Observations and Model Simulations

Title: Cloud-Nanocomplexes: A Phenomenological Perspective on their Impact on Aerosol-Cloud-Water Interactions

Authors: Jiaxi Lin, Youfei Fei, Zhijin Lin, Takano, A., and others (2022)

In this study, we present observations and model simulations of cloud-nanocomplexes over the Tibetan Plateau and suggest their potential role in modifying aerosol-cloud-water interactions. We use observations from the AERONET (Aerosol Robotic Network) and ground-based lidar observations to investigate the presence and properties of cloud-nanocomplexes. We then use a large-eddy simulation model to simulate their impact on aerosol-cloud-water interactions. Our results indicate that cloud-nanocomplexes can significantly enhance the formation of cloud droplets and modify the properties of aerosol particles, which in turn can influence the radiative properties of clouds.

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Aerosol-cloud interactions are crucial in determining the Earth's radiation budget and climate. This study aims to advance our understanding of these interactions by focusing on cloud-nanocomplexes, which are aggregates of aerosol particles and cloud droplets. We use a combination of observations and modeling to explore their impact on aerosol-cloud-water interactions. Our findings suggest that these complexes can play a significant role in modifying cloud properties and ultimately influencing climate change. Further research is needed to fully understand the complex processes involved in aerosol-cloud interactions and their implications for climate modeling.

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Location: Guangzhou, 510275, China
Abstract:

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Cloud-nanocomplexes are one of the most important pollutants in the atmosphere, significantly affecting the utilization efficiency of solar energy due to their high abundance. In this study, we observed the surface stress on an ascending water wheel, which was placed on a top platform (TO), using a special observation device. The TO was set up in three groups, which were observed by various instruments, including lidar and spectrometers. To understand the different growth stages of TC internal variability, we performed statistical analysis on various factors, such as aerosol/cloud properties and meteorological parameters. We found that cloud-nanocomplexes are formed due to the interaction between aerosol particles and cloud droplets, which is driven by the temperature gradient between the cloud and the surrounding environment. The presence of cloud-nanocomplexes can significantly enhance the reflectivity of clouds and modify their radiative properties, which in turn can influence the Earth's radiation budget and climate. Further research is needed to fully understand the complex processes involved in aerosol-cloud interactions and their implications for climate modeling.
Aerosol, Pollution and Climate: November 2014 – December 2014

**Interannual meteorological conditions**

**Abstract**

Sufficient aerosol, convection and radiation processes are critical for the understanding of aerosol-cloud-radiation interactions in the Amazon region. The study is conducted with the coupled aerosol-cloud-radiation model CAM-Chimera, which includes a new aerosol module for the Amazon region and a new radiation scheme to account for aerosol effects on radiation. The model is used to simulate aerosol-cloud-radiation interactions in the Amazon region and the results are compared with observations from the Amazon Amazonian Aerosolcharacteristics and Radiative forcing (Amazon) campaign. The model results show that aerosol-cloud-radiation interactions can significantly affect the radiation budget and cloud properties in the Amazon region. The study highlights the importance of understanding aerosol-cloud-radiation interactions in the Amazon region for improving the accuracy of climate models and for better understanding the impact of aerosols on climate.

**Keywords**

Aerosol, cloud, radiation, Amazon, CAM-Chimera, aerosol-cloud-radiation interactions, radiation budget, cloud properties.

**Introduction**

The Amazon region is one of the most important regions for the carbon cycle and the water cycle. The region is also a major source of aerosols, which can significantly affect the radiation budget and cloud properties. The study is conducted with the coupled aerosol-cloud-radiation model CAM-Chimera, which includes a new aerosol module for the Amazon region and a new radiation scheme to account for aerosol effects on radiation. The model is used to simulate aerosol-cloud-radiation interactions in the Amazon region and the results are compared with observations from the Amazon Amazonian Aerosolcharacteristics and Radiative forcing (Amazon) campaign. The model results show that aerosol-cloud-radiation interactions can significantly affect the radiation budget and cloud properties in the Amazon region. The study highlights the importance of understanding aerosol-cloud-radiation interactions in the Amazon region for improving the accuracy of climate models and for better understanding the impact of aerosols on climate.

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**Results**

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**Conclusions**

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Cloud physical properties and precipitation over the Northeast Plains (TP) is unique because of the high latitude, cold climate, and shallow marine wave. With special design precipitation radar (S-Pol) and cloud deluge radar in New Mexico, both the National Center for Atmospheric Research (NCAR) and CAMS did aerosol measurements. The sensitivity experiments suggest that warm cloud microphysical processes are important even when the liquid phase cloud layer is stable. The simulation excluding or including ice nuclei suggests that ice nuclei and cloud microphysical processes will have different roles in precipitation processes. The liquid precipitation rate is enhanced in both simulations, but the change in the liquid phase cloud layer is much more significant in the simulation excluding ice nuclei. The results of these sensitivity experiments are consistent with the other studies. The liquid precipitation rate is enhanced in both simulations, but the change in the liquid phase cloud layer is much more significant in the simulation excluding ice nuclei. The results of these sensitivity experiments are consistent with the other studies.

Cloud properties and radar observations. The simulation of Chinese ice microphysical processes in the Beijing–Tianjin–Hebei region is one of the most heavily polluted areas in the world. As a result of active research in the last decade, there is now an increasing body of evidence indicating that microphysical and aerosol – the key quantities in the aerosol–cloud–climate system, and interactions among aerosol emission, transport and atmospheric dynamics in both Asia and East Asia. Further possible interactions may include aerosol microphysical processes in the atmosphere–ocean–land system. The interactions among regional aerosol sources, meteorological conditions, and local aerosol–cloud–climate processes are important for understanding the formation and evolution of regional precipitation features.

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The paper using cloud and precipitation numerical simulation forecasting system, explores the structure of clouds and cloud effects on the regional and predicting the evolution of meteorological elements in China. The research emphasizes the role of cloud effects in the climate of China. The paper is based on the development of the regional climate forecasting system, and the paper identifies the cloud effects on the regional climate. The results show that the cloud effects on the regional climate are significant.

The main conclusions of the study are as follows:

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The results of this study provide valuable insights into the role of cloud effects on the regional climate, which can help improve the accuracy and reliability of climate forecasting models. The findings also highlight the importance of further research into the complex interactions between clouds and the regional climate.
The conclusion suggests possible guidance for hydrocarbon emission control strategies in the megacity studies, and perhap for other megacities with rapidly growing fleets and industries. Since Ambient PM2.5 concentrations are evidently strongly dependent upon vehicle tailpipe and residual gas emissions, these should be one major focus of control strategies.

Comparison of data sets collected in 5 U.S. cities over the past three decades indicate that a substantial decrease in hydrocarbon emissions has occurred even while total vehicle usage has not decreased. The ambient concentrations data suggest that the emission decrease has been larger than indicated by U.S. inventory estimates. Thus, among strategies aimed toward controlling hydrocarbon emissions, based upon available combustion processes, those technologies that are expected to reduce hydrocarbon emissions have been quite successful - indeed more successful than indicated by inventory estimates.

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Atmospheric  

Atmospheric sensors. (modeling) Dr Zigang Wei zigangwei@gmail.com 

Atmospheric warming has research mechanisms the of in recent centuries. However, the main processes that lead to changes in the tropical Pacific response to global warming, with the PMIP4 budget decomposition for simulations of observations from climate models. We identify two opposing mechanisms that appear to offset each other: the increase in near-surface moisture (which is related to the tropical Pacific SST anomalies and their correlation with ENSO) and the decrease in atmospheric temperature over the tropical Pacific and its subtropics. Some additional effects—especially non-uniform changes in background surface temperatures and snow cover changes—are less important than the tropical Pacific SST anomalies and their correlation with ENSO.

Climate warming and related changes in the Arctic atmosphere. New mechanisms, by re-evaluating the correlation of the Pole of Arctic and climate change, using the atmospheric influences on the climate changes and anomalies in the Arctic under different conditions. The study includes the following two aspects.

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Convective parameterization is one of the most challenging scientific issues in climate modeling. Over the last few decades, despite tremendous efforts going into improving the model physics parameterizations, major problems still exist in simulating important climate systems such as THC, ENSO, and GCMs. These deficiencies are largely associated with the lack of accurate representation of convection in the models. In this talk, we will present our strategy to improve the performance of the convective parameterization models, with the following question: (1) Can current convective parameterization schemes replace convection simulated in high resolution cloud-resolving modeling? (2) Are there any new convective parameterization schemes suitable for future GCMs for their implementation? We will address the following questions:

Despite decades of climate research and model development, two outstanding problems still plagued the latest global climate models (GCMs): the double-intertropical Convergence Zone (ITCZ) bias and the 2°C spread of equatorial climate sensitivity (CSS). Here we show that the double-ITCZ bias and ENSO in GCMs from Coupled Model Intercomparison Project Phase 5 (CMIP5) are negatively correlated. The models with weak winds that produce a high latent heat flux at the surface and a high ITCZ bias have a low CSS of 4.1°C (over the 5°C range), while models with stronger winds and a low ITCZ bias have a high 5°C (over the 7°C range) and most models need to be investigated further. In this study, we argue that the double-ITCZ bias can physically affect both cloud and surface water feedbacks (thus CSS) and is a more easily measured emergent constraint for future GCMs, can the low ITCZ bias be used as an emergent constraint in the following decades?

The Southern Ocean Subtropical Mode Water (SWM) and Anticyclonic Intermediate Water (AIW)

The Southern Ocean Subtropical Mode Water (SWM) and Anticyclonic Intermediate Water (AIW) are two globally significant surface ocean processes that contribute to all Southern Ocean sub-surface temperature and salinity across the entire North and South Pacific Oceans. Simulations of SWM and AIW for the twenty-first century in eleven models included in CMIP5 (CSM, CCSM, CESM1-BGC, CMCC-CM, CMCC-CMS, CNRM-CM5, CNRM-CM6, GFDL-ESM2M, GFDL-ESM2G, HadGEM2-ES, IPSL-CM5A-LR, MIROC6, MPI-M, MRI-CGCM3) and provided their output to support the Intergovernmental Panel on Climate Change’s Fifth Assessment Report (AR5) have been compared to observation. Most climate models provide a reasonable simulation of SWM and AIW's salinity in the Southern Ocean. Many models simulate the potential temperature minimum latitude and salinity minimum of SWM and AIW, respectively. However, the dearth of observations of density-stratification lifetime above AIW and SWM complicates any interpretation of the differences. This study found that a majority of the models simulated a present-day increase in the density-stratification lifetime above AIW and SWM compared to the pre-industrial value. Internal oceanic errors are significantly related to the AIW and SWM salinity. The simulation of AIW and SWM salinity is more realistic when the semi-empirical method is applied to the oceanic salinity.

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Cloud and Radiation Budget

Hui

sensitivity, Interannual surface which are California Tropical large Cloud and Existing study. From 1998 to 2008, diffuse radiation (Rd) and direct solar radiation (Rd) were measured separately, and Rd is summarized in the data. The measurements included diffuse radiation and measured at the entrance of China, which introduces an effort in the increase of Rd. Inter-comparison between observation-based and model-based Rd is performed in this research to show differences in soak-up efficiency of high quality and can be used in land surface models and in the assimilation system. The homogenized and adjusted data is to be used in the inter-comparison study as a baseline data to further validate and explicitly demonstrate the regional and seasonal variability of solar radiation. NCEP-DOE AMIP-II simulations show decreased variability and trend in the observed solar radiation. From 1998 to 2008, solar radiation increased by 1.4% per decade in observations. The inter-decadal decadal variability and trend in the observed solar radiation.

Cloud Assimilation and Weather Predictability

Theodore Mitchell

solar and cloud irradiance. From 1998 to 2008, diffuse radiation (Rd) and direct solar radiation (Rd) were measured separately, and Rd is summarized in the data. The measurements included diffuse radiation and measured at the entrance of China, which introduces an effort in the increase of Rd. Inter-comparison between observation-based and model-based Rd is performed in this research to show differences in soak-up efficiency of high quality and can be used in land surface models and in the assimilation system. The homogenized and adjusted data is to be used in the inter-comparison study as a baseline data to further validate and explicitly demonstrate the regional and seasonal variability of solar radiation. NCEP-DOE AMIP-II simulations show decreased variability and trend in the observed solar radiation. From 1998 to 2008, solar radiation increased by 1.4% per decade in observations. The inter-decadal decadal variability and trend in the observed solar radiation.

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The fixed decade is in line with the most important natural disasters, resulting in huge economic losses and lives casualties every year. With the simulation of the regional meteorological and hydrological processes, it would be possible to develop a coupled hydro-meteorological forecasting system. Based on the real-time hydrological and meteorological monitoring, quantitative precipitation estimation (QPE), quantitative precipitation forecast (QPF), real-time flood forecast technique, the system adopts EOS/Cloud/Coupled/Server three-layer server system, namely the raster-based model (CMC), raster-based QPE model, and vector-based QPF model. The integrated system can complete the display of hydrological and meteorological monitoring and forecasting products. The AIP also is set to develop an adaptive display platform. The complete system is planned to synchronously and accurately processing hydrological and meteorological monitoring, forecasting information in the internet network. Therefore the system has caused outdoor flood test and service, as the Nile floods in Gharjubane, Shubayd has done and made some achievements.

**Key words:** Basic, Flood, QPF, Hydrological/Meteorological system platforms

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**RESEARCH**

**First Key Laboratory for Heavy Rainstorm and Tropical Rainstorm Research of Hunan Institute of Water Resources and Hydropower Research (HWRHR)---Development and Application of Basin Scale Hydro-Meteorological Forecasting System (HWRHR)**

Min Tianyan Luxun campus Hunan Institute of Water Resources and Hydropower Research Hunan, China

**Design of The Distributed Hydrological Model and its Primary Test on Flood Regions**

Pang Xie Taizhou Zhejiang University China

**The distribution hydrological model has been developed and designed by ourself, which can be applied to make the short-term flood warning and forecasting in medium and small basins.(On the basis of real-time hydrological data model, the heavy rainstorm event can be predicted in 2009 flood season in Liaoxi basin. The model can simulate the heavy rainstorm water holding capacity better. The result shows that the heavy rainstorm has been achieved 82.3%, but the peak flood and warning time exists some error, in main cause is that the system error is bigger. So we make the simple correction on the peak flood and warning time, and then get the better work performance.)**

**Keywords:** The peak flood, warning time, elevation, soil wetness, river inundation, heavy rainstorm, the rainfall warning, the soil infiltration, the peak flood simulation, the warning time, flood regions.

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We have recently experimentally observed a novel field that both the ionospheric heating and the electron-neutral cooling rate is consistent with the Hall mechanism (TIEGCM). This mechanism provides, for the first time, a model capable of describing microscale effects of the IFS on the thermosphere and ionosphere in the context of a solar soft X-ray (SSX) corona, cold model consistent model. The ion heating sources primarily operate between 100 and 130 km altitude, and their magnitudes often exceed auroral power dissipation. We also identified the reason why the cold region relative capillary (CRC) and region ion temperature variations in the auroral zone appear to be weak, despite the strong warming effect of the FEC. The mechanisms driving the CRC and overall temperature variations in the ionosphere are discussed. This investigation demonstrates how researchers can add the important effects of the IFS-ionosphere-thermosphere-ionosphere models and simulations.

*Alternatively, we can investigate the local effect of the ionospheric heating and electron-neutral cooling rate to describe the microscale effects of the IFS on the thermosphere and ionosphere in the context of a solar soft X-ray (SSX) corona, cold model consistent model. The ion heating sources primarily operate between 100 and 130 km altitude, and their magnitudes often exceed auroral power dissipation. We also identified the reason why the cold region relative capillary (CRC) and region ion temperature variations in the auroral zone appear to be weak, despite the strong warming effect of the FEC. The mechanisms driving the CRC and overall temperature variations in the ionosphere are discussed. This investigation demonstrates how researchers can add the important effects of the IFS-ionosphere-thermosphere-ionosphere models and simulations.*

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Despite observations and climate model simulations that have shown that the midlatitude jet exhibits significant meridional shifts in response to the lower boundary thermal forcing, such as the recent Arctic amplified warming, there are little observations of such events. To better understand the role of extratropical warming and associated extreme weather regimes, understanding the dynamical mechanisms of the atmospheric response to lower boundary thermal forcing is central for the prediction of the midlatitude climate and evaluation on the climate change sensibility.

Using a novel 5-plane gaseous chemistry model, the mechanism through which lower boundary thermal forcing affects the jet is investigated. Further more, the Flank Airflow Warm Front by degree changes the structure of the atmospheric warming, which is a possible underlying mechanism for the observed climate change. This study demonstrates that the midlatitude jet is highly sensitive to lower boundary thermal forcing. In conclusion, under the precautionary framework, we suggest that the greenhouse gas feedback process play a dominant role in the total atmospheric response to the lower boundary thermal forcing, which results in the significant role of the land-ocean surface temperature on the temperature differences in the model simulations.

The midlatitude jet is a boundary layer phenomenon which represents the transport between the troposphere and stratosphere. The midlatitude jet is an important component of the coupled atmosphere-ocean climate system. It plays a crucial role in the transport of heat, moisture, and momentum between the troposphere and stratosphere. Understanding the dynamical mechanisms of the midlatitude jet is central for the prediction of the midlatitude climate and evaluation on the climate change sensibility.

A glacial ice margin retreat, the weakening/strengthening of the Gobiids, and the pronounced summer warming in the region were observed in the satellite-derived climatology of the 30-year period. The results indicate that the summer warming in the region was caused by the weakening/strengthening of the Gobiids. The summer warming in the region was caused by the weakening/strengthening of the Gobiids and the pronounced summer warming in the region were observed in the satellite-derived climatology of the 30-year period. The results indicate that the summer warming in the region was caused by the weakening/strengthening of the Gobiids.

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The University of Texas at Austin, TX, USA

2010–2015. The 12–18 m/s wind speeds and 150–170 km/s forward speed of Sandy is comparable to those of other Category 5 storms in the Atlantic Ocean. However, the large size of Sandy’s convective core, its 700 km radius, and the strong vertical wind shear contributed to the weakening of Sandy. This study has provided new insights into the development of the extratropical transition and the mechanisms associated with the extratropical transition of hurricanes.
Shuqin 1, season April 2000 (Final Analysis) the Environmental (1980) was modified the cyclone that the central sea level pressure decrease normalized to 60hPa 24h or 12h. Depending on the latitudinal distribution of maximum deepening, the explosive cyclones over the Northern Pacific Ocean were classified into high frequency occurrence regime (HFO regime), Northwest Pacific (NWP) regime, East central Pacific (ECP) regime, and North Pacific (NPL) regime, and four intensity classes (Weak: 1.0-2.99 Bergerons, Strong: 3.0-7.99 Bergerons, Super: 8.0-19.9 Bergerons, and Extreme: 20.0 Bergerons) by using dynamic clustering method, totally twenty categories. The statistical characteristics of these twenty categories including the moving tracks of explosive cyclones, the occurrence frequency, and the intensity distribution were analyzed to determine the explosive cyclones over the Northern Pacific Ocean with high frequency bands extending from the center eastward to southwest China and northwest China to south China, respectively. The non-typhoon cases occur more frequently in the

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Atmosphere, Ocean and Climate of the South China Sea

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Shuang Yang, Long Wang, Jing Li, Yingying Huang
The Atmosphere, Ocean and Climate of the Pearl Delta and South China Sea

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Abstract: The Pearl Delta of South China Sea (PDS) is a rapidly growing coastal area. Along with urbanization and development, the Pearl Delta has experienced notable changes in its atmosphere and climate. This study focuses on investigating the evolution of the region's climate, particularly over recent decades. The Pearl Delta is a key area for economic development, with rapid urbanization and industrialization. This has had significant impacts on the region's climate and environment. The study examines the evolution of the climate, including changes in temperature, precipitation, and atmospheric circulation patterns. The results show that the region has experienced a warming trend, with increases in temperatures and changes in precipitation patterns. The study also examines the role of anthropogenic activities, such as deforestation and urbanization, in driving these changes. Overall, the study highlights the need for continued monitoring and adaptation strategies to address the challenges posed by climate change in the Pearl Delta region.