



**REPORT ON HEAVY RAINFALL THAT CAUSED  
FLOODS IN JOHOR, MELAKA, NEGERI  
SEMBILAN AND PAHANG**

**DURING THE PERIOD  
17<sup>th</sup> – 20<sup>th</sup> DECEMBER 2006**

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21<sup>st</sup> DECEMBER 2006

## 1. Introduction

Cold surges emanating from high-pressure system over Siberia was the main factor of the intensification in northeasterly wind speed over the South China Sea on 16<sup>th</sup> December 2006. This enhanced the cyclonic wind shear over our region, mainly over the southern Peninsular Malaysia from the 17<sup>th</sup> until 20<sup>th</sup> December 2006. This caused Johor, Pahang, Negeri Sembilan and Malacca to experience heavy rainfall.

## 2. Analysis of rainfall from the 16<sup>th</sup> until the 20<sup>th</sup> of December 2006

Table 1: Daily Rainfall (mm) from the 16<sup>th</sup> until the 20<sup>th</sup> of December 2006

State	Station	Saturday 16/12/06	Sunday 17/12/06	Monday 18/12/06	Tuesday 19/12/06	Wednesday 20/12/2006	Total
Pahang	Batu Embun	15.0	8.8	7.0	30.6	40.0	101.4
	Kuantan	28.0	80.0	84.2	79.2	189.0	460.4
	Muadzam Shah	21.6	35.8	173.8	211.6	125.0	567.8
	Temerloh	9.0	4.6	21.4	10.8	21.0	66.8
Johor	Batu Pahat	0.8	10.8	93.4	71.6	2.0	178.6
	Senai	46.4	94.6	128.0	236.0	40.0	545.0
	Kluang	T	53.2	126.8	266.0	18.0	464.0
	Mersing	0.8	1.8	7.4	133.6	6.0	149.6
Melaka	Melaka	1.6	17.2	63.2	89.8	10.0	181.8

Table 2: December Accumulated Rainfall (1/12/2006-20/12/2006) in comparison with the Monthly Accumulated Mean.

State	Station	Total Rainfall 1/12/06 - 20/12/06	Monthly Mean	Highest Monthly	Lowest Monthly
Pahang	Batu Embun	158.6	250.0	502.0	68.4
	Kuantan	568.4	609.9	1471.1	114.8
	Muadzam Shah	609.4	419.0	849.2	83.8
	Temerloh	162.8	192.3	325.4	50.2
Johor	Batu Pahat	311.6	231.7	377.4	115.6
	Senai	704.0	250.2	563.7	37.2
	Kluang	551.6	250.0	642.1	19.7
	Mersing	277.2	621.2	155.1	72.6
Melaka	Melaka	299.2	143.3	362.5	16.1

Johor and southern Pahang begin experiencing heavy rainfall since Sunday morning, the 17<sup>th</sup> of December 2006. Followed by Melaka and Negeri Sembilan on Sunday night. Senai, Kluang and Mersing stations showed an increase in the daily rainfall on the 17<sup>th</sup> December 2006. The peak rainfall was recorded on the 19<sup>th</sup> of December 2006. Senai station showed an increase in daily rainfall from 94.6mm on the 17<sup>th</sup> of December 2006 to 128.0mm on the 18<sup>th</sup> of December 2006 and increased further to 236.0mm on the 19<sup>th</sup> of December 2006. The daily rainfall recorded by Senai station on the 18<sup>th</sup> and 19<sup>th</sup> December exceeded the monthly accumulated mean for December. Melaka and Muadzam Shah stations showed a marked increase in daily rainfall on the 18<sup>th</sup> and 19<sup>th</sup> of December 2006. Daily rainfall recorded by Muadzam Shah station increased from 173.8mm on the 18<sup>th</sup> of December 2006 to 211.6mm on the 19<sup>th</sup> of December 2006. The continuous heavy rainfall episode in these states had caused flooding in the low-lying areas.

### **3. Radar imageries from the 16<sup>th</sup> to the 20<sup>th</sup> of December 2006**

Weather radar imageries from the radar network stations in Peninsular Malaysia are shown in Appendix A. (Figure a to h) shows the development of the heavy rainfall occurrence in detail. Radar imageries were taken in twelve hour intervals starting from the 17<sup>th</sup> of December 2006 (8.00 am) until the 20<sup>th</sup> December 2006 (8.00 pm). These imageries are a composite of radar echoes taken from the six weather radar stations in Peninsular Malaysia. The development of the heavy rainfall event could be seen from the sequence of the radar echoes. Pahang and Johor have been receiving heavy rainfall starting on the 17<sup>th</sup> of December 2006. The rainfall intensity decreased on 8.00 am on the 18<sup>th</sup> of December (8.00 am) but re-intensified on 18 December 2006 (8.00 pm) based on the reduction in radar echo intensity. Further development of the radar echoes indicates intensification of rain clouds on the 19<sup>th</sup> of December 2006 causing more weather over Pahang and Johor. The intensification also caused Malacca and Negeri Sembilan to experience heavy rainfall.

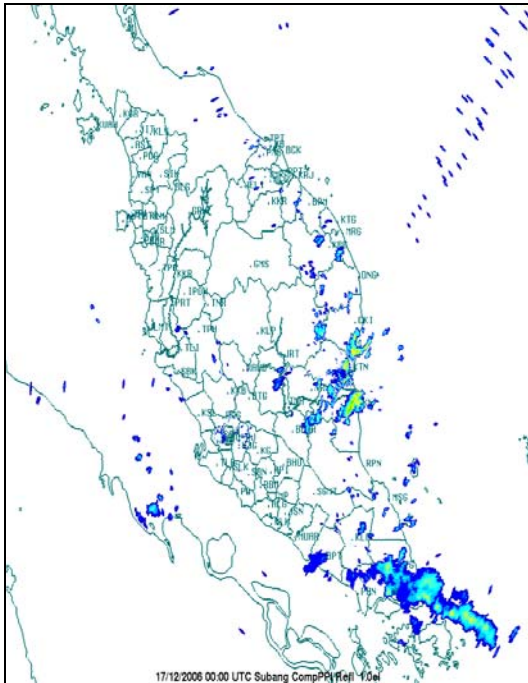
### **4. Weather Satellite Imageries from the 16<sup>th</sup> to the 20<sup>th</sup> of December 2006**

MTSAT weather satellite imageries from the 17<sup>th</sup> until the 20<sup>th</sup> of December 2006 are shown in Appendix B. Cloud development were observed over the southern part of Peninsular Malaysia on 17 December 2006 (8.30 am). Cloud intensity increased further on the 17<sup>th</sup> of December 2006 (8.30 pm). On the 18<sup>th</sup> of December 2006 (8.30 am) there was a reduction in the cloud development over southern Peninsular Malaysia. Cloud development re-intensified over the southern Peninsular Malaysia on the 18<sup>th</sup> of December 2006 (8.30 night). Pahang and Johor begin to receive heavy rainfall. Satellite imageries on the 19<sup>th</sup> of December 2006 (8.00am) showed a further increase in rainfall, which spread to Malacca and Negeri Sembilan. On the 20<sup>th</sup> of December 2006 (8.00 pm) the system move towards north and the intensity begin to reduce on the 21<sup>st</sup> of December 2006 (8.00 am).

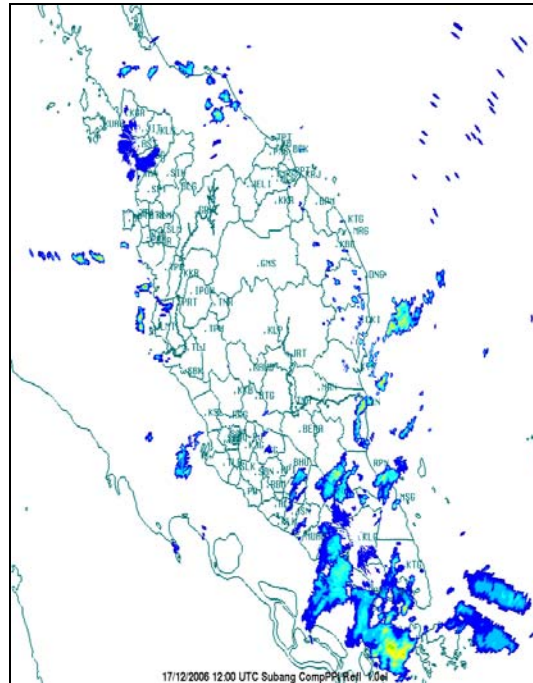
## **5. Conclusion**

Cold surges, strong convergence and cyclonic wind shear over southern Peninsular Malaysia caused an increase in cloud development, which brought heavy rainfall to southern Peninsular Malaysia. Continuous heavy rainfall episodes from the 17<sup>th</sup> until 20<sup>th</sup> of December 2006 which begin in Johor and Pahang spread to Negeri Sembilan and Malacca causing floods to occur mainly in the low-lying areas. There is a gradual reduction in rainfall over these states from the 20<sup>th</sup> onwards.

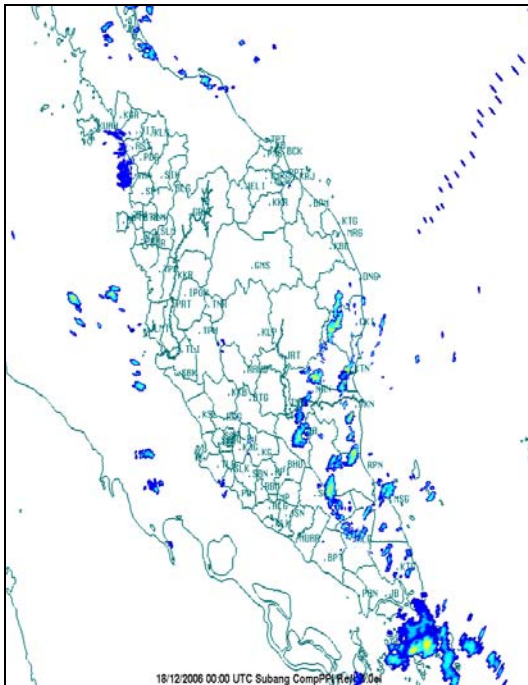
SEQUENCE OF RADAR IMAGERIES AT 8.00 AM AND 8.00 PM FROM THE  
17<sup>TH</sup> TO 20<sup>TH</sup> OF DECEMBER 2006 [(a) TO (h)]



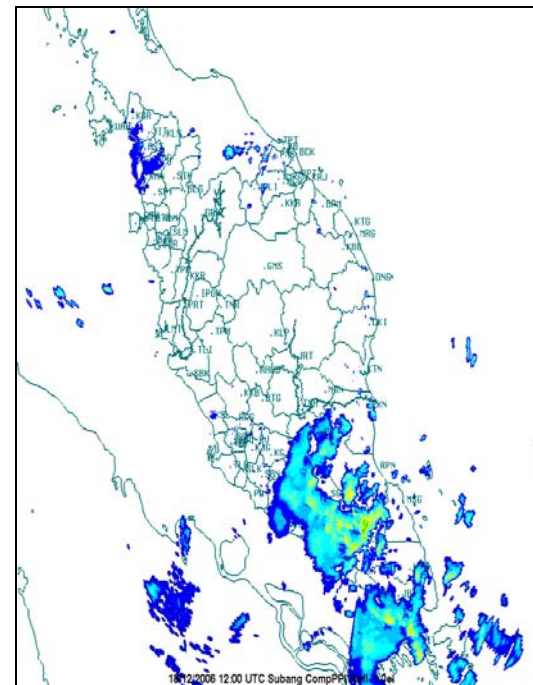
(a) 8.00 AM 17 Dec 2006



(b) 8.00 PM 17 Dec 2006

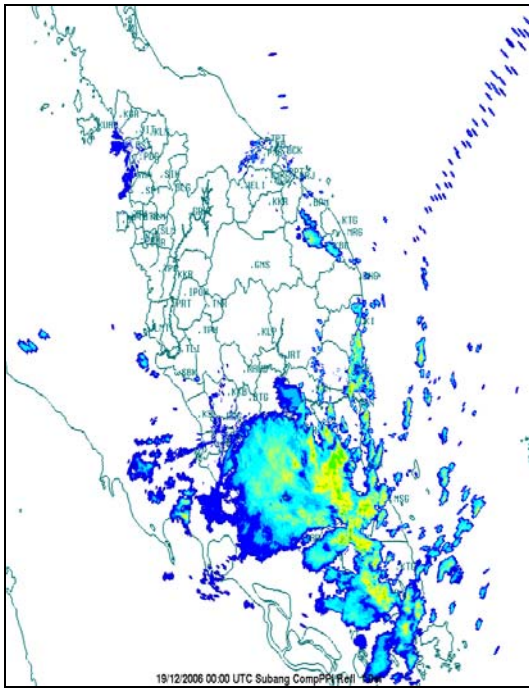


(c) 8.00 AM 18 Dec 2006

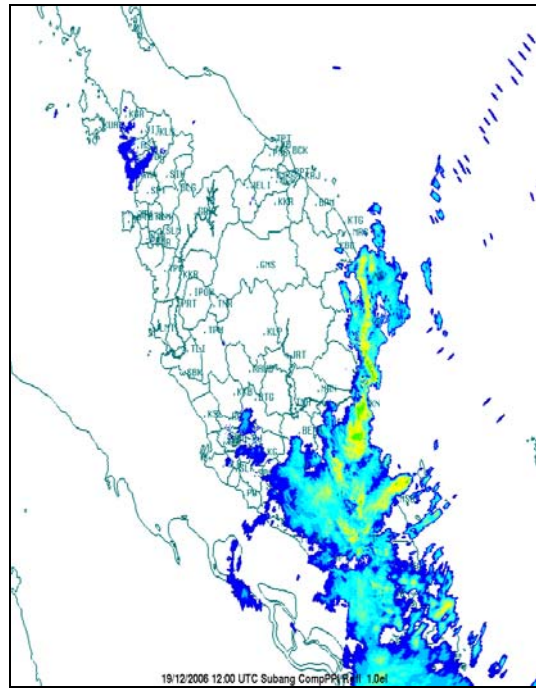


(d) 8.00 PM 18 Dec 2006

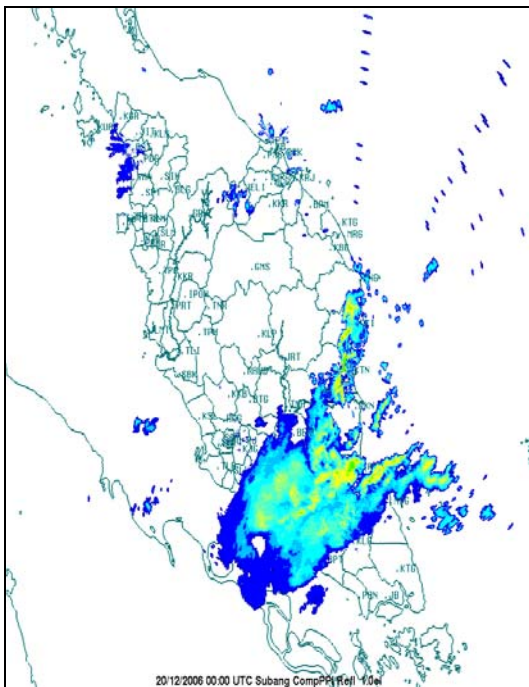
APPENDIX A (CONTINUE)



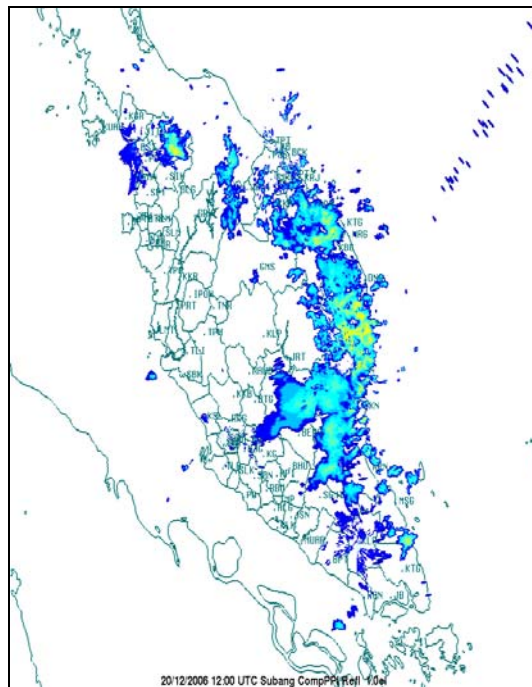
(e) 8.00 AM 19 Dec 2006



(f) 8.00 PM 19 Dec 2006



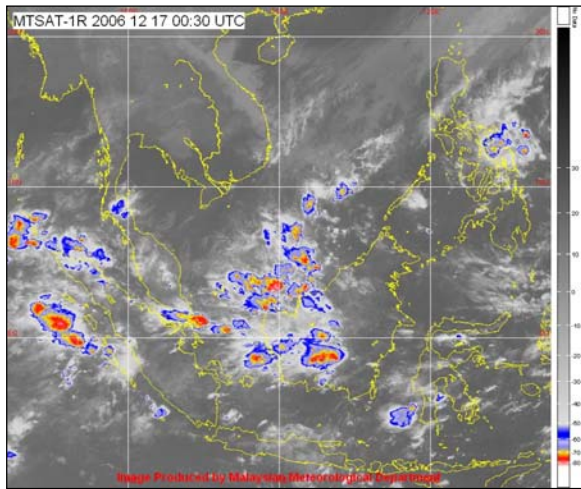
(g) 8.00 AM 20 Dec 2006



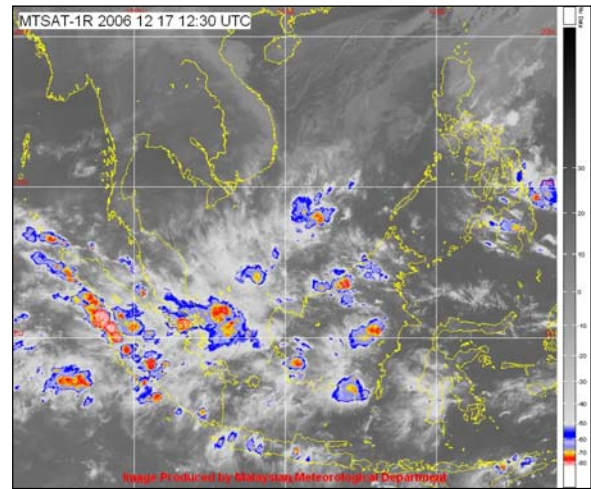
(h) 8.00 PM 20 Dec 2006

APPENDIX B

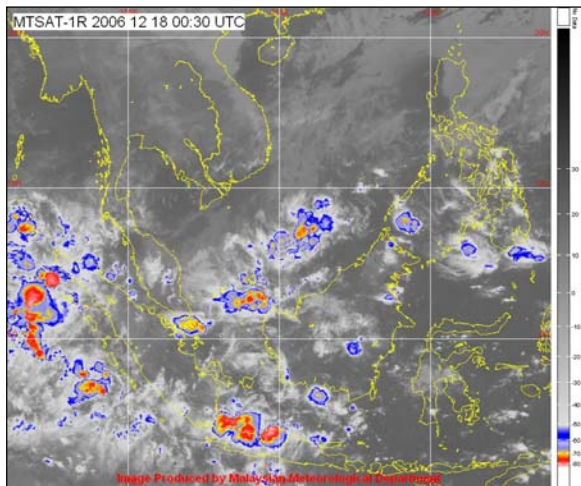
SEQUENCE OF MTSAT WEATHER SATELLITE IMAGES AT 8.30 AM AND 8.30 PM FROM 17 TO 20 DECEMBER 2006 [(a) UNTIL (h)]



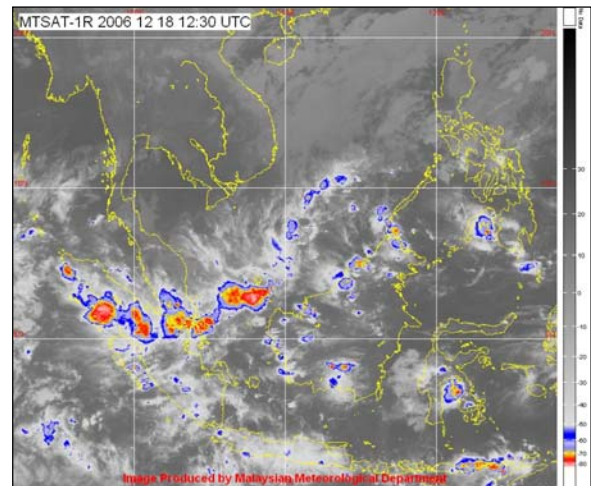
(a) 8.30 AM 17 Dec 2006



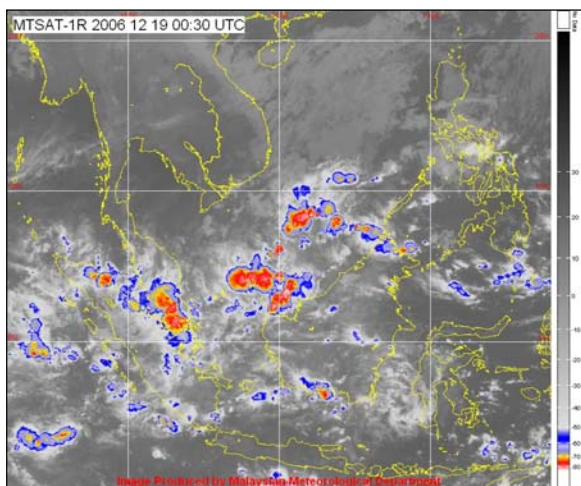
(b) 8.30 PM 17 Dec 2006



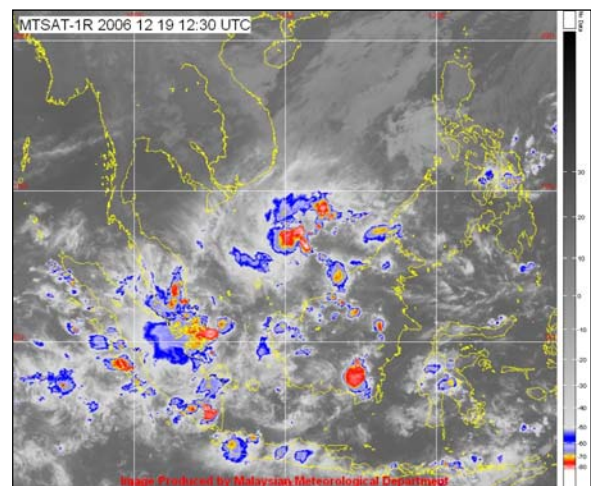
(c) 8.30 AM 18-Dec-2006



(d) 8.30 PM 18-Dec-2006

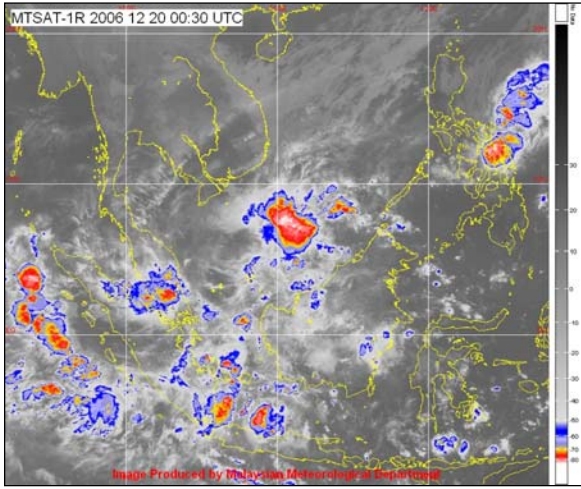


(e) 8.30 AM 19 Dec 2006

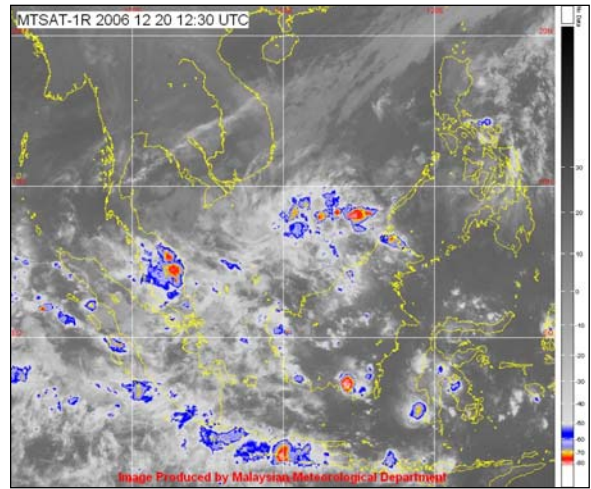


(f) 8.30 PM 19 Dec 2006

**APPENDIX B (CONTINUE)**



(g) 8.30 AM 20 Dec 2006



(h) 8.30 PM 20 Dec 2006