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Monsoon Effect at Flood Phenomena on 2002 and 2007 in DKI-JAKARTA

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Abstract

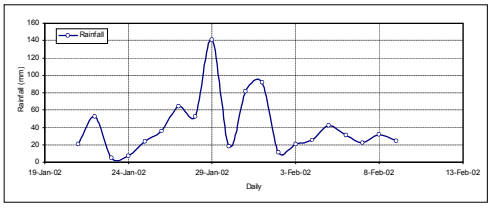
The monsoon effect one think especially represent to important matter as causes of floods happen in area of Jakarta. The research of convection pattern above area of DKI-Jakarta based on to existing perception data, which is expected will give the understanding of growth of convection cloud yield torrential rains and deliver floods in DKI-Jakarta on 2002 and 2007. The result of research into whereas in this research is obtained by the rain study of extreme in DKI-Jakarta. As rainfall data result of average from some stations is residing in DKI-Jakarta. The result of research is obtained by comparison analysis whereas, that cloud dynamics in DKI-Jakarta happened at around of December, January and February, where periodicity of monsoon takes place.

Keywords: *Monsoon, flood and cloud dynamics.*

Introduction.

The floods of natural disaster, what knocks over approximate 70 % of all region in DKI-Jakarta takes place from date 29 January 2002 to 10 February 2002 with pond height ranges from 10-250 cm [**1, 2**] and repeatable at 1-5 February 2007. The nature phenomenon because of taking place torrential rains for hours for area that is wide enough and added with consignment floods which in bringing by river passing DKI Jakarta [**3**].

a



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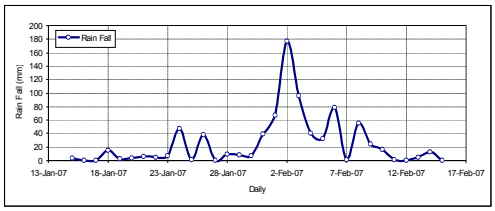


Fig. 1(a). Rainfall graph the year 2002 of Jakarta

(b). Rainfall graph the year 2007 of Jakarta

The floods of disaster, knocking was over area of Jakarta and it's surroundings is because of big and the duration close rainfall as case of atmosphere change anomaly. The change anomaly of atmosphere from rainfall, as in Fig. 1a and b graph of rainfall on 2002 and on 2007 of Jakarta, with maximum of rainfall time periodicity happened on 30 January 2002 and 2 February 2007.

In this paper will be studied of monsoon effect the happening of extremely rain floods DKI Jakarta the year 2002 and the year 2007. The diurnal cycle of rainfall and its regional variations are important in the tropics, where the synoptic-scale cyclones that cause rainfall in extra tropical regions don't exist, because tropical rainfall involves the up take and release of significant amounts of latent heat of vaporization [**4**]. The extremely rainfall phenomenon was evaluated from effect

global, synoptic which is change of atmosphere regional and local factor. When a deep convective, especially thunderstorm, cloud has fully developed and start producing rain, it will create a cold pool in the lower level due to downward advection of cold and dry air by the down draft and the effect of evaporative cooling. In the absence of background wind, the accumulated cold-air will flow outward from the base of the cloud and may induce new convection cell by lifting the encountered hotter and more humid air [**5**]. It is further mentioned that the floods were more accounted for by the extremely large 20-day (from 21 January to 9 February) rainfall total observed at many stations and attributed to the passage of monsoon over Java Island.

Research Methodologies.

As initial step in this research, be study to monsoon effect above area DKI Jakarta based on the observation data, which will give understanding about growth pattern of convection cloud yielding torrential rains and delivers floods in region DKI-Jakarta.

The monsoon effect analysis with determination of extreme rainfall of floods cause is region in DKI Jakarta, dynamical atmosphere analysis based on final analysis (FNL) data from National Centers for Environmental Prediction (NCEP). Then as step of hereinafter, analyses change pattern of periodicities monsoon and index convective of OLR (Out going Long wave Radiation) and infrared (IR1) from http://www.cdc.noaa.gov. and http://weather.is.kochi-u.ac.jp., this thing done to see of monsoon effect to case of floods DKI Jakarta the year 2002 and 2007.

Results and Analysis.

The extremely rainfall phenomenon evaluated from effect synoptic which is change of atmosphere regional, can be in the form of factor change of condition of monsoon and streamline of wind (vortex) of area DKI-Jakarta. The monsoon periodicity was happened on the year 1990 to 2007 as Fig. 2.

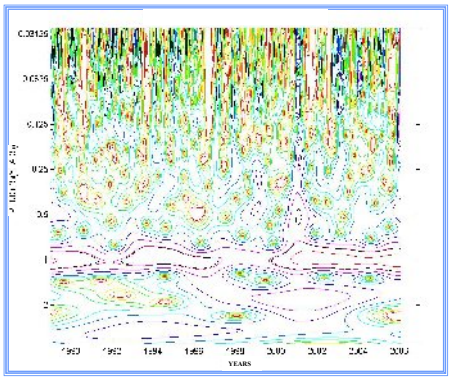


Fig. 2. The periodicity of monsoon on the year 1990 to 2007 on DKI-Jakarta.

The case streamline of wind (vortex) is from date 23 ending 26 January 2002 as in Fig. 4a. and 25 January ending 1 February 2007 as in Fig.4b. The result of analysis is explains case of tropical cyclone in region of Indonesia south happened in one years average of seven cases with monthly rainfall stays to average value with anomaly 12,6 mm [**6**].

The cyclonic vortex is created moisture convergence over relatively large area including the western parts of Java Island. In addition, this vortex also caused a predominantly meridional monsoon flow, i.e. the near surface wind blew almost perfectly in the North-South direction, over West Java. The effect of the predominant northerly wind impinging a rugged topography area in Southern parts of West Java, might have contributed to enhanced convective

activities northerly wind impinging a rugged topography area in Southern parts of West Java

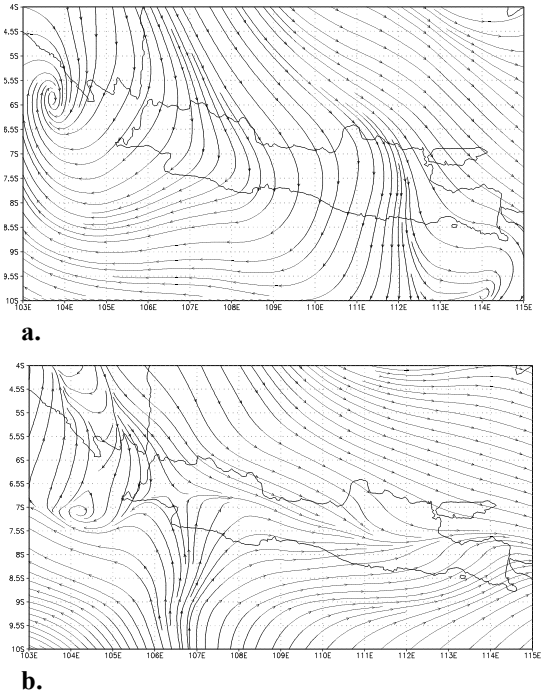


Fig.3(a). The streamline of wind (vortex) is from date 26-1-2002.
(b). The streamline of wind (vortex) is from date 1-2-2007.

It is concluded that tropical cyclone winds are convectively unstable. A review of past measurements provides overwhelming evidence of higher turbulence intensities, guest factor, and turbulence integral length scales in the tropical cyclone boundary layer as compared with those obtained under neutral conditions. This is a direct consequence of convective instability and the additional influence of convective activity above the boundary layer. Instability in the tropical cyclone also causes the mean and gust wind profiles to be flatter than the neutral boundary layer profiles [**7**]. Which if effect synoptic predominating hence rainfall there will be across the board as impact of the effect [**8**] based on the thing, hence extremely rainfall that caused floods on 2002 and on 2007 in DKI-Jakarta.

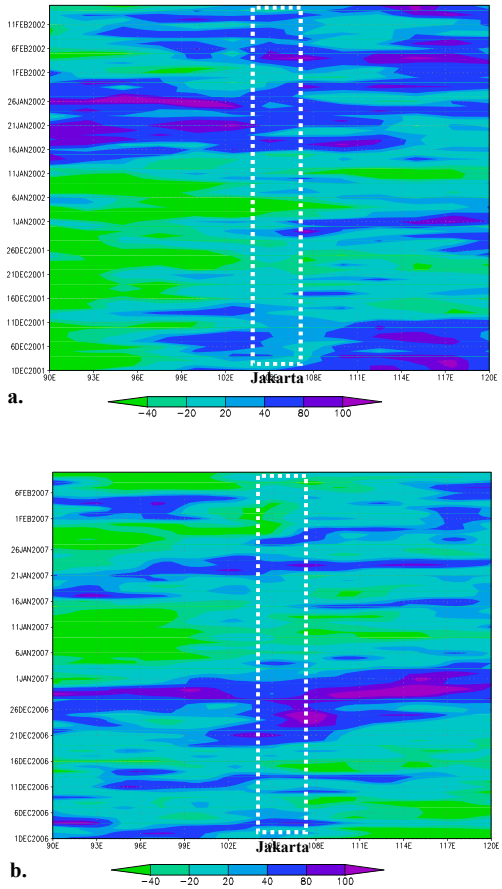
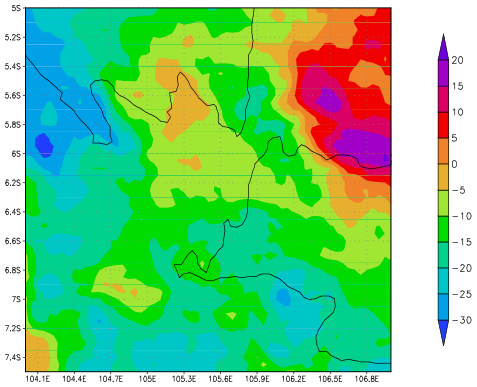


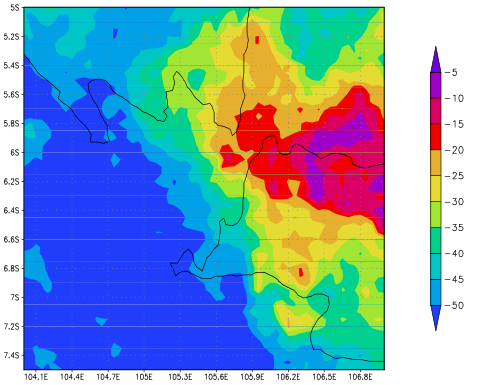
Fig. 4 (a). Convective Index out going long wave Radiation (OLR) on December-January 2002.
(b).Convective Index out going long wave Radiation (OLR) on January 2007.

The dynamic of out going long wave radiation (OLR) before the floods happen can be seen on the figure (see Fig. 4a and 4b). The convective index of OLR anomaly in Indonesia area, in this case happened on a condition of drought to take place out of 1 December 2001 to 11 February 2002 and 1 December 2006 to 6 February 2007 for floods period 2002 and 2007. In this case already happened to storage of energy in atmosphere on this period then is released concurrently, in such a way that happened motivation of modulation of

big energy in this case is in the form of extreme rainfall energy. The consideration is period to come this case need to be gave attention to when the rainy will reach it's the top.



a.



b.

Fig. 5 (a). Convective Index of IR1 Temperature 29 January 2002. at 00 UTC in DKI-Jakarta.
(b). Convective Index of IR1 Temperature 1 February 2007, at 00 UTC in DKI-Jakarta

The extreme rain phenomenon is analyzed based on cloud dynamics pattern (from Convective Index of IR1 Temperature data) in DKI-Jakarta. The growth pattern of cloud is started on 28 January 2002, but growth of maximum cloud happened on 29 January 2002 started when 00-03 UTC (07-09 WIB) and finished on 30 January 2002 (Fig. 5a). In Fig. 5b that show growing pattern of cloud is started on 31 January 2007, but growth of maximum cloud happened on 1 February 2007 started when 00-03 UTC (07-09 WIB) and finished on 2 February 2007. By inspecting the model output in the area if interest, it is found that the largest concentration of convective rainfall over Jakarta and other area in the northern coast of West Java, on the next day convective activities seemed to subside after the previously discussed vortex disappeared and the monsoon trough migrated to the South of Java Island

It can be seen that convective activities were predominant over Indonesia as indicated by the distribution of low daily averaged T_{BB}. On the other hand, the streams line pattern plotted from the FNL data show the convergence zone of the monsoon was passing over Sumatra, Java and other Island in the Sunda Arc region and migrating further South to the Indian Ocean. Therefore, it can be understood that convective activities were their peak during this period of time. It should also be noted that the moisture distribution, in terms of precipitable water in atmospheric column [**9**].

The result research of daily wind data processing (direction and speed) period the year 1988 to 1998 of BMG Jakarta Station assumed represents region Jakarta is got by I_{kh} (Monsoon Khromov Index) equal to 51%, with main wind is Westerly wind (64%) for January and Easterly wind (39%) for July. The blend Wind Velocity for January 1,5 m/sec while the blend wind velocity in July 1,3 m/sec. Index monsoon Khromov is an index gotten from calculating deviation of wind frequency January with July having minimum difference 120^0. The persistence value in January is 0,8, while

in July is 0,6. Assessed valuable wind persistence one if wind blown from and the same direction is valuable zero if wind blew from all directions.

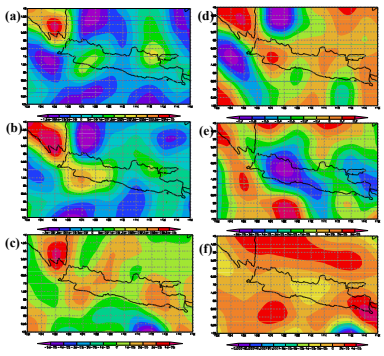


Fig. 6 (a, b, c) Wind divergence of DKI-Jakarta Date of 28-29-30 January 2002.
(d, e, f) Absolute Vorticity [/s] of DKI-Jakarta Date of 28-29-30 January 2002 from data NCEP/NCAR.

The region of DKI Jakarta is monsoon influence region. In January is influenced by westerly wind with the wind of persistence value is 0,8, while wind in July is mastered by Easterly wind (persistence it's 0,6). The local influence still seen strong, this thing is showed with wind value blend which less than 3,5 m/sec. Second rank wind predominating region Jakarta is Northerly wind (14 % in January and 27 % in July) [**10**].

The study in this research will be analyzed from data FNL for date on 28 to 30 January 2002 and on 25 January to 5 February 2007 in DKI-Jakarta. Data of contour pattern FNL for example covering divergence by streamline of wind, absolute vorticity obtained from data NCEP/NCAR (see fig. 6 and 7). Data of every 6 hours from the NCEP/NCAR reanalysis data was used to know that extremely rain influence was predominated by local factor. Fig. 6a, b and c show convergent pattern above sea around area of DKI-Jakarta and Indian Ocean. The Change of pattern was started on 28 January 2002 and became maximal above Java's island on 29 January 2002 and finished on 30 January 2002.

Figure 6d, 6e and 6f show a negative absolute vorticity for on 28 January 2002 between Java's sea and Indian Ocean, around of Jakarta area. Then on 29 January 2002, the negative vorticity anomaly was happened above part of Java's island and finished on 30 January 2002. This thing proves that the activity of tropic convection above ocean is more actively with large variations [**4**].

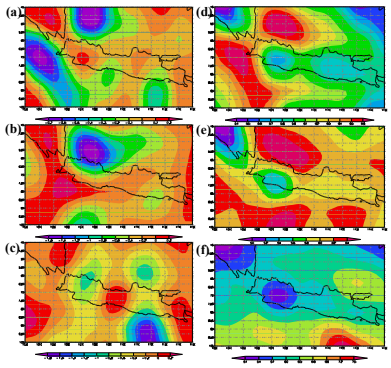


Fig. 7 (a,b,c) Pressure Vertical Velocity [Pa/s] of DKI-Jakarta Date of 28-29-30 January 2002.
(d, e, f) Atmos. column Precipitable water [kg/m^2] of DKI-Jakarta Date of 28-29-30 January 2002 from NCEP/NCAR data.

Figure Fig. 7a, b and c show convergent pattern above sea around area of DKI-Jakarta and Indian Ocean. The Change of pattern was started on 31 January 2007 and became maximal above Java's island on 1 February 2002 and finished on 2 February 2007. Figure 7d, e and f show a negative absolute vorticity for on 31 January 2007 between Java's sea and Indian Ocean, around of Jakarta area. Then on 1 February 2007, the negative vorticity anomaly was happened above part of Java's island and finished on 2 February 2007. This thing

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This thing proves that the activity of tropical convection above ocean is more active with large variations. The growth pattern of cloud in DKI Jakarta was caused by circulation factor of local atmosphere. This thing proves that change of climate anomaly on January 2002 and on February 2007 is affected by the growth of convection.

Conclusion.

The extremely rain phenomenon in region of DKI-Jakarta was analyzed based on change pattern of convective index, of OLR and IR1 temperature so do the tropical cyclone phenomenon. Based on FNL data analysis, OLR and IR Temperature data, the floods in DKI-Jakarta on 2002 and on 2007 are dominated by circulation factor of local atmosphere. The dynamics of rain cloud caused torrential rain or extremely rain is caused by the growth of convection cloud in DKI-Jakarta. This thing proves that case of floods the year 2002 and the year 2007 having resemblance, in the case of atmosphere analysis.

The existence of a cyclonic vortex over the Indian Ocean to the South of Sumatra Island seemed to enhance the low-level northerly winds over the western parts of Java Island. Blocking by topography may initially played role in generating deep convection over land on 31 January 2007. From the satellite observation and global analysis data, it is found that there was synoptic condition favorable for large convective rainfall to occur during the passage of southward migration monsoon trough over Java Island.

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