DCPP

Progress, achievements and plans

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With thanks to Wolfgang Müller
Overview

• DCPP – what is it, and what is the status of experiments
• Science highlights from DCPP-A and DCPP-C
• Future plans for DCPP, including links to WCRP strategy and implementation
The need for decadal climate predictions

• Over the upcoming decade we want to understand and predict:
  • How regional climates may change
  • How underlying risk changes

• Near-term predictions needed to support
  • Global Framework for Climate services
  • UN sustainable Development Goals
  • Sendai Framework for disaster Risk reduction

Merryfield et al, 2010, BAMS
DCPP CMIP6 experiments and progress

- DCPP is a CMIP6 endorsed MIP split into three “components”
- **DCPP-A**: co-ordinated multi-model hindcasts
  - Baseline experiments for assessing skill and mechanisms
- **DCPP-B**: *real-time quasi-operational predictions*

<table>
<thead>
<tr>
<th>CMIP6 experiments</th>
<th>Number of models (currently)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCPP-A</td>
<td></td>
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<tr>
<td>hindcasts from 1960-2016</td>
<td>10</td>
</tr>
<tr>
<td>DCPP-B</td>
<td></td>
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<tr>
<td>predictions initialised every year</td>
<td>1</td>
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DCPP-C: Hypothesis testing and process exploring experiments

• Hiatus+
  • Idealised AMV and IPV experiments
  • Atlantic and Pacific Pace-maker experiments

• Volcano
  • Repeated hindcasts with volcanoes removed (i.e Pinatubo)

• Atlantic gyre experiments
  • Initialise Atlantic subpolar gyre from climatology in 1990s

Boer et al, 2016, GMD
DCPP-A: North Atlantic Climate more predictable than models imply

- Significant skill in 2-9 year NAO found in unprecedently large ensemble using DCPP predictions from CMIP5 and CMIP6
- Calibration of output can be used to provide useful predictions

*Smith et al, 2020, Nature*
Recent advances in predicting biogeochemistry

- Growing understanding of skill (or potential skill) in:
  - Air-sea CO2 flux
  - Ocean acidification (Brady et al, 2020)
  - Net primary productivity (Krumhardt et al, 2020)

*Ilyina et al, submitted*
DCPP-C: Impact of AMV on global climate

- DCPP-C idealised AMV experimental protocol has generated a range of studies, including on:
  - Impact on the Pacific Decadal Variability
  - Atlantic atmospheric jet in winter
  - Global monsoons (Monerie et al, 2019)
  - Other studies in progress, including on hurricanes and impact on Europe

*Ruprich-Robert, submitted*

*Ruggieri et al, 2020, J Clim*
Future plans for DCPP

• DCPP’s primary mission is to define coordinated, multi-model experiments that advance decadal prediction science.

• But there is more room for coordination on multi-model analysis and forward-looking new science opportunities.
  • DCPP could develop new protocols for multi-model experiments
  • E.g. COVID impact on near-term climate, geoengineering, prediction strategies (initialisation, 30-year predictions etc)?
DCPP, WCRP strategy, and lighthouse activities

• DCPP helps to address all four of WCRP’s main objectives
  • Fundamental understanding and predictability are central to DCPP, model development is a key opportunity, providing a bridge to society (through partners).
  • Signal-to-noise issues are key example of how predictions provide something complementary to traditional climate modelling approaches.
  • For DCPP, *International collaboration is key* to develop new understanding – *no one centre can produce 600+ member predictions*

• Potentially strong overlaps with Lighthouse activities
  • Especially ‘Explaining and Predicting Earth System Change’ but also ‘My Climate Risk’
  • Co-ordination of underpinning datasets (i.e. hindcasts) *and* co-ordinated hypothesis testing experiments.