Parallel Session D:
Domain/cross-domain meetings, Convection permitting models

D3: Regional responses to global warmings of 1.5 and 2°C

POSTER PRESENTATIONS

Parallel Session D: Domain/cross-domain meetings, Convection permitting models

D3: Regional responses to global warmings of 1.5 and 2°C

D3-P-01

Detecting regions highly sensitive to extreme events in China under 1.5°C and 2°C warming scenarios: analysis of NCAR CESM low-warming experiments

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In 2015, the Paris Agreement proposed a goal to pursue efforts to keep global temperatures below 2 ℃ above preindustrial levels and better below 1.5 ℃ by the end of twenty first century. As this target is worldwide accepted, it is crucial to assess the difference in global climate changes under 1.5°C and 2°C warming conditions. Extreme weather and climate events have a greater impact on both the natural environment and the human society, so it is necessary to assess the changes in extreme events under different warming scenarios over China.

In 2017, the Community Earth System Model (CESM) low-warming experiment for the first time simulated the process of global mean temperature achieving the 2°C and 1.5°C goals in line with the Paris targets in the late twenty-first Century. We analyzed the output data from the CESM Low-Warming experiment. Our results show that the frequency and intensity of extreme high temperature events in China will increase under the background of global warming. The Tibetan Plateau and semi-arid areas in northern China will be more likely to suffer extreme high temperature events with higher intensity and frequency. While controlling warming below 1.5 ℃ can significantly reduce the influence of extreme high temperature events in these areas. It indicates that the Tibetan Plateau and semi-arid areas in northern China are very likely the regions highly sensitive to extreme high temperature events. In contrast, extreme precipitation events show large spatial heterogeneity over China. The largest increase in extreme precipitation events occurs over the Middle-Lower Yangtze plain under both warming scenarios. At the same time, the difference in extreme precipitation events between 1.5℃ and 2℃ is also the largest for this region. It suggests the Middle-Lower Yangtze plain could be the regions highly sensitive to extreme precipitation events in China.

Keywords: 1.5℃ and 2℃ warming, CESM, Temperature extremes, Precipitation extremes, Precipitation extremes; Regional sensitivity

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D3-P-02

Contributions of solar radiation management to Caribbean climate

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Small Island Developing States (SIDS), such as those in the Caribbean, have had some success in advocating that the continued rise in global mean surface temperature (GMST) be held to a maximum of 1.5°C above preindustrial levels. To this effect the 1.5°C target was included in the Paris Climate Agreement of 2015. There is however much pessimism as to whether the 1.5°C or even the upper 2.0°C long term target goal (LTTG) set under the agreement are truly attainable. Recent studies indicate that based on the current trends in CO2 emissions, the likely increase in GMST would be between 2.0˚C to 4.9˚C. Geoengineering is actively being investigated for its worth and likely impact globally and regionally if it is used as a possible mechanism to contain the rise in GMST. This study uses existing runs from the Geoengineering Model Intercomparison Project (GeoMIP) to investigate the possible effects on Caribbean climate of solar radiation management (SRM). Changes in mean precipitation and temperature are examined for the cases of the G3 (sulphate aerosol is injected into the atmosphere at a location on the equator or uniformly globally to counteract temperature rise that would be cause by a RCP4.5) and G4 (sulphate aerosol is injected into the lower stratosphere (16 to 25km in altitude) at a location on the equator at a constant rate of 5Tg of SO2 per day) experiments. Results are presented.

Keywords: Geoengineering, Solar Radiation Management

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D3-P-03

Future extreme temperature changes over West Africa linked global warming intensity

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Based on CORDEX-Africa high resolution daily dataset, we investigate future (2020-2060) changes in temperature extremes given that the global mean temperature increased persistently under two greenhouse gas concentration scenarios. Results indicate that during 2020-2060, temperature extreme increased significantly over West Africa as compared with the conditions during the preindustrial era. Warm extremes seems to be more persistent, this is an indication that heat waves will be more frequent in the region. More intense warming is observed over the drier West African Sahel, and the wetter Guinea Coast regions. Additionally, warm temperature extremes scales linearly with changes in the 1.5oC and 2.0oC global warming magnitude. This further demonstrates that changes in temperature extremes are related to global mean temperature changes. In a broader social context, this region is home to over 200 million people and thus protective measures are required to lessen the effect of the projected warm temperature extremes on the populates.

Keywords: Extreme temperature, Future changes, West Africa

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D3-P-04

Assessment of thermal stress adaptability in commercial layer production in hot and humid climate

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Withdrawal

A hot and humid climate is one of the important stressors affecting commercial poultry production in tropical and sub-tropical regions. Thus, the effect of high ambient temperature and resultant thermal stress on the performance of commercial egg-laying stocks, need to be assessed. This study was designed to evaluate the effect of thermal stress on the production performance of two strains of commercial layer chickens (Isa Brown and Bovan Nera) in a humid tropical environment.

Data on two strains of layer chickens (Isa Brown and Bovan Nera) were obtained from farm records of Funtuna Farms, Ogere- Remo, in Southwest, Nigeria. The data included egg-laying performance traits and climatic variables. Performance traits include age at point of lay, mortality pattern and egg-laying performance. Climatic variables include temperature and relative humidity from which temperature-humidity index (THI) was derived. The THI was grouped into 3 classes: <26, 26-29, and >29 to show the degree of thermal stress variation in the chicken houses the birds were exposed to. Effect of threshold of thermal stress levels and the associated rate of decline in egg production and mortality were estimated. Egg-laying records of 4,000 pullets on each strain were analyzed to quantify the effect of thermal stress function in a fixed effect model on performance. Effect of thermal stress, genotype, and age of layers on production efficiency, were studied. The data was analyzed using descriptive statistics, linear regression modeling of production function, analysis of variance and the general linear model of SAS®.

Results revealed that egg production was significantly affected by genotype ($P < 0.05$), THI and age of birds ($P < 0.001$). Hen-housed egg production for Isa Brown and Bovan Nera were 4.98±0.21 and 5.20±0.21 per hen per week respectively. There was however, significant effect ($P < 0.001$) of THI on production. The thermal stress function developed showed a threshold at THI= 27.5 and the associated rate of decline were 0.35 eggs per unit increase in THI (Egg Production= -0.35THI + 6.3). Bovan Nera recorded lower rate (0.32eggs/THI) as against Isa Brown (0.37eggs/THI). On seasonal effects, the early rain (ER) was best (13.23 ±1.75) followed by late rain (18.04 ±1.76), early dry (19.19± 1.75) and late dry (20.85±1.79). Further, a highly significant effect ($P < 0.001$) of thermal stress was recorded on mortality. Isa Brown recorded higher mortality (24.19±1.25) per month of lay than Bovan Nera (14.46±1.25) during the study period.

In conclusion, the production performance of the two strains (IB and BN) was influenced by thermal stress, genotype and age of bird. Bovan Nera was superior to Isa Brown as it showed hardiness and better production adaptability, which are desirable characteristics in commercial poultry industry. There exists variability in heat tolerance among the strains and temperature-humidity index (THI) can be used to account for the effects of thermal stress on production performance of commercial layers in hot and humid climate

Keywords: thermal stress, adaptability, commercial layer, hot climate, production

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D3-P-05

Potential impact of 1.5°C , 2°C and 3°C global warming on planting season and crop suitability over West Africa

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West African rainfed agriculture is highly vulnerable to climate variability and change. This study examines the potential impact of 1.5, 2 and 3oC global warming (GWL15, GWL20 and GWL30) on crop growth suitability and planting/growing season in West Africa under RCP8.5 scenarios. Climate variables from 10 CMIP5 GCMs that participated in the Coordinated Regional Downscaling experiment (CORDEX) were downscaled by regional climate model, RCA4. These variables were then used in driving crop suitability model, EcoCrop for six crops pearl millet maize (cereals); groundnut, cowpea (legumes) and cassava and plantain (root and tuber). The robustness of GWLs impacts were assessed using two conditions; first if at least 80% of the simulations agree on the sign of change and secondly that signs of change are statistically significant at 99% confidence interval level, using t-test with respect to climate variability of the historical period. The result showed a spatial distributions of decreasing crop suitability from south to north across the three agroecological zones (AEZs) in West Africa in the historical climate with marginal cropping suitability are observed around lat. 14oN for all crops except for plantain which is approximately at 12oN. Higher suitability is observed to the south of the marginal for all the crops across showing the guinea zone is most suitable across all crops and the Sahel to be unsuitable. The simulations project a robust increase in crop suitability and planting period with increasing GWLs for the six crops. Crop suitability is projected to increase from marginal suitability to beings suitable in the central Sahel for cereals and legumes and over the savanna for root and tuber, plantain while a decrease in suitability is projected for cassava across the AEZs and for plantain in guinea zone with increasing GWLs. Cassava is the most impacted crop with increasing GWLs due to contraction of the suitable area the crop can be grown. Our findings have application in reducing the impacts of global warming on food security over West Africa.

Keywords: Crop suitability, Planting season, Global warming levels, Ecocrop, West Africa

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D3-P-06

Ensemble projection of temperature and precipitation under the 1.5°C warming in East Asia using regional climate models

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Twenty-eight regional climate model (RCMs) projections at a resolution of ~50 km are employed to investigate the future climate change over East Asia under the 1.5°C global warming. Emission scenarios include SRES A1B, RCP4.5, and RCP8.5, with the respective time periods corresponding to 1.5°C global warming are identified from the driving global climate model (GCMs) simulations. Range of the projected changes and the uncertainty across this multi-model ensemble for this level of global warming are investigated. The results indicate that the East Asian land will experience robust and significant warming (1.3°C on average relative to 1986-2005) which is greater than the global average (0.9°C relative to 1986-2005). The annual mean warming is more pronounced over Northwest China, Tibetan Plateau, and Mongolia, and to a less extend over Southeast China. The annual mean precipitation will also increase over most regions (2.3% on average relative to 1986-2005) but with large uncertainties. Highest and statistical significant increases locate at Northwest China and North China, while lowest and statistical insignificant ones locate at Tibetan Plateau and Japan. If the target changes from 1.5°C to 2°C , the warming and precipitation increasing will continue. Comparisons between the RCMs and driving GCMs are also provided.

Keywords: 1.5°C warming, East Asia, regional climate model

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D3-P-07

Evaluation of CMIP5 wind-vector fields and its relationship with precipitation in the Asian-Australian monsoon region

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Vector winds play a crucial role in shaping regional climate and the lateral atmospheric boundary conditions (LBC) of regional models. Model simulated precipitation may largely be determined by simulated vector winds. Nudging the wind field in the process of model integration may effectively improve the model capability to simulate precipitation. In this study, we evaluate 37 CMIP5 models and their multi-model ensemble (MME) in terms of vector winds and their relationship with precipitation in the Asian-Australian monsoon region. Unlike previous model assessments those mostly assessed meridional and zonal wind separately, we treat vector wind as a whole by employing a recently developed vector field evaluation (VFE) method. The results are summarized as follows: 1) in terms of climatological means of wind-vector field, the MME exhibits the best performance, followed by CESM1-CAM5 model and three MPI-ESM models. In summer and autumn, precipitation is generally better simulated in the models those can well reproduce vector wind fields, which indicates that model simulated vector wind field may strongly affect the simulation of precipitation. 2) The MME, CESM1-CAM5 and three MPI models are still the leading models in reproducing the annual cycle of vector winds. Correlation analysis suggests that the annual cycle of precipitation is likely affected by the vector wind field in the northwest Pacific and the southern Arabian region. 3) CMIP5 Models generally overestimate the interannual variation of the 850-hPa vector wind field. The interannual variation of vector wind fields can also modulate the interannual variation of precipitation in South Asian monsoon region in spring.

Keywords: Asian monsoon circulation, Vector Field Evaluation, vector wind, precipitation, model performance

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D3-P-08

Contribution Assessment of Multiple Bias Correction for Summer Extreme Precipitation in BCC-CSM1.1-m over Yangtze-Huaihe River Basin in China

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For the BCC-CSM1.1-m, four statistical bias correction methods, which including the Linear scaling (LS), Quantile mapping (QM), Distribution mapping (DM) and Cumulative distribution function transform (CDFT), are introduced to evaluate their performance in correcting summer daily precipitation, especially extreme rainfall over Yangtze-Huaihe River Basin (YRB) in China. BCC-CSM1.1-m has much better performance in climate simulation over China, but still has evident deviation in the daily rainfall especially extreme precipitation in YRB. After the multiple bias correcting, the simulating ability can be significantly improved, but with different performance in different sides. Of which, the QM has the most significant improvement in the probability distributions of daily precipitation and area mean rainfall, and CDFT comes second. For the spatial consistency of six extreme precipitation indices, LS, QM and CDFT have better simulation capabilities in the total precipitation and moderate rainy days. Meanwhile, only QM can well correct the rainfall days, precipitation intensity and 95% quantile precipitation. For example, the averaged relative errors for 95% quantile precipitation are reduced from -57.8 to -2.8%, and the spatial correlation coefficients are increased from -0.12 to 0.64. It is noted that the continuous dry days, overall, are failed to be well corrected.

Keywords: Bias Correction, Statistical Downscaling, Extreme Precipitation

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D3-P-09

The southern African climate under 1.5 °C and 2 °C of global warming as simulated by CORDEX regional climate models

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Withdrawal

Results from an ensemble of 25 regional climate model simulations from the Coordinated Regional Downscaling Experiment Africa initiative are used to assess the projected changes in temperature and precipitation over southern Africa at two global warming levels (GWLs), namely 1.5 °C and 2.0 °C , relative to pre-industrial values, under the Representative Concentration Pathway 8.5. The results show a robust increase in temperature compared to the control period (1971–2000) ranging from 0.5 °C –1.5 °C for the 1.5 °C GWL and from 1.5 °C –2.5 °C , for the 2.0 °C GWL. Areas in the south-western region of the subcontinent, covering South Africa and parts of Namibia and Botswana are projected to experience the largest increase in temperature, which are greater than the global mean warming, particularly during the September–October–November season. On the other hand, under 1.5 °C GWL, models exhibit a robust reduction in precipitation of up to 0.4 mm day−1 (roughly 20% of the climatological values) over the Limpopo Basin and smaller areas of the Zambezi Basin in Zambia, and also parts of Western Cape, South Africa. Models project precipitation increase of up to 0.1 mm day−1 over central and western South Africa and in southern Namibia. Under 2.0 °C GWL, a larger fraction of land is projected to face robust decreases between 0.2 and 0.4 mm day−1 (around 10%–20% of the climatological values) over most of the central subcontinent and parts of western South Africa and northern Mozambique. Decreases in precipitation are accompanied by increases in the number of consecutive dry days and decreases in consecutive wet days over the region. The importance of achieving the Paris Agreement is imperative for southern Africa as the projected changes under both the 1.5 °C , and more so, 2.0 °C GWL imply significant potential risks to agricultural and economic productivity, human and ecological systems health and water resources with implied increase in regional water stresses.

Keywords: 1.5 degree, CORDEX, Southern Africa, Global warming

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D3-P-10

onset variation under 1.5 and 2.0 degree

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In this work we are looking the variation of the onset date on a single pick rainy season under 1.5 and 2 degrees C. We used the donwscaled CORDEX data simulated by multimodel ensembles over Senegal. Results show a shift of the onset dates and the frequency of dry spells after the onset dates.

This has implication on agricultural activities over west africa which depends most of the population and thus an impact on the economy which relies mostly on rainfed agriculture.

Keywords: onset, agriculture

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D3-P-11

Enhanced dryness and drought over Indonesian region under global warming of 2°C and 4°C and possible combined effects of climate change and El Niño

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Indonesian region, especially Sumatera and Kalimantan, is known to experience drought in months of June to October during El Niño. During strong El Niño, the anomalous Consecutive Dry Days (CDD) can be more than 50% compared to normal years. While we experience such dry condition inter-annually in the current climate because of El Niño-induced condition, in future such dryness is projected to occur annually in months of June through October if climate change is not fully mitigated. Under RCP 4.5 and 8.5, CDD of multi-model simulations of CORDEX Southeast Asia showed Indonesian region is projected to experience robust and significant increase in dryness when global mean temperature reaches 2oC above pre-industrial level. The level of dryness is projected to further increase when global mean temperature increase reaches 4oC. While the inter-annually occurring dryness and drought experienced during El Niño in the current climate exerted tremendous environmental and socio-economic implications, the annually occurring dryness and drought because of climate change would cause much greater impacts. However, in future years when El Niño is also occurring, the combined effects of unmitigated climate change and El Niño could enhance the dryness and drought over Indonesia to unprecedented level.

Keywords: CORDEX Southeast Asia, dryness and drought, Consecutive Dry Days, El Nino, Indonesia

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D3-P-12

Climate Change projection for the Uttarakhand, India using CORDEX South Asia model

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The possible consequences of climate change are yet to be understood as it's a major global environmental and developmental problem. It is now established that adverse impacts are likely from an increased frequency of extreme weather and extreme climate variability where natural calamities such as Landslide, Flood, Cloud Burst, Flash flood, Drought etc.

In this study, climate change projections for the Uttarakhand State is carried out using outputs of high resolution Regional Climate Models (RCMs) from the Coordinated Regional Climate Downscaling Experiment program (CORDEX). It represents the trend of temperature and precipitation with their comparison. The resolution of both gridded data is 0.25 x 0.25 at global level where the CORDEX South-East Asia modelled climate data includes 12 models. The study is based on selected parameters Precipitation, Maximum Temperature, Minimum Temperature & Mean Temperature. The RCP 4.5 (moderate emission) and RCP8.5 (high emission) scenarios is to be used in this study. The processed climatic data represents Mid-Century (2021-2050) and End-Century (2070-2099) with respect to the Base-Line (1976-2005). For both emission scenarios, increase in annual and seasonal minimum temperature is projected for Uttarakhand and its district towards MC and EC. Heavy and extreme precipitation is projected to increase for majority of districts towards MC and EC as compared to BL.

The socio-economic development in developing country like India is partially effected by impact of Climate Change. Local adaptation is the only possibility for reducing those impacts. Scientific study helps in formulation of effective adaptation strategies. This study will be use in policy making and adaptation & mitigation strategies for the state of Uttarakhand.

Keywords: Representative Concentration Pathways (RCP's), Temperature, Precipitation, Adaptation, Mitigation

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D3-P-13

Changes in the land-atmosphere interaction in the Congo Basin: processes driving the decline of precipitation recycling ratio under 1.5°C and 2°C global warming levels in CORDEX Model

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This study investigates precipitation recycling in the Congo Basin (CB) using Swedish Regional Climate Model RCA4. The model was driven by eight General Circulation Models (GCMs) from the Coupled Model Intercomparison Project Phase 5 (CMIP5). Responses to the global warming of 1.5°C and 2°C levels under the representative concentration pathways (RCPs) 4.5 and 8.5 were analysed. Results indicate that RCA4 captures reasonably well patterns and modes of variability of CB recycled precipitation although some uncertainties exist between observed and simulated fields. Existing seasonal biases thought to be due to combined effects of boundary conditions and the RCM inherent errors. Empirical Orthogonal Functions show that the spatial pattern of the recycling rate (RR) displays a dipole in the CB, explaining two distinct mechanisms that control the recycling process. Over the northern sector (2°S-5°N; 12-30°E), the soil moisture seems to control the RR whereas on the southern part (2-10°S; 12-30°E), the solar radiation is found to be the main driver of the precipitation recycling. The CB will experience a general decline of the RR, more robust under RCP8.5 and larger amplified at 2.0°C of global warming.

Keywords: precipitation recycling, Congo basin, global warming levels, Regional Climate Model RCA4

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D3-P-1'

Detecting regions highly sensitive to drought events in China based on multiple soil moisture data

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Drought events have great impacts on agricultural production, social economy and human life. The frequency and intensity of drought events shows large spatial heterogeneity, thus the regions which are highly sensitive to drought events needs to be identified. In this paper, multiple long-term soil moisture products are evaluated in comparison to in-situ measurements in China, then the product with highest quality is selected to explore the location and evolution of the regions highly sensitive to drought events in China. The evaluation of the soil moisture products is conducted at both local and regional scale from 1992 to 2013. According to the Brunke ranking method, ESA CCI performs best among the evaluated soil moisture products, followed by ERA-Interim, NCEP/DOE-R2 and NOAA/CIRES-20CR. Soil moisture drought (SD) events were then defined using ESA CCI soil moisture data. Results show that SD events occur more frequently in the semi-arid and some parts of arid area of China, and have increased significantly since 1987. Flash drought (FD) is an extreme event that comprehensively reflects the characteristics of drought and heat wave. From 1979 to 2014, FD events increased by more than 115% in China. The high temperature driven FD is more likely to occur in wet and semi-humid areas, while the low soil moisture driven FD are more frequent in arid and semi-arid areas.

Keywords: climate change, soil moisture, soil moisture drought, flash drought, China

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D3-P-15

Impact of global warming levels on photovoltaic power generation over West Africa

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Many West African countries are plagued with poor electricity. An abundance of solar irradiance over the region makes solar energy an attractive solution to the problem, but there is a dearth of information on how the ongoing global warming and solar dimming at a specific level may alter the solar energy over the region in the future. This study investigates the impact of climate change on photovoltaic power generation potential (PVP) over West Africa under various global warming levels. Fourteen regional climate model simulations from the Coordinated Regional Climate Downscaling Experiment (CORDEX) were analysed for the study. The capability of the simulations to reproduce climate variables (surface-downwelling shortwave radiation, Rs; air temperature, Ts; wind speed, Ws; and relative humidity, Rh) over West Africa was quantified. The simulated PVP were also compared with the observed. The impact of climate change on simulated PVP over West Africa was examined at four global warming levels (1.5°C ; 2.0°C ; 2.5°C and 3.0°C) under the Representative Concentration Pathways 8.5 (RCP8.5) climate change scenario.

The results show that the CORDEX simulation ensemble captures the spatial distribution of climate variables (Rs, Ts, Ws and Rh) and PVP over West Africa, though with few biases. It also reproduces the annual cycle of these variables over the different climatic zones. The simulation and observation agree that PVP over West Africa ranges from 8% along the Guinea zone to 25% over the Sahel zone, and that the annual cycle of PVP is influenced by the seasonal variation of the monsoon system. The simulation ensemble projects a decrease of PVP over West Africa in the future and indicates that the magnitude of the decrease grows with warming levels. The decrease in PVP is attributed to a decrease in Rs (solar dimming) and an increase in ambient temperature induced by global warming. Nevertheless, the spatial and temporal distribution of the PVP changes are more influenced by Rs changes than by Ts changes, such as at GWL1.5, an increase in PVP is projected over all zones during the rainy season when an increase in Rs is projected. A decrease in projected PVP is also projected over all the countries. Nevertheless, the maximum decrease in PVP projected over any country or zone in the region is less than 3.8% even at GWL3.0. Hence, the study suggests that ongoing global warming may have an influence on PVP over West Africa.

Keywords: Solar Energy, Global warming

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D3-P-16

Fine structure and sensitive areas in China under 1.5/2.0°C warming as indicated by extreme climate events

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The Paris Agreement aims to keep global average temperature rise well below 2.0°C and better to limit the temperature increase no more than 1.5°C above pre-industrial levels by the end of this century. To detect the regions highly sensitive to extreme events under 1.5/2.0°C warming scenarios, we perform dynamic downscaling using output data from CESM low-warming experiment and Weather Research and Feasting model (WRF). Our results show that arid and semi-arid regions such as North, Northwest and Northeast China are more sensitive to extreme temperature events under 1.5/2.0°C scenarios. Extra 0.5°C warming restriction can significantly reduce the risk of extreme temperature events. WRF simulated frequency and intensity of extreme temperature events in China under 1.5/2.0°C warming scenarios is larger than that simulated by CESM. At the same time, WRF shows that larger risks of extreme temperature events can be avoided from controlling extra 0.5°C warming, suggesting that the benefit of extra warming control tends to be estimated by CESM. WRF results show that more frequent and intense extreme precipitation events occurs over the Tibetan Plateau, Southwest China and Northeast China under 1.5/2.0°C warming scenarios. While the bias in the extreme precipitation events between WRF and CESM as well as between 1.5°C and 2.0°C scenarios show a large spatial heterogeneity among all analyzed indices, indicating a large uncertainty remains in the extreme precipitation events.

Keywords: 1.5/2.0°C warming, Sensitive Areas, downscaling,WRF

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D3-P-17

Peak forecast of carbon emissions under climate change background: A case study

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The Paris Agreement sets the target of controlling the increase of the global average temperature within 2 degree by 2050 comparing to pre-industrial level, which will push the carbon discharges peak coming as early as possible at global and regional level. IPCC has set the new Shared Socio-economic Pathways (SSPs) to realize the climate targets by different combination of climate adaptation and mitigation options in social and economic developments. Anhui Province is chosen as a regional case study to discuss how regional carbon emission peaks under different SSPs framework, as it is a major energy production and consumption province in China. This paper uses ridge regression to fit the expanded STIRPAT carbon emission model in Anhui Province, and selects five indicators: population size, per capita GDP, energy intensity, urbanization rate and secondary industry ratio. Under the five scenarios of sustainable path (SSP1), intermediate path (SSP2), regional competition path (SSP3), unbalanced path (SSP4) and fossil fuel-based development path (SSP5), the future Carbon discharges peak value and time of Anhui Province from 2016 to 2030 are predicted and analyzed respectively. Relevant policy suggestions are put forward to ensure the smooth implementation of Anhui Province's low-carbon development plan and sustainable development.

Keywords: Carbon emissions, Peak prediction, STIRPAT model, SSPs

Parallel Session D: Domain/cross-domain meetings, Convection permitting models

D3: Regional responses to global warmings of 1.5 and 2°C

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Projected change of precipitation over China under 1.5°C and 2°C based on model performance and independence

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A weighting scheme which considering both model performance and independence (PI-based weighting scheme) was applied to investigate the change of average and extreme precipitation over China under the 1.5°C and 2°C warming above preindustrial. Compared to the Rank-based ensembles and the simple arithmetic mean ensemble, the PI-based ensembles achieved significant improvements to simulate temporal and spatial patterns in precipitation simulation, especially in western China. Averaged bias over china was decreased in all climate index (PRCTOT:9%, RX1day:5%, RX5day:5% R95p:11%).

The model projected tendencies of PRCTOT, RX1DAY, RX5DAY and R95P values increase for both the 1.5 °C and 2 °C warming levels under RCP 4.5 and 8.5 scenarios by three different schemes across the whole China. The spatial distribution of PRCTOT for the three schemes follow a similar pattern, but PI-based scheme shows large percentage increases at the Southwest for both 1.5 °C and 2 °C warming levels under two scenarios. The PI-based scheme shows an average 4 percent increase in PRCTOT for the whole China. Northwest and middle part of the study region in both scenarios show a bigger decline in precipitation than Rank-based and MME results. Similar results can be found in RX1DAY, RX5DAY and R95P. Comparing to 1.5 °C , PRCTOT \RX1DAY\RX5DAY\R95P increase more obviously at 2 °C warming levels, especially on west and northwest. All indices decrease in middle region and west marginal region. There is a bigger increase in R95P under 0.5 difference with the maximum value exceeding 20%.

Keywords: 1.5 /2.0°C global warming, precipitation projection, CMIP5 model