WGSIP, DCPP and GC-NTCP

40th Session of the WCRP Joint Scientific Committee

Doug Smith and Bill Merryfield, WGSIP co-chairs
May 2019
Geneva, Switzerland
Progress and achievements - WGSIP

- 368 presentations, 347 participants, 38 countries
- 9 WGSIP members on organizing committees
- BAMS S2S/S2D survey article submitted soon
- New: JMA/MRI-CPS2, JAMSTEC/SINTEX, NMME models (in progress) → >25 systems
- Sea ice variables added
- New storage system for long term hardware integrity

Current cycle of WGSIP projects
- Teleconnections: ENSO global circulation influence in CHFP/Copernicus models
- SNOWGLACE: paper on snow initialization impacts submitted to JGR S2S issue
- Transient Intercomparison Project: shock/drift diagnostics developed →

WGSIP engagement with WMO operations
- Contributed to writing and review of “Guidance on Operational Objective Practices for Seasonal Forecasting” document for WMO regions →
- Participation in 2nd WMO Workshop on Operational Climate Prediction
- S2S/S2D conference R2O: session + current research survey article
Progress and achievements - DCPP

Robust skill of decadal predictions

- S/N ratio too small
  - Need large ensemble to remove noise
  - Use anomaly correlation (insensitive to magnitude)
- Impact of initialisation masked by common signals
  - Assess variability *not captured* by uninitialized runs

Predicting extremes

Atlantic hurricane numbers

Sahel drought

N. Hemisphere JJA continental extreme temperatures

Smith et al 2019

Caron et al 2018; Hermanson et al 2014; Sheen et al 2017; Leo Borchert MPI-M
Progress and achievements – GC-NTCP

WMO operational decadal predictions

WMO Lead Centre for Annual-to-Decadal Climate Prediction

The Met Office is a designated Lead Centre for Annual-to-Decadal Climate Prediction (LC-ADCP). The LC-ADCP collects and provides hindcasts, forecasts and verification data from a number contributing centres worldwide.

Towards operational predictions of the near-term climate

- Sets out the case for operational decadal predictions
- Kushnir et al 2019

Annual-to-decadal climate update

- Lead centre for annual-to-decadal climate prediction
  - Met Office
- 4 global producing centres
  - BSC
  - DWD
  - Environment and Climate Change Canada
  - Met Office
- www.wmolc-adcp.org
Future plans - WGSIP

• Major changes in WGSIP membership in 2019-20
  - broadened geographical representation, improved gender balance
  - expertise in subseasonal/seasonal/decadal prediction
  - 9 WMO Global Producing Centres represented

• New cycle of WGSIP projects
  - to be identified and initiated at WGSIP 21 in late May
  - candidate projects include:
    - nature of unprecedented extremes in hindcasts
    - prediction of extremes across time scales
    - Asian summer/winter monsoon in CHFP
    - ocean climate forecasting (beyond SST)

• WGSIP led workshop in 2020 or 2021
  - to be formulated at WGSIP 21
  - +seasonal-multiseasonal session at Fall AGU/WCRP Science Week
Future plans - WGSIP

• WGSIP considering engagement in CMIP
  ➢ pilot for sub-annual prediction MIP would build on CMIP6 DCPP
  ➢ hindcasts to ~12 months initialized 4x per year as in CHFP
  ➢ main motivations include:
    - wider range of earth system variables at higher frequency than typically available in hindcasts (cf. DCPP)
    - leveraging ESGF for data access, multi-investigator coordination
  ➢ cognizant of CMIP/ESGF resource challenges, engaging WMO could help provide stability

• WGSIP possibly to lead operational prediction assessments
  ➢ TPOS2020 draft Second Report recommends periodic assessment of seasonal to interannual forecast skill + biases
  ➢ Discussions underway with TPOS2020; CHFP could provide basis
Future plans - DCPP

• Coordinate analysis of CMIP6
  – Compare hindcast skill with CMIP5, assess extreme event predictions
  – Component C “understanding” experiments (AMV, PDV → teleconnections, storm tracks, Sahel, aerosols, Mediterranean,…)
  – Volcano experiments

• Papers and workshops/meetings
Future plans - DCPP

- Coordinate new Earth System decadal predictions
- Contribute to global stocktake
- Run new forecasts if volcano erupts
- CMIP7 (eddy resolving ocean?)
Future plans – GC-NTCP

• This year
  – Finish website development
  – Issue first Annual-to-Decadal Climate Update
  – Decadal session Fall AGU/WCRP Science Week

• Afterwards
  – Standards, verification methods and guidance for operational near-term predictions
  – Continued issuance of Annual-to-Decadal Climate Update including uncertainty, skill estimates
  – Focus on developing users
Links to the WCRP Strategic and Implementation Plans

• Primary WGSIP/DCPP/GC-NTCP links are with Objective 2, *Prediction of the near-term evolution of the climate system*
  - high-frequency hindcast data across earth system components from DCPP + possible sub-annual MIP will enable predictability & skill assessment for meteorological, oceanic and hydrological extremes
  - verification against specific observed events (not possible for simulations/projections) points to model successes & errors
  - rigorous verification requires high-quality observations

• Potential capacities also to address other Objectives:
  - 1 “Understanding”
    - unprecedented extremes in hindcasts → new climate dynamics insights
    - annual to decadal forecasts of energy, water, and carbon flows could enhance their understanding
• Suggestions for implementation plan:
  - large-scale meeting (akin to 2017 pan-WCRP modelling meeting) addressing each objective of Strategic Plan (also modelling, obs?)
  - for Objective 2, would involve WGSIP, DCPP, GC-NTCP, S2S + core project expertise aligned with prediction aspects of ocean, land, cryosphere, stratosphere…
  - chairs would report back to and iterate with JSC

3 “Future evolution”
- verified decadal hindcasts could improve understanding of influences of external forcing (especially solar, volcanoes and anthropogenic aerosols) on climate evolution
- development of seamless information out to projection time scales

4 Bridging climate science and society – continue developing collaborative links, providing information on emerging predictive capabilities to WMO operations and associated Expert Team
Emerging issues

- Viability of pilot sub-annual prediction MIP aligned with CMIP6 DCPP will require rapid engagement with and approval by CMIP panel.

- In terms of future structure and functioning of WCRP relating to prediction, could have much better coordination and leveraging of expertise between prediction-centric groups and prediction elements of core projects, some GC (e.g. Carbon, Extremes), and CORDEX.

- A pan-WCRP prediction meeting in ~2020 would jump start such coordination and accelerate strategic plan implementation relating to prediction.