

25 Predictability and Forecast Accuracy

Smooth

Locally variable

Easiest to predict

Hardest to predict

Pressure

Winds

Temperature

Precipitation

While most of us care most about precipitation, it is hard to assess a regional precip forecast since precip varies considerably between nearby locations.

Instead, usual measure of midlatitude forecast skill is prediction of height of 500 mb pressure surface.

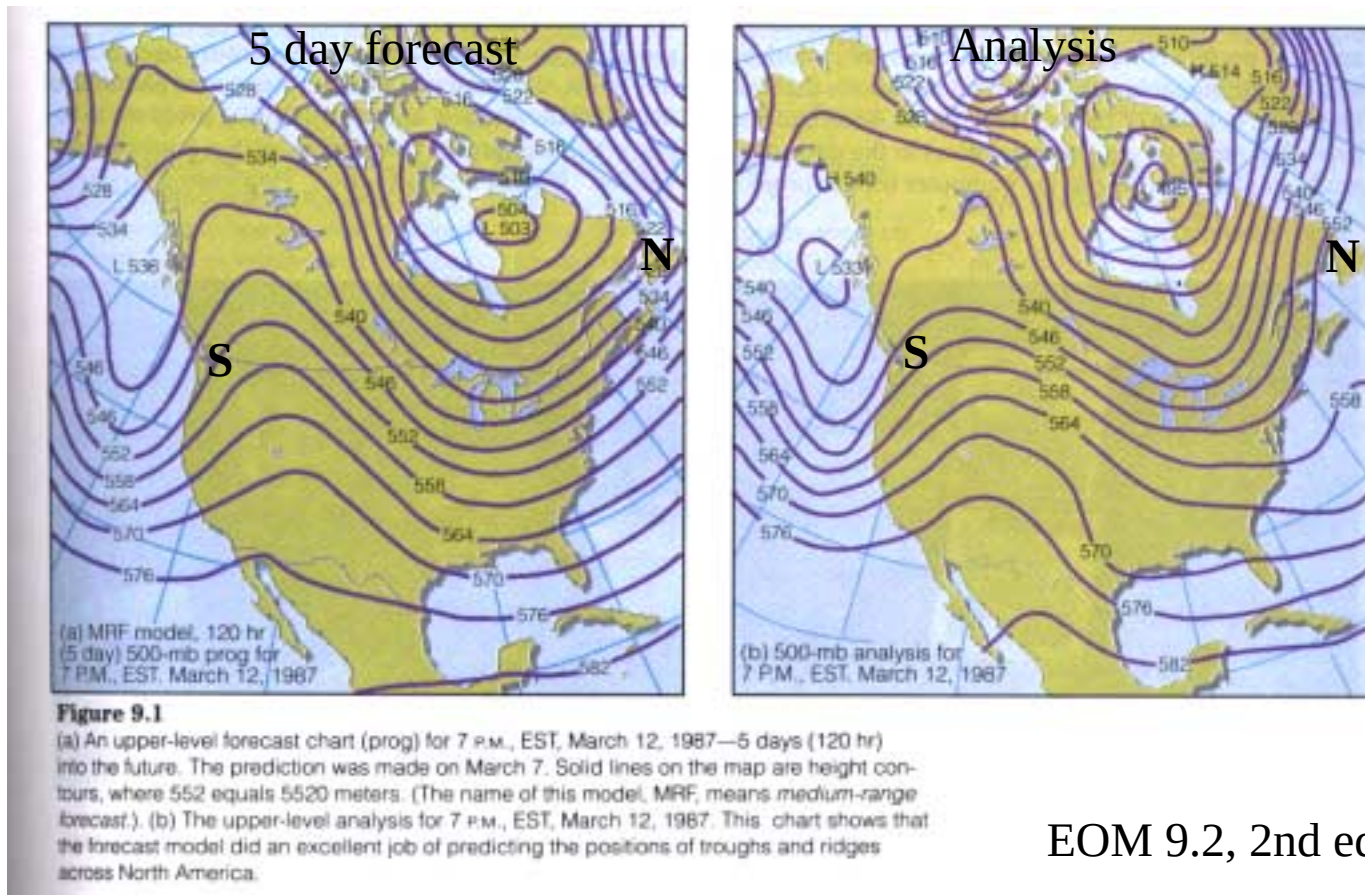
Forecast Error = Average over region of
(predicted - observed) 500 mb height

Must beat two simple forecasts:

Persistence - atmospheric state doesn't change (has little skill after 3 days)

Climatology - atmospheric state reverts to average.

Example of Error Calculation



EOM 9.2, 2nd ed.

<u>Location</u>	<u>Forecast</u>	<u>Analysis</u>	<u>Error</u>
S	5520	5550	30 meters
N	5280	5540	260
Map Average			60 - ridge and trough locs well forecast.

Current Skill

<u>1980</u>		<u>1990</u>		<u>2000</u>	
5 day	=	7 day	=	10 day	forecast skill
3.5 day	=	5 day	=	7 day	
1.5 day	=	3 day	=	5 day	

0-12 hrs: Can track individual severe storms

12-48 hrs: Can predict weather changes well, including general regions threatened by severe weather.

5-10 days: Can predict major storms, heat and cold waves. Precip forecasts less accurate.

10-14 days: Can predict five-day average temperature and precip with some skill, but day-to-day weather not well forecast.

30-90 days: Only slight skill, and then only in predicting average temp., precip. over period. Forecasts may use statistical correlations (e.g. with El Nino).

Chaos and Limits on Forecasting

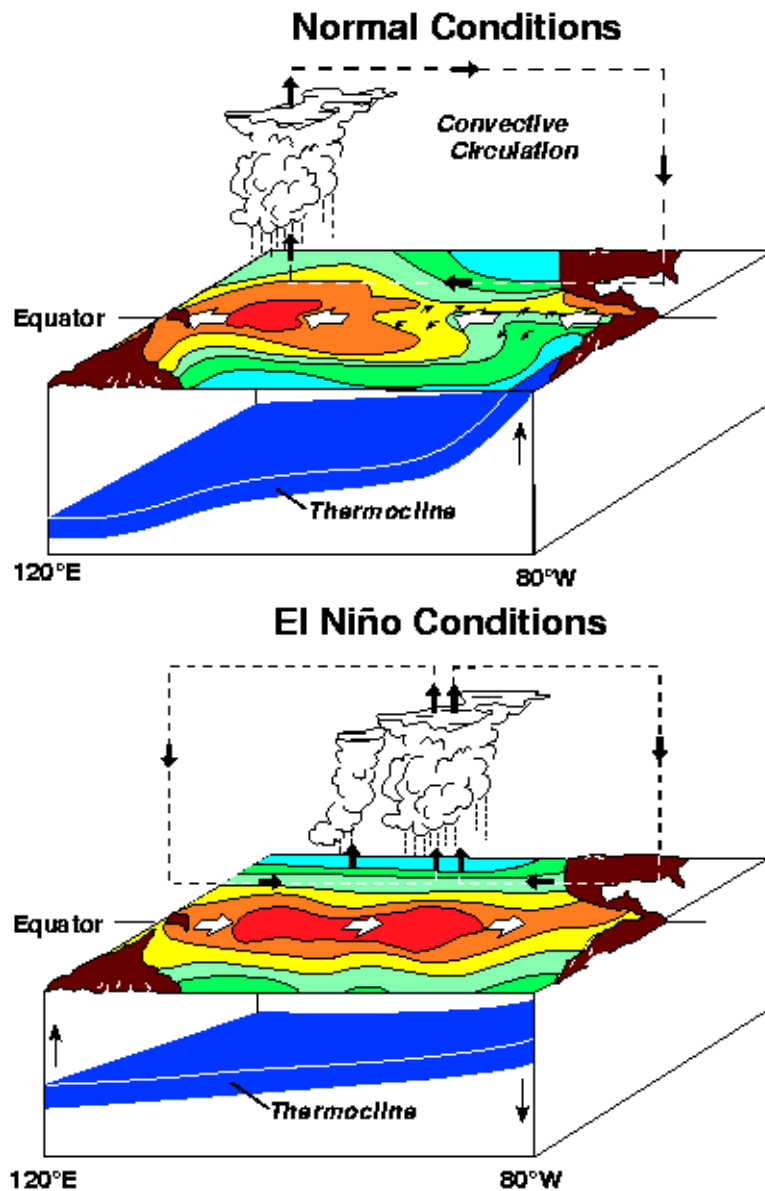
Atmospheric scientists believe that even if our models were perfect, we would not be able to predict individual storms more than 10-14 days ahead.

This is because an undetectably small error in the observations can magnify to ruin the forecast after this time.

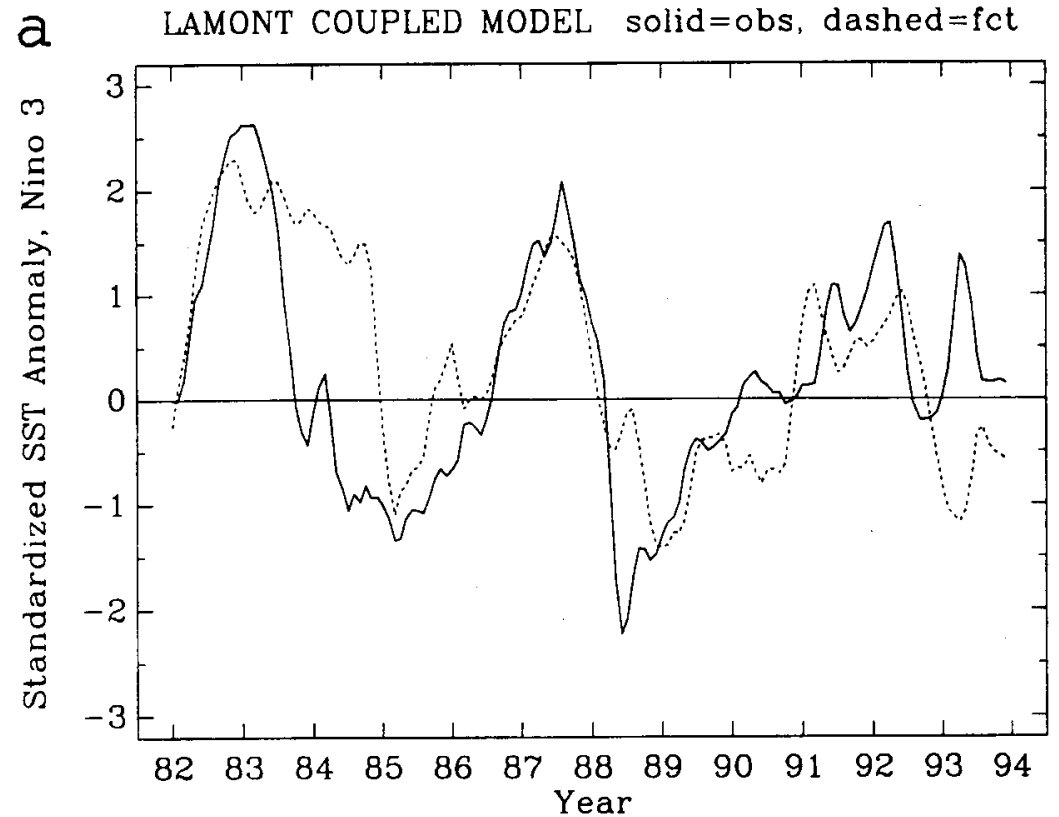
The butterfly effect: Even a butterfly flapping its wings changes the atmospheric state, and ultimately affects the weather all over the globe. This is a manifestation of the *chaotic* nature of our atmosphere.

Chaotic systems are characterized by not settling down into a simple, predictable behavior, and being very sensitive to small changes in their initial state.

El Nino Forecasting



E Pacific SST Anomaly 6 mo 'hindcasts'



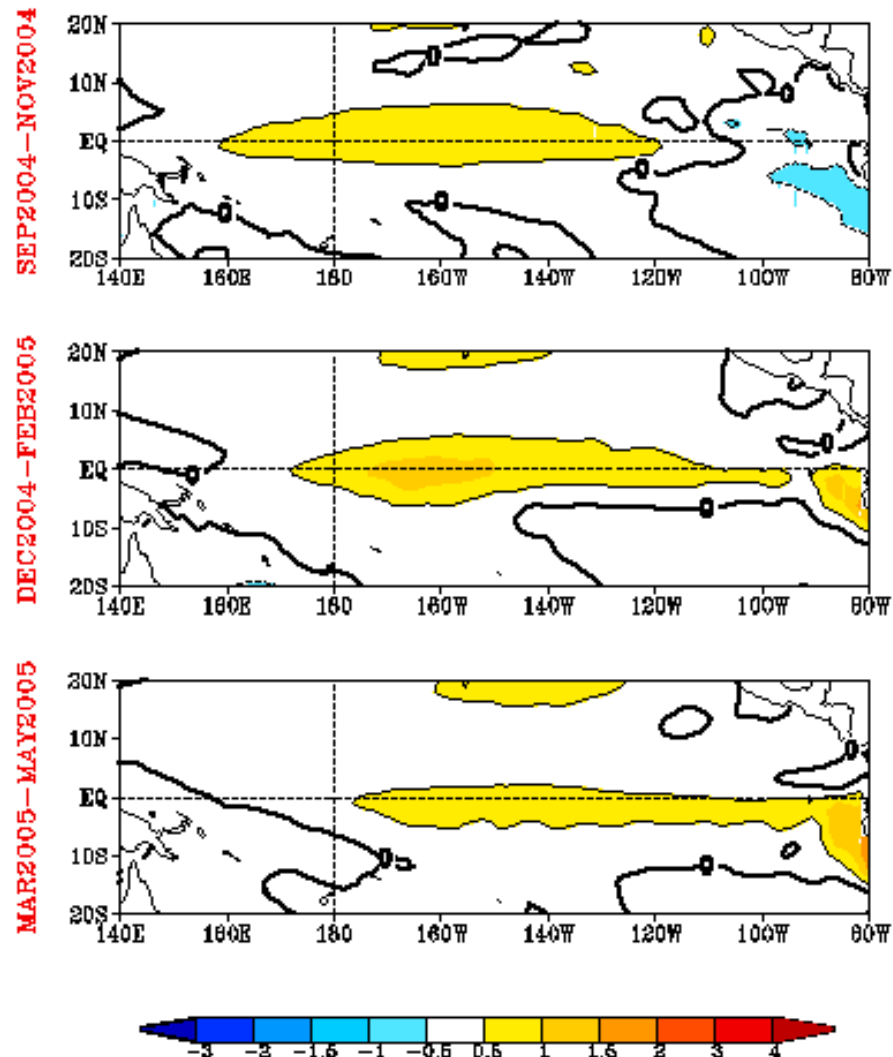
Barnston et al. 1994, BAMS

Current ENSO Forecasts



NCEP/CMB Weak to moderate
El Nino conditions in winter

FORECAST SST ANOMALIES



NOAA temperature and precipitation outlooks for Jan-Mar 2005

