



Requirements for Reanalysis, Sub-Seasonal (SS), and Seasonal to Interannual (S-I) Climate Prediction

Jim Laver

Climate Prediction Center, NOAA/NWS/NCEP

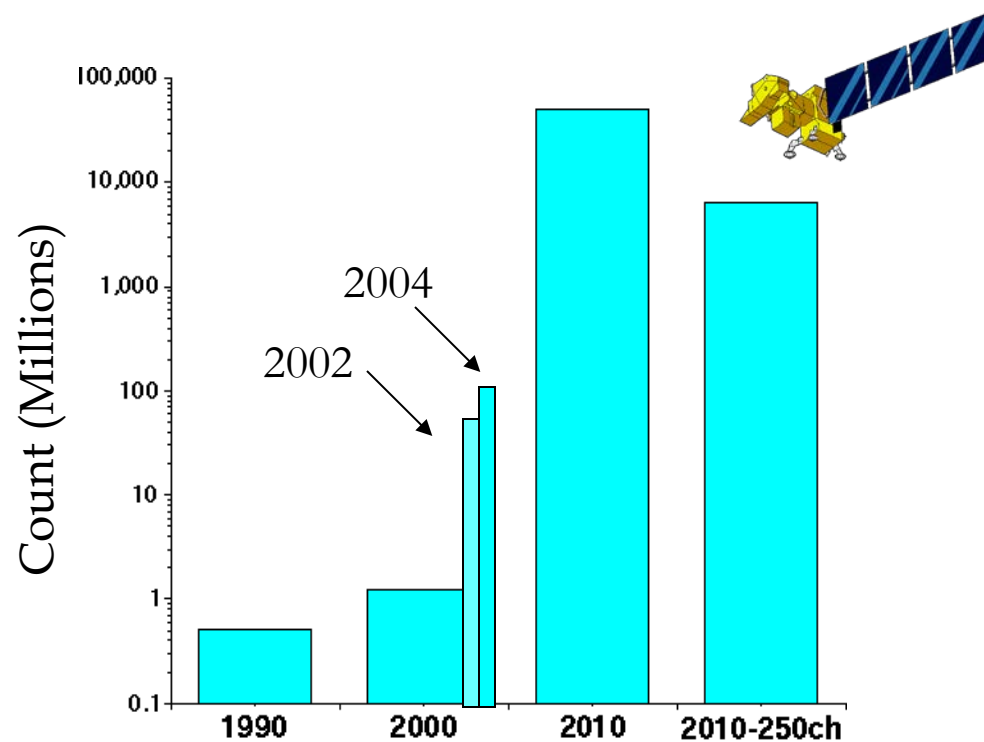
February 7-11, 2005 - Boulder, CO

www.cpc.ncep.noaa.gov



JCSDA

Daily Upper Air Observation Count

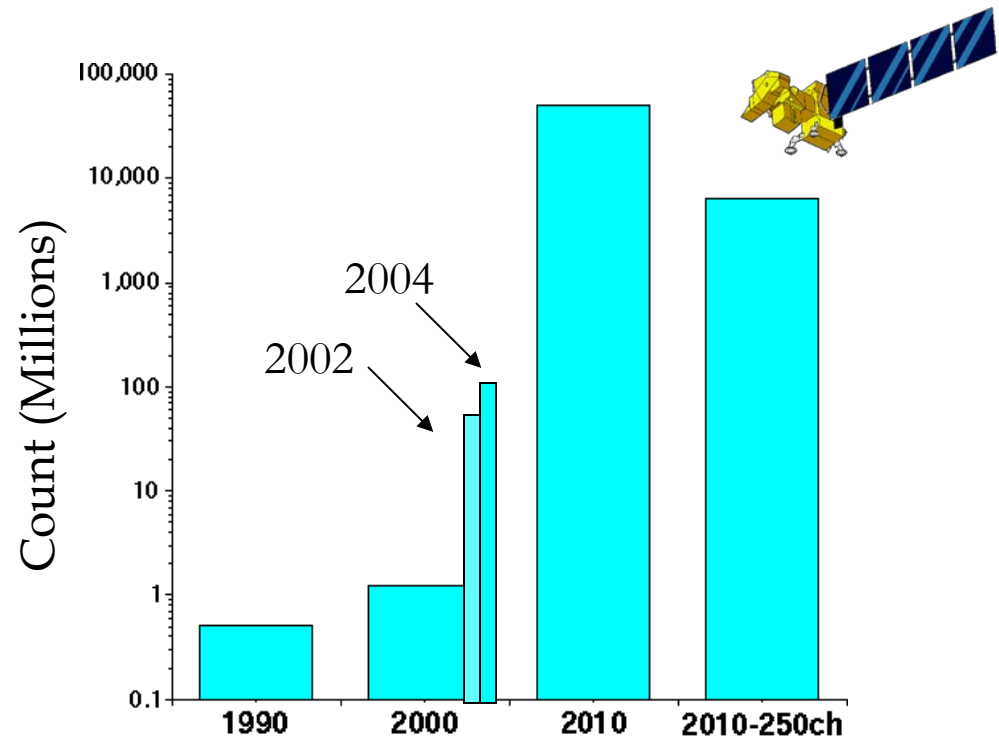




JCSDA

Daily Upper Air Observation Count

**Meanwhile,
Mexico - R/Ss 15→8
at once per day**





Outline



- **Output Products**
- **Input Requirements**
- **Sources of SS & S-I Predictions**
- **Methods of SS & S-I Predictions**
- **Climate Variables of Interest to Society**
- **Skill & Verifications Measured at Surface**
- **The Climate Test Bed & Reanalysis**
- **Some Issues and Problems (the Matrix?)**



Output Products

- **Probabilistic Outlooks**
 - Week 2 (6-10 Day, 8-14 Day), Week 3, 4,...
 - Next Month, Next Season 1-13, Interannual
 - Drought Next Season, Hurricane Season
- **Diagnostics and Expert Assessments**
 - Monthly Diagnostics Bulletin, ENSO Advisory
 - Annual Assessment - Outlooks, Attribution, Stratosphere

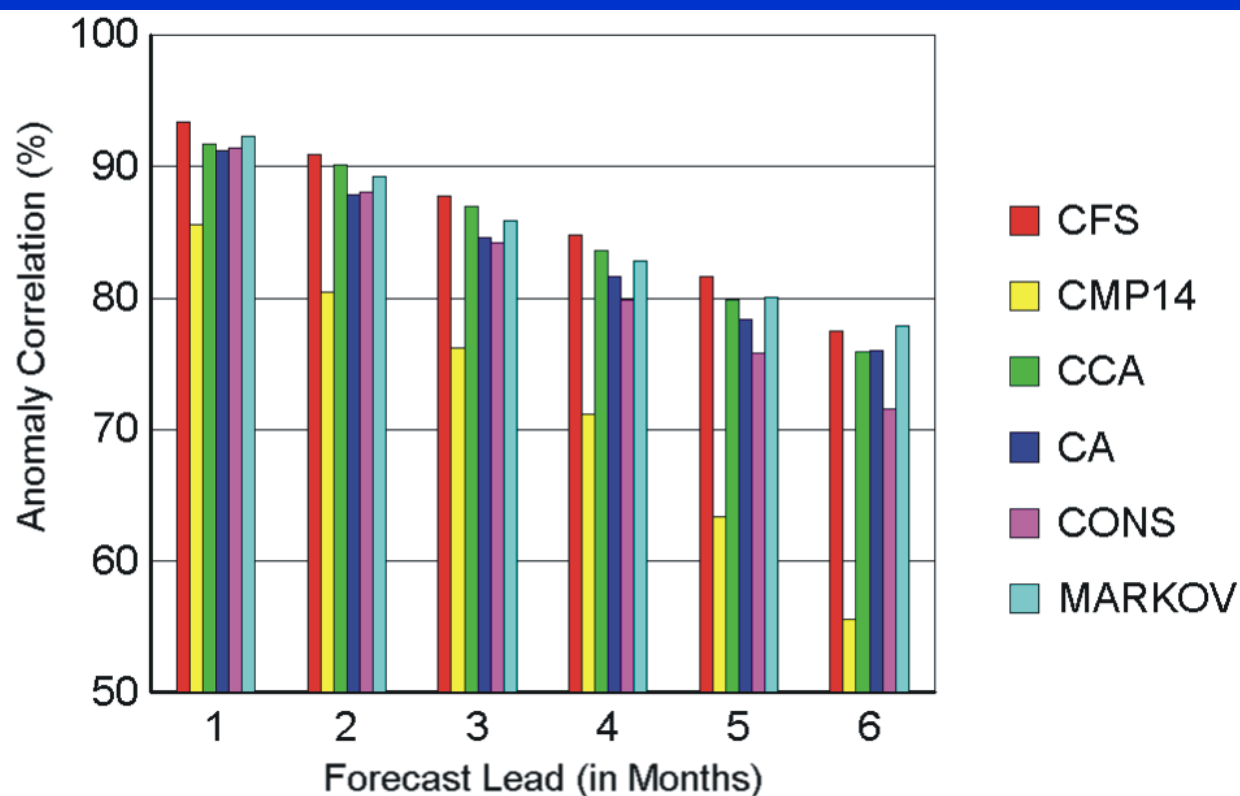


Input Requirements

- **Climate Model Operational Forecasts**
 - Dynamical & Statistical
 - Model improvement potential?
- **Ongoing/Reanalyses (12 yr old) and Re-Forecasts**
- **Climate Awareness Tools**
 - Upper-air circulation and anomalies
 - Satellite-derived precip, clouds, anomalies



Skill in SST Anomaly Prediction Niño 3.4 (DJF 97/98 – DJF 03/04)





Sources of SS & S-I Predictions

Routine vs Forecasts of Opportunity:

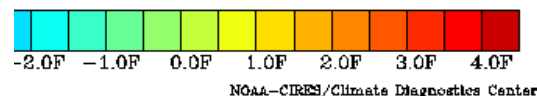
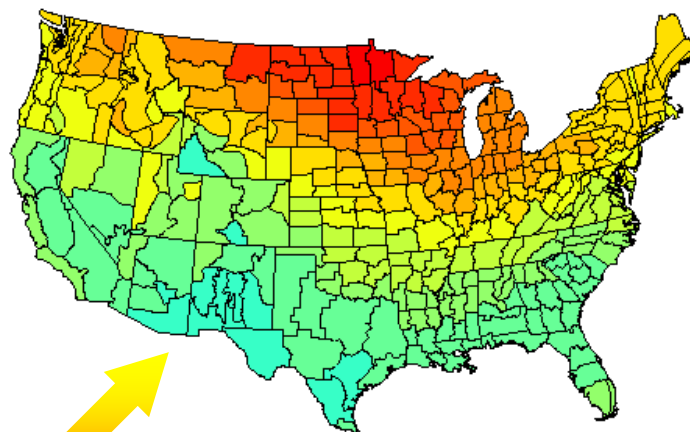
- **ENSO & its Teleconnections**
- **Arctic & North Atlantic Oscillation**
- **Madden-Julian Oscillation**
- **Trends**
- **Episodic Events (e.g., Volcanic, Solar?)**
- **Land/Soil & Ice/Cryosphere**
- **Stratosphere Conditions (e.g., Baldwin)**
- **Siberia & Snowpack (e.g., Cohen)**



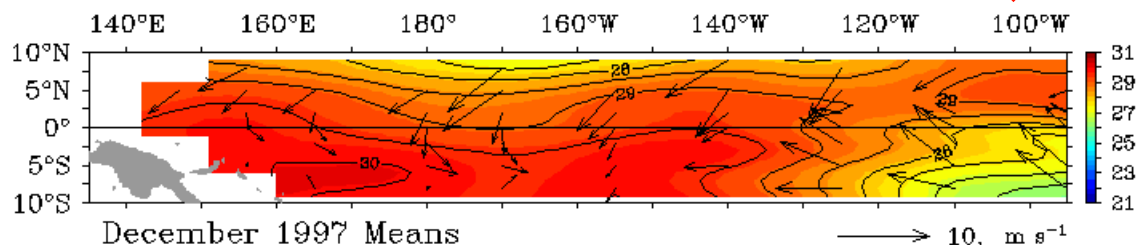
ENSO & its Teleconnections Via Upper Air Patterns

Composite Temperature Anomalies Nov to Mar
Versus 1950-1995 Longterm Average

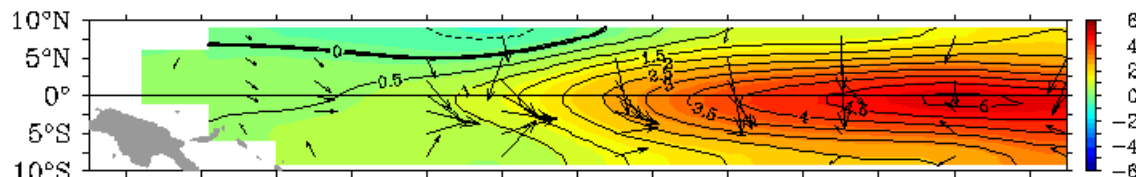
1962-83, 1991-82, 1987-98, 1957-58, 1968-88, 1972-73, 1985-86, 1986-87



TAO Monthly Mean SST ($^{\circ}\text{C}$) and Winds (m s^{-1})



December 1997 Means



December 1997 Anomalies

El Nino Conditions

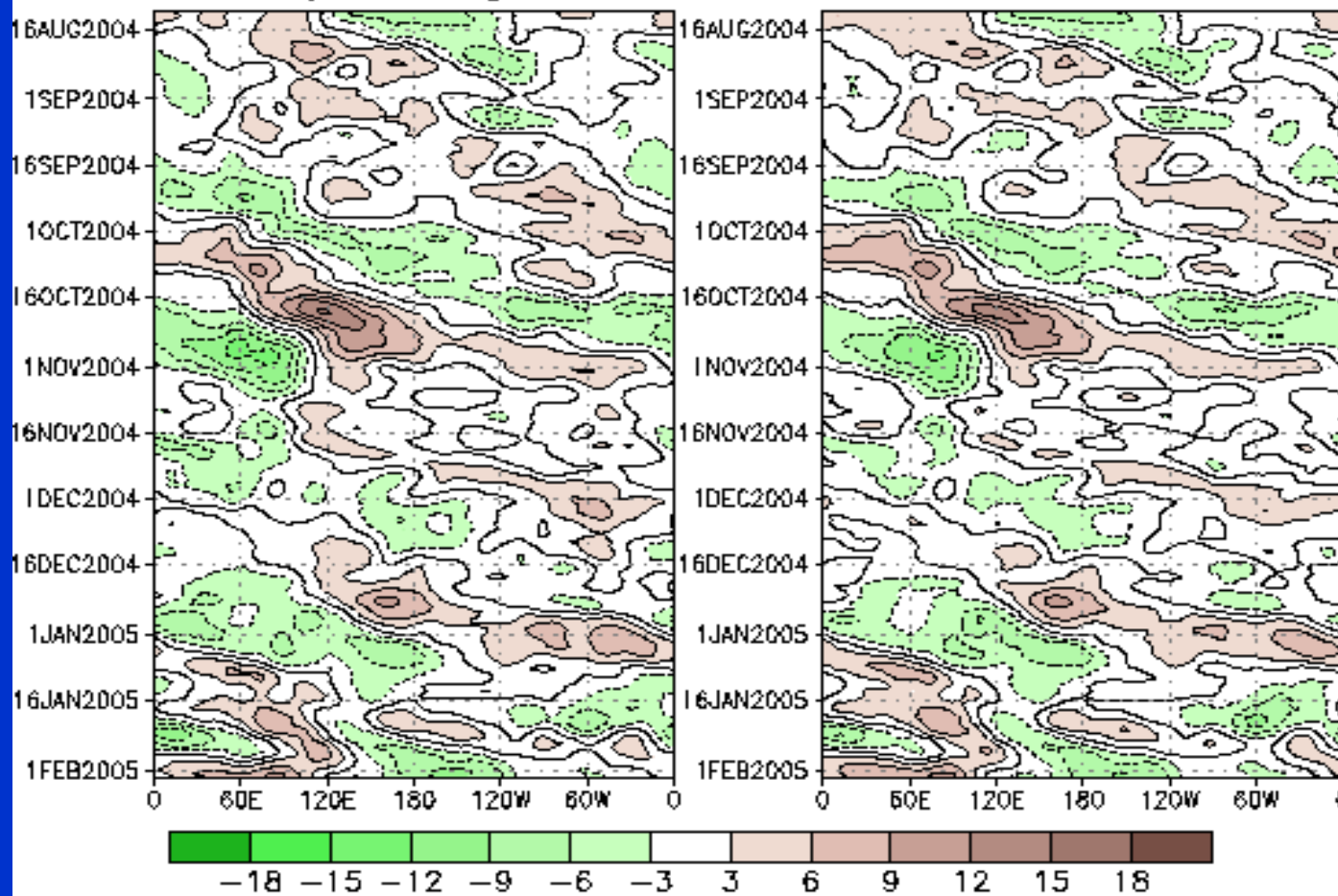


MJO

200-hPa Velocity Potential Anomaly: 5N–5S

5-day Running Mean

Period-Mean Removed



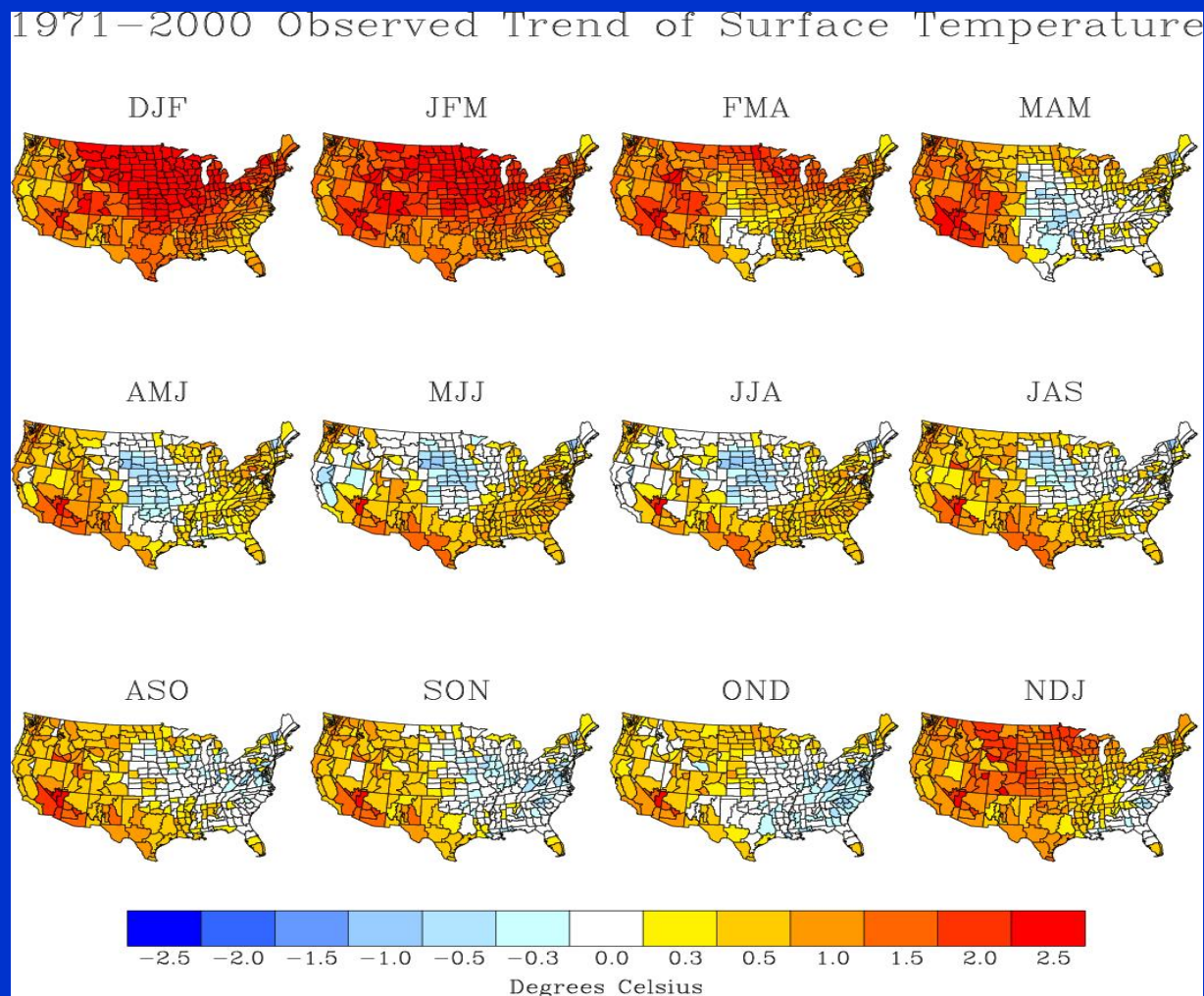
Data updated through 05 FEB 2005

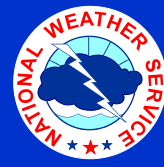
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Trends

1971-2000 Observed U.S. SFC Temperature Trends





Episodic Events

Global Temperatures Following Mt. Pinatubo in June 1991

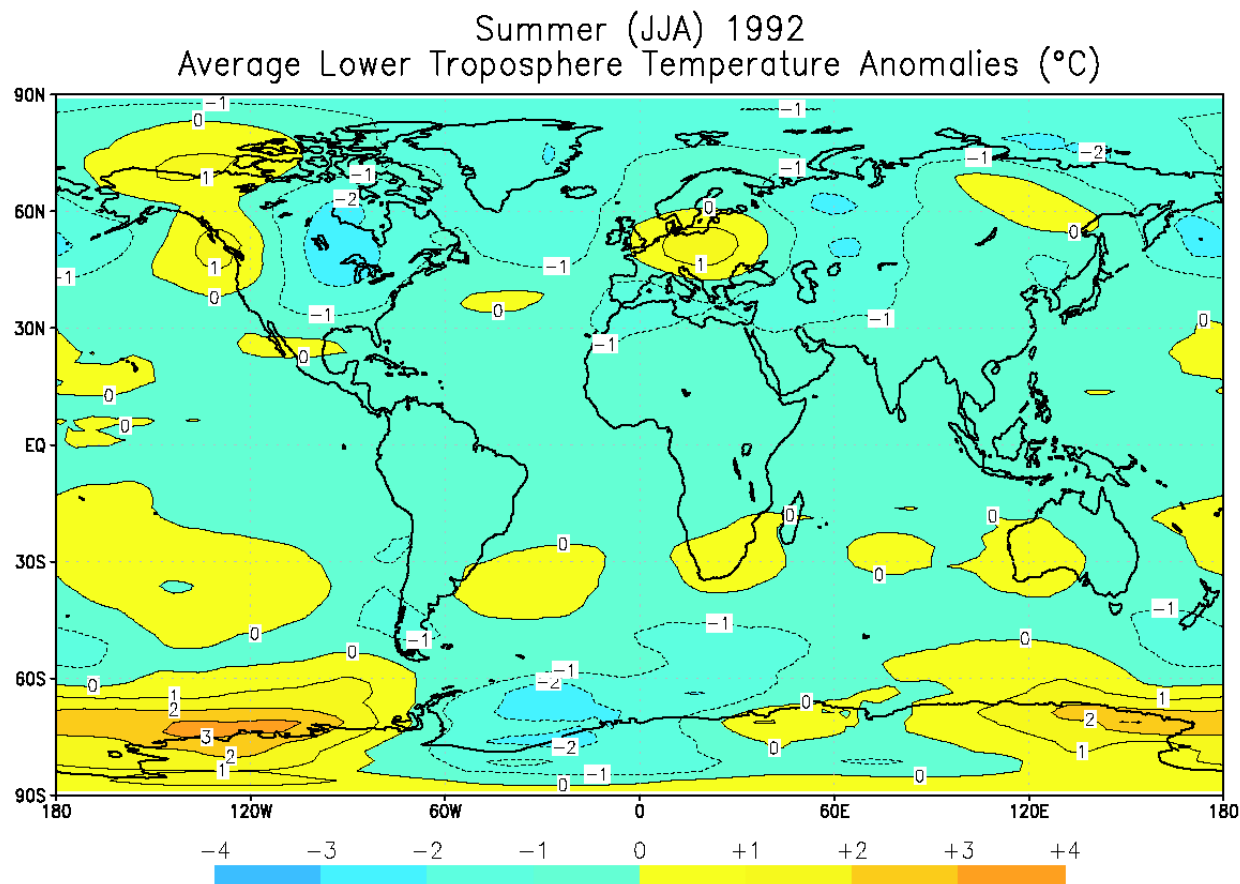


Plate 3. Summer (JJA) 1992 lower tropospheric temperature anomalies (with the non-volcanic period of 1984–1990 used to calculate the mean) following the 1991 Mt. Pinatubo eruption. Data from Microwave Sounding Unit Channel 2R [Spencer *et al.*, 1990], updated courtesy of J. Christy and now called Channel 2LT. Anomalies less than -1°C are shaded. (See the color version of this plate at the back of this volume.)

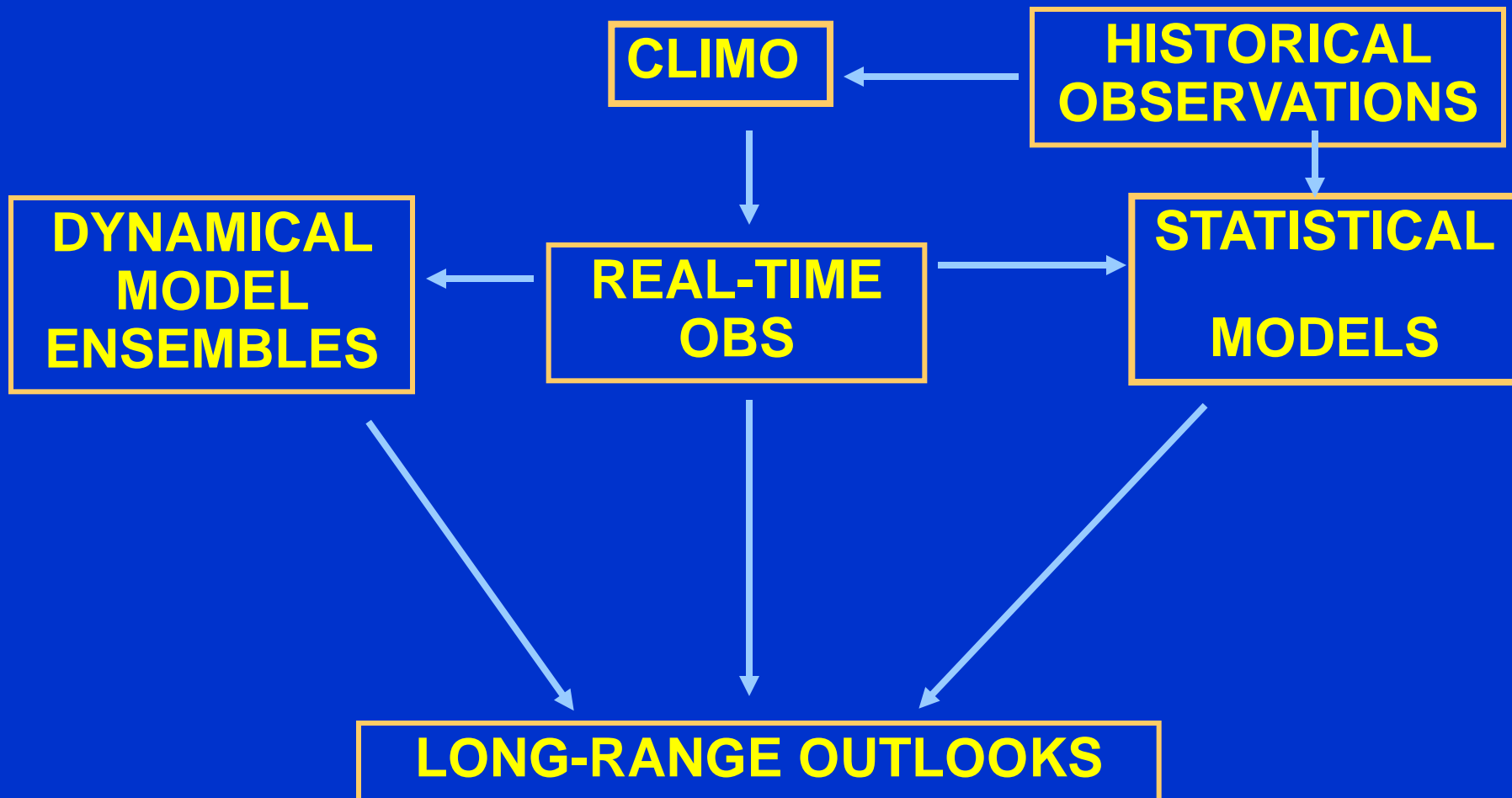


Methods of SS & S-I Prediction

- **Empirical - based on historical data**
 - ENSO Composites, Trends, CCA, OCN, ...
 - Unbiased, but Limited by Available Data
- **Dynamical**
 - Atmospheric GCMs, Coupled Models
 - Can have Large Biases, but Could Handle Unprecedented Situations



S-I Method/Technique





Climate Variables of Interest to Society

Temperature, Heating & Cooling Degree Days

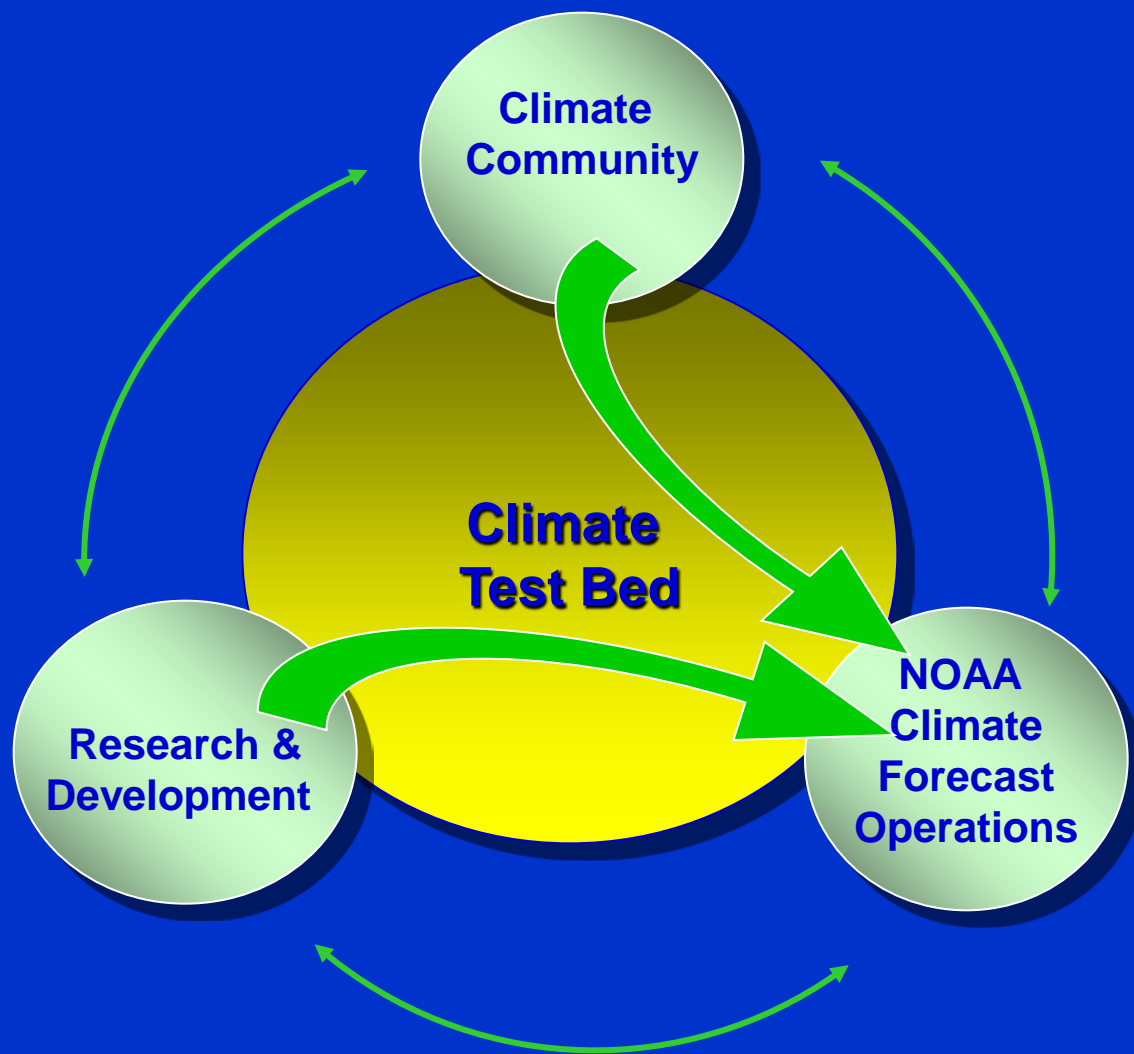
Precipitation, Drought, Hurricane Activity, ENSO

**Skill & Verifications Measured at Surface
Driving Forces → Atmospheric Response**



THE NOAA CLIMATE TEST BED

12 January 2005



Mission: to accelerate the transition of research and development into improved NOAA operational climate forecasts, products, and applications.



Climate Test Bed Potential Projects



- **Reanalysis – Real Time Component of the Ongoing Analysis? NOAA needs a plan and a Champion**
- **Develop an Objective Climate Forecast System**
- **A Strategy for Multi-model Ensembles for Seasonal Climate Prediction and Attribution**
- **Diagnosis and Improvement of the NAO in the GFS and CFS**
- **A Drought Monitoring and Early Warning System for the US**



Issues and Problems

- **R/S – e.g., Mexico – budget 15→8 (1/day)**
- **R/S vs Satellite – The UK study, the Matrix, other OSSEs**
- **Stratosphere – US, 30km, \$?Ms, model chem, OSSEs**
- **MJO – Winds, satellite cloud/clear, “pineapple express” event in Jan 2005, need for OSSEs**
- **ENSO – SST vs. circulation/winds**
- **Models – NCEP CFS = NWP input; Other models?**
- **Reanalysis & Proposed Ongoing Analysis of the Climate System – old technology, FY06+, NOAA CHAMPION?**