Technical Aspects and Current Practices for OCP – Seasonal Forecasts

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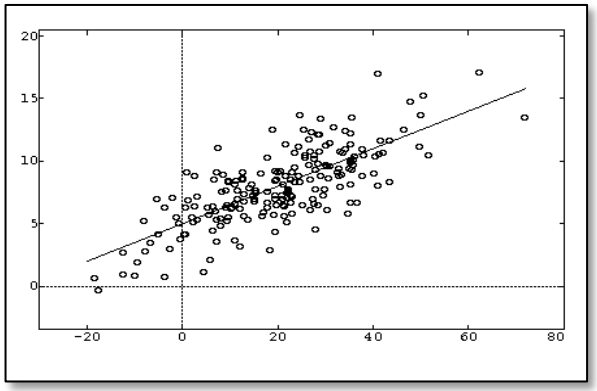
Seasonal Forecasts

- What makes seasonal forecasts possible? (Predictability)
- Seasonal forecast methods
- Components of seasonal forecast
- Current operational forecast infrastructure (various talks)

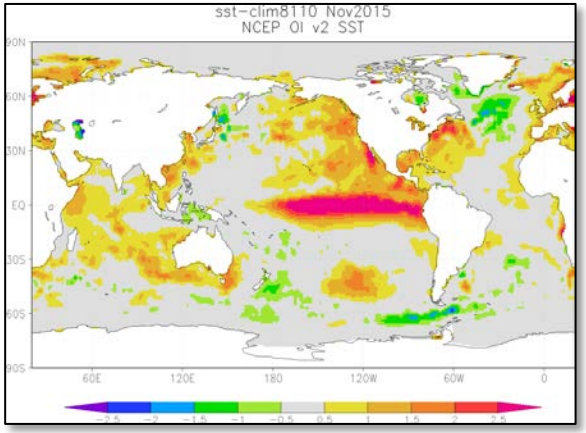
Seasonal forecast methods (1)

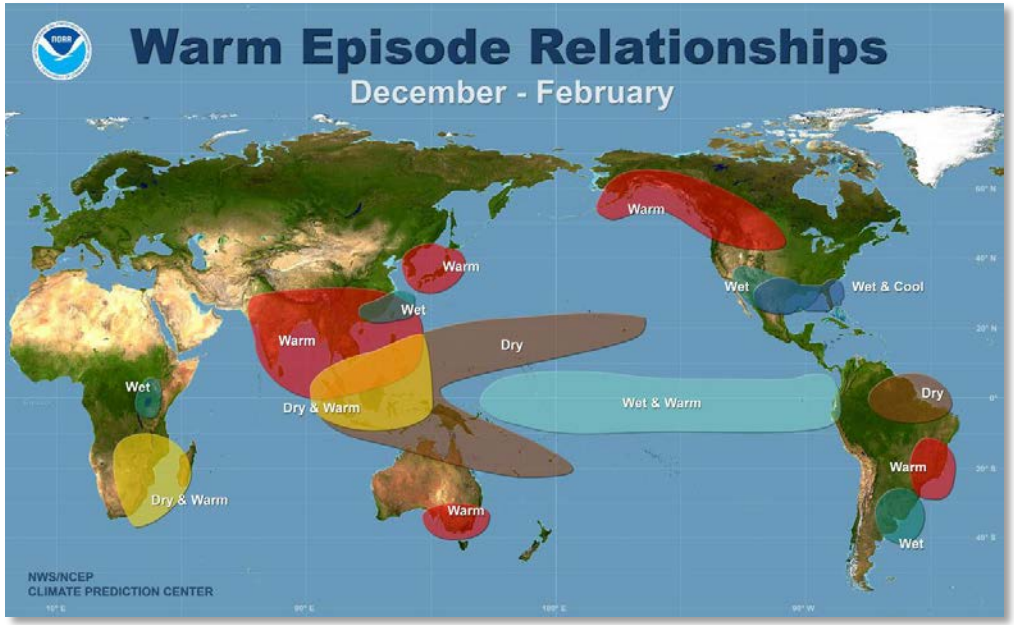
- Empirical forecast tools: Developed based on historical observations
  - Advantages
    - Unbiased
    - Simple and computationally efficient
  - Disadvantages
    - Limited by observational data
    - Mostly depend on linear relationships
    - Non-stationarity in climate is hard to include
    - Cannot handle unprecedented situations



Large scale influence of ENSO on precipitation

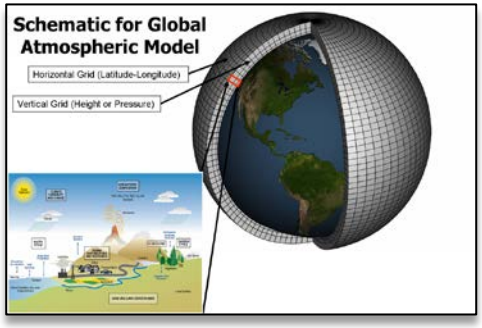
ENSO





ENSO Influence

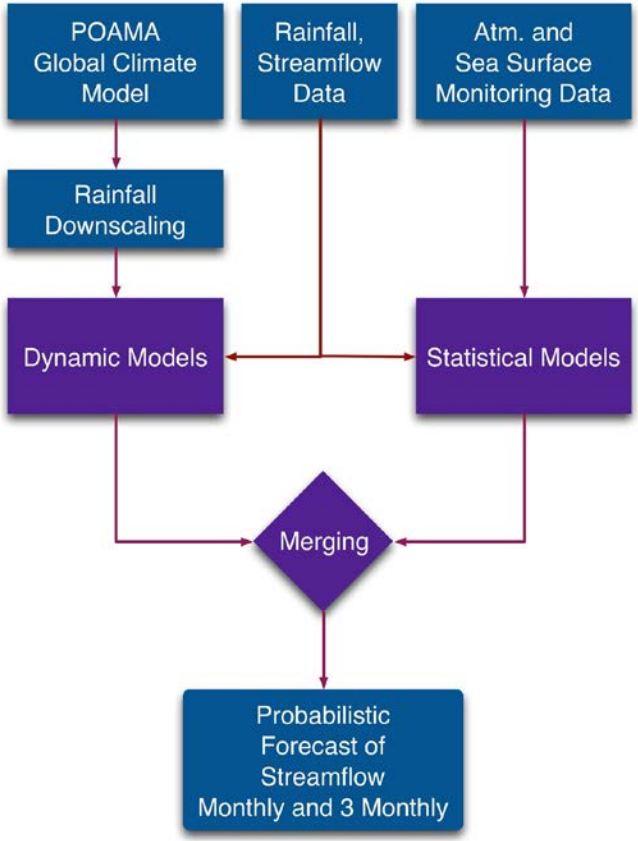
Seasonal forecast methods (2)



- Dynamical
  - Advantages
    - Non-linearity and non-stationarity is not an issue
    - Easier to infer probabilities for various seasonal mean outcomes
    - Can handle unprecedented situations
  - Disadvantages
    - Computationally expensive and require large infrastructure
    - Forecast systems have biases that require special consideration

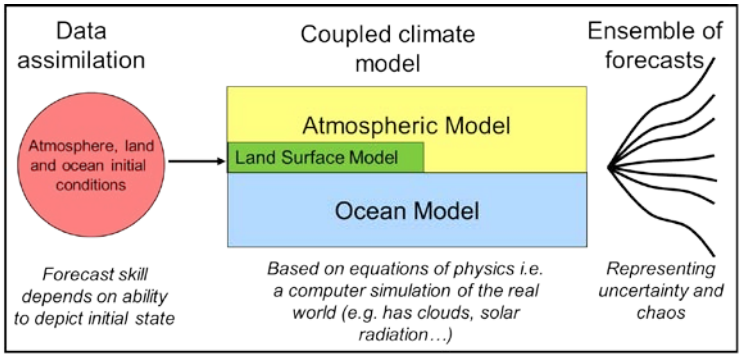
Seasonal forecast methods (3)

- Properties of empirical and dynamical prediction tools are complementary, and in general, both could be used in the development of final seasonal outlook



Components of a seasonal forecast delivery system

- Forecast system components
  - Initialization (atmosphere, ocean, land…)
  - Ensemble generation
  - Hindcasts
  - Real-time forecasts
- Product generation
  - Bias correction and calibration
  - Forecast consolidation
- Forecast dissemination and communication
- User feedback and assessing user requirements

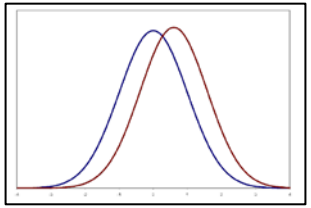


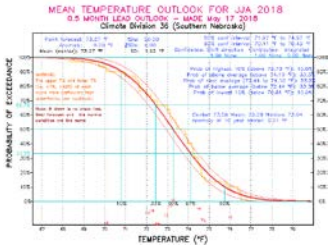
Hindcasts

- What is the purpose of hindcasts
  - Provides an assessment of skill of seasonal forecasts (manage expectations)
  - Because of model biases
    - Real-time forecasts have to be bias corrected
    - Hindcasts provide the means for bias correction (forecast climatology that is lead-time and initial condition dependent)
  - Calibration of real-time forecasts
- Maintaining consistency (of forecasting system) between hindcasts and real-time forecasts is <u>important!</u>

Seasonal forecast products

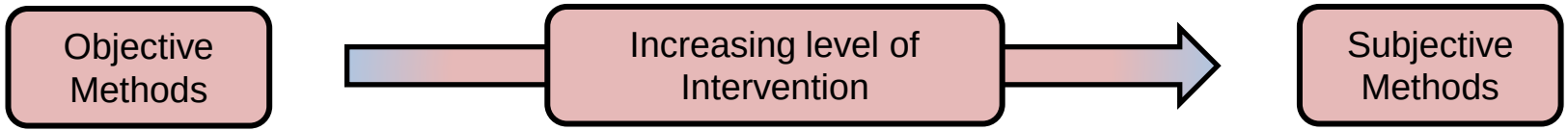
- Seasonal outlooks should be cast in terms of probabilities
- Various forecast formats to suit diverse user needs are required
  - Forecast for tercile categories
  - Providing full probability distribution of seasonal mean outcomes
  - Probability of exceedance
- Forecast variables could have regional dependence (monsoon onset/withdrawal dates; seasonal hurricane activity…)





Methods for combining tools for seasonal forecast

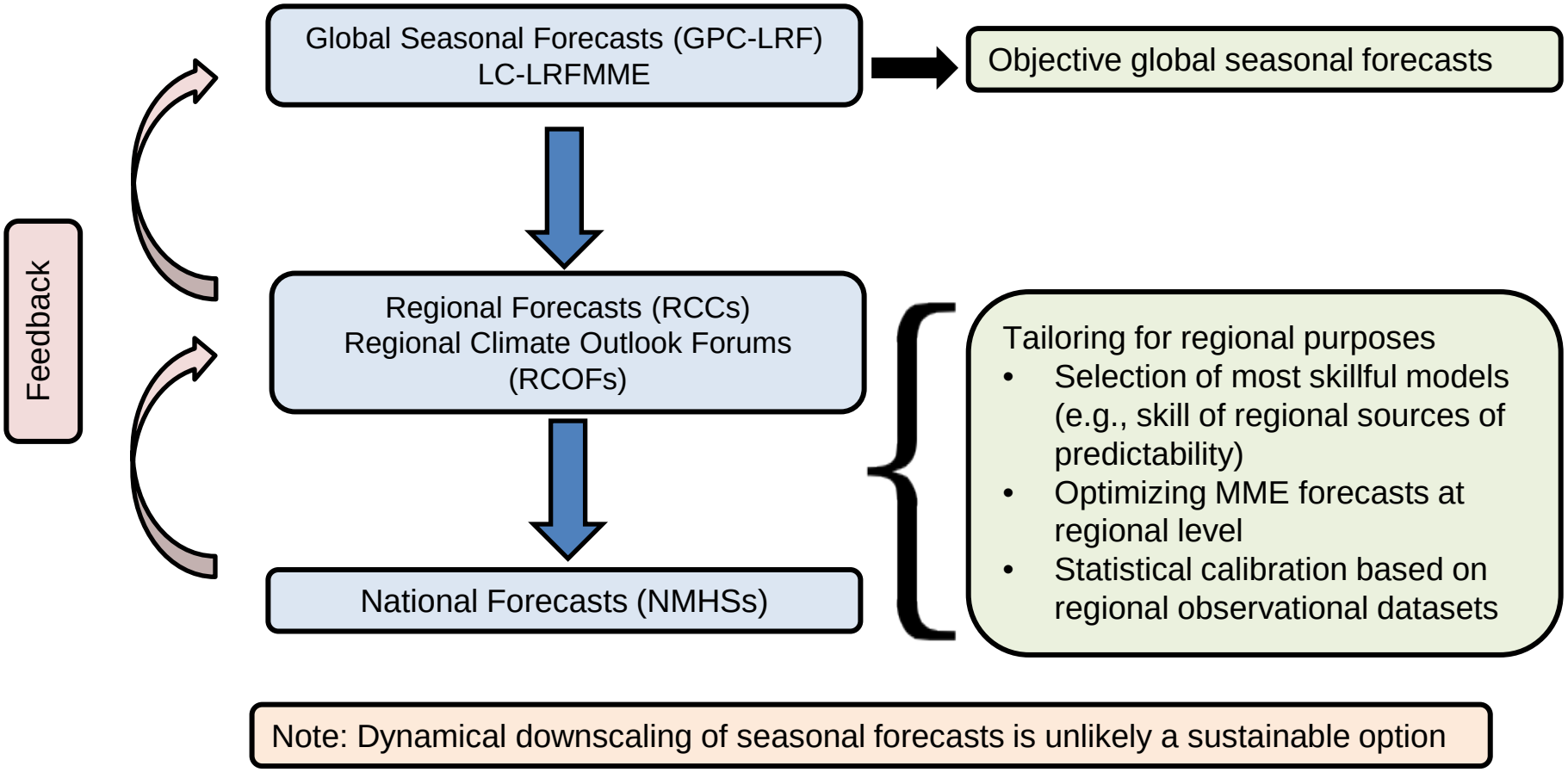
- Objective
  - Skill weighted average of forecasts from various tools
  - Forecast procedure could include calibration
  - No further human intervention is made
- Subjective
  - Select forecast tool on some ad hoc basis
  - Based on some subjective knowledge base, intervene to modify initial (objective) forecast guidance



Advantages of Objective Methods

- Traceability of forecast process;
- Improved credibility for forecast provider;
- Forecasts made earlier can be repeated as forecast methods improve (allowing one to assess and quantify progress);
- Forecast history and the digital data, can be archived;
- Skill of forecast can be quantified (and communicated to the users)
- Underlying digital data is readily available and can be used in application models (e.g., streamflow prediction);

A strategy for objective seasonal forecasts



Thank you