

WCRP Flagship objectives and associated projects

INPUT FROM CLIVAR

To establish the scientific basis for adaptation and mitigation action for a climate resilient society

Understanding and predicting climate variability and its response to human activities

Enabling the generation of actionable climate information on global to local scales.

WCRP Experimental campaign

WCRP Climate University and Open Lab

DISCUSSION POINTS

— What are the top three overarching developments that can revolutionize our insight into the climate system and solve many societal challenges ahead of us?

- **Reliable seamless prediction and projections**
- **Better exploitation of observations for initialization, modeling and calibration**
- **Improved and reliable earth system models: resolution and complexity**
- **Capacity building, support interface organizations**

— Is there one experiment that needs to be performed jointly by the international community that cannot be done by individuals because it is too big but that needs to be performed to make progress? Which question(s) would it solve?

Risky to focus on a single experiment or single model.

Essential to bring together interdisciplinary aspects (e.g. ocean biochemistry)

— Is there a single big infrastructure item required to make this progress?

- **Data basis for sharing experimentation and observations**
- **Modelling infrastructure to exchange/share model modules (efficient exchange of ideas)**
- **Observation handling infrastructure to confront (and combine) model with observations**
- **In the case of the ocean, enhance coordination with GOOS and IOC to boost the ocean observing system.**

Societal Needs and Knowledge Gaps

Big societally relevant questions/needs:

- **Support adaptation and mitigation actions**
- **Predicting climate emergencies and risks**
- **Securing ocean climate for ecosystems and humans, securing our shores**

New and novel research required to address these needs?

Knowledge gaps

- **Regional impacts of climate change**
- **Are there limits to adaptation? (e.g. Tipping points)**

Limits to the assessment which are relevant for research directions

- **Model errors and Large uncertainty**
- **CMIP cycles too frequent to learn lessons**
- **Need to better use model and observations together**
- **Research done in silos. Not enough multidisciplinary aspects nor society engagement.**

Role of WCRP in the program landscape to address these questions

- **maintain data bases -such as ESGF- to make model results and observations available to the community**
- **Promote other experiments in addition to CMIP**
- **Capacity Building: WCRP CLIMATE UNIVERSITY and VIRTUAL MULTIDISCIPLINARY LAB**

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Experimental Campaign

To complement the existing CMIP protocol with initialized ensemble seamless predictions

Needs:

- **Truly ESM operating at all time scales:** leveraging efforts among modelling centers)
- **ES Reanalysis** back in time (data rescue and DA methods)
- **Innovative Machine Learning** solution for
 - Modelling complex components
 - Enhance the information content of model output (downscaling, calibration, filtering, conditional probability)
 - Identify signals and errors, causality, attribution

WCRP Climate University and Open Lab

Primarily online - Multidisciplinary

**Two-way training between climate scientists and climate stakeholders
Governments – Corporate - NGO**

University:

Core projects to provide faculty in the "hard" sciences of our research areas
It would offer rigorous and credible certificates (even degrees?) in elements of climate science, risks, adaptation, etc., providing credentials that would give the recipients credibility within their organizations.

Open Lab:

It would provide a space for bringing together communities of practice addressing problems shared in widely separated regions across the globe (e.g., salinization of agricultural lands due to sea level rise, health impacts of extreme heat, flooding from intense rains in extratropical storms, etc.)

Philanthropic funds could be sought to enhance bandwidth