Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)


ACG06-01 Room:101A Time:May 26 11:00-11:20

# Quick water cycle over the Indonesian maritime continent: An ”AM radio” hypothesis

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High-resolution observations with radars and other hydrometeorological instruments have been installed and operated since JEPP-HARIMAU (FY2005-09) and SATREPS-MCCOE (FY2009-13) projects by Japan-Indonesia collaborations.

The most important result is that over the Indonesian maritime continent (IMC) all of landward (sea wind) water-vapor transport, rainfall and seaward (river) water transport have diurnal cycles, which suggest a very quick hydrologic cycle. In other words the water budget is almost balanced and reset every day, and is probably closed locally almost within a river basin, although the cycling (e.g. rainfall) amount is changed each day/area dependent on the diurnal-cycle (sea-land breeze circulation) amplitude controlled directly by sea-land heat/water contrast (affected by longer/larger scale climate such as cold surges and ENSO/IOD).

This situation is just like an AM radio, in which an input signal modifies the output amplitude but generates no interactions/modifications in the carrier wave frequency itself. Therefore, the concept/strategy of hydrometeorological observations/predictions over IMC must be somewhat different from those in mid-latitudes where synoptic-scale space-time continuity is most important. Namely, over the IMC, observations arranged in each area/basin and predictions restarted each day (with many recalculations analyzed statistically) would be more effective than in mid-latitudes.

Keywords: Indonesian maritime continent, cloud convection, water cycle, diurnal cycle, HARIMAU, MCCOE

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# MJO role on Intraseasonal variation of stable isotope of Precipitation in Indonesia Maritime Continent

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MJO (Madden-Julian Oscillation) is one of the disturbances for Asian Monsoon in the Maritime Continent Area. Intraseasonal variability of precipitation in the Indonesia Maritime Continent (IMC) is mainly due to The Madden-Julian Oscillation (MJO), cold surge, or other synoptic scale disturbance. This study examined the relationship between MJO and stable isotope in precipitation over the IMC. Observation and simulation model data from isotope circulation model was used. From 2001 - 2009, 10 main MJO events were detected and 6 of the event occurred at Boreal Winter season (Asian Monsoon). Temporal and spatial analysis from simulated stable isotopes model reveals that isotopic variation is correlated to MJO event in different phase for different stations. Generally, $\delta^{18}$O in precipitation became lighter in most observation station at phase 3, 4 and 5 at western part of IMC, and phase 4, 5, and 6 at north east part of IMC. Spatial distribution of $\delta^{18}$O in precipitation for each MJO phase show that mainly MJO governed $\delta^{18}$O variability in intraseasonal timescale for IMC area. Further investigation showed clear signal of MJO in $\delta^{18}$O was observed at Bukit Tinggi (GAW) station only; it is confirmed with result from Isotope Circulation Model (ICM). When MJO is in active phase (enhanced) precipitation in western part of IMC, precipitable water was came from Indian Ocean and South IMC Ocean.

Keywords: asian monsoon disturbance, stable isotope, Madden Julian Oscillation, moisture transport analysis

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# Relative role of the ocean for interannual and decadal variations in summer monsoon onset over the South China Sea

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In this study, we reveal a difference of mechanisms with interannual variation a 15-years variation in the South China Sea Summer Monsoon (SCSSM) onset. The SCSSM onset occurs in active convections over the South China Sea (SCS), when convections are active over the Philippine Sea (PS). Variations in the SCSSM onset are affect by the variations in the convective activities over SCS and PS. The increase in the sea surface temperature (SST) over the Western Pacific in recent years causes the more active convection over the PS, therefore the SCSSM onset is advanced in 15-years variation as already pointed out by Kajikawa and Wang (2012).

Moreover, we elucidate the relation between the SCSSM onset date anomaly and aggregated SST over the SCS from January to March. The correlation is good between the SCSSM onset date anomaly and the aggregated SST over SCS, while a poor relation founds between the 15-years variation oriented signal in onset date and the SST in SCS. When SCSSM onset date is delayed, the aggregated SST in SCS has tend to high temperature. On the other hand, the correlation is good between the 15-years variation in the SCSSM onset date and the aggregated SST over the PS. The SST anomalies over the SCS are influenced by the frequencies and strength of cold surges during boreal winter. Strong and longer cold surges bring the lower SST over the SCS. The cold surges are brought about the anticyclone over the Eastern Eurasian continent. An arctic sea-ice decline instigates the high-pressure deviation over the Eurasian Continent. Then relatively lower land surface temperature in middle latitude, and bring the cold surge over the SCS.

Keywords: summer monsoon, onset, South China Sea

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# Climatological seasonal changes of rainfall and circulation in the Philippines

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Climatological seasonal changes of rainfall and lower tropospheric circulation in the Philippines were analyzed by utilizing 5-day mean TRMM 3B-42 and station rainfall data provided by PAGASA, and ERA-Interim wind data for the period 1998-2013. In particular, climatological onset and withdrawal processes of the southwest monsoon were investigated.

It was found that the onset of southwest monsoon occurred abruptly in mid-May. It started from the north in the Philippines both in rainfall and wind, which showed a peculiar feature in this region. After the onset, anti-cyclonic flow from the Pacific high was predominant, and it changed into cyclonic flow in mid-June. Easterlies still remained in the south until early July, afterwards SW monsoon covered the whole country and enhanced from late July.

Southwest monsoon began to retreat from the north in mid- September, and fully retreated from the southern tip of the Philippines in late October.

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Keywords: monsoon, seasonal changes, monsoon onset, monsoon withdrawal, rainy season

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# Long-term Regional Precipitation Disparity in Northwestern China and Its Driving Forces

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Precipitation in Northwestern China (NW China) is characterized by salient regional differences. Yet, the long-term regional precipitation disparity in NW China still remains insufficiently-explored. In the present study, we base on historical documentation to derive the fine-grained precipitation indices of two macro regions in NW China between AD580 and 1979 to (1) determine the multi-decadal to centennial regional precipitation disparity in NW China; and (2) find the major driving forces behind it. Wavelet analysis is applied. Our results show that there is significant regional discrepancy of precipitation change in NW China over extended period. Besides, the association between the regional precipitation disparity in NW China and various modes of atmospheric circulation (Asian Summer Monsoon, Arctic Oscillation, Pacific Decadal Oscillation, and North Atlantic Oscillation) is significant and characterized by a regime shift during the transition from the warm episode to the Little Ice Age in the $14^{th}$ century. Most importantly, the $\sim$180 to 240 year cycle of the El Niño-Southern Oscillation is found to be the most prominent pacemaker of regional precipitation disparity in NW China at the long-term temporal scales. Our findings help to demonstrate which atmospheric circulation is primarily responsible for the long-term regional precipitation disparity in NW China, which may have important implications for water resource management there.

Keywords: precipitation, moisture, atmospheric circulations, Asian Summer Monsoon, El Nino-Southern Oscillation, Northwestern China