Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

AHW02-01 Room:102B Time:May 21 09:05-09:25

On the Establishment of Maritime Continent Center of Excellence (MCCOE) in Indonesia

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Indonesia Maritime Continent (IMC) with its complex topography and bathymetry are surrounded by large scale ocean and climate systems along Pacific and Indian Oceans to Asian and Australian continents. They are at the central importance of El Nino Southern Oscillation (ENSO) and Indian Ocean Dipole (IOD) and Asian monsoon so that their strategic location could influence directly on the Pacific and Indian oceans heat and water mass transport affecting on regional and even global climate changes. A small change in Sea Surface Temperature (SST) transmitted from Pacific to Indian oceans through the current system what so called Indonesian throughflow will affect the magnitude of monsoon and climate over the regions. In this critical perspective, the IMC in a whole system of earth, atmosphere, and ocean play important roles in regulating global climate changes. Because of its position and roles, they could be also very reluctant with the natural disasters come from the ocean and atmosphere, such as tsunami, drought, flood, and many others in more local impacts due to topography. In this presentation, we are going to introduce Maritime Continent Center of Excellence (MCCOE) as one of our ultimate goals of ongoing JST/JICA SATREPS project (2010 ? 2014) in Indonesia. This will be a one step international research center to study IMC in the perspectives of land, ocean, atmosphere, and their interactions among other. The MCCOE office is located in the Puspiptek, Serpong, 35 km from the central Jakarta, Indonesia. We are going to launch the MCCOE in this coming October 2013 and from that opening will be a milestone where International community could work together with us to study the importance of IMC to the global climate changes. The facilities and opportunities as well as the scientific frame work that MCCOE could offer to the international communities will be presented in the meeting.

Keywords: MCCOE, Indonesia Maritime Continent, Climate change

Japan Geoscience Union Meeting 2013
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AHW02-02 Room:102B Time:May 21 09:25-09:45

Coastal Heavy Rainbands Formed along Sumatera Island Studied by HARIMAU Project in Indonesia

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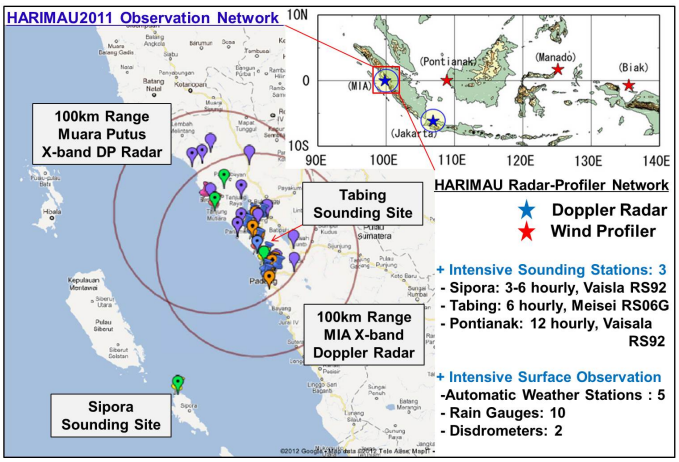
Coastal heavy rainbands (CHeRs) are widely identified over Asian monsoon region (e.g., Western Ghats, Bay of Bengal, Gulf of Thailand, southwestern Sumatera Island, northwestern Kalimantan Island, and western Philippines) by satellite observations. Some of them are explained well by synoptic wind-terrain interaction (Xie et al., 2006 JC) because they are anchored along mountain ranges face to southwest direction and predominant during boreal summer southwesterly monsoon season. Most Asian megacities are located in coastal regions, thus they have much risk to be suffered from torrential rainfall embedded in CHeRs which may cause flash floods in downtown cities and landslides in mountainous regions. Moreover, rainfall amount over the coastal land varies quite largely if those CHeRs change their lateral location a little, therefore water resource management for social community is seriously sensitive to their variability.

Satellite observations show that CHeRs are modified by various kinds of environmental variations, e.g., diurnal, intraseasonal/MJO, monsoonal, ENSO, and IOD. However, climatology, structure, and mechanism of CHeRs have not been examined in detail from mesoscale points of view because there are quite few studies based on ground based radar observations. Previous studies (e.g., Mori et al. 2004 MWR, 2011 JMSJ; Sakurai et al. 2009, 2011 JMSJ; Yamanaka et al. 2008 JDR; Wu et al. 2007 SOLA) showed most CHeRs in Indonesia are identified along coastlines where convective diurnal variation is predominant, and coastal heavy rain are brought mainly in the nighttime observed with a radar-profiler network deployed by Hydrometeorological ARray for Intraseasonal variation (ISV) - Monsoon AUtomonitoring (HARIMAU) project. In addition, they are confirmed even in the seasons when the wind-terrain interaction cannot explain them well. These results suggest that CHeRs are formed by not only the synoptic wind-terrain effect but also mesoscale convections which developed nocturnally everyday along coastlines.

We carried out HARIMAU2011 campaign observation over Sumatera Island during 01-31 December 2011 to study the CHeR formed along southwestern coastline of Sumatera Island by using an X-band Doppler and a dual-polarimetric (DP) radars, intensive soundings at two stations, disdrometers, and surface observation network. Overview of the campaign is presented and its preliminary results mainly observed with two radars are discussed at the presentation.

Keywords: mesoscale convective system, diurnal variation, radar meteorology, Asian monsoon, MAHASRI



Japan Geoscience Union Meeting 2013
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AHW02-03 Room:102B Time:May 21 09:45-10:00

The Impact of Trans-equatorial Asian Winter Monsoon and the MJO on Extreme Precipitation over Western Java Island

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An extreme precipitation/flood event that occurred in the Indonesian capital of Jakarta in Java Island in the middle of January 2013 coincided with an active phase of the Madden-Julian Oscillation (MJO) with the enhanced convective phase centered the western Pacific. Analyzing upper-air sounding data showed that strong upper westerly winds persisted over the island prior to and during the heavy rain event, which were caused by the active phase of the MJO. Ocean surface winds from the WindSat satellite showed a persistent trans-equatorial monsoonal flow from the Northern Hemisphere in mid-January prior to and during the extreme precipitation event. Meteorological radar observations indicated regular genesis of convection at night over the sea to the northwest of the island, and southeastward propagation over the island from the nighttime to early morning. The results suggest that the eastward propagation of an active phase of the MJO exerted a strong influence on the formation of extreme heavy rain over western Java Island.

Keywords: heavy rainfall, Asian winter monsoon, MJO

Japan Geoscience Union Meeting 2013
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AHW02-04 Room:102B Time:May 21 10:00-10:15

Effects of the cross equatorial northerly surge to interannual rainfall variability over northwestern Jawa

Jun-Ichi Hamada[1*], HATTORI, Miki[1], WU, Peiming[1], MORI, Shuichi[1], MATSUMOTO, Jun[1], YAMANAKA, Manabu D.[1], HARYOKO, Urip[2], LESTARI, Sopia[3], SYAMSUDIN, Fadli[3]

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Hamada et al. (2012) investigated that interannual rainfall variability in northwestern Jawa over the Indonesian maritime continent and its relation to the Indian Ocean Dipole (IOD) and El Nino-Southern Oscillation (ENSO) events. IOD events clearly influence interannual rainfall variation in the dry season (May-October) in northwestern Jawa. Droughts conditions during the dry season occur in conjunction with simultaneous development of positive IOD and El Nino events, whereas wet conditions tend to appear in negative IOD (with our without La Nina) rather than single La Nina events.

On the other hand, interannual rainfall variation in the rainy season (November-April) is not closely related to ENSO/IOD, but rainfall tends to be abundant in neutral (non-ENSO/IOD) years. From the correlation analysis among rainfall, SST, and wind, the rainy season rainfall may be influenced by Asian winter monsoon strength and/or variability. Hattori et al (2011) statistically showed that cross-equatorial northerly surges (CENS) over South China Sea and Jawa Sea were related to increased rainfall over the northern coastal region of Jawa Island in the rainy season. Thus, in this study, we aim to investigate effects of Asian winter monsoon, especially for the CENS events, to interannual rainfall variability in the rainy season over northwestern Jawa.

By following the definition of Hattori et al (2011), the CENS event was defined as the area-averaged northerly wind exceeding 5 m/s over South China Sea and Jawa Sea (105E-115E, 5S-EQ) based on the QuikSCAT sea surface wind data. During the analysis period (December 1999-March 2008), 53 CENS events were extracted. We used surface daily rainfall data at 9 stations in northwestern Jawa to investigate the rainfall variability and its relation to the CENS events.

As for the intraseasonal variations, CENS events and northwestern Jawa average rainfall peaks were well-corresponded including the Jakarta flood events in January 2002 and February 2007. Greater rainfall amount was observed during the CENS events (18.0 mm/day) in the rainy season (average is 10.1 mm/day). This rainfall increase tends to be dominated in the coastal stations than the inland stations. Though the occurrence frequency of CENS events was about 20%, the contribution of CENS rainfall amount to the total rainfall amount in the rainy season was about 30-40%.

As previous studies pointed out, interannual rainfall variations in the rainy season over northwestern Jawa were not closely related with ENSO. On the other hand, interannual variations of CENS events rainfall were well-corresponded to the interannual variations of the rainy season rainfall (simultaneous correlation coefficient is 0.82). Thus, it is suggested that CENS rainfall is one of the important factor to determine rainy season rainfall. It will be also suggested the CENS events would influence the rainfall variability in the rainy season over the southern part of the maritime continent, especially for the northern coast of the islands.

Keywords: maritime continent, rainfall variability, monsoon, ENSO, rainy season

Japan Geoscience Union Meeting 2013
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AHW02-05 Room:102B Time:May 21 10:15-10:30

Simulation of the diurnal cycle of Ciliwung River, Jawa, Indonesia

Reni Sulistyowati[1*], Ratih Indri Hapsari[2], Hamada Jun-Ichi[4], Shuichi Mori[4], Fadli Syamsudin[3], Satoru Oishi[1], Manabu D. Yamanaka[1]

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This study focuses on a simulation of the diurnal cycle of Ciliwung river water level observed during the intensive observational period of HARIMAU2010 (15 January to 15 February 2010) over JABODETABEK (greater Jakarta) region, by using a distributed hydrological model (the CDRMV3 model).

Rainfall data over this region have been obtained from a C-band Doppler radar (CDR), by using Marshall-Palmer formula. We have found that there are diurnal cycles of rainfall migrating in the meridonal direction from south (mountain) to north (coastline) mainly in the afternoon and in the opposite direction mainly in the morning. Therefore, we consider that such rainfall characteristics may cause the diurnal cycle of water level over Ciliwung river basin.

Using the CDR rainfall data, the CDRMV3 model has been used to simulate runoff for each sub catchment in the Ciliwung river basin. Discharges from simulation results have been verified with the discharge from observational data. Simulations for the cases of meridional migration of rainfall with diurnal cycle provide large discharges as observed actually.

Keywords: Weather radar, Diurnal Cycle, Distributed hydrological model, Rainfall, Runoff

Japan Geoscience Union Meeting 2013
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AHW02-06 Room:102B Time:May 21 10:30-10:45

Monitoring emission through GOSAT over Indonesian area

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[1]BPPT, Indonesia

The Greenhouses Gases Observation Satellite (GOSAT) is a spacecraft that launched on January 23, 2009 aimed to monitor the dynamics of greenhouse gases in the earth's surface. GOSAT spatially measures carbon flux (including CH4 and aerosols) in the regional to continental level and temporal scales from synoptic to interannual. This can be exploited to gather new knowledge about the global distribution and temporal variation of greenhouse gases will also be able to know at the same time the global carbon cycle and its influence on climate. GOSAT can also potential be used to predict future climate change and its impact through developing a new methodology for the measurement of greenhouse gases. This study aimed to monitor GHG emission over Indonesian area by coupling with relevant data (hot Spot, wind, etc). Based on the initial analysis represents that the raising trend of both CO2 and CH4 concentration occured since 2009 until June 2012 over Indonesian area. Even if the trend after June 2011 represents the slight slump, yet the general trends indicate the increase form. Based on the analysis as well they depict that the occurrence of hot spot (forest fire) have correlation with the raising trend of CO2 and CH4. In general phenomena and based the historic data during this time, the hot spot usually achieve the peak condition in dry season. The field condition during that time implies the direct or indirect correlation with distribution concentration of CO2 and CH4 during the July (2009, 2010 and 2011). This condition is not so much severe during January (2009, 2010 and 2011), where the rain fall was still high (rainy season). For the near future analysis, the uncertainty of the actual source of emission need more investigation and prove based by coupling with historical data of wind, as emission is a mix concentration (value) that come from some sources.

Keywords: GOSAT, monitoring, emission, Indonesia

Japan Geoscience Union Meeting 2013
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AHW02-07 Room:102B Time:May 21 11:00-11:15

Heavy precipitation events in central Vietnam during boreal autumn and its relationship to MJO activity

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Rainy season in central Vietnam is from late September to early December. Heavy rainfall events were mostly occurred during the rainy season. VPREX2010 was conducted in central Vietnam during autumn of 2010, and five heavy rainfall events were observed. Wu et al. (2012) analyzed a heavy rainfall event, and pointed out that interaction between an westward moving tropical depression from the western North Pacific to the South China Sea and convective active region of MJO approaching the Maritime Continent (MC) have influence to produce the heavy rainfall event. In this study we investigated impact of MJO on heavy rainfall events in central Vietnam using 26-years long surface daily rainfall data.

We defined ”heavy rainfall over broad area (HRBA)” as the day when heavy rainfall was observed at more than 15 stations. RMM (Wheeler & Hendon, 2004) was utilized for creating statistics of rainfall for each MJO phase. We found that 69% of HRBA events are concentrated in Phase 4 to 6, those phase correspondents to convective center appearing in the MC. Composite map of rainfall anomaly in Vietnam based on APHROTIDE rainfall data showed that positive rainfall anomaly was appeared in central and southern part of Vietnam when MJO existed around the MC. These results suggest that convection center of MJO around the MC plays important role for preparing regional scale circulation during heavy rainfall events in central Vietnam, at least in a statistical sense.

Keywords: Vietnam, Heavy precipitation, MJO

Japan Geoscience Union Meeting 2013
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AHW02-08 Room:102B Time:May 21 11:15-11:35

Simulation of 1961-2000 summer monsoon onset over Vietnam using a regional climate model

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[1]Department of Meteorology, Hanoi University of Science, Vietnam

This study aims to investigate summer monsoon onset dates over Vietnam and surrounding regions by using the Regional Climate Model version 4.2 (RegCM4.2) driven by the ERA-40 reanalysis data. Comparison of the 1960-2001 averages of wind fields at 200 and 850 hPa shows the consistency of RegCM4.2 with ERA-40. However, there are large differences in air temperature at the low level of 850 hPa, which are mainly attributed to the resolution difference between RegCM4.2 and ERA-40. Over Vietnam, monsoon onset date varies considerably among the regions. During the 1960-2001 period, the earliest onset generally occurs around April 15 in the western part of the Highland region and the latest onset occurs early June in the north. A long-term trend analysis shows that the monsoon onset dates over South Vietnam (North Vietnam) have shifted to approximately 0-10 days earlier (0-15 days later) in recent decades.

Keywords: Asian summer monsoon, monsoon onset, regional climate model, trend analysis

Japan Geoscience Union Meeting 2013
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AHW02-09 Room:102B Time:May 21 11:35-11:50

Variations In Rainfall In Vietnam Under The Global Warming

quan trananh[1*]

[1]Quan Tran Anh, School of Environmental Design, Kanazawa Univ., [2]Assoc. Prof. Kenji Taniguchi, Faculty of Environmental Design, Kanazawa Univ.

Recently, global warming due to intensifying greenhouse effect could cause profound climate change. It is becoming a serious problem in the world that must be accepted. Although the warming effect caused by emission of greenhouse gases has some uncertainties as in all climate observations, several observations indicated that the earth is warmer now than in the past century. Located in the South East Asia (SEA), with more than 3200 km coastal line next to the western Pacific Ocean, Vietnam has been known as one of the most affected countries in the world due to climate change. In the recent decade, Northern Vietnam has been facing terrible weather regime disturbances, while more storms and floods come in the rainy season, more drought and water shortage often occur in the dry season. The variation of rainfall has become further complicated.

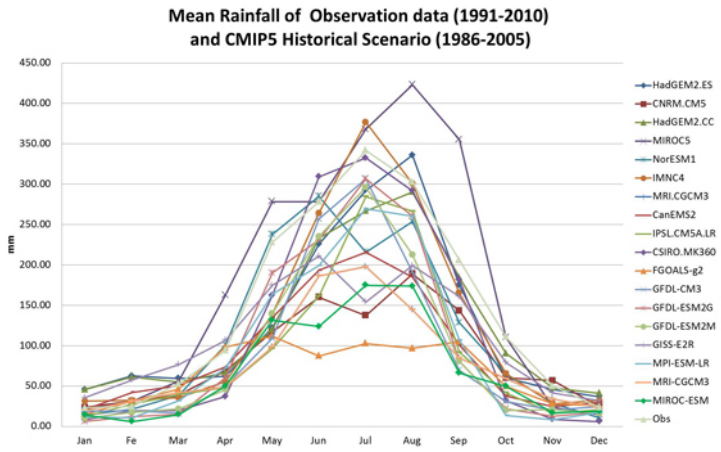
In order to address the changes in rainfall in Vietnam, this study has two main purposes. The first purpose is to investigate the behaviour of rainfall in the past to find out the happened trend as well as annual variation and second is to examine the future variation of rainfall in Northern regions of Vietnam.

To examine the behaviour of climate change in the past, the observation data of Northern Vietnam has been used to make the analysis. Rainfall data of 11 provinces in Northern Vietnam was collected with different time series ranging from 1950-2010. This research also used the updated dataset of 5th phase of climate model inter-comparison project (CMIP5). Meteorological data reproduced from 17 simulation models of CMIP5 follow 3 different scenarios: Historical, RCP4.5, RCP8.5 have been used for comparison with the observation data and investigate inter-annual and seasonal variation of rainfall. The first term of the research focused on comparing the observed data with the simulated data from Historical scenario to examine the reproducibility of CMIP5 models. The second term is, using regenerated data of RCP4.5 and RCP8.5 scenarios, to investigate inter-annual and seasonal variation of temperature and rainfall.

Results of the research have shown a significant decrease of total rainfall amounts during roughly 5 decades from 1960-2010. Observed rainfall data of 11 provinces show annual rainfall ranging from 1,453-2,480mm.yr-1. While the total rainfall in rainy season (JJA - Jun, July, August) accounted for 38.7-64.2% of the year, dry season (DJF - December, January, February) only accounted for 0.6-9.4% of the total. The average rainfall of the area from 1960-2010 is 1,677 mm.yr-1. Among 17 models in Historical scenario, 9 models show the same significant decrease trend with the observed data. Both observation data and most of the CMIP5 models show the largest rainfall in Jun, July and August and the lowest rainfall in December, January and February. Correlation coefficients of seasonal variation shown of all models are varying from 0.84-0.97 with 16 models higher than 0.9.

Initial results of the research using RCP4.5 and RCP8.5 scenarios also shows in the coming future, there will be large inter-annual variation of total amount of rainfall. There might be an increase in rainfall in Northern Vietnam in the end of 21st century with the increments mostly happen the rainy months. In dry season, the variation of rainfall is unclear and unpredictable.

Keywords: rainfall, Vietnam, CMIP5, global warming, climate change



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AHW02-10 Room:102B Time:May 21 11:50-12:05

Generalized dynamics of monsoon and sea-land breeze circulations

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[1]MCCOEPO-BPPT / RIGC-JAMSTEC / DEPS-CPS-KobeU

In the maritime continent the diurnal cycle is the most dominant component of wind (sea-land breeze) and rainfall, and other components such as the annual cycle (rainy season or monsoon, in particular in the southern-hemispheric part) appear as amplification of the diurnal cycle. The diurnal and annual cycles are both induced by the insolation varying astronomically with time (local time and season) and location (latitude and longitude). If the Earth's rotation is much slower (like Venus), these two periodicities are not clearly distinguished. If the Earth is an aqua planet without lands or a land planet without seas, only global modes between winter-summer hemispheres (like Martian atmosphere and Earth's middle atmosphere) or between day-night hemispheres (i.e., diurnal tide) are generated. Because of land-sea heat contrast, local modes around the coastlines are generated and are more dominant.

A quasi-two-dimensional (zonally uniform but permitted to move) linear convection equation on the equatorial beta-plane for a periodically-oscillating equatorially-anti-symmetric heating such as the case of a coastline along the equator (between the northern and southern hemispheres covered totally by land and sea, respectively) is analytically solved. For a periodicity shorter than the local Coriolis period (e.g., diurnal cycle near the equator) the solution becomes a sea-land breeze circulation (purely meridional in this case) consisting of a pair of internal (almost non-inertial) gravity waves, and the motion becomes non-hydrostatic and ageostrophic. For a periodicity longer than the earth's rotational period (e.g., annual cycle in the extratropics) the solution becomes a monsoon circulation consisting of mixed Rossby-gravity and Rossby waves with zero zonal wavenumber, and the motion is quasi-hydrostatic and quasi-geostrophic. In the latter vertical velocity is associated mainly with inertia-gravity waves, as so far shown by Kosaka and Matsuda (2005) for a steady heating.

In the Earth's history continent-ocean distribution is varied with 10^2 Myears, and glacier-interglacier oscillation is with 10^2 Kyears (due to variation of the Earth's rotation and revolution, known as Milankovic cycle). Variations of tropical rainfall and their effects on the global climate are discussed.

Keywords: monsoon, diurnal cycle, air-sea-land interaction, climate history, planetary rotation and revolution

Japan Geoscience Union Meeting 2013
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AHW02-11 Room:102B Time:May 21 12:05-12:25

AMY-reanalysis: atmospheric reanalysis data using JRA-55 system and Asian Monsoon Years observation

Kenji Kamiguchi[1*]

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Global atmospheric reanalysis data is indispensable for meteorology. Japan Meteorological Agency (JMA) is now creating a new state-of-the-art reanalysis data JRA-55 (Ebita et al., 2011) with a period after the mid-20th century which will be completed during 2013. The biggest improvement from the previous version JRA-25 is data assimilation system, four-dimensional variational data assimilation (4D-Var) with Variational Bias Correction (VarBC) is used in JRA-55 which enables not only to directly handle observed physical elements such as radiation by satellite but also to ingest non-scheduled observation data. Accordingly, we are developing an extra reanalysis data AMY-reanalysis for the years 2008-2010 by putting a special observation data collected by AMY (Asian Monsoon Years) project into the reanalysis system and the observation data used in JRA-55. In this presentation, the impact of AMY observation on making atmospheric reanalysis data will be presented.

Keywords: atmospheric reanalysis data, observation

Japan Geoscience Union Meeting 2013
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AHW02-12 Room:102B Time:May 21 12:25-12:45

Water isotope modeling and observations toward reconstruction for Asian hydroclimatology

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Asian hydroclimatology in the past has very important to understand the climate system and likely for the evolution of the historical civilizations. However direct measurement data is quite limited, so some proxy data for example water isotope information conserved in tree cellulose, speleothem, and/or coral shell, etc. would be highly useful. As a very preliminary step, this study presents idealized tests of a newly-developed data assimilation system for assimilating high-frequency vapor isotope observations from satellites, using an ensemble Kalman filter with the isotope-incorporated general circulation model. An LETKF-based four dimensional data assimilation system was newly developed for the first time to obtain dynamically and physically consistent analysis of both water isotope and meteorological variables. Moreover, we also aim at assessing the isotope observation impact on the dynamical fields (wind, temperature, humidity, pressure). Several numerical experiments have been performed with various synthetic observations using a model simulation as the ”nature run”. The control experiment assimilates conventional rawinsonde-like observations, and the test experiments with additional isotope observations showed general improvement in both isotopic fields and dynamical fields. The positive impact on the dynamical fields was surprisingly larger when the number of conventional observations was decreased. These results are promising, so that the satellite isotopic data could be very useful to analyze the atmospheric states, particularly for the past (before 19th century) when isotopic measurement data were a major source of observations.

Keywords: water isotope ratio, climate reconstruction, general circulation model, ensemble Kalman filter

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AHW02-13 Room:102B Time:May 21 14:15-14:30

Lightning observation network in SE-Asia as a tool for monitoring of atmospheric convection in thunderstorm

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SE-Asia is one of the most important regions in the world, which is closely related to the important meteorological phenomena, such as Madden Julian Oscillation, El Nino, etc. Also very sever weathers sometimes happen in this area, which leads to loss of human lives and estates. Therefore, monitoring and understandings of atmospheric activities in this region is quite important. However, it is not easy only with existing observation equipments and the limited number of advanced facilities such as expensive meteorological radars. Lightning observation in frequency range of VLF would be a very effective methodology to monitor the activity of thunderstorms, which are driving the global atmospheric circulation and may cause significant disasters. We have been developing Asia VLF observation network: AVON, which now consists of 3 stations located at Taiwan, Thailand and Indonesia. The geolocation will be carried out by time-of-arrival method with an error of 10 km. From AVON data, we could estimate the charge moment change of the lightning stroke, which might be a good proxy of meteorological parameters in thunderstorm. In order to improve the accuracy of geolocation and to achieve the redundancy, we plan to add 2 or 3 more stations in SE-Asian countries, such as Philippines, Vietnam. Based on information of lightning, we will try to establish the methodology for prediction of thunderstorm location and strength. Here we discuss the scope of AVON observation including various possibilities of applications to meteorology and climate studies in SE-Asia.

Keywords: lightning, network, thunderstorm, monitoring, SE-Asia

Japan Geoscience Union Meeting 2013
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AHW02-14 Room:102B Time:May 21 14:30-14:45

Effects of increase of observation data input on terrestrial climatological mean temperature data over Asia

Natsuko Yasutomi[1*]

[1]RIHN

We created a daily mean gridded temperature dataset of monsoon Asia (15S-55N, 60E-150E) for the period of 1961-2007, with a 0.50 x 0.50 degree grid.

We analyzed this dataset based on station observations collected and a quality control and interpolation system developed through the activities of the Asian Precipitation – Highly Resolved Observational Data Integration Towards Evaluation of Water Resources (APHRODITE) project. The number of stations is up to 2 times the number of stations based on the Global Telecommunication System (GTS), which have been used to obtain other gridded temperature products. Especially, we obtained daily surface observation of Nepal in collabollation with local agency.

Comparison between monthly mean temperature datasets, CRU_TS3.0 and Univ. of Delaware, and APRHODITE daily mean temperature dataset (AphroTemp V1204R1) is made to estimate the effect of the increase of surface observation input.Significant difference is not shown over coastal and plain region over Monsoon Asia. However, differences of 5-6 degC are shown in mountainous region of Tibetan Plateau and Central Asia.

Another product (AphroTemp_V1204R1g), using on-line available surface observaion data and adapting same interpolation algorithm, is derived to estimate the difference attributed to the increase of input data. Significant difference is shown around Nepal. Similar difference is found in comparison with other monthly datasets (CRU_TS3.0 and Univ. of Delaware).

In and around Nepal, it is found out to be warmer than preceding estimates. On the other hand, significant differences are not found in other places such as China, Mongolia and Taiwan, where we also obtained original inputs.

Keywords: temperature dataset, Monsoon Asia, climatological mean temperature

Japan Geoscience Union Meeting 2013
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AHW02-15 Room:102B Time:May 21 14:45-15:00

Future changes and uncertainties in Asian precipitation simulated by ensemble experiments with high-resolution MRI-AGCMs

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[1]Meteorological Research Institute

This study focuses on projecting future changes in mean and extreme precipitation in Asia, and discusses their uncertainties. Time-slice experiments using a 20-km-mesh atmospheric general circulation (AGCM) were performed both in the present-day (1979?2003) and the future (2075?2099). To assess the uncertainty of the projections, 12 ensemble projections (i.e., combination of 3 different cumulus schemes and 4 possible different sea surface temperature (SST) patterns) were conducted using 60-km-mesh AGCMs. For the present-day simulations, the models successfully reproduced the pattern and amount of mean and extreme precipitation, although the model with the Arakawa?Schubert (AS) cumulus scheme underestimated the amount of extreme precipitation. For the future climate simulations, in South Asia and Southeast Asia, mean and extreme precipitation generally increase, but their changes show marked differences among the projections, suggesting some uncertainty in their changes over these regions. In East Asia, northwestern China and Bangladesh, in contrast, mean and extreme precipitation show consistent increases among the projections, suggesting their increases are reliable for this model framework. Further investigation by analysis of variance (ANOVA) revealed that the uncertainty in the precipitation changes in South Asia and Southeast Asia are derived mainly from differences in the cumulus schemes, with an exception in the Maritime Continent where the uncertainty originates mainly from the differences in the SST pattern.

Keywords: future projection, rainfall, Asia, high-resolution model, ensemble projection

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AHW02-16 Room:102B Time:May 21 15:00-15:15

Relationship between future changes in summertime precipitation and topography in the Japanese islands

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This study investigated future changes in summertime precipitation over the Japanese islands and their relations to the topography by analyzing data from 20-km resolution regional climate model downscalings of MIROC3.2-hires 20C3M and SRES A1B scenario data. To obtain the geographical distributions of simulated daily precipitation amounts in Japan during the periods of 1981-2000 (hereafter ”recent climate”) and 2081-2100 (”future climate”), we analyzed results of long-term numerical simulations performed by three RCMs: Non-Hydrostatic Regional Climate Model (NHRCM; Saito et al., 2006; Ishizaki and Takayabu, 2009), Regional Atmospheric Modeling System V 4.3 (Pielke et al., 1992) modified by National Research Institute for Earth Science and Disaster Prevention (NRAMS; Dairaku et al., 2008), and Weather Research and Forecasting model (Skamarock et al., 2008) V 3.1.1 modified by University of Tsukuba (T-WRF; Kusaka et al., 2012). Each simulation was carried out with a 20-km horizontal grid resolution, as part of the Japanese research project of Multi-Model Ensembles and Downscaling Methods for Assessment of Climate Change Impact (S-5-3; e.g., Ishizaki et al., 2012). Results of the analyses indicate that future increases in June-July-August mean daily precipitation amounts are noticeable in the west and south sides (windward sides) of the mountainous regions, especially in Western Japan where heavy rainfall is frequently observed in the recent climate. The large precipitation increases are likely to occur not only in high altitude areas but also at low altitudes. The model grid points where the future increases in JJA mean daily precipitation exceed 3 mm and 5 mm are shown in Figure 1 (a figure shown in this abstract) after dividing the topographical heights at every grid points into several elevation zones at an interval of 300 m. In the west and south sides of the mountainous regions, the precipitation increases of more than 3 mm day-1 can be seen not only in high altitude areas but also at low altitudes below 300 m above mean sea level (AMSL) (Figures 1a-c). Note that the precipitation increases exceeding 5 mm day-1 are widely distributed at the low altitude areas in the western part of Kyushu (Figures 1d-f). In those areas, the occurrence frequencies of precipitation amounts greater than 100 mm day-1 would also increase under the future climate scenario (A1B). One of the main causes of these precipitation changes appears to be the intensification of southwesterly moist air flows in the lower troposphere, which is likely to be associated with future increases in the north-south atmospheric pressure gradient, especially at latitudes south of 35 degrees north. The intensified southwesterly moist air flows that impinge on the western and southern slopes of the mountains can generate stronger upslope flows and well-developed clouds, leading to the increased precipitation. In contrast, the future changes of the simulated precipitation amounts in the lee sides of the mountainous regions, such as the Tokyo metropolitan area would be comparatively small.

Acknowledgements
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Keywords: Future changes in summertime precipitation, Topography, Regional climate modeling, Multi-model, Dynamical downscaling, Dynamical mechanism of future precipitation changes

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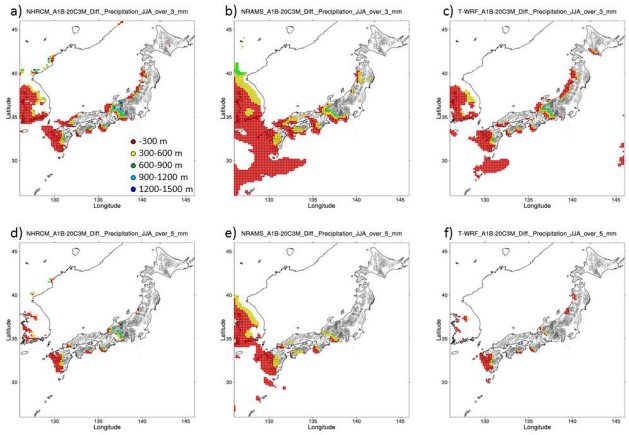

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Future risk assessment of two types of climate-related disasters: fluvial flood risk and tropical cyclone risk in Asia

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This presentation will consist of two parts. Both are recent attempts on large-scale risk assessment of climate-related disasters particularly in Asia. This presentation will be done on behalf of many other collaborators.

Firstly, we estimated future changes in tropical cyclone risk in the Western North Pacific using a Stochastic Typhoon Model (STM). Information derived from CMIP3-based four AOGCM outputs was introduced into the STM. The STM was used to generate typhoons for two sets of hypothetical 1000 years (possibly 10000 years); one is under the current climate condition and the other is under a future climate condition. This kind of simple stochastic modeling framework is useful for risk assessment of extremes like tropical cyclone because such a risk assessment should be probabilistic in its nature. The changes in exposure to tropical cyclones in coastal areas of WNP countries will be presented.

Secondary, we computed future changes in flood risk at the global scale, using daily river discharge derived from 11 AOGCMs forced by the CMIP5 future scenarios. We also computed the future time series of global exposure to flooding that is global population potentially affected by inundation. Projected future risk is very remarkable in Asia.

These attempts will provide us indispensable information for the adaptation to the impact of future climate change. In addition, these attempts would be useful to set a mitigation target.

Keywords: climate change, tropical cyclone, flood