Parallel Session B:
Coupled Models

B1: Atmosphere-land

POSTER PRESENTATIONS

Parallel Session B: Coupled Models

B1: Atmosphere-land

B1-P-01

Contribution of Urban Heat Island on Landscape Composition and Its Impact to the Land Surface Temperature (Case Study on Palembang City-Indonesia)

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Palembang as the capital of South Sumatra Province, and also famous as the host of the Asian Games 2018 has high development activities along with the increasing population. Development carried out through the diversion of land functions into built-up land causes an increase in surface temperature which triggers the urban heat island phenomenon. This study aims to discuss the phenomenon of Urban Heat Island in Palembang City and its relation to land composition and population density on surface temperatures obtained from the processing of multi-temporal Landsat Images in 1989, 2001, 2018, with the specification of cloud-free (clear sky) using the Land Surface Temperature (LST) algorithm and guided classification (supervised). The results of surface temperature, population density, and land composition were then carried out simple regression tests. The distribution of the UHI phenomenon is obtained by classifying LST to obtain the UHI threshold. The results showed a link between changes in surface temperature, population density and land composition. The value of the determinant coefficient (R2) between the relationship of changes in surface temperature which is directly proportional to the increasing population, the increase in the area of each open land and built-up land reached 62.6%, 86.3%, and 55.0%. Conversely, there is a negative link between surface temperature and dense vegetation with a determinant coefficient reach 90.4%. The affected area of UHI is located in the center of Palembang, reaching 33.5 km2 of the total area of Palembang City in 2018. It is necessary to have an ideal city mitigation and arrangement by calculating the green area with the increasing population in Palembang City.

Keywords: Urban Heat Island, LST, Landsat

Parallel Session B: Coupled Models

B1: Atmosphere-land

B1-P-02

Diurnal cycle of precipitation and atmospheric humidity flux in South America: role of land-atmosphere interactions

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Model accuracy of the timing of precipitation in its diurnal cycle is as important as that of the daily mean to correctly represent climate, but nevertheless it is often overlooked. We analyzed the diurnal cycles of precipitation (DCP) and convergence of atmospheric humidity over South America in the wet season (October through March), using two regional climate models (RCA4 and LMDZ). The simulations were compared with two satellite-derived products and one reanalysis. Consistent with previous results, these RCMs have a wrong representation of the DCP because precipitation is being unrealistically triggered too easily. Both models showed qualitatively similar errors in the DCP compared to reference data. However, the humidity flux convergence - a necessary condition for a correct rainfall simulation - and its diurnal cycle at the continental scale were satisfactorily captured compared to the reanalysis. We speculate that the boundary layer evolution and its thermodynamic properties could be sensitive to the coupling between the soil and the atmosphere. In order to explore if the diurnal cycles of convection and different properties of the boundary layer are sensitive to the land-atmosphere coupling, an additional run was performed with each RCM: an Uncoupled experiment that shares the same set-up as the control (coupled) one, except that its soil-moisture evolution at each day is replaced with the climatology of the control for that day, uncoupling the land surface from the atmosphere. The main results of this experiment will be presented during the conference.

Keywords: diurnal cycle, south america, precipitation, atmospheric humidity flux convergence, land-atmosphere coupling,soil moisture

Parallel Session B: Coupled Models

B1: Atmosphere-land

B1-P-03

Land surface contributions to the amplification of Australian heatwaves via local land-atmosphere coupling

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Climate change is likely to increase the frequency, intensity and duration of heatwaves, particularly over Australia. Heatwaves pose a significant risk to ecosystem and human health as evident in the impacts of several well documented case studies, including the 2003 European heatwave, the 2010 Russian heatwave and the 2012/2013 summer in Australia. Heatwaves are generally associated with the clear skies, increased subsidence, warm air advection and prolonged heat arising from persistent quasi-stationary high-pressure systems. However, land surface conditions have been shown to have an influence on amplifying the surface temperatures experienced during a heatwave. Most analyses to date focus on the role anomalous soil moisture conditions preceding exceptional events (e.g. the 2003 European heatwave). However, in general it is not known how much the rate of land surface drying, through land-atmosphere interactions, both before and during a heatwave contributes to the intensity of these extreme events. Therefore, in this study we examine how the rate of land surface drying preceding a heatwave event contributes to heatwave intensity. Here we focus on Australian heatwaves using both observational data and model output from the CORDEX AustralAsia project. We find that rate of land surface drying prior to a heatwave event influences the magnitude of temperature anomalies experienced but only over regions where there is strong coupling between the land and the atmosphere. We also find that heatwaves are triggered more frequently over regions where there is strong land-atmosphere coupling. Time permitting, we will also present new results distinguishing between dynamical and non-local land surface contributions.

Keywords: land-atmosphere interactions, heatwaves

Parallel Session B: Coupled Models

B1: Atmosphere-land

B1-P-04

Response of LUCAS-models to forestation and afforestation in Europe under dry, wet and hot climate conditions

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Within the CORDEX Flagship Pilot Study LUCAS - "Land Use and Climate Across Scales", the bio-physical impacts of land-use and land cover changes (LULCCs) on the regional climate in Europe are currently extensively investigated. An ensemble of different regional climate models (RCMs) coupled to diverse land surface models (LSMs) has been set up to perform idealized experiments with extreme LULCC scenarios for the EUR-44 domain driven by ERA-Interim. In the first scenario, Europe is covered with forest where trees can realistically grow (FOREST), while in the second scenario all forests are turned into grassland (GRASS). An evaluation run (EVAL) with the individual model land surface distributions was also conducted for each participating RCM-LSM. The responses of the RCM-LSM ensemble to the two extreme LULCC scenarios show robust seasonal signals for some regions and some variables but also disagreements between the different RCM-LSM.

In this study, the influence of atmospheric conditions on the responses to the extreme LULCC is investigated to understand the inter-model differences and to asses the robustness of the responses. This is done by analyzing differences between the FOREST and GRASS simulations under dry, wet, and hot climate conditions. Dry and wet climatic conditions are detected using two different methods. For the first method, the five wettest and five driest years are determined in the EVAL runs for each

PRUDENCE region and season. The second method is based on the standardized precipitation index (SPI), computed from the monthly precipitation in the EVAL runs. Months with a low (high) SPI over the majority of the corresponding region are defined as dry (wet) conditions. Regional scale hot conditions are detected using the hot season definition. The differences in near-surface variables between the FOREST and GRASS simulations are then averaged for the different climatic conditions and compared to the average response computed for the whole period.

Keywords: LUCAS, Land-use and land cover change, extreme climate conditions

Parallel Session B: Coupled Models

B1: Atmosphere-land

B1-P-05

Indian Summer Monsoon in a coupled land-atmosphere regional downscaling experiment

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One of the visions of the CORDEX project is to evaluate and improve different regional climate downscaling techniques through testing different models over a common area. In this regard, the capability of regional climate model RegCM4 forced with two different GCMs and three different land-surface parameterization schemes (i.e. BATS, CLM4.5, and Subgrid-BATS) in simulating the mean features of Indian Summer Monsoon is tested for the present climate (1975-2005). The selection of the GCMs (MIROC5 and CCSM4) were made on the basis of their ability in representing the seasonal mean, inter-annual and the intra-seasonal variability of monsoon over the Indian region based on the available literature. In total, 6 different long term simulations were carried out and assessed in terms of seasonal mean near surface air temperature, precipitation and low level wind fields for June-September season over CORDEX-South Asia domain. Among all the experiments, MIROC-RegCM-CLM4.5 experiments outperform others in simulating the JJAS seasonal mean precipitation and wind climatology with comparatively less dry bias over the Indian region. The model performance were assessed in terms of Taylor's metric (for seasonal mean precipitation, temperature, zonal wind, meridional wind and total cloud fraction), mean annual cycle, Index of Agreement, Normalized Root Mean Squared Deviation, and Probability distribution function over the Indian landmass region. The model experiments were found to simulate the moderate precipitation events more accurately than higher intensity precipitation events when compared with IMD observations. The inherent biases in the model simulations are attributed to the weaker meridional wind simulation in the experiments along with restrained vertical motion during monsoon especially in case of those forced with CCSM4 GCM. This emphasizes the importance of appropriate GCM forcing as well as land surface parameterization scheme for the simulation of a coupled land-ocean-atmosphere system such as Indian Summer Monsoon.

Keywords: RegCM4, CLM4.5, CORDEX-South Asia, Monsoon, Downscaling

Parallel Session B: Coupled Models

B1: Atmosphere-land

B1-P-06

Regional climate impact assessment of vegetation change in Loess Plateau: Combining WRF-Noah model and long time series satellite observations

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Loess Plateau (LP), a pilot region with arid and semi-arid climate in China, has undergone significant vegetation change since the launch of the 'Gain for Green' Program (GGP) in 1999. As the aim of GGP to increase forest cover and control soil erosion, parts of agriculture land have converted to forests and grassland. The net warming or cooling effect of afforestation in this region is still uncertain, depending on the competing contributions of albedo and evapotranspiration as well as background climate. Further, it is reported that vegetation change has altered the rainfall distribution and frequency in LP.

With the availability of decades of satellite observations, the transition of land cover types and change of vegetation status can be represented realistically. Through incorporating this information into the static field of coupled atmosphere-land regional climate model, it is expected to quantify the climate effects due to vegetation change.

The objective of this study is to investigate how surface air temperature and precipitation response to vegetation change due to government policy in LP, through combining multiple long time series satellite products from 1982 to 2016 and WRF-Noah model. To highlight the effect of GGP and avoid sensors calibration issue, the whole temporal range is divided into two periods: 1982-1999 and 2000-2016. Contrasting sensitivity experiments are conducted using real vegetation observations and static vegetation background to isolate the effects of vegetation change.

Keywords: Vegetation Change, Climate Effects

Parallel Session B: Coupled Models

B1: Atmosphere-land

B1-P-07

The study of the surface roughness length and its application in the NoahMP on the northern of the Tibetan Plateau

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This study focuses on the temporal and space variation of the roughness length on the northern of the Tibetan Plateau. The figures show that there is the distribution of the surface aerodynamic roughness of 40000km2 around BJ site (BJ site is in the center, time is taken on the 15th of each month). It can be seen from the figure that the surface roughness of the area shows a decreasing trend from January to February, which may be due to snowfall and other reasons, resulting in a small surface roughness and a continual decrease in surface roughness. From February 15 to March 15, the z0m has recovered somewhat in a month as figure C is basically consistent with figure A, it indicates that the z0m has reached to its lowest, it could indicate by snowfall must begin to melt, and the contribution of the complex underlying surface environment to z0m is enhanced. On March, April, May z0m continues to increase, and the vegetable low growth in these three months, the monthly chart changes are not large. These figures show the coverage of the surface is indicating the complexity of the surface, whether the surface or vegetation will have an important impact on the z0m. From March until August, z0m has been on a rising trend. Corresponding to the obvious changes of relative humidity, temperature and pressure brought by the summer monsoon mentioned above, the height and coverage of surface vegetation are all increasing. Therefore, z0m is also constantly increasing, reaching its peak in August. It is noteworthy that the change from May to June is very significant. This may be due to the start of the corresponding plateau summer monsoon in June, which will lead to the increase of precipitation. After the precipitation increases, the growth of vegetation will accelerate and the z0m will rapidly increase. June, July, August three months, due to continuous precipitation and other reasons, leading to plant growth is very strong, but grow to the maximum no longer grow, corresponding to the map is the maximum surface roughness has not changed, but due to the abundant water, the z0m gradually expanded in the past three months and reached the maximum area in August. From September to December, with the decline of plateau monsoon, some changes have taken place in temperature and relative humidity, compared with the prevailing summer monsoon, which are no longer suitable for the growth of vegetation. From this month, the vegetation contribution to z0m is gradually weakened, and the height and coverage area of z0m gradually decrease. Therefore, z0m also decreases continuously and the range begins to decrease. In December, the z0m area near BJ site sudden decrease may be due to snowfall.

It can also be seen from the above simulation that the z0m changes not only impress with the time scale but also with the spatial scale. From these figures of the characteristics trend, we can see that the underlying surface has different complexity, the trend of the z0m is different. After inverting the satellite remote sensing data, we also get the variation of z0m of 40000 km2 around the BJ station at northern Tibetan Plateau in 2008, which shows the data decrease from Jan. to Feb. It reaches its peak in Aug. and then decrease again. This annual variation is to some extent related to the plateau summer monsoon and snowfall. Besides, the vegetation height in dry seasons is low, so the z0m is determined mainly by the relief of land surface in dry season. On the other hand, improved roughness length was

applicated in the NoahMP simulation process and the simulated results were evaluated using observation.

Keywords: the roughness length,numerical simulation,Tibetan Plateau

Parallel Session B: Coupled Models

B1: Atmosphere-land

B1-P-08

Probable deviations of air temperature in the surface layer of arid regions of Armenia in the context of global climate change

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Today the effects of climate change are felt around the world and Armenia is not an exception. Armenia is characterized by vulnerable mountainous ecosystems, arid climate, an active process of desertification and natural disasters are often observed, which makes the country more vulnerable the impacts of climate change. The air temperature has a main role in the forming of atmosphere circulation, evaporation and moisture regime of territory. That is why the air temperature study is an important task and caught our attention. So, clarifying and estimation of regularities of temporal distribution of air temperature importance, especially for more accurate definition of thermal balance, for productive using of thermal resources.

For solving of suggested problems as a theoretical base have been used appropriate researches, as a raw material - actual data of long-term observations of air temperatures the meteorological station of the territory of republic for last 100 years, which are kept in fond Armstatehydromet. In work have been applied methods: mathematic-statistical, geographical, extrapolation, analysis, correlation, complex.

Average data of air temperature observations in Armenia at meteorological stations for the period of 1935-2017 has been analyzed.

In study area the values of average annual air temperature are within 14.3 ºC (Meghri) and -2.6 ºC (Aragats). During the year the warmest months are July-August, with average monthly temperature 9.0…27.0 ºC, and the coldest month are January with average monthly temperature -12.7…1.5 ºC.

In Armenia air temperature changes have been estimated for different periods, and results have been used in first and second national messages of Climate Change of RA. The results show, that during last ten-years period in Armenia observes increasing of air temperature. During 1935-96 period for comparison to basic period (1961-1990) average annual temperature increased on 0.4 ºC, in 1935-2007 period – 0.85 ºC, in 1935-2012 period - on 1.03 ºC. It means that the temps of temperature increasing increased. Since 1994 the deviations of average annual temperature in comparison with average temperature in 1961-1990 were only positive.

By the forecasts of ECHAMS, GFDL, GISSER, HadCM3 models in Armenia predicts annual increase of air temperature for 1.1-1.5 ºC in 2011-2040, 2.0-3.0 ºC in 2041-2070, and 3.5-5.5 ºC – in 2071-2100. So, in the results of studies we have the following conclusions and suggestions:

In perennial observations notes a tendency of increase of annual average values of air temperature;

- have been made many researches, but there are not studies systemized of reasons of air temperature change yet, and existed are just for some sides of it. So, is better to continue studies and to develop future forecasts, using new models;

- estimation of problems of air temperature dynamics change will get right solving, when will be known the relations, which it have with other components of nature area complex in conditions of direct influence of human.

Is necessary:

- providing of meteorological stations with modern equipment (especially automatic);
- evaluation of the vulnerability of ecosystems as a result of changes in air temperature;
- realization legal-organization, institutional, technical arrangements for adaptation of economy to new natural conditions and soften of climate change consequences;
- strengthening of scientific studies of climatic problems and implementation of new technologies;
- working out of real climatic scenarios;
- working out of the programs for softening the negative effects of air temperature change;
- financial satisfy support from government and other donor organizations made implementations must be visible for society, directed for realization of specific programs and have control by some organs;
- providing of modern ways of availability and outspread of information;
- working out and implementation of qualification programs, organization of studying processes, development of specialists' qualification;
- realization and providing international scientific-educational cooperation, strengthening of inter-agency cooperation.

Keywords: air temperature, arid regions, probable deviations, global climate change, Armenia

Parallel Session B: Coupled Models

B1: Atmosphere-land

B1-P-09

Dynamics change of annual number of atmospheric precipitation of Arabat physical geographical arid region in global climate change context

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The atmospheric precipitation change is a reason of different dangers ecological situations manifestations. Need to study the cause-and-effect relationships of precipitation change became more vital since the late 20th century, when it became clear that the sustainable development of the society due to climate components protection

So, considering the above, studied and evaluated the dynamics change of annual precipitation of an important agricultural region of the republic, Ararat valley, clarified the distribution patterns, revealed the challenges of sphere.

For solve these problems as a theoretical and informative basis served appropriate studies, published works, decisions of the Armenian government, reports, development programs, projects, working plans. As a starting material used actual date of long-term observation of atmospheric precipitation (1935-2015) of meteorological stations of Armstatehydromet of MES of RA of study area, as well as climatic reference-books. As a methodological basis used geographical, mathematics-statistical, extrapolation, matching, comparison, analysis, correlation methods.

The tasks of atmospheric precipitation change discussed and studied by the results of actual data of separate meteorological stations. As a result of the study revealed, that in the region observes regular spatial distribution of dynamics change of the number of precipitation during the year. Thus, at the territory of Ararat valley is noticed increase of amount of annual precipitation until 1300m height, and on greater heights-tendency of decrease. But it does not means, that humidification and artificial irrigation issue of valley are resolved. The reason is, that at low zone due to high air temperature and its increase tendency is great the evaporation, therefore, the loss of precipitation also. On the other hand, on the territory of the RA the river runoff is formed at 1800m and more heights mainly. And in this zone observes only a decrease tendency of precipitation. So, it is necessary to manage and use right the water resources from atmospheric precipitation, especially in the context of the global climate change.

According to regional climatic models (Armstatehydromet) in Armenia is expected an increase of annual temperature on 1.1-1.5ºC in 2011-2040, 2.0-3.0ºC - in 2041-2070, 3.5-5.5ºC – in 2071-2099 and decrease of annual precipitation appropriately on 5-10%, 10-15%, 15-25%.

Thus, in the result of such change of atmospheric precipitation will observed a violation of natural ecosystem balance, particularly an aridity of climatic conditions, sail degradation, biodiversity violation. So, it is necessary to evaluate precipitation change with ecosystem approach, by separate physical-geographical regions or river basins, to work out appropriate programs of consequences mitigation and adaption events, taking into account local features of any area.

In the result of studies we came to following conclusions and proposals:

- The atmospheric precipitation belongs to that meteorological elements, which characterized with more local features of spatiotemporal distribution;
- The number of precipitation regularly increases from low regions of valley to south-eastern slopes of Aragats. Maximum annual number of precipitation(988 mm), in the Republic also, observes at Aragats meteorological station, minimum number (166 mm) – at Taronik meteorological point;
- On the result of study has negative effect a circumstance, that in study area meteorological stations and points are located until 1200m height mainly, at 1300-2000 m height their number is 2;
- Until 1300 m height is observed a tendency of increase of annual number of precipitation, and more higher – a tendency of decrease;
- In the conditions of conservation of such cause of precipitation change, probably, will be growth of aridity of the region, intensive soil degradation.

  It is necessary

- Providing of continuous comprehensive and systematic scientific studies of dynamics change of precipitation, investment of new programs and technologies;
- Providing of homogeneity, continuity and reliability of observations of actual data series;
- Training professionals, organizing of training courses continuously;
- Improving of information and notification systems;
- Evaluation of vulnerability of ecosystems due to precipitation change;
- Reserving of water of small streams and rivulets of upland areas during humid period for irrigation relatively dry areas in dry season in low areas;
- Mitigation of legal-organizational, institutional, technical events for softening of effects of atmospheric precipitation change and adapting of economy to new natural conditions.

Keywords: atmospheric precipitation , global climate change, Ararat physical geographical, arid region

Parallel Session B: Coupled Models

B1: Atmosphere-land

B1-P-10

Forecast of Planting Calendar for Sorghum (Sorghum bicolor) from Downscaling Method in Kivu Mountain, DR Congo

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Assessing impact of climate change on Sorghum production and analysis of future adaptation measures bears enormous advantages in general and in South Kivu in particular, owing to the country's low adaptive capacity. The analysis shows that climate change will reduce Sorghum production in South Kivu Mountain through time horizons i.e till the year 2030s, 2050s and 2080s.This study was conducted to characterize climate, assess its impact on Sorghum production and identify management options for the climate future dates in South kivu Mountain DR Congo. Daily climate data, normalized large scale Hadley Centre coupled Model version 3 model predictors and crop and soil data were analyzed. Past and present climate variability characterization was assessed through seasonal rainfall amount, monthly rainfall statistics and dry spell length using R analytical tool and INSTAT climate guide. Temperature variability was examined in terms of pattern and trend. For future projection, Climate change scenarios for rainfall, minimum and maximum temperatures were developed for the period 2001-2099 by using the Hadley Centre coupled Model version 3 under A2a and B2a Special Report on Emission Scenarios using Statistical Downscaling Model version 4.1software. Decision Support System for Agro-technology Transfer, crop model was used to simulate future changes in Sorghum and to determine best adaptation measures in Kivu area under modified environment. Seasonal rainfall amount was found to decrease with significance for 42 years period ($P<0.05$) while monthly rainfall statistics showed a high variation (CV of 80.6 to 34.4 % across months). Minimum and maximum temperatures showed an increasing trend at inter annual scale (0.21ºC per decade and 0.14ºC per decade respectively). The future projection analysis showed a decreasing trend of annual rainfall and increasing trend for temperatures during the period from 2001-2099. Accordingly, the average annual minimum temperature was found to rise in 2020, 2050 and 2080s for A2a and to decrease for B2a emission scenarios. While maximum temperature was predicted to increase in 2020, 2050s and 2080s under both emission scenarios. In 2080s, the average annual maximum temperature increment would be high for B2a scenarios. The crop model simulation indicated a positive impact on the cultivars across climate change scenarios relative to baseline due to climate change by 2100s. As adaptation options under changed climate conditions, And best agricultural practices have been found to be a combination of late planting date, high plant population and high fertilizer application rate. The cultivar has been found to be more sensitive on high fertilizer application rate. Therefore, growing cultivar under future climate condition with improved management options such as high fertilizer application rate, improved soil water and planting in third dekad of July could ensure high yields during a good rainy season. Likewise, good yield could also be observed during a poor rainy season.

Keywords: Downscaling, scenarios, Crop Model, ,Sorghum

Parallel Session B: Coupled Models

B1: Atmosphere-land

B1-P-11

Land surface temperature in high resolution simulations with RegCM over Southeastern Brazil

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With the refinement of the horizontal resolution of the regional climate models, satellite observations have become a source of information to validate the simulations. In this context, land surface temperature (LST) from Moderate-Resolution Imaging Spectroradiometer (MODIS) was used to validate two Regional Climate Model (RegCM) version 4.6.1 simulations for southeastern Brazil. LST-MODIS is registered only in clear-sky conditions. Here, we used the LST from merging the products from the satellites TERRA and AQUA with 1 km of horizontal resolution for 2010-year. RegCM was driven by ERA-Interim reanalysis and was integrated with 5 km of horizontal grid spacing, using the Emanuel cumulus convection scheme and with different land-surface schemes: the Biosphere–Atmosphere Transfer Scheme (BATS) and the Community Land Model (CLM). These simulations were denominated RegBATS and RegCLM, respectively. Considering the whole simulation domain, RegBATS (RegCLM) has a tendency to underestimate (overestimate) the LST registered by MODIS. Focusing on the large urban centers of southeast Brazil (São Paulo, Rio de Janeiro, Belo Horizonte and Vitória), both simulations reproduce the LST annual cycle in agreement with MODIS. The greatest similarity in LST values between RegCM and MODIS occurs in the coastal regions (Rio de Janeiro and Vitória). For example, in Rio de Janeiro the LST mean annual bias is 0.9oC (-0.6 oC) in RegCLM (RegBATS). In São Paulo, RegCLM (bias of 0.6 oC) is closer to the MODIS, while in Belo Horizonte smaller bias is found in RegBATS (bias of -0.4 oC). The biases over these urban centers are relatively small since they are less than ± 1oC.

Keywords: land surface temperature, RegCM,MODIS

Parallel Session B: Coupled Models

B1: Atmosphere-land

B1-P-12

Projected trends of precipitation regime in Ukraine during the period of 2020-2050

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The projected spatiotemporal distribution of precipitation in different regions of Ukraine under the climate scenario RCP8.5 was defined. The data of the regional climate modelling project CORDEX EUR-44 have been used for construction time series of projected precipitation. For the Steppe and Forest-Steppe areas, trends of projected climate extreme indices for precipitation were assessed.

The analysis showed that the projected amount of summer precipitation will decrease over the territory of Ukraine, but unevenly in different decades. In the period of 2020-2030 precipitation amount will not change in the northern, central and western regions, but in the Crimea and the Carpathians will decrease by 17% and 38% respectively. In the southern and eastern regions precipitation amount will increase by 17-25%. During the period of 2030-2040 projected precipitation amount will decrease by 7–46% throughout the country, except for the western regions. In decade 2040-2050 an increase in precipitation by 13-15% is expected in the northern and central parts and in the Crimea. In the other regions the amount of precipitation will decrease by 5-38%.

The analysis of time series of the ALTCDD index shown that the number of dry days in all areas will increase and reach up a maximum in 2044-2045. During this period, is projected from 30 dry days in Forest-Steppe to 51 dry days in the southern Steppe.

According to projected trends of the SDII index the precipitation intensity will weakly increase in all regions. The highest intensity up to 5 mm/day will expected in the northern Forest-Steppe at the end of 2040s, when the general decrease of precipitation sums is expected.

The analisys of time series of the R95pTOT index showed that the amount of extreme precipitation will increase during the study period. A maximum amount is projected in the central and south-western Steppe regions, where it range from 115 mm/year in 2020s to 150 mm/year in 2038–2039.

Keywords: climate scenario, precipitation regime, climate extreme index

Parallel Session B: Coupled Models

B1: Atmosphere-land

B1-P-13

Climatic impact over South America caused by the Amazon deforestation during distinct Pacific Decadal Oscillation phases

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Numerical simulations indicate specific changes in the precipitation patterns, mainly during the summer period, over South America due to deforestation scenarios of Amazonian forest: precipitation decrease over adjacent and deforested areas, and, on the other hand, precipitation increase over the eastern South America sector. Diagnostic studies indicate a dipole-like precipitation pattern over the eastern side of South America during the positive and negative Pacific Decadal Oscillation, PDO, phases. In this study we verified the ability of the regional climatic model RegCM new version, RegCM4, in simulate the climatic variability on the decadal scale over South America, from 1970 to 2003.. Additionally, we sought to evaluate the climatic impact over South America due to the extrapolated Amazon deforestation for the year 2050, for the distinct PDO phases. The RegCM4 model was able to represent the precipitation dipole pattern observed over South America for the three PDO phases, although the dipole pattern is displaced southward than the obtained with the NCEP-NCAR reanalysis I precipitation. The deforestation experiment using extrapolated Amazon landuse provided a stronger increase of air temperature and precipitation over South America on the positive PDO phase if compared with the negative PDO phases. The next steps will allow quantifying the climatic impacts during El Niño events occurred on the distinct PDO phases.

Keywords: Amazon deforestation, regional model RegCM4, decadal variability

Parallel Session B: Coupled Models

B1: Atmosphere-land

B1-P-14

An analysis of extreme rainfall events over the Himalayan region using coupled models

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North-West Himalayan (NWH) region in Indian is highly vulnerable to extreme rainfall events. Due to intricate topography, the observational network is sparse in this region. Owing to the limitations with the satellite derived rainfall data sets over the mountainous region, it poses several challenges to the scientific community to analyse and monitor the heavy rainfall events. In a climate changes scenario, a substantial increase of heavy rainfall events over the NWH region is anticipated (Menon et al., 2013; Bharti et al., 2016 and references therein). Therefore, it becomes essential to improve forecasting skills of the regional models to minimise the disastrous impact of the extreme rainfall events on the livelihood of the region, however due to the availability of limited observational data sets, a comprehensive evaluation of the model derived rainfall forecast may not be carried out. Regional models those participated in the CORDEX project uses the boundary conditions derived by coupled climate CMIP5 models. Hence, it is also imperative to assess the coupled climate models in estimating the heavy rainfall events over the NWH region. In the present study 4 CMIP5 models are utilised for analysing the extreme rainfall events for various future warming scenarios (i.e. representative future warming scenarios: RCPs) for present years and towards the end of the 21st century. Present analysis suggests a substantial change in the extreme rainfall events distribution over the NWH region under the warmest future warming scenario RCP 8.5.

Keywords: North-west Himalayan region, extreme rainfall events, regional model, RCP 8.5

Parallel Session B: Coupled Models

B1: Atmosphere-land

B1-P-15

Institutionalization of Climate Adaptation Practices: A Case Study of Planned city of Chandigarh, India

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Cities seem to be very vulnerable to disasters and climate related risks occurring more frequently in recent past. The potential risks of disasters are putting pressure on city governments for devising knowledge based innovative tools to cope with the emerging challenges. Chandigarh, the most attractive planned city in Northwestern India has initiated very remarkable and participatory initiatives for improving environmental conditions in poor neighborhoods and institutionalize climate adaptation practices. The major climate friendly initiatives of the city are introduction of Garbage Bin Free Scheme, Sahej Safai Kendras (Easy Sanitation Centres), Scientific Landfill of Waste, Setting up of Waste to Energy Plant, revitalization of green belts, parks and round abouts, opting for energy saving street lights, augmentation of secondary and tertiary treatment of liquid waste, SCADA for water management, construction of dedicated bicycle lanes, switchover to CNG/ LPG based automobiles, modernization of fire services and a very important initiative of making solar energy systems compulsory in the larger housing units. institutions and offices etc. The results of the initiatives in Chandigarh have been remarkable. The city has been adopted as a model city for the solar energy and it has been moving very fast in making city a 'solar city'. It has also been adjudged the greenest city in the country. Chandigarh has received awards for providing quality sanitation in 2010, best performance award for providing water supply, waste water management and drainage in 2008, an award for increasing forest and tree cover in 2010 and six award on e-governance during last five years. The paper based on some studies by the author is an effort to describe the initiatives of Chandigarh towards institutionalization of climate adaptation practices.

Keywords: Institutionalization , Climate Adaptation

Parallel Session B: Coupled Models

B1: Atmosphere-land

B1-P-16

Characterization of air and surface temperature coupling over the Tibetan Plateau: Results from multi-source reanalyses

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Tibetan Plateau (TP), known as Earth's "Third Pole", exerts a tremendous influence on regional and even global weather and climate systems through its mechanical and thermal-dynamical forcing. Land-atmosphere interactions are key parts of Earth climate systems. Near-surface air temperature (Ta) and surface temperature (Ts), two crucial parameters of land-atmosphere interactions and climate change, both exhibit significant increasing trends on the TP, however with diverse magnitudes. Yet it is still unclear whether and how the two variables couple with each other along with their involved physical processes. In this regard, this study attempts to analyze the variation characteristics of two individual variables at seasonal and inter-annual scales and detect the distributions and trends of their contrast (Ts-Ta) using four latest reanalysis datasets ECMWF family (ERA-Interim and ERA5), MERRA2, and JRA-55, together with gridded observations. Possible forcing mechanisms are explored and discussed furthermore. The present findings will provide insight into regional climate modeling improvement and advance study of land-atmosphere interactions over the TP.

Keywords: Tibetan Plateau, Air temperature, Surface temperature, Temperature contrast, Reanalysis dataset

Parallel Session B: Coupled Models

B1: Atmosphere-land

B1-P-17

Assessment of the Uncertainties of Options in the Noah-MP Land Surface Model Simulations over China

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The interactions between the atmosphere and the land surface is believed to have significant impacts on the climate change. Land surface influences both regional climate and mesoscale atmosphere through exchanges in heat, water and momentum with the atmosphere. The main purpose of this study is to assess the impact of the Noah-MP land surface model options on regional climate simulation over China. Therefore, we have performed 4 groups of simulations during summer and winter seasons of 2007 and of 2015 with the WRF model coupled with the Noah-MP land surface model. Each group contains 5 experiments: NOAHMP, ALB with the BATS snow surface albedo scheme, BTR with CLM stomatal sesistance scheme using matric potentials as fuction of soil type, DVEG allowing annualy constant vegetation fraction and time-varing LAI and SAI from lookup tables, ROUOFF adopting a simple groundwater parameterization based on the TOPMODEL runoff scheme. From the comparison of the mean distribution between observation and experiments, high CORRs and relatively low RMSEs are detected for the temperature. During summers in 2007 and in 2015, warm biases are generally found in the north, while cold in the south. The experiments also underestimate winter temeperature in general. However, relative low CORRs for precipitation with larger RMSEs (wet biases) are found in summer. For the inraseasonal variations, the comparisons between the NOAHMP and observation show high CORRs and low RMSEs for the mean surface air temperature in summer and relative large RMSEs in winter. For precipitation, the WRF model shows relatively poor performance in intraseasonal variability with low correlations and large RMSEs especially in summer. The intercomparisons of experiments will be dicussed in the future.

Keywords: Noah-MP,options

Parallel Session B: Coupled Models

B1: Atmosphere-land

B1-P-18

Impact of Equatorial and Northern Bay of Bengal SST's on the Indian summer monsoon rainfall

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The influence of East equatorial Indian Ocean and the northern Bay of Bengal SST's on the rainfall pattern over monsoon core zone during Indian summer monsoon is investigated. During Indian summer monsoon, rainfall over monsoon core zone and the SST at the East equatorial Indian Ocean are negatively correlated, whereas it is positively correlated with Northern Bay of Bengal. A new index, the summer monsoon SST index from the SST difference between the East equatorial Indian Ocean and the Northern Bay of Bengal regions is formulated. Summer monsoon SST index shows strong correspondence with the intraseasonal oscillation of Indian summer monsoon and, rainfall over Monsoon core zone varies in coherent with the increasing/decreasing periods of summer monsoon SST index. The rising limb of the monsoon Hadley cell and the associated atmospheric convection shows north-south shifting according to the increasing/decreasing trends of summer monsoon SST index. This coherent variation of rainfall over monsoon core zone with summer monsoon SST index suggests that SST's at East equatorial Indian Ocean and Northern Bay of Bengal are teleconnected with Monsoon core zone and consequently modulate the rainfall pattern over Monsoon core zone

Keywords: Monsoon core zone, Summer monsoon SST index, Indian Summer monsoon