computed alternative is the *bounding box* of the ensemble, which is defined for as few as two members in an ensemble.
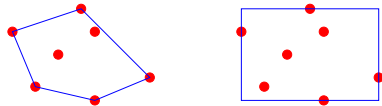
Probability of capturing truth

It is easy to compute the probability that a bounding box captures truth. If truth lies at the median of the distribution of the ensemble, then for an ensemble with n members in a d-dimensional state space,