USCMS Rapporteur Notes

11:00 – 12:30 Subseasonal-to-Seasonal-to-Decadal Modeling

Moderator: Arun Chawla. Rapporteurs: H. Archambault and D. Koch

11:00 – 12:30 Subseasonal-to-Seasonal-to-Decadal Modeling - H. Archembault

- System development - highest priorities?
- Research - what sources of predictability are being investigated? What is state of understanding and prediction?

GFDL

- Components of S2D systems: observing systems, assimilation systems, models, changing radiative forcing
- (modeling is only one of the key components)
- Aim is for a seamless modeling approach across timescales
- Hydro and non-hydrostatic TC prediction (HiRAM)
    - Non-hydrostatic performs as well as well-tuned hydrostatic version for N Atlantic
    - Non-hydrostatic version not as successful for WPac TC prediction
- Prediction of Winter 2015-16 precipitation over western U.S.
    - FLOR without atmosphere and land initialization does not get southern CA dryness
        - Need to initialize atmos., land
- Decadal prediction:
    - Decadal prediction of Atlantic SST comes not from RF changes but from IC of ocean (initial-value problem on regional scale)
    - In contrast, RF matters a lot for global mean SST prediction

NCEP

- Building coupled system using NEMS/NUOPC
- Not clear what ice model will be
- Prototype system of GSM-MOM5-CICE5 (v0.X of UGCS; Unified Global Coupled System) ready for testing by Sept 2017
    - 6 years of month long simulations
    - Currently beating CFSv2 in skill
- DA ready by Jan 2018
- Improvements in new coupled system skill over uncoupled system and CFSv2
- Interested in exploring atmos. coupling with ocean for weather timescales

Q: How will you assimilate 1/12 degree ocean?

A: Not planning to; will smooth out data (obs are too sparse)

Q: HPC for operations? Need 30 petaflops

GMAO

- Contributes older model to NMME

Highest priority areas:

- Skin layer: top layer of ocean isn't thin enough to properly capture what is coming in from the atmosphere - mechanism for sensible heating, latent heating, downward LW radiation
- Looking at alternative ensemble perturbations
- Bias correcting of forecasts
    - Teleconnections → geographically remote bias correction can improve precip over US
- Looking at skill added from NASA data: land initialization, dynamic phenology, coupling between atmosphere and composition
- Dynamical sources of predictability:
    - Transport associated with Rossby wave guides (tropical–midlatitude teleconnections)
    - Feedbacks between sea ice extent and surface pressure

ACME

- Not being used in prediction mode
- No prediction experiments
- But, interested in understanding S2S2D variability → effects on energy, water
- Doing v1 water cycle and cryosphere experiments
- Looking at S2S2D processes and predictability
    - Modes of variability
    - Decadal trends
    - Cryospheric processes

Q: ACME v1 was for DECK and historical CMIP6 runs - is that at a different resolution than what is given here?

A: DECK will be run at only 1 degree resolution; sets of experiments mentioned will be run at both low and high resolution

Q: Planning to add a DA system component and initialized predictions?
A: No plan to do that yet. No DA system, no plan for how to accomplish that

CESM

- More of an NCAR talk relative to CESM (not NCAR as a whole)
- NCAR initiative: community model and predictions (predictions part is new)
- Unifying DA across NCAR is as much of a challenge as unifying models
- On climate model side, have a prediction system with CESM → days, subseasonal through multi-year
    - Will become an NCAR wide project
- Goals: sources of predictability outside the troposphere
- No intent to get into prediction (focus on predictability -- NSF focus)
- Now:
    - NMME (DOE NOAA NSF)
    - Decadal hind/forecasts (NSF DOE)
    - S2S hindcasts with strat. Resolution (NOAA)
    - S2S high res coupled hindcasts (ECMWF NSF)
- Plans ("dreams" - not certain)
    - Complete coupled reanalysis using EnKF (S2S2D)
    - Coupled model development hindcast suite for multi-component CAPT (S2SI)
    - High res experimental hindcasts (S2S)
    - Atmospheric dynamical core hindcasts (S2SI)
- Suite of dycores now available for testing

Comment: Noting plans for unified DA; JCSDA was originally about data; now is focused on unified DA approach through JEDI

Response: Not doing DA for climate side; possibly for weather time scales

Community is trying to put pieces of WRF DA and global DA into JEDI now

Problem with JEDI is that it is a DA system, not really a framework

Duane Waliser

NRC S2S report and WWRP/WCRP S2S Project

- This 2016 report follows on the 2010 ISI report sponsored by NOAA
- Sectors (ag, energy management) already use S2S forecasts
- Goal is a 10 year scientific research agenda for S2S
- Vision: S2S forecasts will be as widely used 10 years from now as wx forecasts are today

Q: why a decade goal?

A: convenient, optimistic time scale

A: no metrics of success for broad use of S2S predictions

Q: Just because community wants skillful S2S prediction doesn't mean it's possible; how can S2S prediction be used as widely as weather forecasts

A: Some areas where it could make sense

Response: but S2S predictions will never be as useful as weather predictions

S2S Prediction Project

- One of the three post-THORPEX projects
- Associated database came available 2 years ago
- Emphasizes subseasonal more than seasonal
- Goal is to connect outcomes with operational centers and applications community
- S2sprediction.net → database of 11 operational center hindcast and forecasts
- Forecast lengths: 30-60 days (more closer to 30 days)
    - Differences between hindcasts and forecasts (in terms of ensemble members)
    - Atmospheric fields, planning to add ocean fields
    - Common 1.5 degree grid
    - 80 variables
- Initial 5 year period ends in Fall 2018
- How to expand?
- Developing a 2nd 5 year period proposal
- What are centers willing to contribute to this proposal?
- Centers should contact Duane if interested in being involved
- Under Office of Federal Coordination of Meteorology, have 5 coordination committees
    - One of the groups is coordinating the work along the 3 post-THORPEX groups
    - Science committee:
        - Duane is co-chair for S2S - how to coordinate across agencies
            - In process of forming these committees (reps from different agencies)

Panel discussion on S2S2D

- Goal is for 2 principle action items

Issues put forward by panel

- NWS's problem: being told to produce products regardless of whether there is skill (weeks 2–6) -- problem is unique to NWS
- What are predictability of "disruptive events"?

- May have windows where forecasts could be delivered (windows of opportunity) -- when are these?
- Coupling issue -- what components need to be coupled when/for what problems?

- Where do existing efforts fit in?
- A: SubX (interagency experiment funded by CPO with NASA, Navy, Environment Canada) is tailored for S2S prediction (real time)
    - participating research and operational centers follow a protocol for a controlled experiment (set length of hindcasts, same initialization dates, etc)
    - Real time predictions are starting this summer

- How to evaluate predictability/prediction at S2S?
- Multi-model approach still gives best prediction skill
    - When do you lean on MM approach vs. focus on single model development?
        - How fast does this happen?
- How does approach to predicting extremes change for S2S and beyond vs. routine predictions that use means?
    - Do we have strategies to get to the tails of the distribution? Do we need to plan strategies for this type of analysis?
        - Need more conditional forecasts
        - Need more detailed physics
- Can also advance S2S prediction with better or new obs (slowly varying boundary conditions)
- Agencies are significantly investing in S2S → projects being funded in the external community; good opportunity to entrain academic community
- What about initialization at S2S time scale?
    - Coupled atmosphere-ocean initialization is very important (increasingly ocean subsurface)
    - Elements of both modeling and DA (unlike for NWP or projections)

11:00 – 12:30 Subseasonal-to-Seasonal-to-Decadal Modeling - D. Koch

6 centers
GFDL:

- TC prediction – hydrostatic not so different from nonhydrostatic GFDL HiRAM
- West Pacific not as good as north atlantic
- Precip pattern in Western US – FLOR fcst using ocean and Merra-land product together
- Decadal Regional SST from ocean IC's not from radiative forcing, global forcing important for global mean SSTs

NCEP

- NEMS/NUOPC coupled framework
- Prototype with GSM-MOM5-CICE5 beating CFSv2 in skill, should be ready this year
- Coupling is improving predictability, will move to MOM6
- DA – ocean/ice plus waves
- Presented timeline out to FY22 to build out forecast system, will ocean at weather scales improve forecast? Improve physics
- Q from Bill Large – plan for 1/12 degree ocean assimilation – will this be smoothed out – answer is yes
- Q from A. Bamzai – regarding throughput for forecast – answer (Tolman) – will need 30PF to include all planned components, should be possible for FY20 target, although 1/10 (Atmos) and 1/12 (ocean) resolutions can't be afforded at same time

GMAO

- Current – production – pre-MERRA-2, MOM4, CICE
- New-frozen – synced with NWP atmos and cryo – replay ocean with foreward-play atmosphere, ensemble perturbations
- Planned change – ½ deg atmos (as is now), ¼ degree ocean; change "replay" method
- Highest priority – improve "skin-layer" of ocean, bias-correct forecast, ensemble-perturbation improvements
- Land initialization using SMAP soil moisture – from NASA data – also some vegetation features and atmosphere composition
- Question from B. Large on skin-temperature issue

ACME

- Not doing assimilation, but interested in high-resolution
- V2 will do more with high-resolution, e.g. RR in Arctic, N. Am.
- V3 non-hydrostatic atmosphere CAM-SE as well as MMF-ECP
- Process – scale-aware to go from ultra-high to convection-permitting; improve hydrological, cryosphere
- Most-urgent issue – weak-ENSO, lacks variability – ongoing diagnosis, trying different configurations – probably is ocean problem
- Scientific research – what drives changes in water cycle – aerosols forcings & water use vs GHG
  How to initialize? How to get statistics from ensembles
- S2SD processes – modes of variability effects on extremes
  Cryospheric processes that influence SLR
  Human activity effects
- Question from J-F regarding DECK – to be done with v1? Answer – only low-res version, but high-res and low-res both will use various forcings
- Question from Annarita - add assimilation? Answer – no plan yet, but interest

CESM

- Community modeling and predictions – DA, not needing major computing resource
- Develop prediction suite – days to multi-year
- Predictability for particular elements of the climate system
- NMME; Decadal hind/fore-casts; S2S hindcasts with stratosphere; S2S high-resolution coupled hindcasts
- Plans/dreams: Coupled reanalysis using EnKF; Coupled-CAPT; High-resolution hindcasts – horizontal+vertical; Atmos-dycore-hindcasts

- Hendrik: Data-assimilation from Joint-Center – unified approach expertise (Tom?) – could be leveraged with NWP-interests; Bill-L – use of CIME for such joint efforts, but not so much interest for operational DA, less intent on full-system

Duane Waliser presentation on workshop and project on S2S (see slides for details)
Important comments:

- Private sector has interest in products for S2S, but engagement and communication is critical
- Bottom line is from 5 "Recommendation" pages/charts
- Ram Q: S2S forecasts will be widely used in a decade (?) why in a decade? A: that is the optimistic vision, capability may come in that time-scale
- Hendrik: Metrics of success? A: no this wasn't discussed
- Gavin: Won't usefulness depend on skill? A: Need to set expectations and seek opportunities. Gavin: Seems too optimistic, these won't be so useful as weather is.
- Andrea: What will users need for forecast to be useful? How is this relative to predictability? A: exchange of information between users, developers is needed

S2S Prediction Project – ECMWF and IRI are co-chairs – see slides,
http://s2sprediction.net/static/subproject

- Subseasonal maybe more than seasonal
- Uses operational centers' contributions for hind and fore casts
- Another 5-year proposal being planned, based on community input – also good time to engage; OSCM – coordinated meteorology – 5 working groups (e.g. satellites, operational centers, research – includes e.g. Tsengdar, Eleutario – committee is formed to brainstorm directions

Panel discussion – focus on important issues/topics

- Hendrik – seasonal-to-subseasonal is scary – should base on forecast skill – Not a question of "how to sell", but week 3-4-5-6 is in great demand – but skill is poor, but people want products anyway! It is being forced on the weather forecast centers
- Ruby – how to predict "disruptive event" – what is predictability – how will models capture this?
- Bill L – some atmospheric conditions allow some forecast/skill, but others not possible – need to be clear; e.g. sea-ice extent maybe influence of winds could be used for some aspects. Non-operational groups might be interested in component skill development even if not doing operational forecasting. Where do NMME fit into plan? Duane – not expert on NMME, but maybe subx maybe useful? Jinn – Subx is complementary to S2S, but Subx give protocol, and real-time forecast. Some overlap in participants. NMME/Subx workshop in September.
- Andrea – can we release characterization of reliability of various products; Hendrik – agrees – prediction/predictability could be topic for next year.
- Hendrik – best product is multi-model, but this is not sustainable, so single-model also needs to be developed, with component ensembles.
- Hendrik – are others scared of sub-seasonal "mandate"?
- Ram – is perspective different for very anomalous events than for routine S2S? Distribution rather than mean may be more important, tails of distribution? Is there a strategy or should there be?
- Steve P – agrees – 2-4 week scale could provide probabilistic view of extremes
- Hendrik – look at conditions, not specific events

- Wayne H – Are we being too pessimistic – there is clear improvements for e.g. MJO, tropical cyclones. Weather service can push that forecast out using this, atmospheric rivers, heat-outlooks (week 2) – there is more skill than is being used
- Hendrik – concern is that we are being pushed into areas where skill is missing
- Duane – 2 areas - natural modes of variability and slowly evolving boundary conditions. Some of the latter are known, but not others (e.g. deeper levels) and these could help improve the predictability
- J-F – some models have much-improved MJO – could provide connection to S2S – why are models improving, which processes led to improvement?
- Steve P: this is great opportunity! Agencies are investing, and research community could contribute to important improvements and insights
- Dave C: What about initializations and role for S2S improvements – any comments? Ram – coupled ocean-atmosphere+ice is very important for these timescales, subsurface also important even for shorter timescales – so yes, these are important. Hendrik – both initialization and model skill together are important for these timescales

Moderator: J. Dunne. Rapporteurs: D. Barrie

1:30 – 2:00 pm HPC and Exascale computing update [D. Bader, F. Indiviglio]; Challenges in HPC for Climate Prediction and Projections

2:00 – 3:00 pm Modeling Intercomparison Projects (MIPs) Panel: J-F. Lamarque, G. Schmidt US-centric initiative derived from RFMIP, AeroCheMIP, DAMIP. E.g., Aerosol forcings and contrasts with GHG effects on the US continental-scale.

- **Frank Indiviglio**
  - Computational costs for add-ons like BGC and new processes balanced against mission needs
  - 2PF at NOAA is fine grain/GPU-based
  - Concern is that in the past, hardware improvements would bring 2-3x bounce in model performance, but in 2015, that stopped, and they're lucky to get 1.5x improvement in model performance -- need software improvements now
  - Data analysis for growing datasets also a big challenge -- how to store/share this data; pushing bounds of architecture at NOAA now
  - Tape storage is becoming a less-common architecture; how to make decisions on what can be kept/removed?
  - A lot of newer architectures are pushing industry toward inlining of analysis -- how can that be leveraged to do analysis within the computation to save time/space?

- GFDL archive growth is exponential -- 110 Petabytes; keeping this growth will become more challenging forcing hard choices
- DOE SUMMIT and AURORA machines represent different architectures -- communication and layout will look different
- Since 2008, the curve of performance increase based on the SC500 list has decreased/flattened
  - New benchmarks are being used to evaluate the computes on the SC500 list, including metrics like HPCG, which is a better estimate of the performance of model codes
- Software challenges
  - Moving to fine grain architecture -- some kernels work well, but not necessarily good for whole systems
    - Can start doing code revisions on architecture we have now
    - Can also develop kernels and work out to larger applications (e.g., what ACME has been doing)
  - Climate and global models are increasingly memory bound -- hard to find an application that handles the memory assignment needs well
    - Dave Bader
- Ideal machine -- fast clocks, large memory
- Support strong scaling
- DOE has two pre-exascale architectures (SUMMIT @ Oak Ridge, AURORA @ Argonne)
- Architectures:
  - One is a hybrid of CPU/GPU w/ powerful central core (e.g. Titan, SUMMIT) -- more like traditional Wx/Cx computer, but with hybrid nature of GPUs
    - Small number of very powerful notes -- data movement is easy
  - Another (more dominant) is low-power many-core; Cori-2 @ NERSC.
    - Homogenous cores; met moore's law by not increasing the number of transistors, but instead adding more cores per node; lots of replication of cores on a node
- DOE team has looked at a lot of applications across the office of science on these machines
  - Machines are not good with PDE-type calculations that are needed in climate science
  - The architectures just aren't working for these applications -- going in the wrong direction with slower processors/clocks because of the power requirements
- Code restructuring is a big investment of time -- limited returns on investment for huge amounts of software work
- Need to start exposing software at the algorithmic levels
- Unstable platform technology over time is a huge problem because the re-coding process is so time-consuming and onerous.
- Working on GPUs for the ocean
- Need new I/O libraries because some of the NetCDF libraries are inefficient at the moment, e.g.

- Investment and complexity is non-trivial
- The I/O performance varies across DOE installations; depends on sharing, utilization of scratch space, etc. despite that this shouldn't have an effect on processing performance
- Ensembles is a perfect application for these new systems
- Need to make way for the computer time and expertise to test at the algorithmic level
- DOE machine that may replace AURORA may be based on hardware that is not designed for climate model problems -- ARM processors built for big data and AI that don't have a lot of hardware support for arithmatic and things that are computationally intensive
  - Modeling does not control the market -- vendors are not going to go into co-design with the labs in this market.
- DISCUSSION
  - Going from vector to distributed machine took a long time
  - Comments on labor force? Changes that are necessary or requirements?
    - People that you need are in great demand and hard to get for this application, but also don't have the kind of money to get these people (competing with Google, etc.)

MIPs session -- J-F and Gavin (Ram - host)

- Ram introduction
  - Changes to various aspects of GFDL codes -- radiation
    - Lots of changes in AM4 for radiation; HITRAN 2012, new H20 continuum, O2 continuum, and new solver
  - Typically, models have been comparing 2x CO2 to benchmark calculations
  - AM4 has too much absorption in the atmosphere for clean-sky (no aerosols/particles)
  - AM4 has too little absorption over the tropics and midlatitudes for clear sky; too much absorption in the polar latitudes
  - Can do standard profile calculations and models are close for radiation, but when you compare to the models' own line-by-line profiles, there are some differences
  - Some differences from elementary things -- profiles and other details are not necessarily the same between the models
  - RFMIP -- project in the US and international context where LBNL and DOE agreed to take profiles from every center and do calculations for every modeling center; 3 centers participating (NCAR/CESM, GFDL, MPI, Australia, French and some other centers are participating)
- J-F
  - Last year, put thoughts together on what could be a US-centric MIP; Gavin and JF have discussed
  - Could frame this as climate and air quality impact of Clean Air policies in the U.S. -- one of the motivations is the Chip Levy paper which kept RCP emissions which have decreased in aerosol precursors at 2005 level and looked at impact

- This would build on the CMIP6 historical emissions, but build on short-lived climate forcers related to air quality policies over the U.S.
- Probably 3-10 ensemble members
- THere is an AerChemMIP element focused on air quality based on future conditions
  - Proof-of-concept
- Study looked at impact of US SO2 emissions
  - Turned off emissions, tested with CESM,GFDL,GISS
  - Strong regional forcing; all models have direct and indirect forcing
- Change in surface temperature; temperature response isn't just co-located with the forcing
  - Small but statistically-significant signal
  - Different models show different things
  - GISS model doesn't respond as strongly as the other models
  - NH warming of 0.5-1 K
  - Basic research questions
- Enough members and models would help us start detecting if there has been impacts from decisions that were made on the air quality
- A lot of questions on the impacts side that could be looked at beyond the surface temperature
  - Remote change in SO2 in GFDL model could be indirectly caused by changes in precipitation over Africa and Eurasia; could also be a change in dust
  - DISCUSSION
- Is there any expected impact that would make these experiments worth doing?
  - Air quality
  - Trying to understand the impact of certain decisions
- What do you learn from modeling as opposed to the extensive observations we already have from post-clean air act
  - Looking at the world that we avoided by making a policy change
  - Models are telling you how increases in emissions and population impacted the situation
  - Trying to factor in other changes that have occurred over this period, in the physical climate, for example
  - Want ot show that specific policies can have specific effects -- one of the problems with future predictions is that they aren't specific to particular policies, e.g., the RCPs are not useful for anyone except us
- Inverse value is also what happens if a country stops preventing these emissions
- GMAO would be interested in participating with the caveat that htey can't run the whole DECK experiments
  - No protocol yet for the experiments; could be done from a branching for a 20th century simulation in 1950s/1960s; collection of 50-year runs and hopefully 5-10 to create an ensemble with 4 models, hopefully to get an ensemble
- Potential for including AMIP simulations?

- Might be; some of what they're seeing in the preliminary results is that the response involves a coupled response
- What's going to come from getting a collection of model ensembles - learn what the world would have looked like or why some models have particular responses?
- Step 0 is the consensus, and then would want to understand consensus by understanding what's going on
- Dust feedback has already been interesting
- Two-fold experiment where the high-resolution models can also participate
- What sort of accommodations?
- Have to bring in the air quality/health/acid rain issues as well
- What comes from the world-avoided papers is that you see the emergent feedbacks that were not considered when the original motivating experiments were done
- Calculations will show the climate impacts avoided. On the air quality side, how would we be able to show the air quality impacts avoided; do we have a good quantification of that
- Most of the damage is via ozone or particulates; agricultural loss; health loss; mortality; economic losses due to yield issues
- Exercise is based on assumption that the model is nearly perfect such that we trust the model response to this magnitude of forcing
- Planning on circulating a set of forcings?
- Steve Smith will likely be able to do this -- once there is interest and when people are interested in performing the simulations, then Gavin and JF would work with Steve to build a set of emissions, and would look exactly like the CMIP emissions
- Only for the U.S.

Rapporteur: Fred Lipschultz

3:00 – 3.15: VIACS [A. Ruane] (on webex/phone)

3:15 – 3:40: Land issues, irrigation, water and carbon cycles – prospective next year topic? [R. Leung, J. Dunne]; New GFDL Land Model Development

Alex Ruane VIACS

- Bridge between climate modeling and applications community to improve use of climate model output. Two way communications between science and application goals via model scenarios, informed use of outputs, design of diagnostics, metrics and visualizations.
- Two groups – VIA and various projects/programs (CORDEX, ICONICS, AgMIP, TGICA etc). Climate service operationalizes climate & VIA info into user-oriented products & tools. VIACS tries to improve interactions for CMIP6 for mutual benefit thru the VIACS Advisory Board members.

- Assessed 900+ CMIP6 variables for utility for VIA are ranked and can be accessed by CMIP6 Data Request. New requests include low-frequency reports of high-frequency statistics such as monthly summary of hours where precip exceeded given rain threshold.

Ruby – can they evaluate how use by VIA community has changed from CMIP3 to 6. Alex: good point but not planned- needs someone to lead. Would show value of climate information.

JF – are new requests being transmitted to CMIP6 for action.

Alex – not sure how much uptake of new requests by GCM groups. Hope is that variables are saved as a 'package' to ensure use by VIA since missing key variables greatly limits utility.

Annarita – is VIACS focused on climate or shorter term weather needs.

Alex – CMIP6 climate scale but there is desire for shorter term outputs for climate services which are rooted in climate variability.

Land Issues

ACME (Ruby)

- has topography, CNP coupled model and relative demand model.
- In soil has vertically resolved model with variable flow model, as well as a river flow model with floodplains.
- Focused on carbon modeling.
- Have implemented an ecosystem demographic model and human activities via GCAM and others for crops etc.
- Coupled models for human impacts on water cycle using ALM-MOSART-WM to deal with irrigation differences and different crops.

GFDL (John) –

- using LM3 which is new ecosystems and hydrology model, with LM4 under development to include urban tiles for UHI, comprehensive biogeochemistry, river biogeochem, dust, fire, and more.
- Model data fusion with satellite data at 1km scale for North America.
- Has 30m land tiles across CONUS.

CESM (JF) –

- also has MOSART coupled with CN model, fire, snow & hydrology, with crops and LULCC.
- Planning on implementing ecosystem demography as in ACME.

GISS (Gavin) -

- rivers are connected to lakes and they can expand/contract rather than rise in height with fixed surface area. For large river systems, this is critical. There is a power law for lakes that they might be able to utilize.
- Vegetation is captured by ecosystem model with fire.

Bill – Does river temp change with distance
Ruby – only in offline mode but working on coupling.
John – GFDL does modify and keep track but still produces odd behavior.
Jin – is there interaction with GEWEX.
JF – not sure what connection is.
JF asked Ruby how to choose between models & approaches using appropriate datasets to test realism metrics. Ruby says they are still struggling with that.
Also asked about groundwater – ACME tracks but evaluates against GRACE or wells.

4:00 – 5:30 USCMS organizational issues

Rapporteur **Todd Ringler**

Ram: Ideas for 2018 workshop: predictability, US-centric MIP, land effects on climate, CMIP6 update/analysis
Maybe a few too many topics were covered at CMS
Thinning the topic list would permit a bit more depth on each item
Do we want to have workshop accompanying CMS or an extended CMS?
Hendrik: topics for next CMS focus: Uncertainty vs accuracy, including value of MMME, agreement of metrics
Steve: Maybe target/align CMS with a broader conference, such as an AMS conference.
This alignment would permit longer workshop and/or CMS meetings if desired
Gavin: Since we only meet once per year, we spend a significant amount of time on boilerplate discussion.
If the workshop required preparing work packages, then more substance could be covered in less time.
Susanne: Balance the general update from the modeling centers paired with a more directed, specific topic of interest
The focus of the activity needs to be on what ties everyone together.
Hendrik: Recall that CMS began to get the groups to talk. Progress has been made.
We need to be careful about changing the focus of CMS from high-level coordination to detailed science discussion.
Ram: The group are at a higher plane since the most basic information about each modeling group has been exchanged.
This forum does play a role in explaining to OMB the what/why of each modeling group.
There is a constraint of the topics — need at least 2/3 of groups with strong buy-in order to be appropriate for CMS
Dave: On idea that we have not followed through on is the POC to help tie the CMS activities today between annual meetings
Hendrik: Is there a consensus of CMS #4?

Gavin: Suggested previously that each modeling group provide a list of experts aligned with specific modeling activities. This would allow the groups to build networks at multiple levels. Google doc. Build potential focus areas of interest.
Ram: Action Item: Get all groups to build out this expert/activity list.
Andrea: The CMS could consider helping to organize/coordinate/socialize the value of the observational data sets.
JF: Would be valuable to tie these datasets to ongoing validation activities. ILAMB being on example of success.
Anjuli: Clara Deser and the large-ensemble is another example of success.
Ram: SHEBA is a dataset that has proven very useful, and even more so if it were more widely exchanged and used.
NASA: Following up from Gavin's comment …. having a focused CMS activity might lead to more definitive products (e.g. tuning paper)
Ram: Would like to step down as CMS chair. One name has been put forward — Hendrik will be the next chair.
Ram: CMS needs a co-chair. Co-chair should not be from NOAA (since Hendrik is from NOAA). Co-chair will be Steve.
Ram: Site for next year could be at NOAA Silver Springs or maybe NSF — but that choice can be delayed for awhile.
Ram: Connecting CMS to ongoing IGIM activities has been useful and should continue (and maybe with more frequency/strength)
Hendrik: Closes the meeting with a "thank you" from participants to Ram for his leadership in getting and building the CMS activity.