Who cares about S2S research to improve forecasts?

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Who cares about S2S research to improve forecasts?

- Based on a set of interviews with users

- Presents specific example applications and needs, rather than a comprehensive assessment
Key forecast users
Energy

What they do:
• Consult for some of the biggest energy companies in the world

• Help companies monitor meteorological conditions to determine potential impacts on natural gas or electricity prices
Energy

What information they typically use

• Temperature and precipitation (mostly temperature)
  • Starting to see interest (mostly in Europe) in forecast fields relevant to renewable energy (ex. wind speeds)

• Download raw data for processing and calibration

• Produce weekly average forecasts for weeks 3-6; seasonal forecasts for months 1-3, some out to 6 or 7 months

• Most use CFSv2

• NMME users working on optimized weighted combinations
What they need

Research questions
• Better understanding of initialization sensitivities
• Stratospheric-tropospheric interactions in the winter and their surface reflection in temperatures

Product needs
• Desire for a plan for the NMME to ensure confidence in its stability/longevity
• CFS is commonly used over the NMME due to the comprehensiveness of the CFS data and needs of the users
Drought/Agriculture
Drought/Agriculture

What they do

Texas Water Development Board

• State agency that provides data to the public such as surface and groundwater, salinity, and information on drought conditions
Drought/Agriculture

What information they use

Texas Water Development Board
- Use global CFS seasonal forecast fields (1-3 month leads) to drive county level precipitation forecast for May-July
- Would like to use NMME, but data missing some needed fields (e.g., surface dewpoint temp)
- Provide Water Weekly with update on current drought conditions
  - Use NMME as guidance to develop the discussion
  - Helps provide aid for agriculture
  - Stakeholders: 800-1000 contacts including state legislators, Texas Department of Emergency Management, river authorities, Drought Preparedness Council

https://waterdatafortexas.org/drought/rainfall-forecast
Drought/Agriculture

What they need

- Better understanding of:
  - Land-surface coupling in June and July and land-surface memory
  - How the NAO affects rainfall in May-July season

- Improved skill in predicting spring rainfall; understanding of blocking and atmospheric rivers

- Improved ability to forecast flash floods
  - Looking into using the CFS-based severe weather guidance dashboard (need guidance on how to use)

- Subseasonal information
  - Lot of learning to do to figure out what would be suitable (need guidance)
Water Resources
Water resources

What they do

Detroit Army Corps of Engineers (Bolinger et al., 2017)

- Produces monthly lake level forecasts for the Great Lakes
- Lake levels affect ability of commercial and recreational boats to move through marinas and harbors and amount of cargo vessels can carry
- Can also affect severity of harmful algal blooms
Water resources

What information they use
Detroit Army Corps of Engineers
• Previously estimated numbers qualitatively from CPC maps
• Now use NMME-based Great Lakes Seasonal Climate Forecast Tool developed by GLERL
  • Takes NMME temperature and precipitation forecast values; applies them to Great Lakes region climatology
• Use numbers from tool as input into lake level forecast models; has helped speed up processing
• Appreciate probabilistic range and uncertainty from large ensemble

https://www.glerl.noaa.gov/data/climateForecasts/
Water resources

What they need

• Would be useful to be able to easily switch between the individual NMME model maps for easier comparison

• Subseasonal information would be very useful for Army Corps’ rainfall runoff models for lake level forecasts
  • Any information they can glean would be helpful; if not skillful enough, could use as a risk assessment
Health
Zika-climate connection example (Muñoz et al., 2017)

- Zika spread through the Americas in 2015 and 2016
  - No vaccine and limited treatment options
  - To spread, mosquito has to bite an infected host, or the virus can be sexually transmitted
  - Predicting human behavior is difficult, so scientists have focused on suitable environmental conditions for the mosquito
- Mosquito and virus reproduction and survival affected by temperature and precipitation
  - Window of suitable temperatures
  - Need water for development; prefer calm environments
  - Virus replicates faster with higher temperatures
Health

Climate and health collaboration

• Pan American Health Organization (PAHO) formed research team with the Latin American Observatory for Climate Events and other researchers

• Conversations began about a year ago during El Niño conference at IRI

• Could recent Americas Zika outbreak have been predicted?

What information they use

• Used NMME seasonal reforecasts as input into mosquito model (developed by Caminade et al., 2017)

• Produced potential risk of transmission (very low to very high); found experimental forecast system could see signals of outbreak 1-3 months ahead

• “NMME has good skill in Latin America and reforecasts available for a long period of time which allowed us to do a good skill assessment. We have more than 100 ensemble members which is really good when we want to give our uncertainty in our forecasts.”

Health

What they need

• “There are so many reasons we could mention about why we use the NMME. Right now we are getting everything we want from the NMME.”

• More concerned with health component of experimental forecast system
  • Complicated ethical and socio-economic implications due to human behavior playing a major role

• Would like to develop a seamless forecast system if subseasonal forecasts become skillful enough
Takeaways

• Users show need and excitement for new subseasonal forecast data and point to research needs to improve seasonal data

• Examples highlight sector applications of CFS and NMME global output for regional focus

• Hindcasts support research for new applications outside of conventional approaches
Extra slides
What the users are saying

• “We definitely value a lot of the work that’s being done inside NOAA”

• “We are getting a lot of interest in this [the subseasonal] time frame...they [clients] monitor the information almost as much as the medium range forecasts. Users want to have that continuous spectrum.”

• “One week I was on vacation and didn’t put the [subseasonal] forecast out. I had about 50 emails saying where is the subseasonal forecast, we are dependent on that. We have a growing body of subscribers to that product.”

• “We are very limited in the subseasonal space right now and are praying to get more data other than from the CFS and ECMWF. People are starting to trade in the subseasonal space.”

• “Understanding and getting better model skill scores for subseasonal forecasts...[are some] of the premier growth areas in the field right now.”
Drought/Agriculture

What they do

Food and Agriculture Organization of the United Nations (FAO)

- Studying the movement of desert locusts

- Swarms 1-100 km² in size, 40-80 million locusts per km²; eat the same amount of food as 35,000 people

- Provides forecasts up to 6 weeks ahead to countries in danger of invasion
Drought/Agriculture

What information they use

Food and Agriculture Organization

- Precipitation and temperature affect locust survival, reproduction, migration patterns, and ultimately their impacts on crops
- Use custom temperature and precipitation information from CFS to performs own analyses

Water resources

What they do

Texas Water Development Board

• Provide information on salinity in bays and estuaries to Galveston Army Corps of Engineers, National Wildlife Federation, the Nature Conservancy, and other Texas State Agencies and consulting firms

• Salinity is a key factor in regulating oyster and fisheries populations in bays and estuaries; implications for coastal storm surge protection

• Past work has been based on observations
Water resources

Texas Water Development Board

- Looking into using NMME global hindcast and forecast fields (precipitation, wind, sea surface height) as input into a hydrodynamic circulation model
- Assessing seasonal predictability of salinity in the bays and estuaries along Texas Gulf Coast