PROCEEDINGS:

The Second International Workshop on Climatic Changes and Their Effects on Agriculture in Asian Monsoon Region

MEXT
MINISTRY OF EDUCATION, CULTURE, SPORTS, SCIENCE AND TECHNOLOGY-JAPAN

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Workshop Philippine Secretariat:
NUEVA VIZCAYA STATE UNIVERSITY

4-6 March, 2013
The Forest Lodge, Camp John Hay, Baguio City, Philippines

PROGRAMME

March 4, 2013		
8:30 - 9:00	*Registration*	
	Opening Session Chair	Jun Matsumoto
9:00 - 9:10	*Opening remarks*	Masaru Mizoguchi (University of Tokyo, Japan)
9:10 - 9:20	*Opening remarks*	Florentina S. Dumlao, President, Nueva Vizcaya State University (Philippines)
Session 1 Climatic changes in Asian monsoon region (1) **Chair: Tsuneo Kuwagata**		
9:20 - 9:40	**Jun Matsumoto (JAMSTEC/TMU, Japan), Marcelino Villafuerte II, Hiroshi Takahashi, Ikumi Akasaka and Hisayuki Kubota:** Long-term trends and variability of rainfall extremes in the Philippines	
9:40 - 10:00	**Ikumi Akasaka (TMU, Japan), Hisayuki Kubota, Marcelino Villafuerte II, Esperanza O. Cayanan and Jun Matsumoto:** Seasonal march of rainfall and its year-to-year variations in the Philippines	
10:00 - 10:20	**Jianqing Xu (JAMSTEC, Japan), Jun Matsumoto, Hisayuki Kubota, Ikumi Akasaka, Miki Hattori, Tomoshige Inoue and Esperanza O. Cayanan:** Onset signal of the summer monsoon observed from the surface downward longwave radiation in Laoag of Philippines	
10:20 - 10:40	**Tomoshige Inoue (JAMSTEC, Japan), Jun Matsumoto and Nobuhiko Endo:** Changes in boreal autumn rainfall in the recent 50 years (1961-2010) over the Indochina Peninsula	
10:40 - 11:00	**Coffee break**	
Session 2 Climatic changes in Asian monsoon region (2) **Chair: Ikumi Akasaka**		
13:50-14:10	**Masaru Mizoguchi (UT, Japan) :** Fundamentals of Field Monitoring System (FMS) in Asian monsoon region	
14:10-14:30	**Patricia Mae C. Bonife and Gemma T. Narisma (Ateneo de Manila University, Philippines):** Investigating potential relationship between climate change impacts and rice production in the Philippines	
14:30 - 14:50	**Felino P. Lansigan (UPLB, Philippines)and Francis John F. Faderogao :** Assessing climate change impacts on crop productivity in selected rice-growing areas in the Philippines	
14:50 - 15:10	**Wilfredo A. Dumale Jr. (Nueva Vizcaya State University, Philipplines) and Masaru Mizoguchi:** Potential applications of the field monitoring system (FMS) for local and farmer-level climate change adaptation in agriculture	
15:10 – 15:30	**Chusnul Arif (UT, Japan), Masaru Mizoguchi, Budi Indra Setiawan and Ryoichi Doi :** Optimizing water management of system of rice intensification for climate change adaptation strategy based on field monitored data	
15:30 - 15:50	**Coffee break**	
Session 4 Climatic change effect on agriculture in Asian monsoon region (2) **Chair: Kei Tanaka**		
15:50 - 16:10	**Virgillo Julius P. Manzano Jr. (Mariano Marcos State University, Philipplines) and Masaru Mizoguchi:** Soil moisture monitoring using field monitoriung system (FMS) and analysis of rainfall data for tomato cropping calendar under Batac City, Ilocos Norte, Philippines Condition	
16:10 - 16:30	**Florentina S. Dumlao(Nueva Vizcaya State University, Philipplines) and Reginald Laxum T. Atabay :**Vulnerability analysis and climate change mitigation strategies of the Aringay River Watershed, La Union, Philippines	
16:30 - 16:50	**Bernardo S. Umaguing (Nueva Vizcaya State University, Philipplines) :** Recycling of abattoir wastes (cattle rumen contents) for animal feeding: A localized alternative to climate change mitigation	
16:50 - 17:10	**Mild T. Rumusod (Nueva Vizcaya State University, Philipplines) :** Agbibinnulig: An Iloko cultural resource in managing water problems in rice farming	

17:10 – 17:30	**Agustin Lunag (Nueva Vizcaya State University, Philipplines) and Merlinda P. Calubaquib:** Installation of Participatory Guarantee System (PGS) for Organic Farming Practitioners in Nueva Vizcaya
17:30 – 17:50	**Atsuko Tanaka, Seishi Ninomiya, Yumi Mori, Toshiya Takasaki, Yasukazu Okano, Takaharu Kameoka, Takashi Togami, Kyosuke Yamamoto, Akanae Takezaki, Ryoichi Ikeda, Toru Ishida, Masaru Mizoguchi (UT, Japan):** Youth mediated communication model: site-specific decision support system under climatic change
17:50 – 18:40	**Cultural event**
18:40 – 19:40	**Welcome reception**
March 5, 2013	
Session 5 Climatic change effect on agriculture in Asian monsoon region (3) Chair: Masaru Mizoguchi	
9:00 - 9:20	Dhanachandran Sudharsan(UT, Japan) : Development of decision support system for suitable crop simulation in Northeast Thailand
9:20- 9:40	Mallika Srisutham (UT, Japan) , Masaru Mizoguchi and Ryoichi Doi: Cassava growth after rice in sandy soil with no-irrigation in Northeast Thailand
9:40 – 10:00	Somsak Sukchan (Land Decvelopment Department, Thailand) TBD
10:00-10:20	Kei Tanaka (NARO, Japan), Takuji Kiura and Hiroe Yoshida: Prediction system to optimize double cropping of rice and cassava in Thailand
10:20-10:40	**Coffee break**
March 6, 2014	
	Field Trip

Summer Monsoon Onset over Vietnam for the Period of 1961-2000 using RegCM4.2

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Summary: This study aims to investigate summer monsoon onset dates over Vietnam and surrounding regions 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: Climate Change, Monsoon Onset, Regional Modeling, Vietnam

1. Introduction

Over the past recent decades, Asian summer monsoon (ASM) has become a critical issue in many studies. For example, [12] used the relative climatological pentad mean rainfall to describe the spatial–temporal structure of the Asian–Pacific summer monsoon rainy season. The results showed that monsoon rainfall first increases in the East Sea and then extends to the Pacific Northwest. The 850-hPa zonal winds averaged over the central East Sea (50–150N and 1100–1200E) was used by [13] in order to determine the monsoon onset dates for the period of 1948-2001. The earliest onset occurs in the 25th pentad (1-5 May) while the latest is in the 34th pentad (14-19 June) [13]. The onset of ASM as suggested by [1] occurs the earliest over the central and the southern regions of the Indochina Peninsula. The trends of ASM onset dates during the period of 1979–2008 were examined by [4]. The authors showed that monsoon onset occurred earlier over the Bay of Bengal and the western Pacific region due to the heat contrast between the Asian landmass and tropical Indian Ocean. The 850 hPa zonal wind data of the Coupled Model Inter-comparison Project phase 3 (CMIP3) was used by [3] to show that the onset dates over the Bay of Bengal, the Indochina Peninsula and the East Sea are projected to delay by 5 to 10 days in the end of the 21th century under the A1B emission scenario. One of the reasons for this change might due to the delay of the reversal of upper-tropospheric meridional thermal gradient between the Eurasian Continent and the north Indian Ocean.

Located in the eastern part of the Indochina peninsula, Vietnam is a country with tropical climate and complex topography. Given the strong influence of the ASM system, many socio-economic sectors of Vietnam such as forestry, fisheries and agriculture are strongly dependent on the monsoon activity. Therefore, it is of great importance to understand monsoon characteristics as well its impacts over Vietnam. However, knowledge gaps in the monsoon activity over Vietnam still remain large. Recently, [7] used daily rainfall at six stations in southern Vietnam and 1000 hPa reanalysis zonal wind data to determine the monsoon onset dates in Vietnam for 1979-2004. It is shown that the mean onset date is May 12, with the earliest onset occurred in 1979 (April 19) and the latest one occurred in 1993 (June 9). The authors also indicated that late (early) onsets over Vietnam are preceded in March-April by higher (lower) sea level pressure over the East Sea, stronger (weaker) southeasterly winds over southern Vietnam, decreasing (increasing) deep convection over the Bay of Bengal and the reverse situation over Indonesia.

To the best of our knowledge, previous studies have not considered yet the variability of monsoon onset dates over the different sub-climatic regions of Vietnam. This study will be a first attempt to depict those detailed features. In the next Sections, we will introduce a new set of criteria to calculate monsoon onset dates and apply those criteria to the output of the Regional Climate Model version 4.2 (RegCM4.2) [2]. The trend of onset dates for the period of 1960-2001 over Vietnam will be discussed.

2. Numerical Experiment and Onset Monsoon Index

a) Numerical Experiment

The domain size of RegCM4.2 extends from 95ºE to 119ºE and from 6ºN to 29ºN with a horizontal resolution of 20 km for both east-west and north-south directions. The 1960-2001 ERA-40 reanalysis data with horizontal resolution of 2.5ºx2.5º and 6 hr time interval [11] are used as initial and boundary conditions for the experiment. Other physics options are similar to [8].

b) Onset Monsoon Index

To identify the monsoon onset for each model grid over Vietnam and the surrounding regions, a new set of onset criteria is defined as follows:

1) Daily zonal wind at 850 hPa (u850) is greater than 0.5 m/s and originally from the Bay of Bengal;
2) Daily zonal wind at 200hPa (u200) is less than 0 m/s; and
3) Criteria 1) and 2) are satisfied for at least 5 consecutive days.

3. Results

3.1. Model performance

Comparison of the 42 year averages (1960-2001) of air temperature and wind fields at 200 hPa for the two typical periods JJA and DJF shows the consistency of RegCM with ERA-40 in both spatial distribution and magnitude (Fig. 1). The Tibetan anticyclone at the upper level with the monsoon easterly jet in JJA over Vietnam is well reproduced. Some differences can still be detected in the boundary regions.

At 850hPa, there are more pronounced differences between RegCM4.2 and ERA40 (Fig. 2). With the resolution of 20 km, i.e. 10 times better than that of ERA-40, the RegCM4.2 experiment clearly shows the topography effect on air temperature at the low level, particularly over the Tibetan region and over the Indochina Peninsula during both DJF and JJA. Over Vietnam, RegCM4.2 amplifies the easterly wind during DJF while it slightly pushes the simulated JJA westerly jet more northward.

3.2. Monsoon Onset

Monsoon onset date varies considerably among the regions over Vietnam (Fig. 3). The earliest onset date occurs in the western part of the Highland region in the end of April. The mean onset date is around May 15-20 in the South and Central Vietnam. The monsoon continues to expand northward and the onset is around May 25 – June 5 in the Northern part of Vietnam.

To examine the monsoon onset variability, we selected two equal periods: 1960-1979 and 1980-1999. The monsoon onset dates over South Vietnam have shifted to approximately 0-10 days earlier in recent decades (Fig. 4). In contrast with the Southern region, the onset dates have shifted to 0-15 days later over North Vietnam.

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The non-parametric Mann-Kendall test [6] is used to examine the trend-significant level for the onset series (x1, x2, …, xn) where xi represents the onset date of year i. Trend's value (Q) is estimated using the Sen's method where Q is the median of the series composed of n(n-1)/2 elements { , k=1,2,…,n-1; j>k} [10]. Fig.5 confirms the findings in Fig.4, with earlier onset in the southern regions and later onset in the North. However, the trends are only

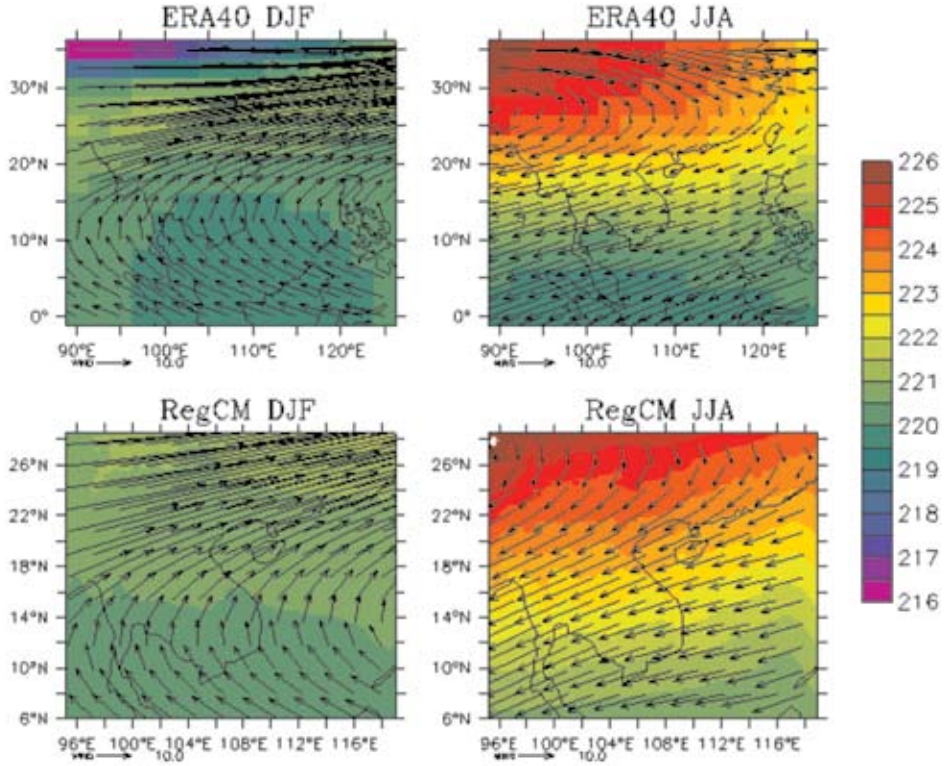

Fig. 1. 1960-2001 average wind and temperature at 200hPa from ERA-40 (top) and RegCM (bottom) simulation in DJF (left) and JJA (right).

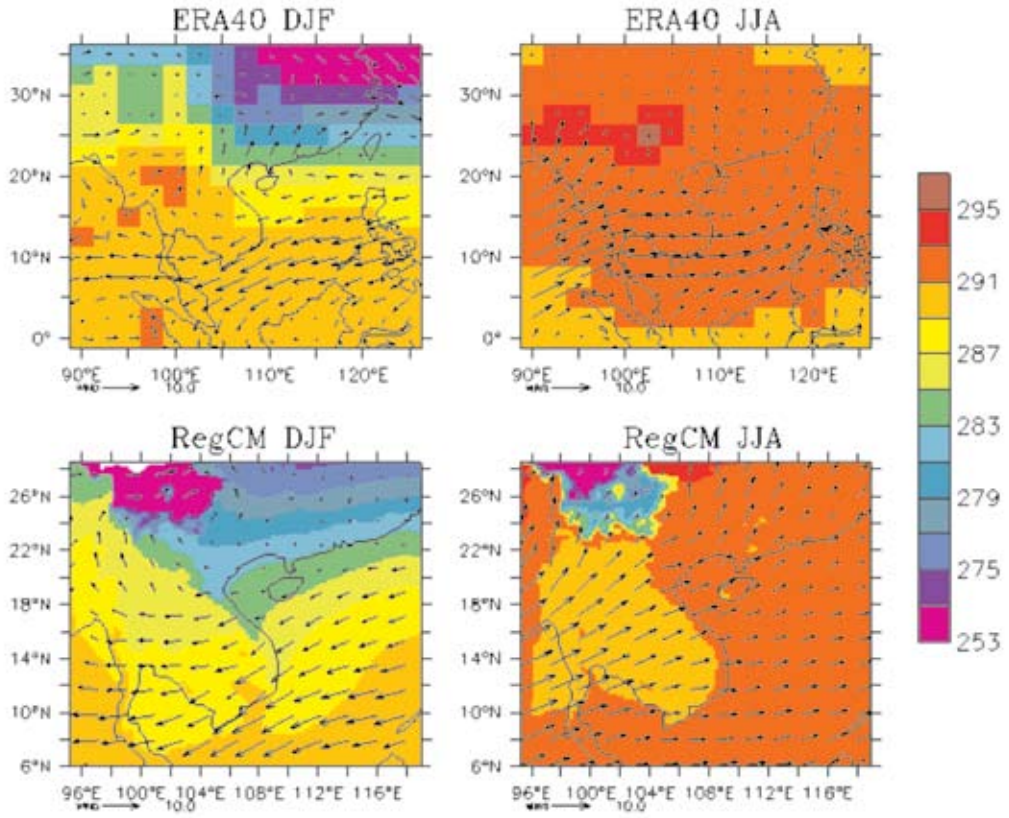

Fig. 2. As Fig.1 but for 850 hPa.

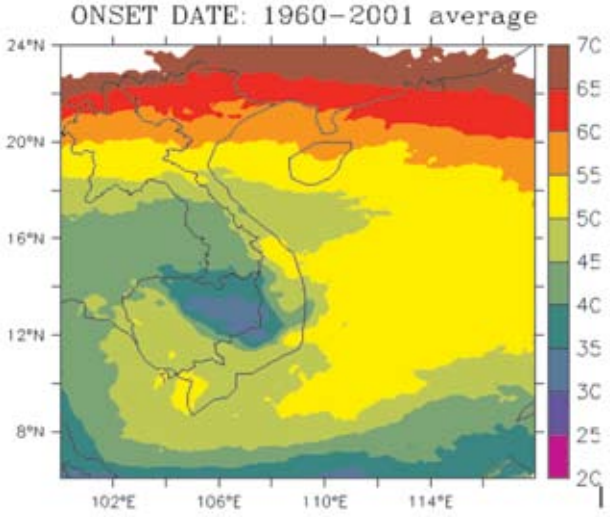

Fig. 3. Average monsoon onset date for the 1960-2001 period. Days are counted from April 1st.

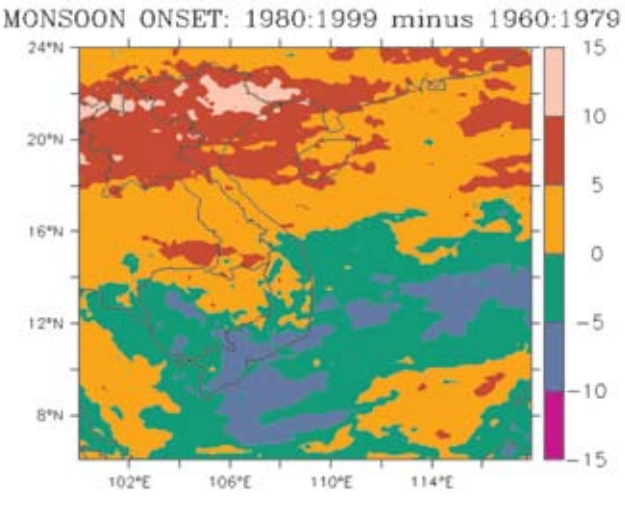

Fig. 4. Difference in the monsoon onset between 1980-1999 and 1960-1979. Units in days.

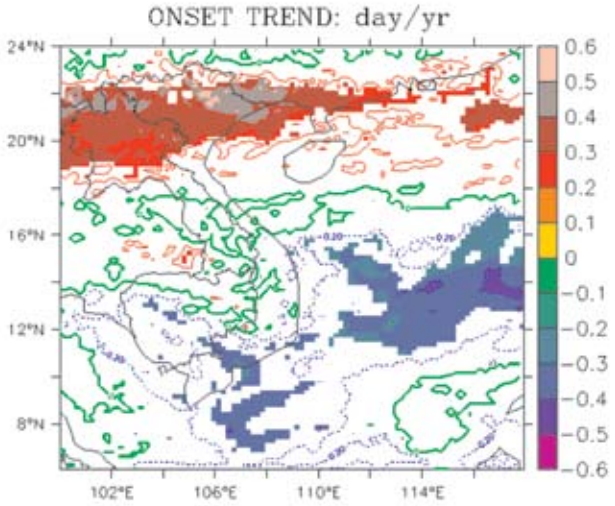

Fig. 5. 1960-2001 trend of the monsoon onset dates. Shaded areas denote the trend at 90% level of significance (two-tailed test). Red/blue contours represent positive/negative trends. 0-trend is represented by green contours. Units in day/year.

significant over North Vietnam and over the southwest part of the East Sea. A possible factor of the advanced large-scale monsoon onset is likely to be attributed to the heat contrast between the Asian landmass and the tropical Indian Ocean [4].

4. Conclusions

The new set of monsoon onset criteria has been applied for the RegCM4.2–ERA40 simulation. Taking the 42 yr averages (1960-2001), it was shown that the earliest onset in Vietnam generally occurs around April 15 in the western part of the Highland region and the latest onset occurs early June in the north. Advanced (delayed) monsoon onset over South Vietnam (North Vietnam) is detected with significant trends over North Vietnam and over the southwest part of the East Sea. Further investigations in the near future are needed to elucidate the possible mechanism that produces the opposite onset trends in North and South Vietnam.

Acknowledgement

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