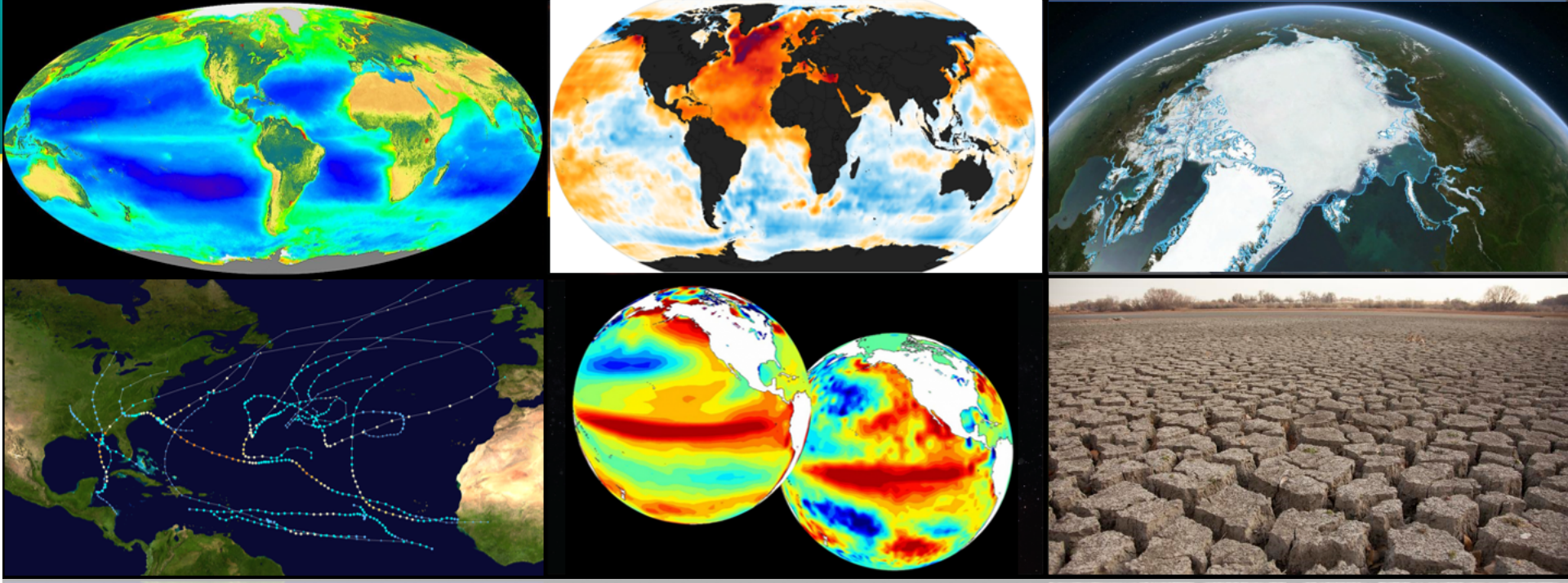


WGSIP, DCPP and GC-NTCP

40th Session of the WCRP Joint Scientific Committee

Doug Smith and Bill Merryfield, WGSIP co-chairs

May 2019

Geneva, Switzerland

WORLD METEOROLOGICAL ORGANIZATION

United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission

International Science Council

WCRP World Climate Research Programme

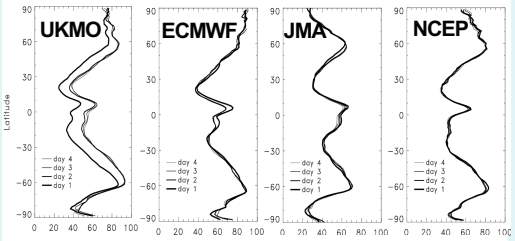
Progress and achievements - WGSIP

- 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

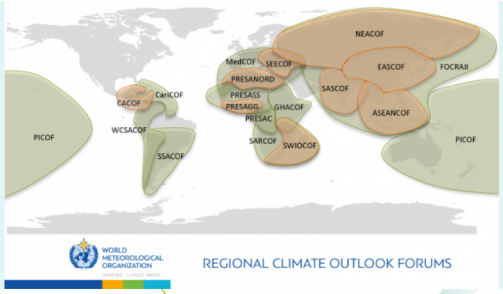
Current cycle of WGSIP projects

- 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



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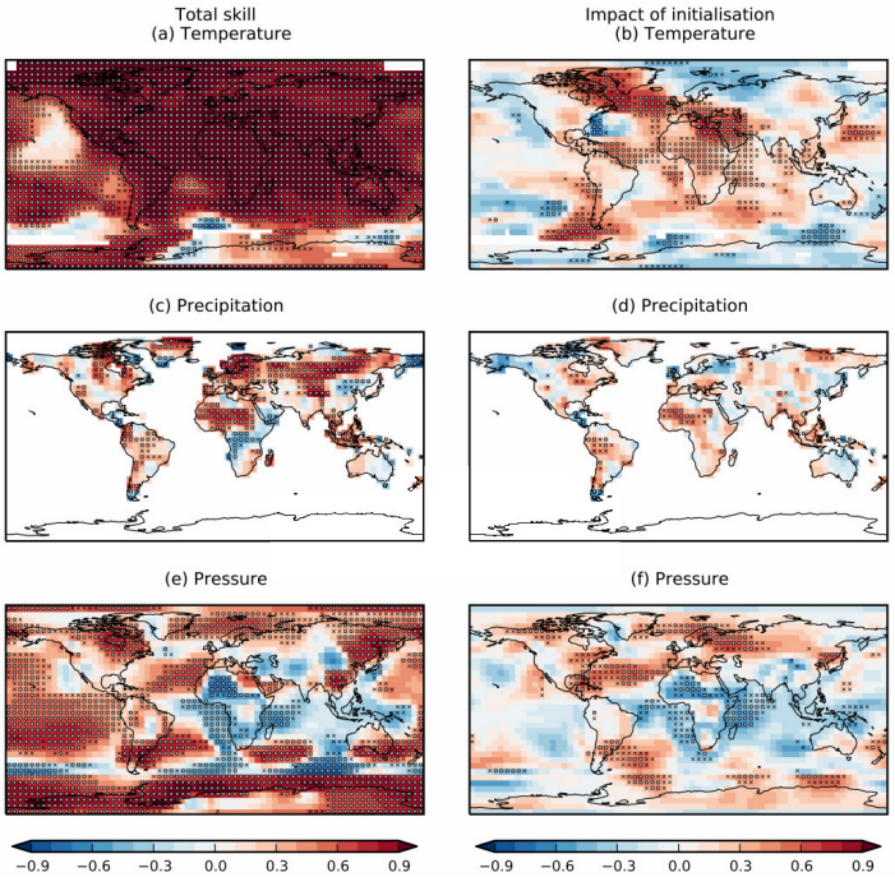
Progress and achievements - DCPP

Robust skill of decadal predictions

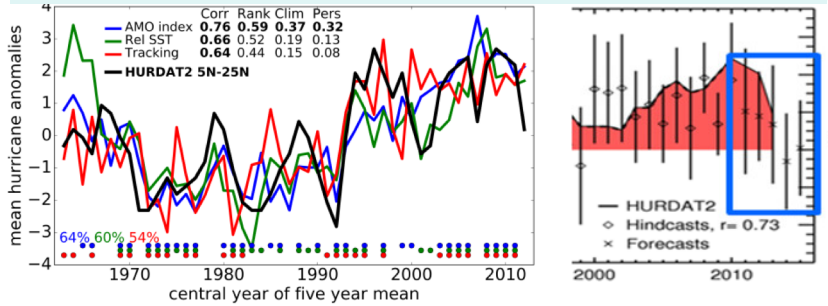


- S/N ratio too small
  - ➢ Need large ensemble to remove noise
  - ➢ Use anomaly correlation (insensitive to magnitude)
- Impact of initialisation masked by common signals
  - ➢ Assess variability *not captured* by uninitialized runs

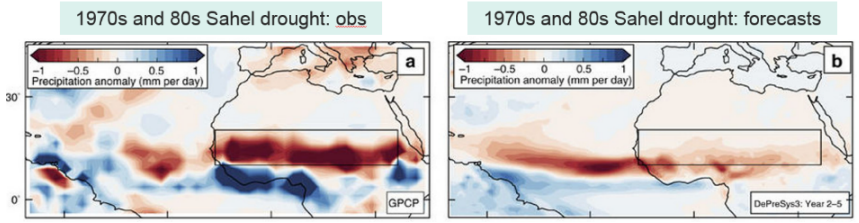
Smith et al 2019

Predicting extremes

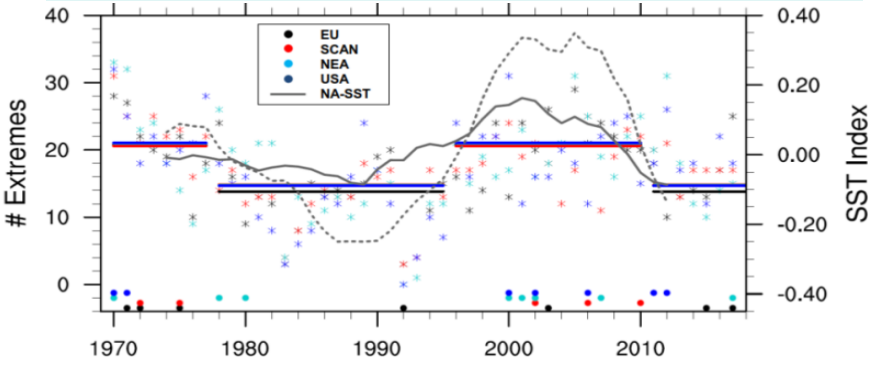
Atlantic hurricane numbers



Sahel drought



N. Hemisphere JJA continental extreme temperatures



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.

- 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

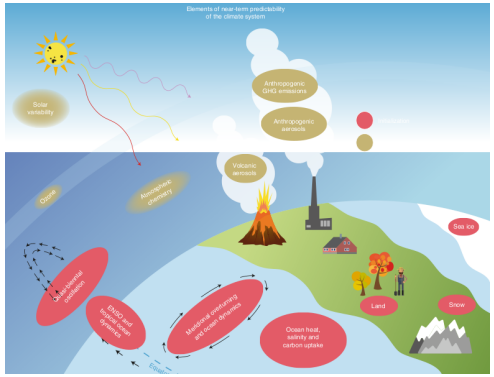
nature climate change

PERSPECTIVE

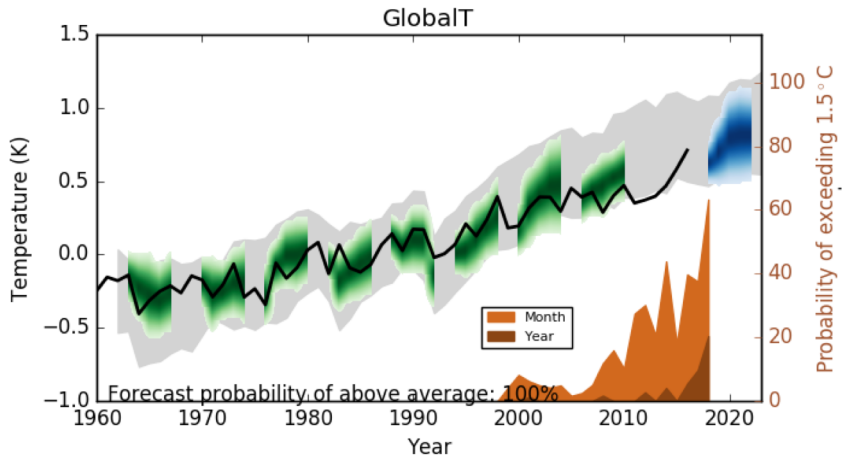
https://doi.org/10.1038/s41558-018-0359-7

Towards operational predictions of the near-term climate

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

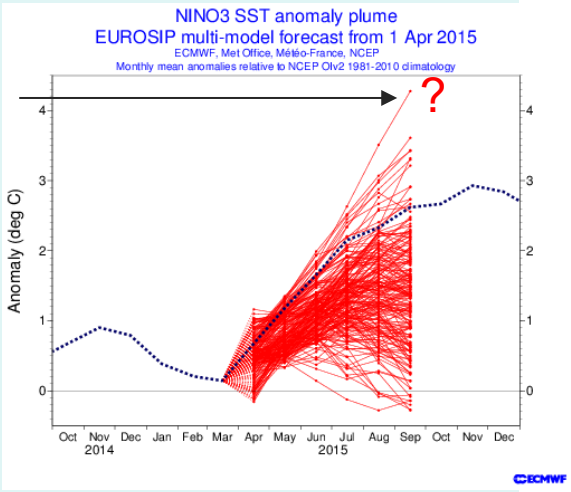


Annual-to-decadal climate update



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

Links to the WCRP Strategic and Implementation Plans

- 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

- 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

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