Climate prediction

Guidance

Guide to Climatological Practices (WMO-No. 100)

All the relevant information regarding the most important practices and procedures in climatology is established in the Guide to Climatological Practices.

Manual on the Global Data-Processing and Forecasting System (GDPFS) (WMO-No. 485)

The Manual on the Global Data-Processing and Forecasting System (GDPFS) is the single source of technical regulations for all operational data-processing and forecasting systems operated by WMO Members, including their designated meteorological centres, as well as those designated in close cooperation with a WMO technical commission.

Technical Regulations Volume I: General Meteorological Standards and Recommended Practices (WMO-No. 49)

This volume contains the regulations of the World Weather Watch, climatology; meteorological services for marine activities, agriculture and environmental pollution; meteorological bibliography and publications; education and training; units and procedures used in international meteorological research programmes and during special observational periods.

Guidelines on Communicating Forecast Uncertainty (WMO/TD No. 1422)

These Guidelines address the issue of communicating forecast uncertainty. The emphasis is on how National Meteorological and Hydrological Services (NMHSs) can incorporate uncertainty information in their hydrometeorological forecast services, including the best ways to communicate this information to the benefit of users.

Guidelines on Ensemble Prediction Systems and Forecasting (WMO-No. 1091)

The present Guidelines are intended to provide some general advice to forecasters and forecast providers on the effective use of the Ensemble Prediction Systems (EPS), and on what EPS can and cannot be expected to provide.

Training

Create and/or Interpret Climate Forecasts and Projections

These training modules aim to help the user understand how long-range forecasts and outlooks for specific regions are created using past climatological data and records, as well as analyzing patterns (see training competency 2). The layout of these modules initially allows the user to learn the background behind the set up and structure of the forecasting, then applies more specific examples using both climate records and patterns. The last two modules allow the user to experience a more interactive example as they create and interpret their own climate outlooks.

1. Introduction to Climate Models: https://www.meted.ucar.edu/education_training/lesson/913
2. Climate Variability Lectures:

    a. CPC Outlooks: https://www.meted.ucar.edu/climate/cvc_lectures/media/flash/halpert_cpc.mp4
    b. NOAA Atlantic Hurricane Season Outlook: https://www.meted.ucar.edu/climate/cvc_lectures/media/flash/bell_hurricanes.mp4
3. An Introduction to the Downscaled Climate and Hydrology Projections Website: https://www.meted.ucar.edu/education_training/lesson/1104
4. Seasonal Forecast Training with the Climate Predictability tool: https://iri.columbia.edu/training/cpt-training/
5. Using Climatology in Forecasting Convection in West and Central Africa: https://www.meted.ucar.edu/education_training/lesson/1266
6. Tokyo Climate Center Annual Training Seminar: https://ds.data.jma.go.jp/tcc/tcc/library/index.html
7. Interpreting Climate Outlooks: An Australian Example: https://www.meted.ucar.edu/education_training/lesson/1247

Ensure Quality of Climate Information and Services

These training modules focus on ensuring the quality of climatological products.This competency focuses on explaining the importance and real world purposes of the first three competencies. The above modules are all specific examples on how analysis of climate data and forecasting applies to very specific circumstances. The user will complete these modules and have a deeper understanding of why climate products are important.

1. ASMET: 2009 Drought in East Africa https://www.meted.ucar.edu/education_training/lesson/923
2. Ocean Acidification: https://www.meted.ucar.edu/education_training/lesson/1195
3. Using the Local Climate Analysis Tool (LCAT) for Water Resilience Decisions: https://www.meted.ucar.edu/education_training/lesson/1244
4. How Cloud Seeding Works: https://www.meted.ucar.edu/education_training/lesson/10054
5. Using Climatological Products in Common Operations: https://www.meted.ucar.edu/education_training/lesson/512

Communicate Climatological Information with Users

These training modules focus on how to properly communicate climate products and forecasts with the general public. This is a key issue, considering how audiences that need this information may have little background in regards to climate. The video modules provide a background into how scientific information, specifically climate, is structured to be easily accessible and readable. The second and third modules dive deeper into communicating specific issues such as drought and climate change.

1. Climate Variability and Lectures:
    a. Climate Science Communication: https://www.meted.ucar.edu/climate/cvc_lectures/media/flash/arndt_communication.mp4
    b. Climate Communication Skills for Use with Decision Support Audiences: https://www.meted.ucar.edu/climate/cvc_lectures/media/flash/buhr_clim_communication.mp4

2. Communicating Subseasonal to Seasonal Impacts:
    a. Climate-Weather Interactions: https://www.meted.ucar.edu/education_training/lessons/10157
    b. Drought: https://www.meted.ucar.edu/education_training/lesson/10174
    c. Climate Change: https://www.meted.ucar.edu/education_training/lesson/10173

Tools

Predicting climate

CAROGEN

The CariCOF Outlook Generator (CAROGEN) is an online portal primarily designed for participating countries to the Caribbean Climate Outlook Forum (CariCOF), allowing their National Meteorological and Hydrological Services to (1) submit and access historical daily and monthly temperature and precipitation data; (2) to generate seasonal climate outlooks and verify past seasonal forecasts. National and region-wide forecasts made in CAROGEN are driven by the Climate Prediction Tool (CPT) which has been integrated into the platform. In addition, CAROGEN contains a public section allowing viewing of climatological norms, summary climate statistics and basic monitoring tools for monthly rainfall and temperature data.

CLIK

The CLimate Information toolKit (CLIK) aids users in retrieving and using climate prediction data as well as information from the APCC data servers in a user-friendly manner. Climate forecasters, disaster managers, water resource managers, researchers, and others in the world can access this service. The tool has an immense potential to contribute to early warning and management of climate-related disaster and resource management, particularly in developing countries. The CLIK system provides customized multi-model ensemble (MME) prediction with verification. It also has a statistical downscaling tool which conducts predictor pre-screening and basic diagnostic testing.

CPT

The Climate Predictability Tool (CPT) is a software package for constructing a seasonal climate forecast model, performing model validation, and producing forecasts given updated data. Its design has been tailored for producing seasonal climate forecasts using model output statistic (MOS) corrections to climate predictions from general circulation model (GCM), or for producing forecasts using fields of sea-surface temperatures or similar predictors. Although the software is specifically tailored for these applications, it can be used in more general settings to perform canonical correlation analysis (CCA), principal components regression (PCR), or multiple linear regression (MLR) on any data, and for any application.

WRF

The Weather Research and Forecasting (WRF) Model is a next-generation mesoscale numerical weather prediction system designed for both atmospheric research and operational forecasting needs. It features two dynamical cores, a data assimilation system, and a software architecture facilitating parallel computation and system extensibility. The model serves a wide range of meteorological applications across scales from tens of meters to thousands of kilometers.

Downscaling and verifying predictions

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