

The favorable atmospheric conditions for occurrence of repeated torrential rains over Jakarta in Java Island

Peiming Wu, Masayuki Hara, Manabu D. Yamanaka and Jun Matsumoto
Fadli Syamsudin, Reni Sulistyowati and Yusuf S. Djajadihardja



Indonesian floods of February 2007

- 40-70 % of Jakarta was under water, up to 4 meters deep in some areas.
- At least 100 people been killed.
- Almost 300,000 forced from their homes.

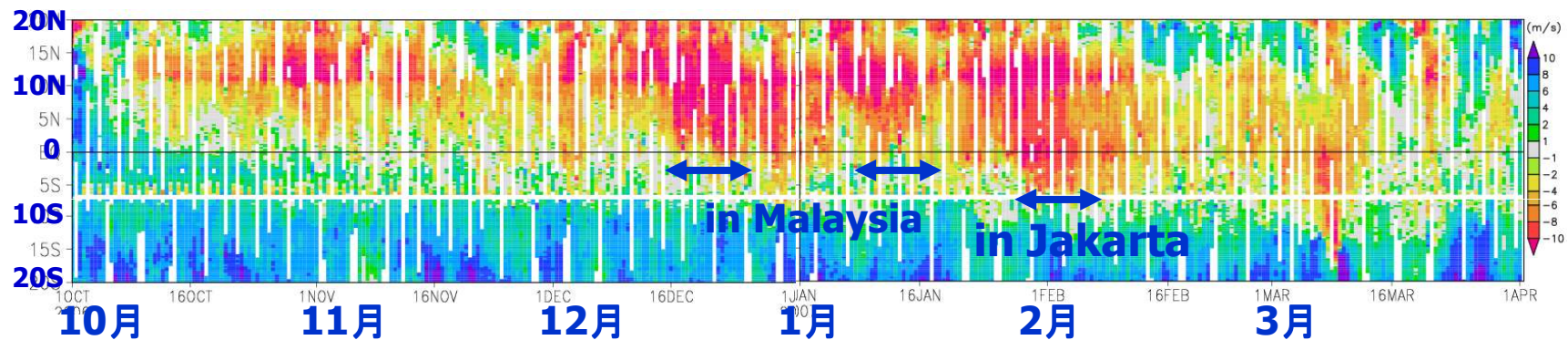


Indonesian floods of February 2007

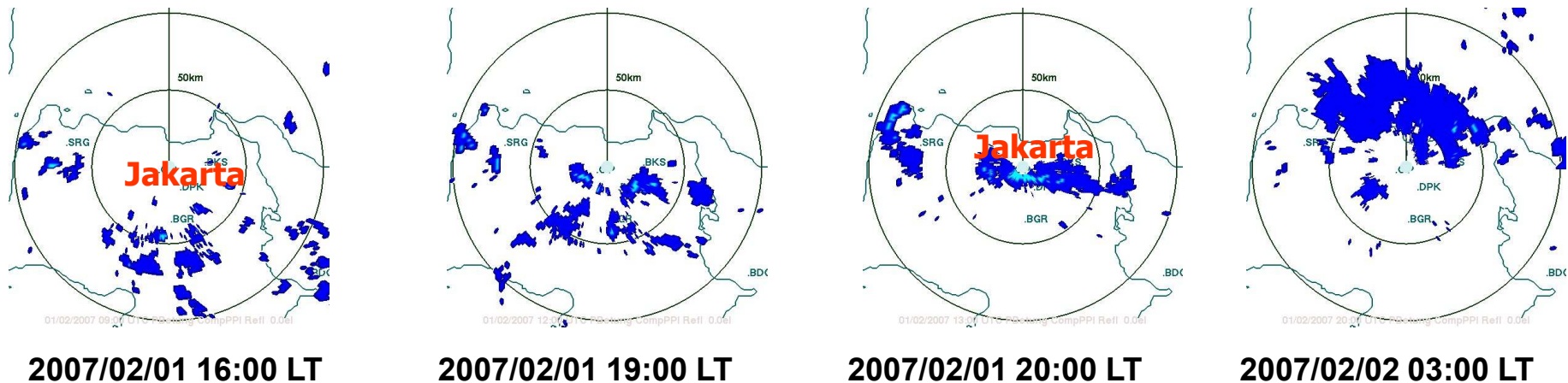
Wu et al., 2007: *SOLA*, Vol. 3, 93-96, doi:10.2151/sola.2007-024.

1. Heavy rain falls during a strong trans-equatorial monsoon flow occurs.

Meridional winds along 108° E from QuikSCAT satellite:

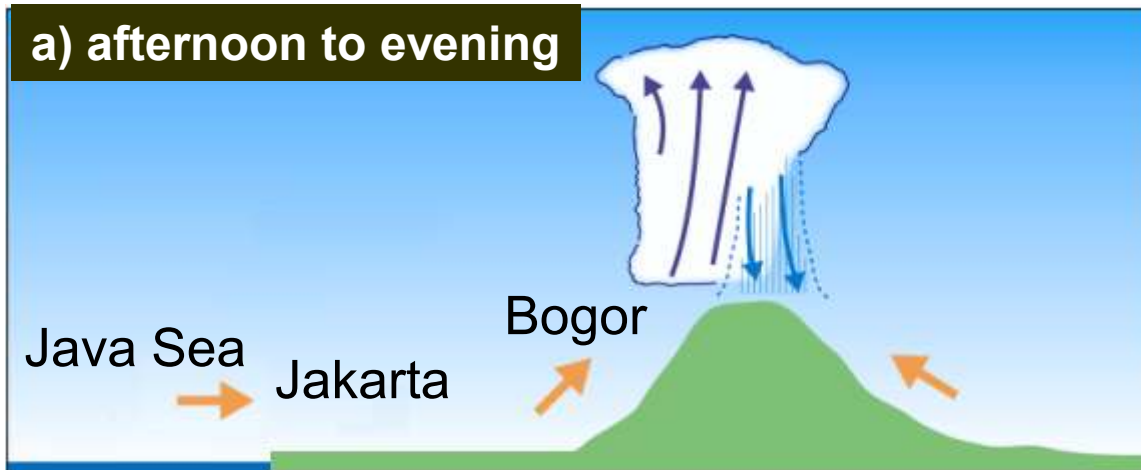


Radar PPI reflectivity at Pondok Betung (2. A pronounced diurnal cycle of heavy rainfall):

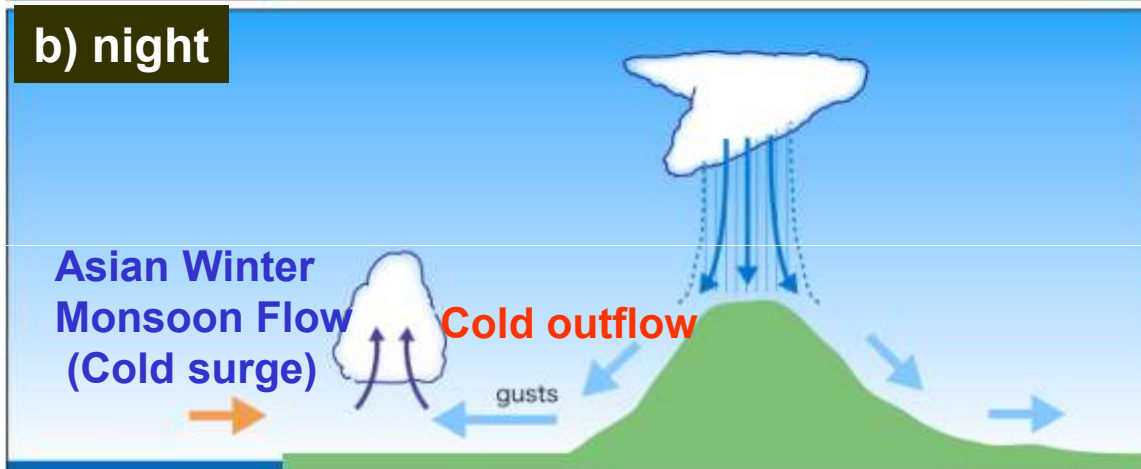




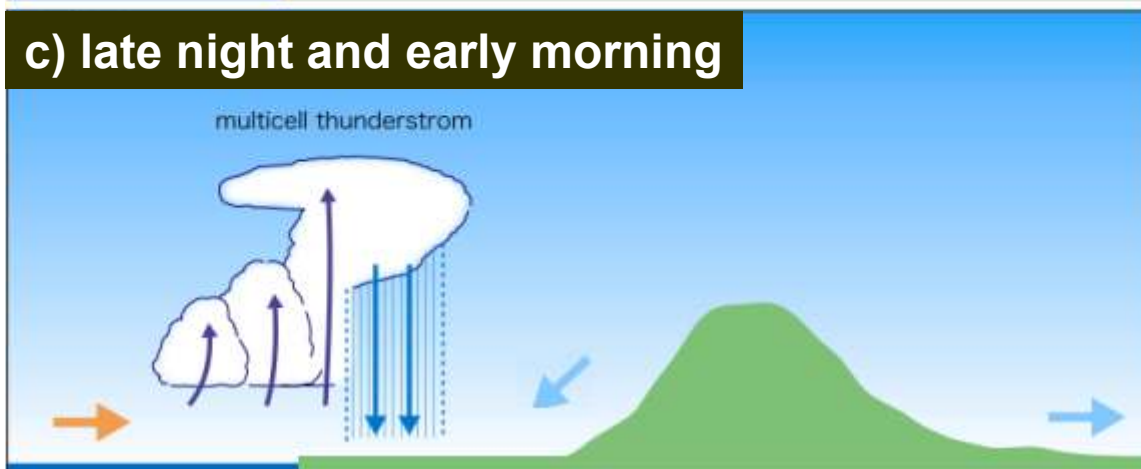
a) afternoon to evening



b) night



c) late night and early morning



Why heavy rain falls over Jakarta?

1) convection occurs over the southern mountains of Java Island in the afternoon and evening.

2) The mountain convection induces a cold surface outflow in evening, which creates an intensive low-level wind convergence, triggers convection over the plains near the mountain foot.

3) The trans-equatorial monsoon flow interacts with the local circulations, enhancing the convections over the mountains in the afternoon, and over the plains in the night and morning.

Banjir Jakarta Punya Siklus Lima Tahunan?

Banjir Jakarta 2007

Dari Wikipedia Indonesia, ensiklopedia bebas berbahasa Indonesia.

Banjir Jakarta 2007 adalah **bencana banjir** yang menghantam **Jakarta** dan sekitarnya sejak **1 Februari 2007** malam hari. Selain sistem **drainase** yang buruk, banjir berawal dari **hujan** lebat yang berlangsung sejak sore hari tanggal 1 Februari hingga keesokan harinya tanggal 2 Februari, ditambah banyaknya volume **air** 13 **sungai** yang melintasi Jakarta yang berasal dari **Bogor-Puncak-Cianjur**, dan air **laut** yang sedang pasang, mengakibatkan hampir 60% wilayah DKI Jakarta terendam banjir dengan kedalaman mencapai hingga 5 meter di beberapa titik lokasi banjir.



Curah hujan besar bersiklus 350 tahun mengguyur hampir seluruh Indonesia.

15-26 Januari 2002, Kapuk, Kebon Bawang dan jalan toll bandara terendam karena waduk jebol.

29 Januari-15 Februari 2002, 40.000 rumah terendam setinggi 3-9 meter karena hujan dan pasang laut. 380.000 pengungsi, korban 75 jiwa.

22 Februari 2002, hujan lagi. 15.000 rumah terendam lagi. [berbagai sumber]

2005 : 72 genangan



Sejak 18 Januari hingga 7 Maret 2005, ribuan rumah bolak-balik terendam. Di kawasan Kampung Melayu dan Bukit Duri ada yang mengaku sampai 7 kali mengungsi.

2002: 159 titik genangan



1996: 90an titik genangan



6-9 Januari 1996, Jakarta terendam setelah hujan dua hari.

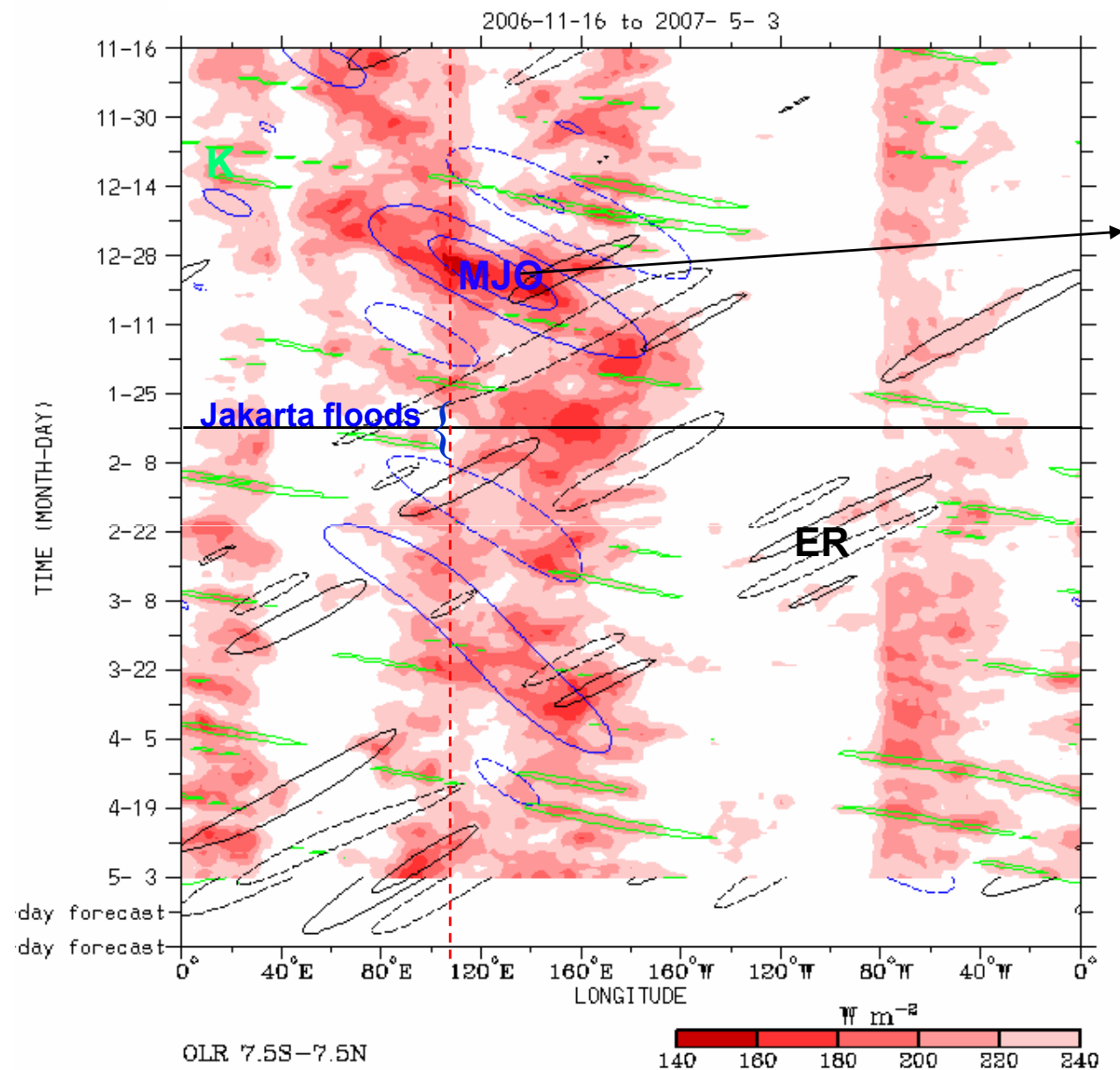
Sebulan kemudian, 9-13 Februari 1996, tiga hari hujan lebat dengan curah lima kali lipat di atas normal, merendam Jakarta setinggi 7 m. melimpas tanggul sepanjang 2,5 km. 529 rumah hanyut, 398 rusak. Korban 20 jiwa, 30.000 pengungsi. Nilai kerusakan 435 juta dollar. [sumber: Satkorlak PBP DKI dan Dartmouth Flood Observatory].

quatorial Modes by OLR : Wheeler-Kiladis Diagram

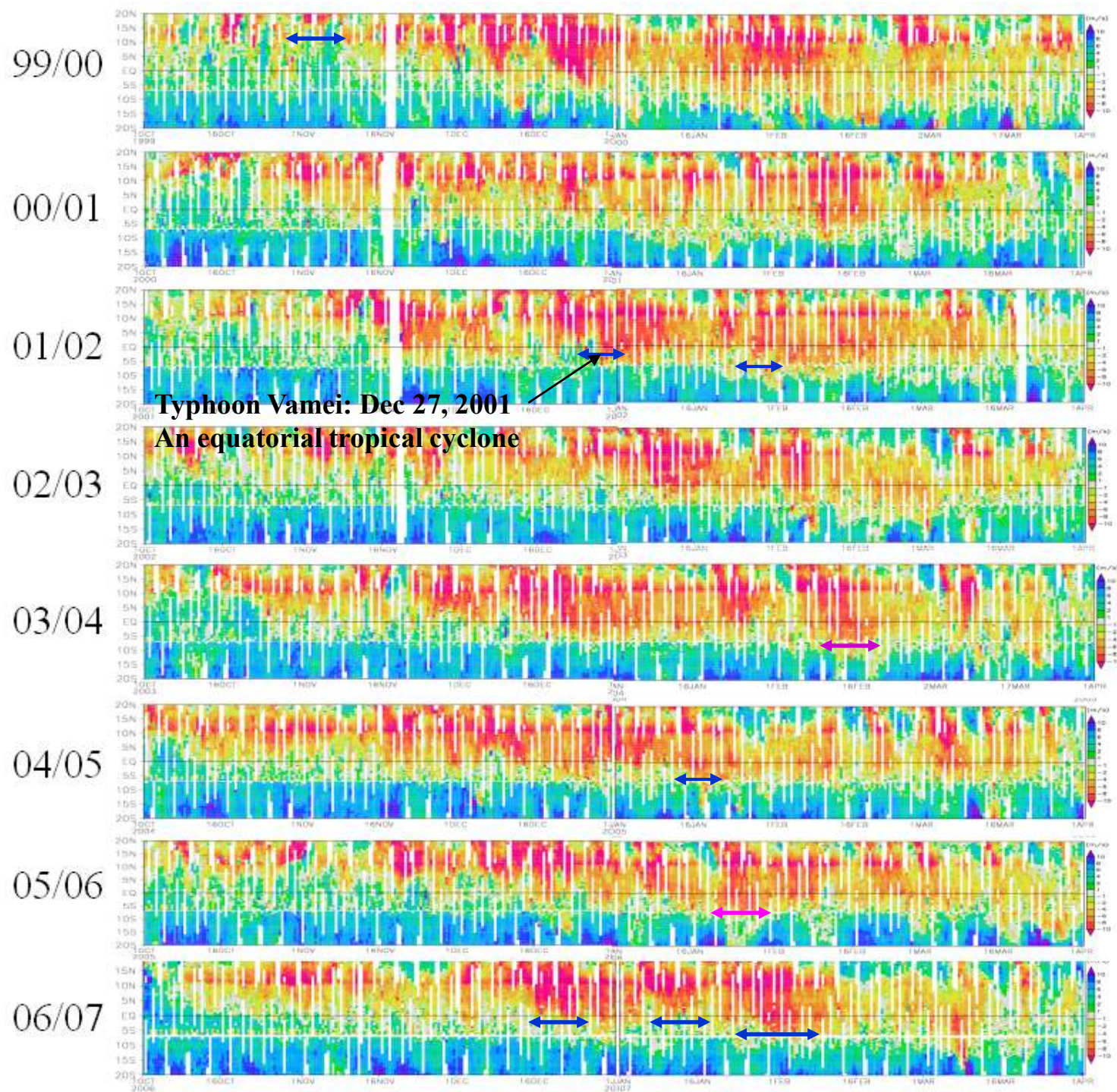
2006/12/29 00:00 LT

2006/12/29 12:00 LT

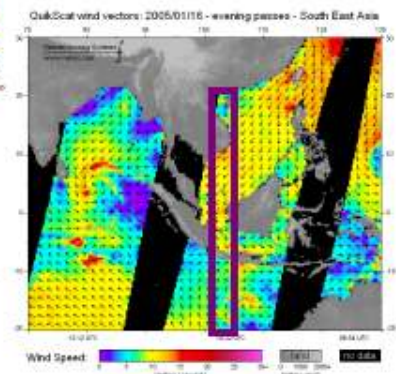
2006/12/30 00:00 LT



http://www.cdc.noaa.gov/map/clim/olr_modes/hovEt.html



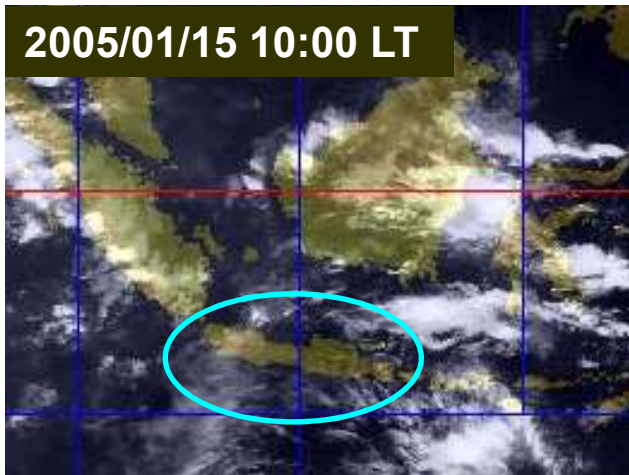
**Time-latitude
diagram along
108 E (106-110E)
of the
meridional
winds
from QuikSCAT
sea surface
winds**



2002/01/27 12:00 LT



2005/01/15 10:00 LT



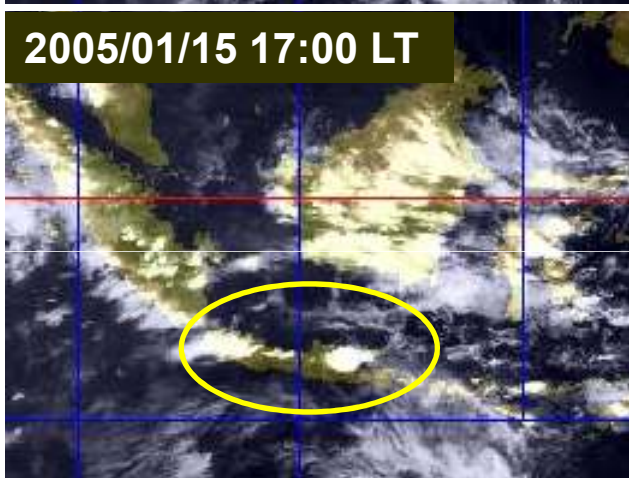
2007/02/01 10:00 LT



2002/01/27 17:00 LT



2005/01/15 17:00 LT



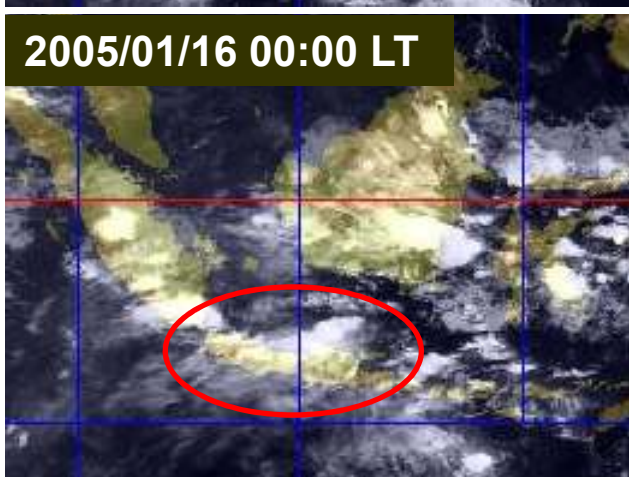
2007/02/01 17:00 LT



2002/01/27 23:00 LT



2005/01/16 00:00 LT

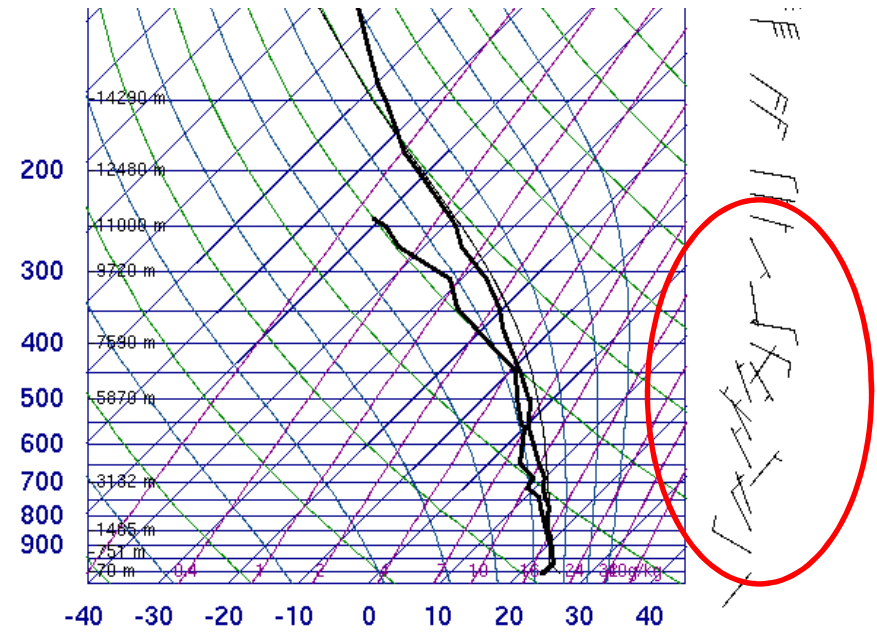
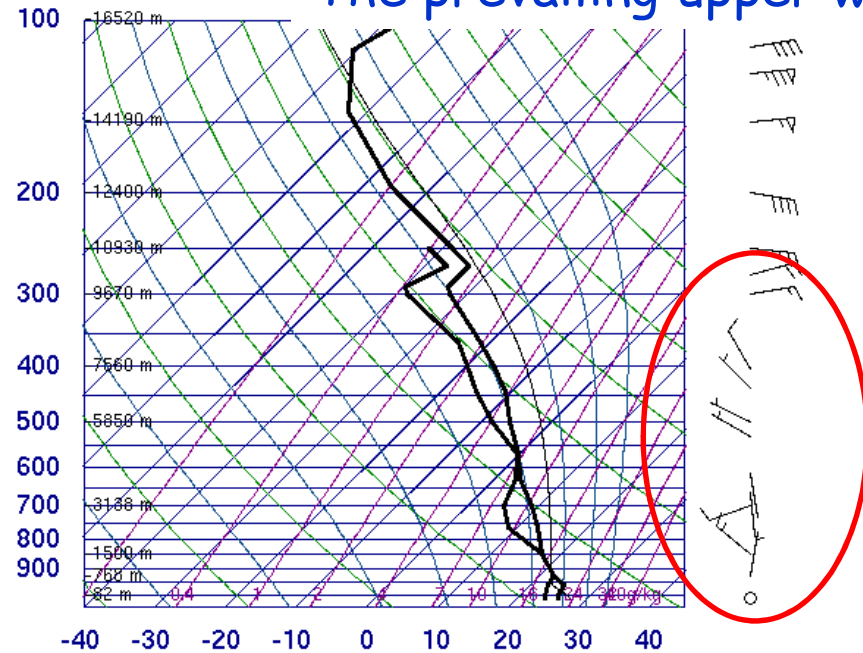


2007/02/01 21:00 LT

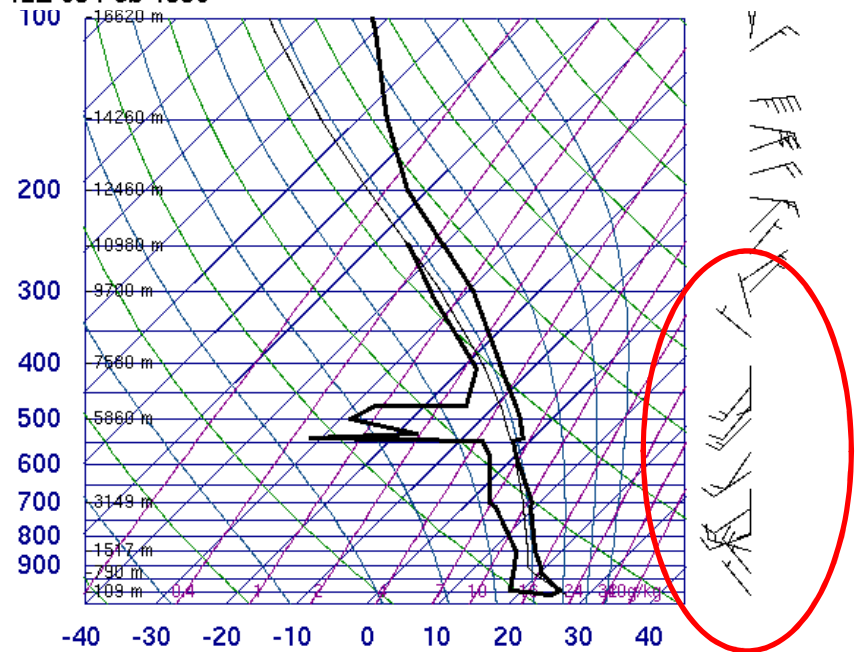


96749 WIII Jakarta

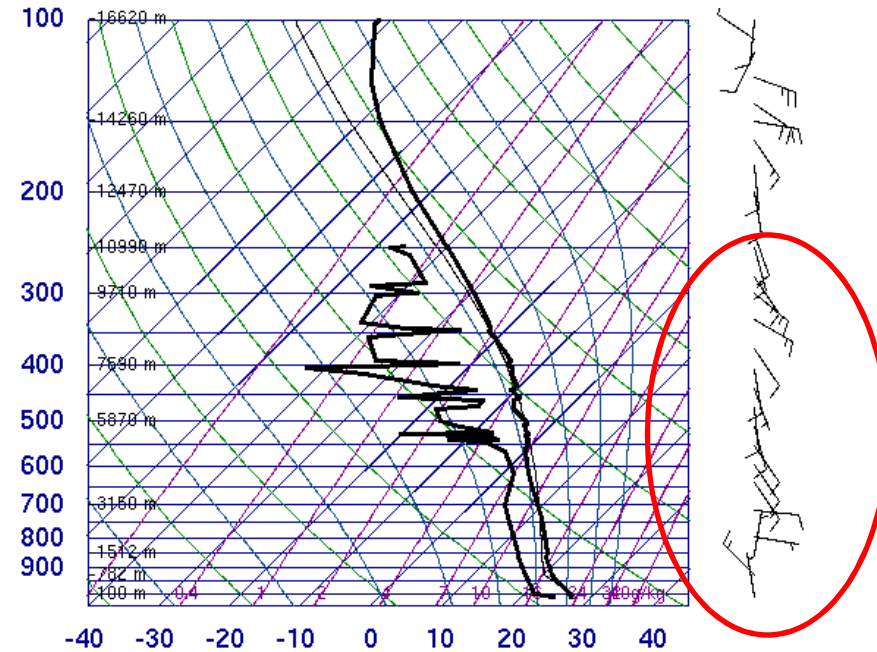
The prevailing upper winds are weak during the heavy rains.



12Z 09 Feb 1996



00Z 26 Jan 2002

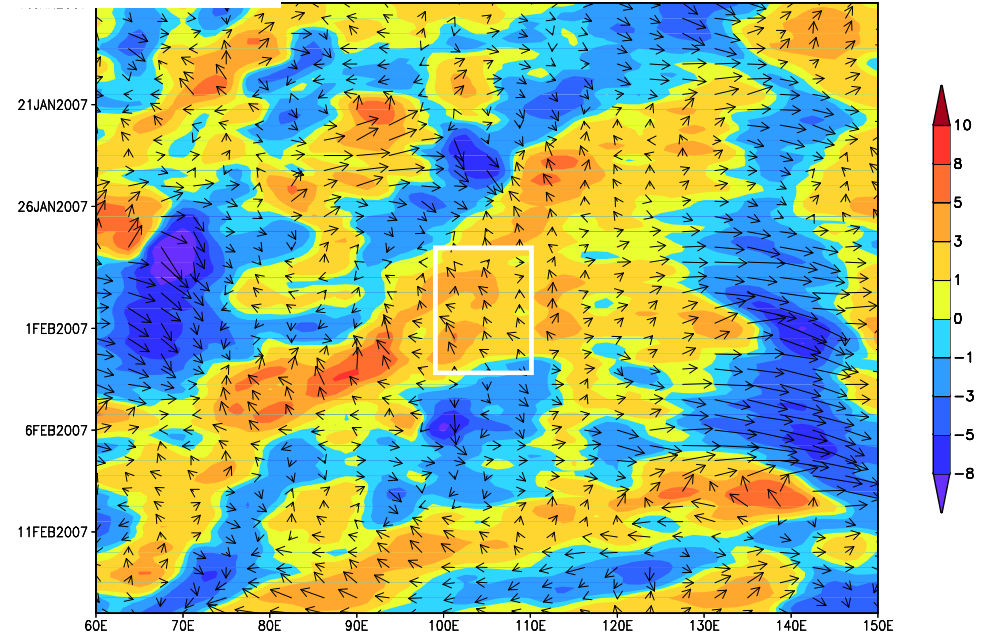
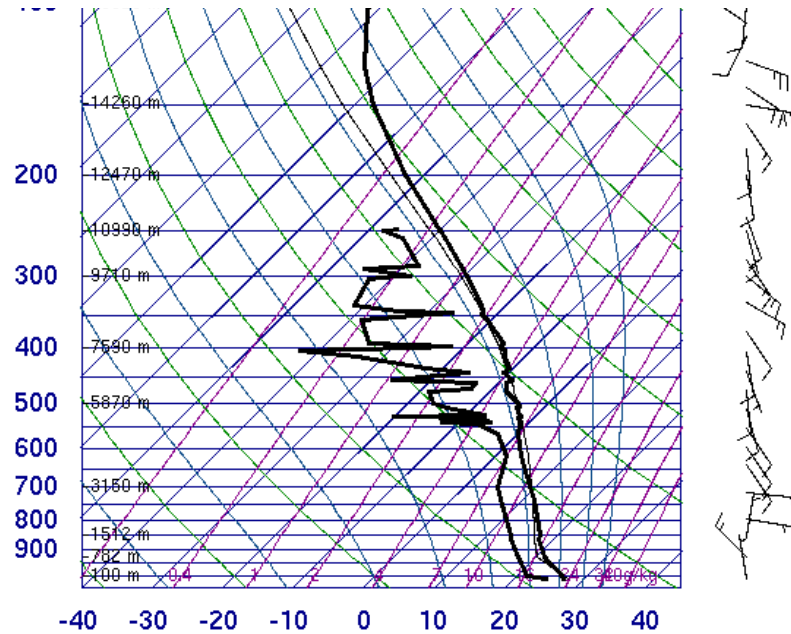


00Z 17 Jan 2005

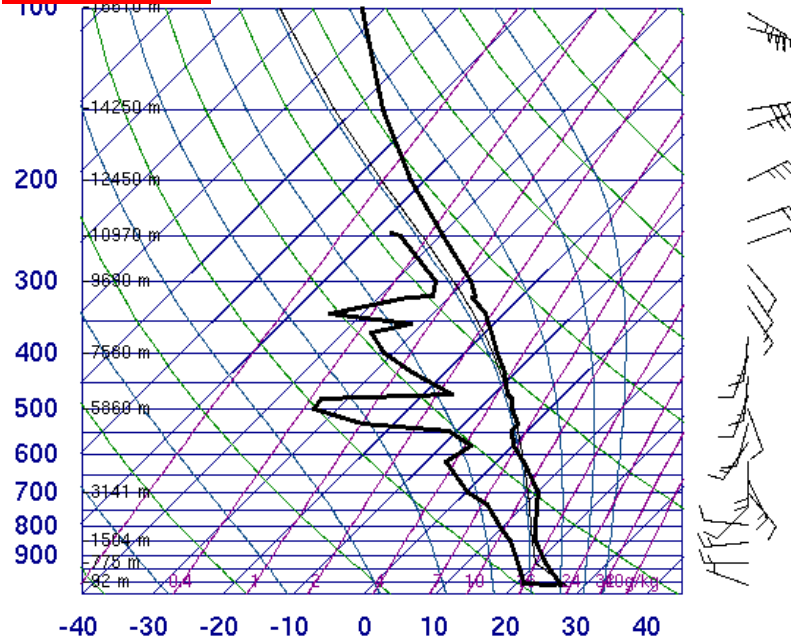
12Z 01 Feb 2007

The equatorial waves may play a role in heavy rain.

7S 700hpa v

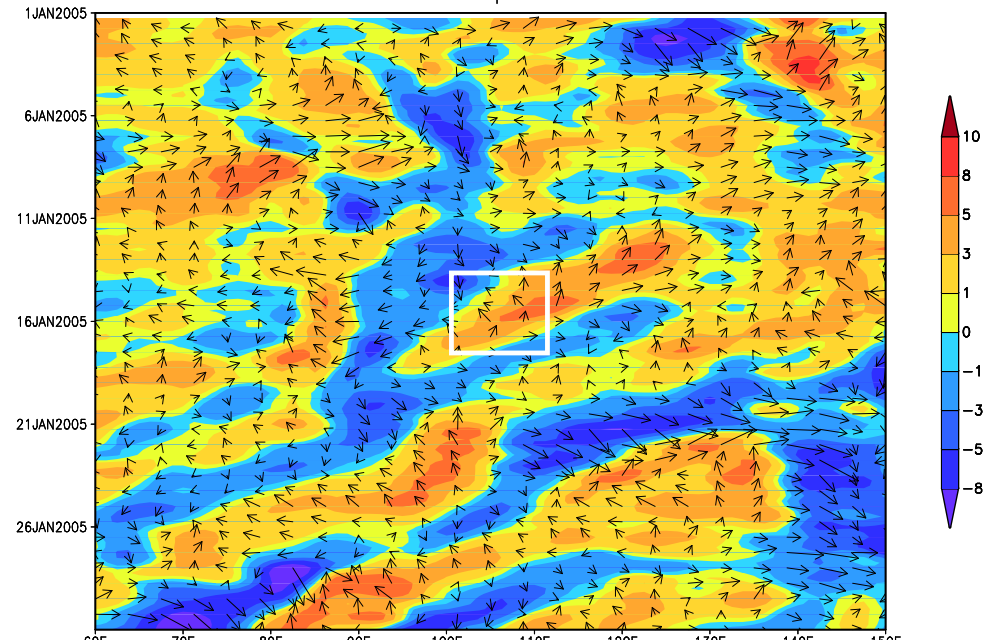


12Z 01 Feb 2007



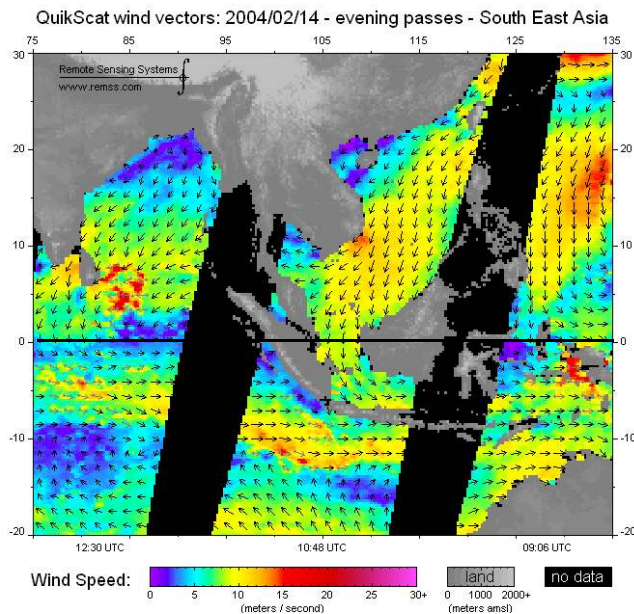
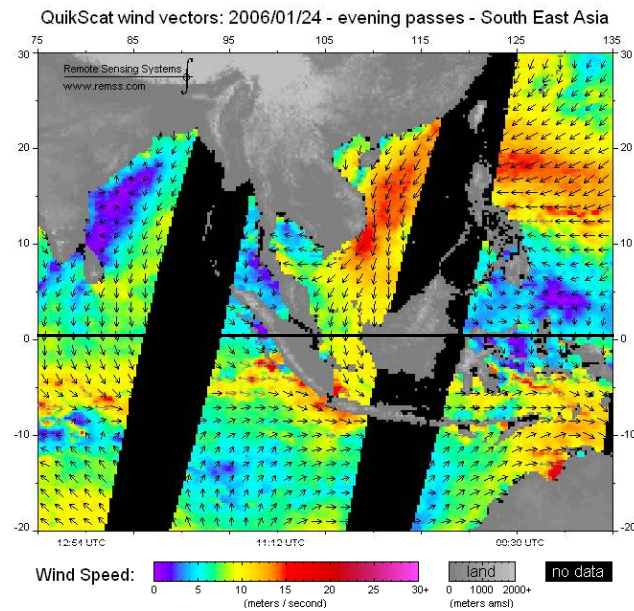
00Z 16 Jan 2005

700hpa v

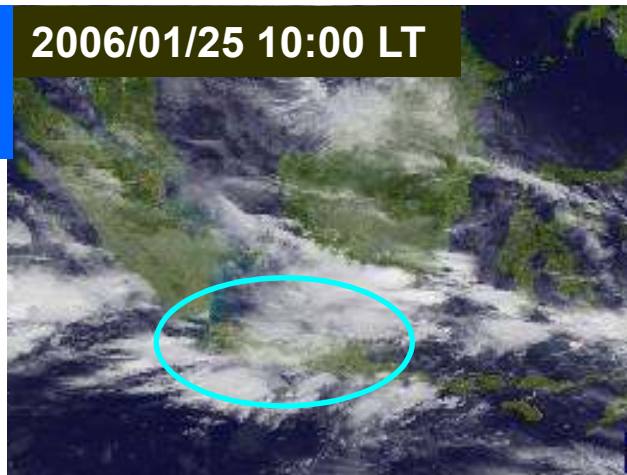


15

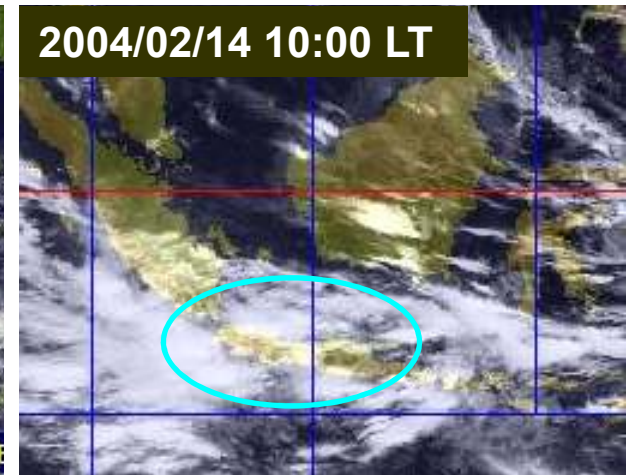
The trans-equatorial monsoon flow is **not** a sufficient condition for causing torrential rain.



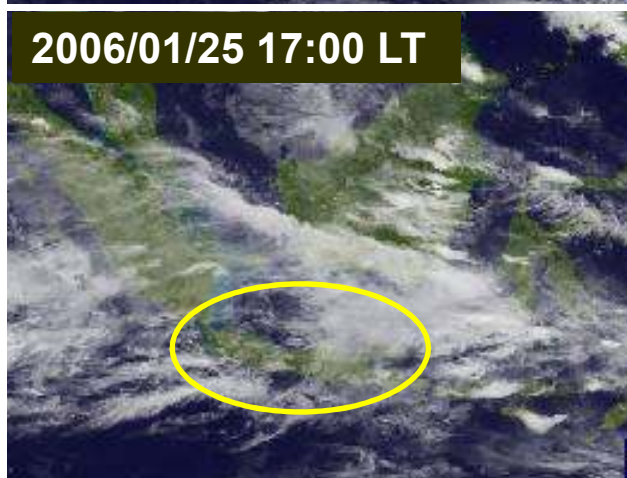
2006/01/25 10:00 LT



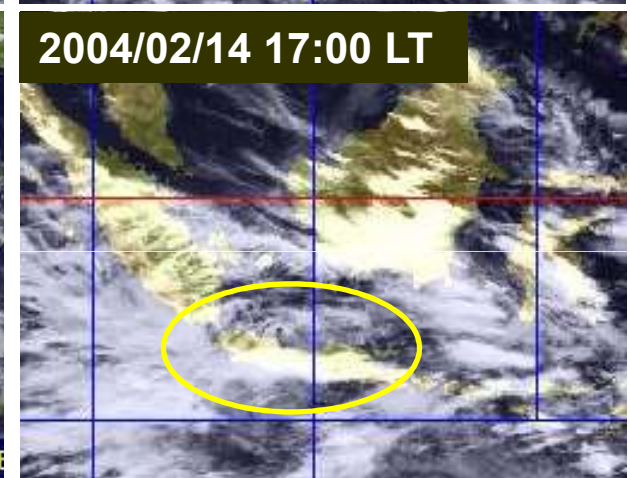
2004/02/14 10:00 LT



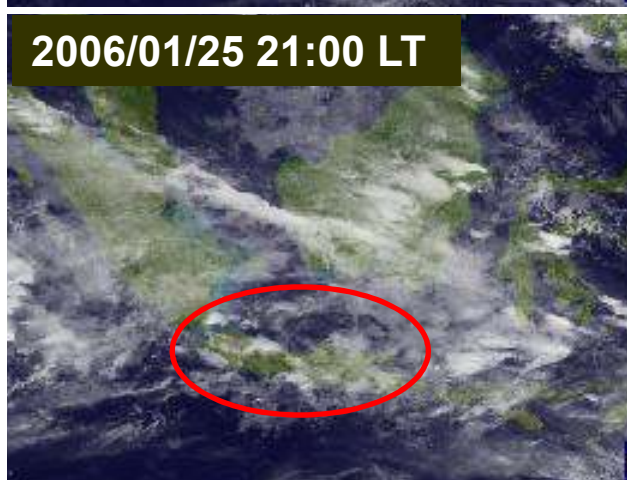
2006/01/25 17:00 LT



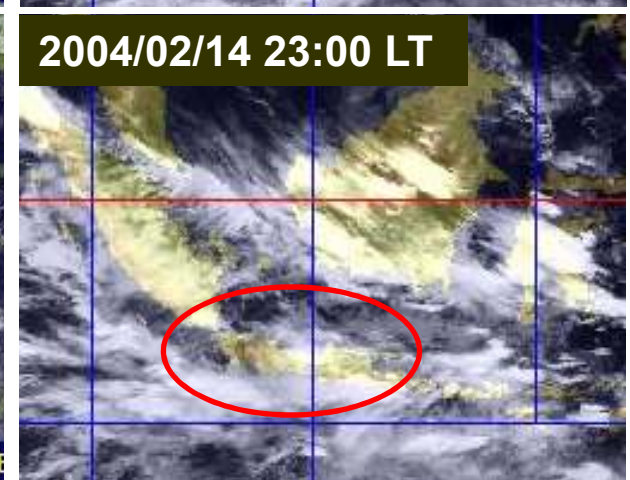
2004/02/14 17:00 LT



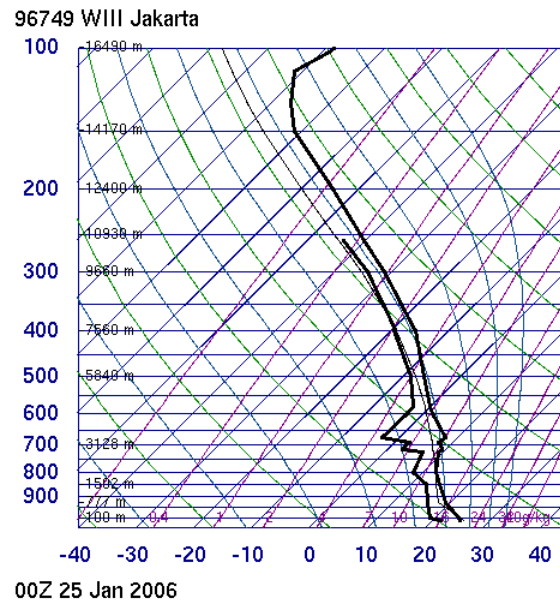
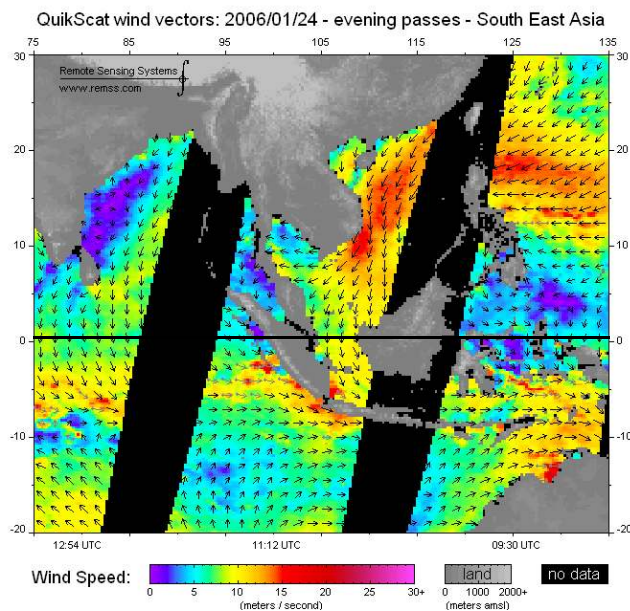
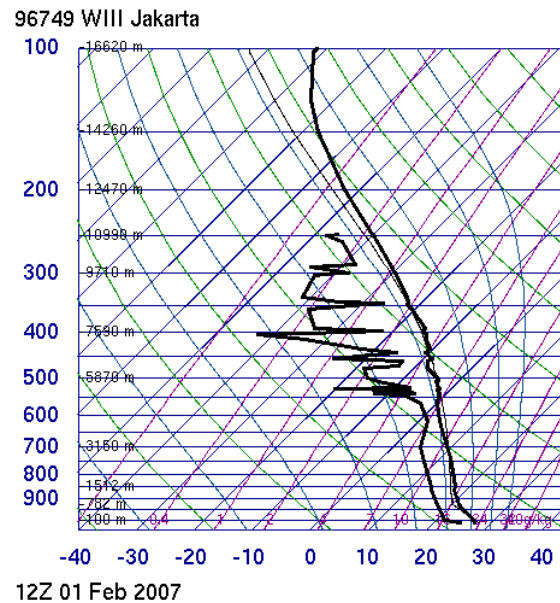
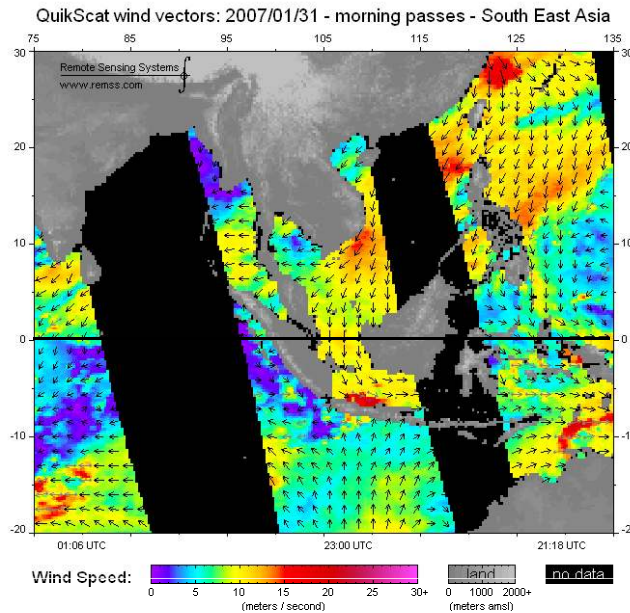
2006/01/25 21:00 LT



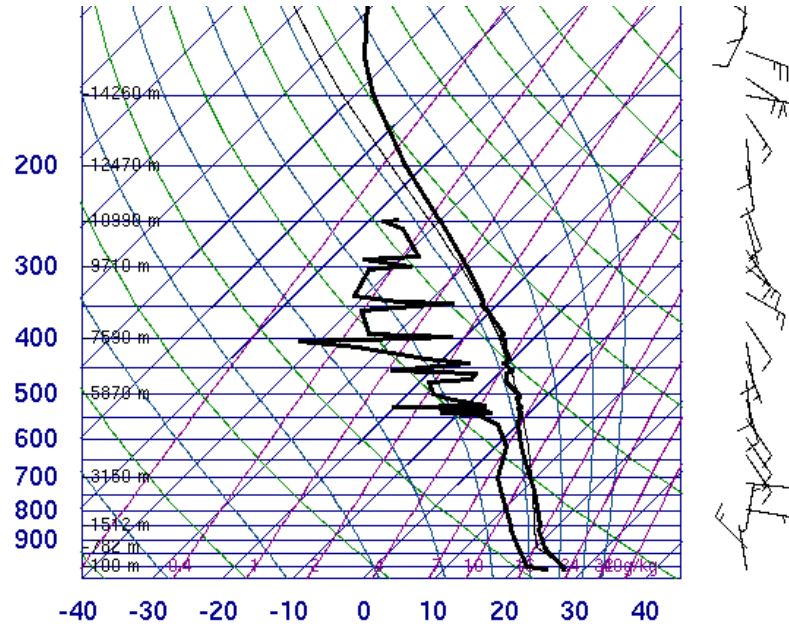
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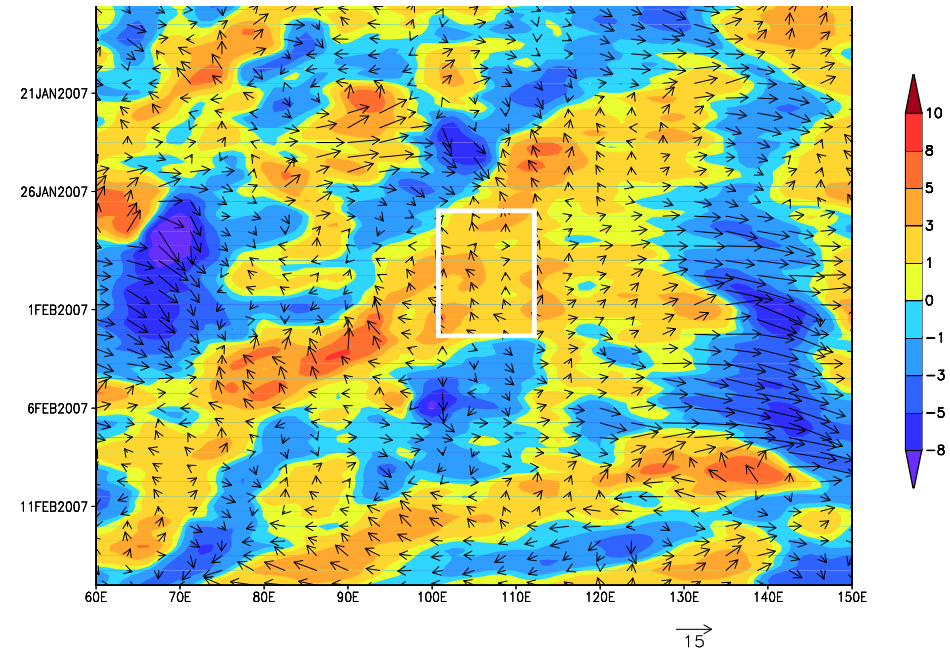
A comparison between the conditions with torrential rain and without torrential rain (upper row of panels) (lower row of panels)



The prevailing upper winds are weak during the heavy rains. **700 hPa V winds**

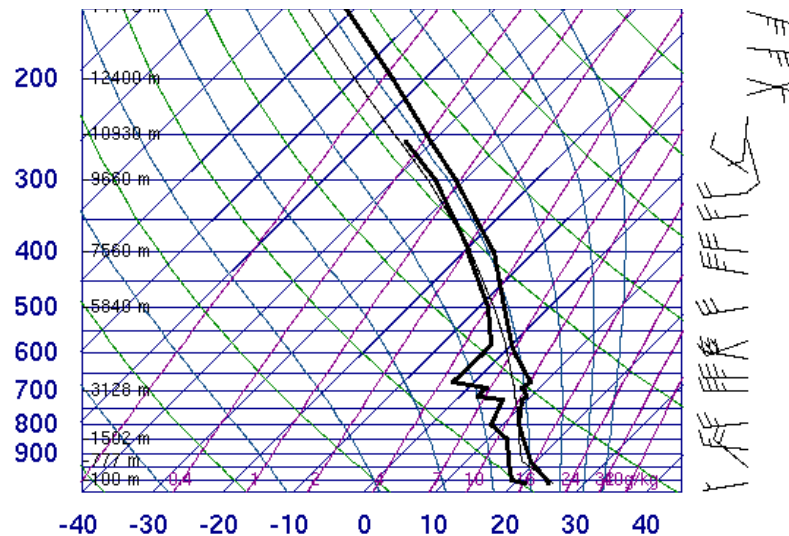


12Z 01 Feb 2007

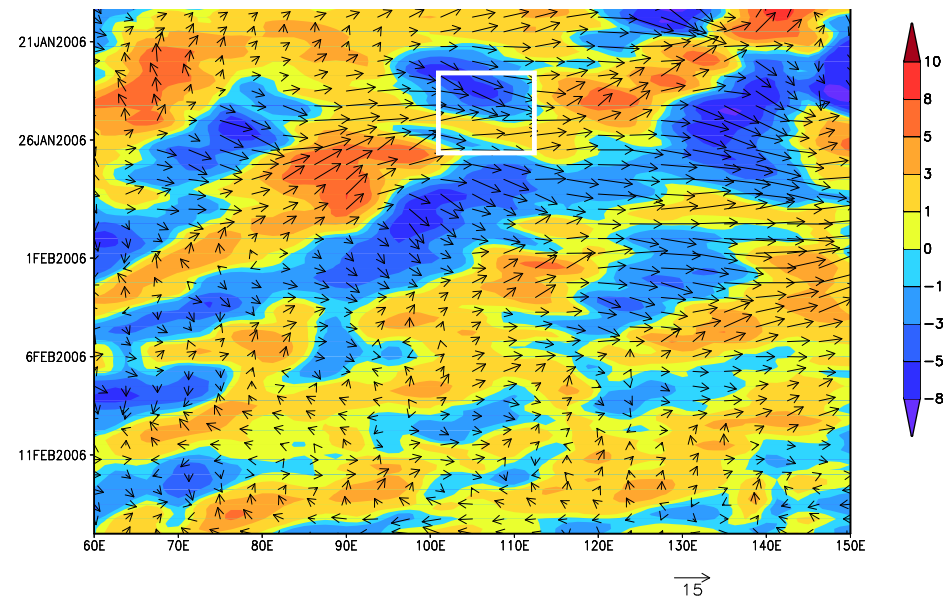


700hPa v

Strong prevailing upper winds suppress the diurnal cycle of convection → no heavy rain.



00Z 25 Jan 2006



15

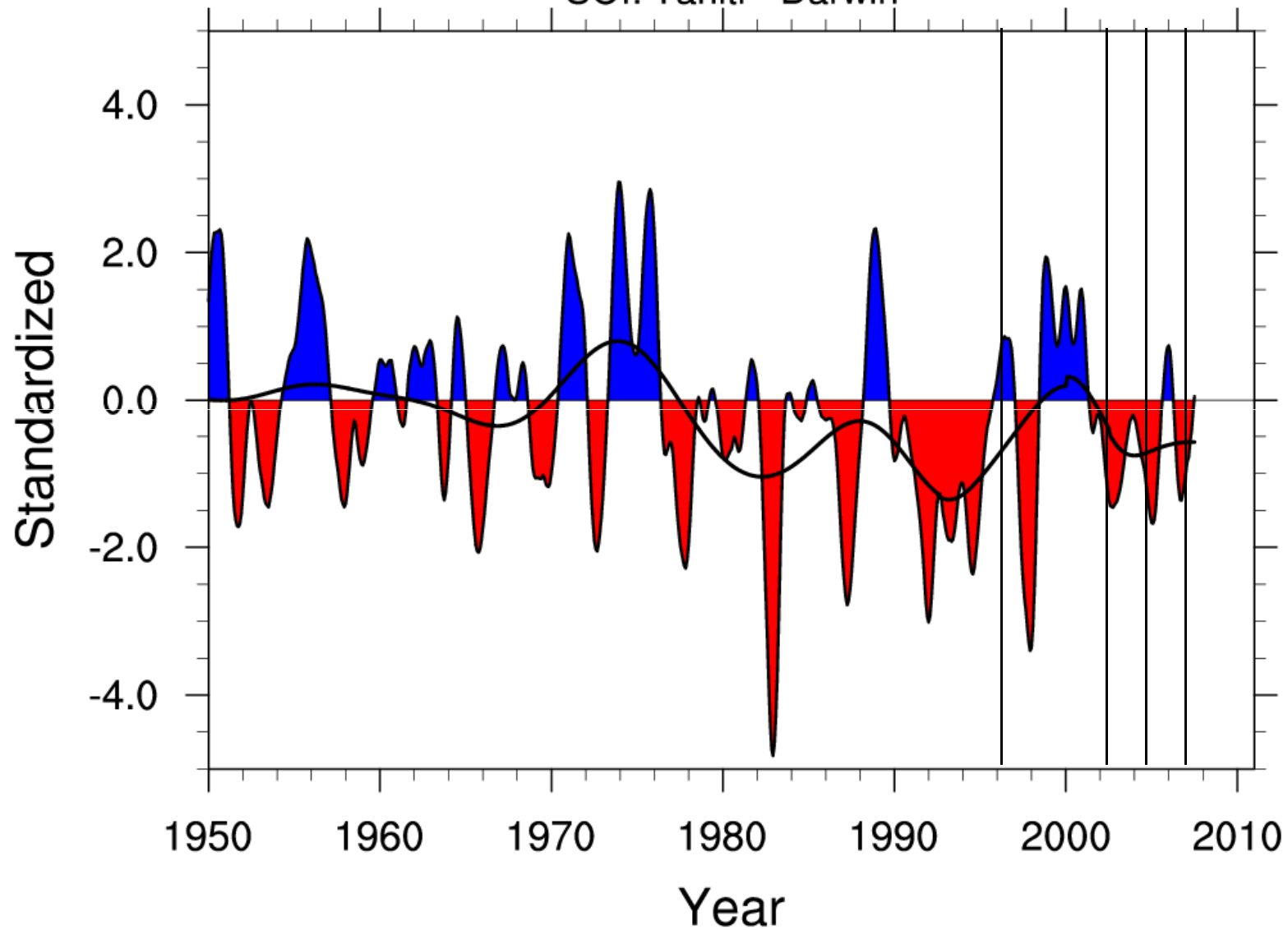
The favorable atmospheric conditions for occurrence of repeated torrential rains over Jakarta in Jawa Island

- A strong and persistent **trans-equatorial monsoon flow** from the Northern Hemisphere. (1996), 2002, 2007, 2009.
- **Weak prevailing upper winds** in the region. 1996, 2002, 2007, 2008 →
- A pronounced **diurnal cycle of convection** over Jawa Island → 1996, 2002, 2007:
the trans-equatorial monsoon flow **interacts** with local winds.
- The diurnal cycle of convection over Jawa Island is suppressed by strong prevailing upper winds. 2004, 2006.

Thank You !

Southern Oscillation Indices

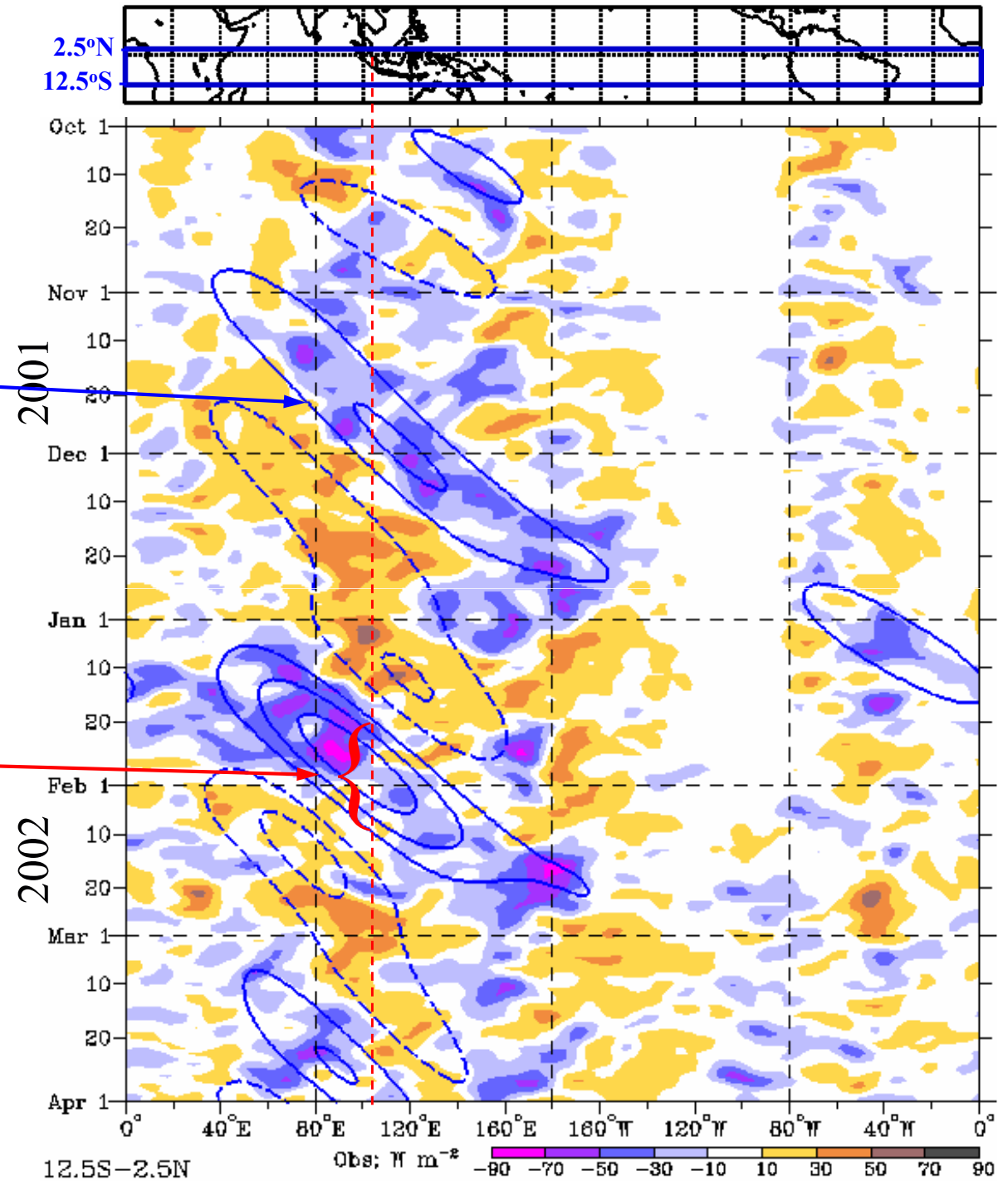
SOI: Tahiti - Darwin



OLR Anomalies for the MJO

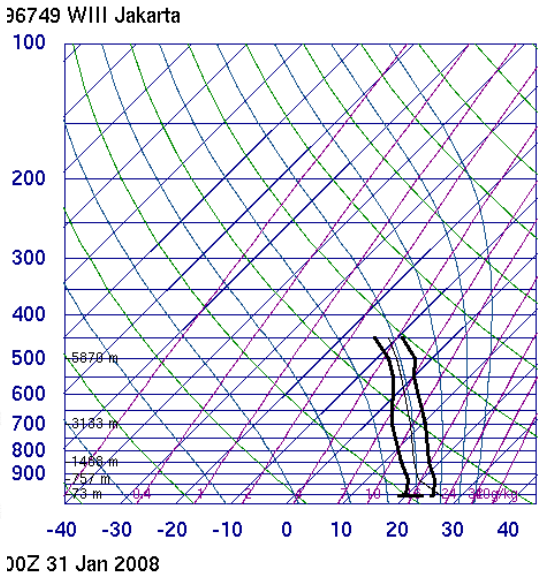
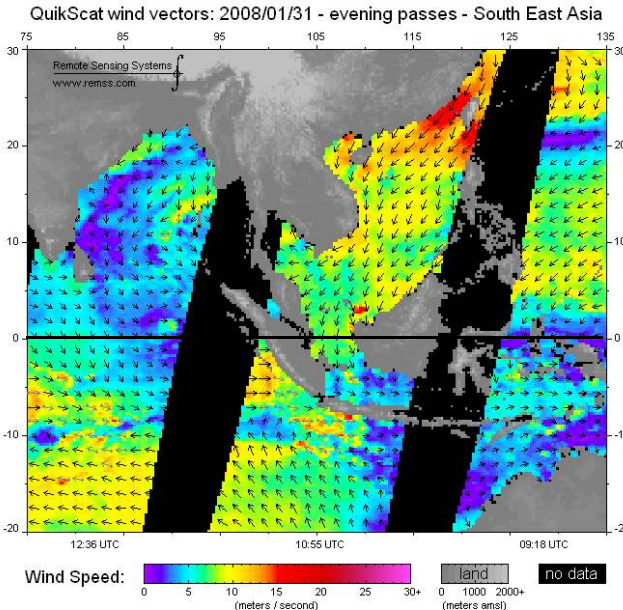
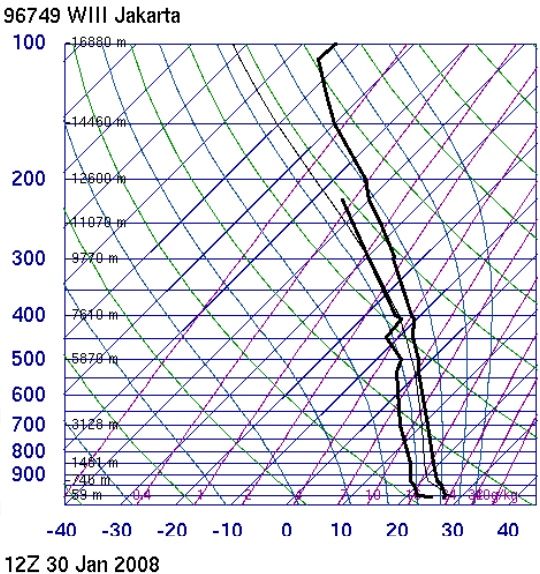
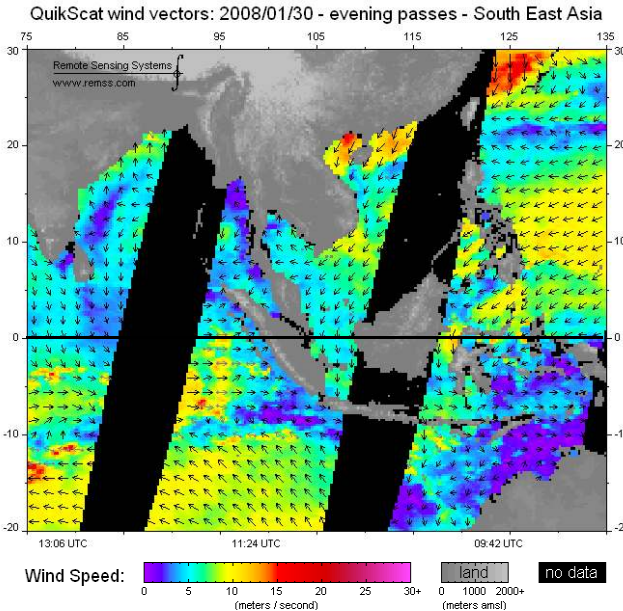
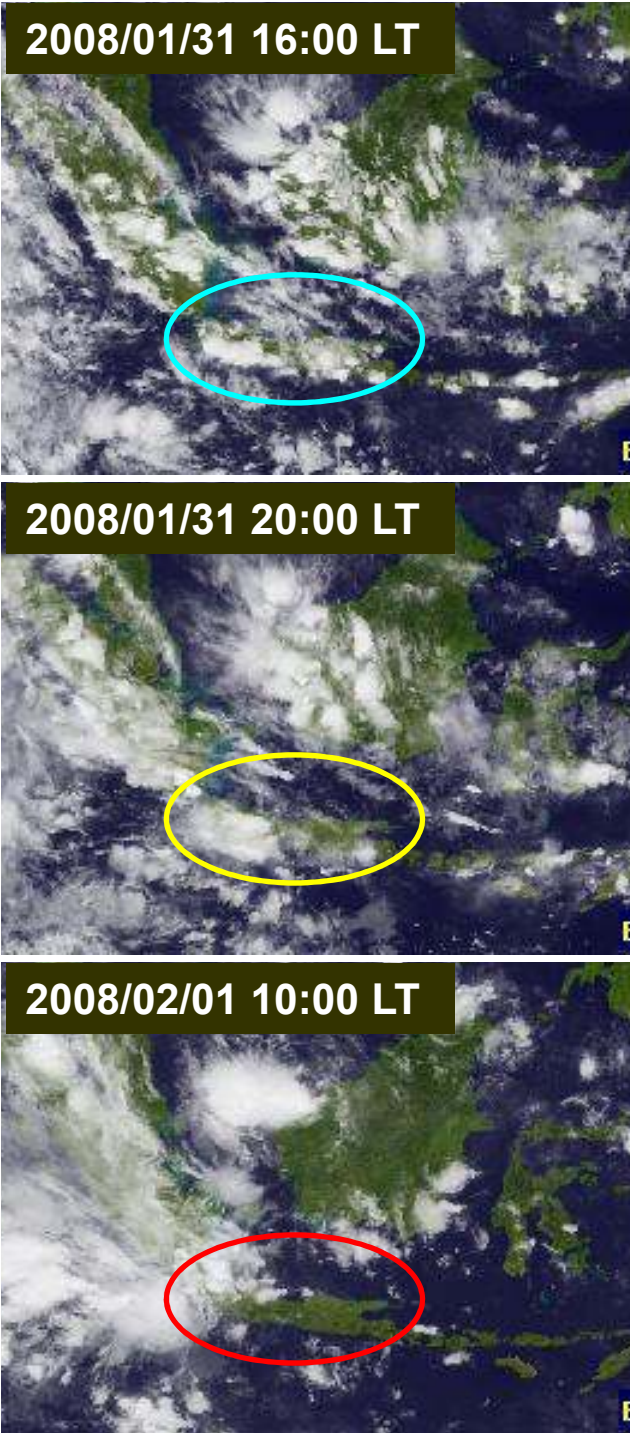
Eastward wavenumbers 1-5,
Periods 30-96 days

Jakarta floods



Banjir Jakarta 2008

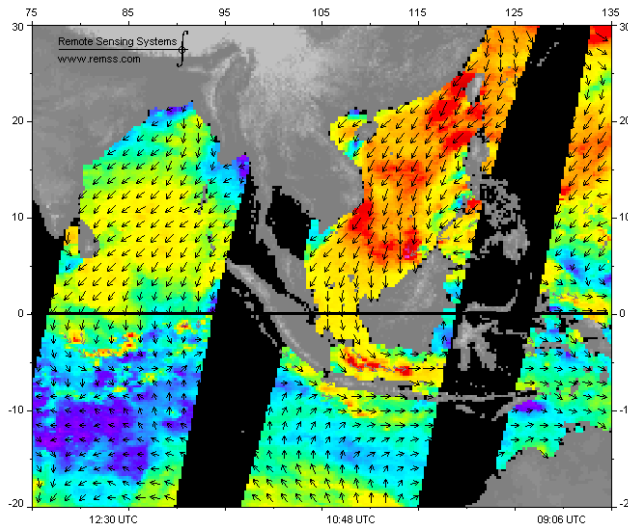
Jan 28 – Feb 1



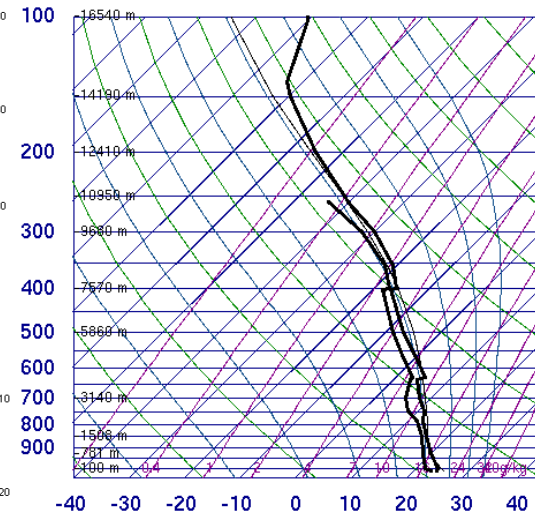
Banjir Jakarta 2009

January 12 – 15

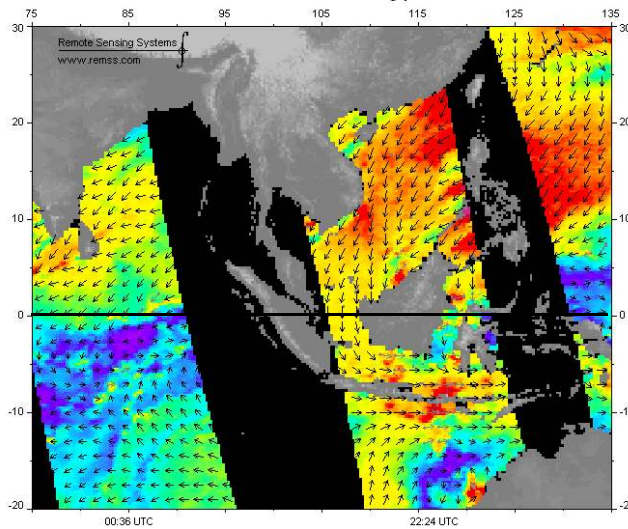
QuikScat wind vectors: 2009/01/12 - evening passes - South East Asia



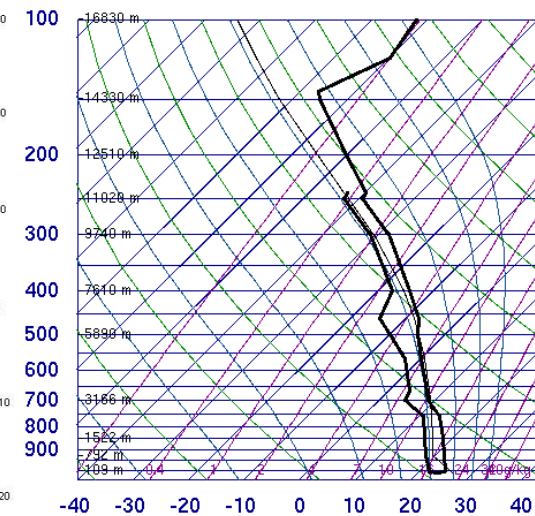
96749 Will Jakarta



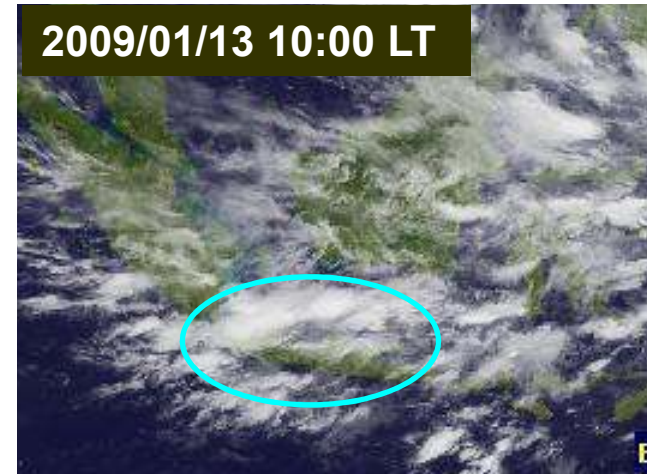
QuikScat wind vectors: 2009/01/14 - morning passes - South East Asia



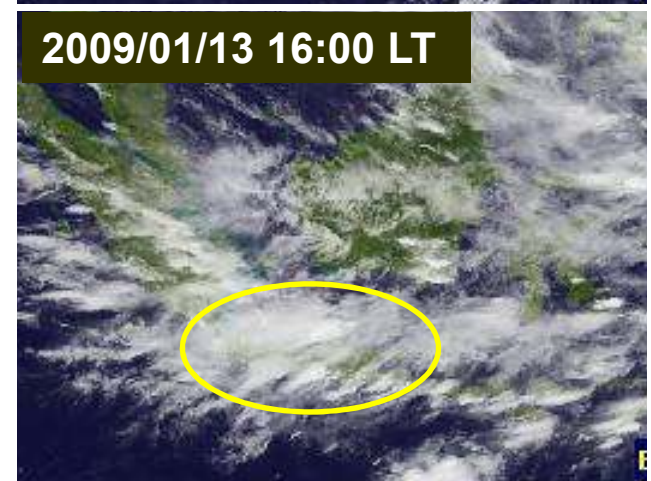
96749 Will Jakarta



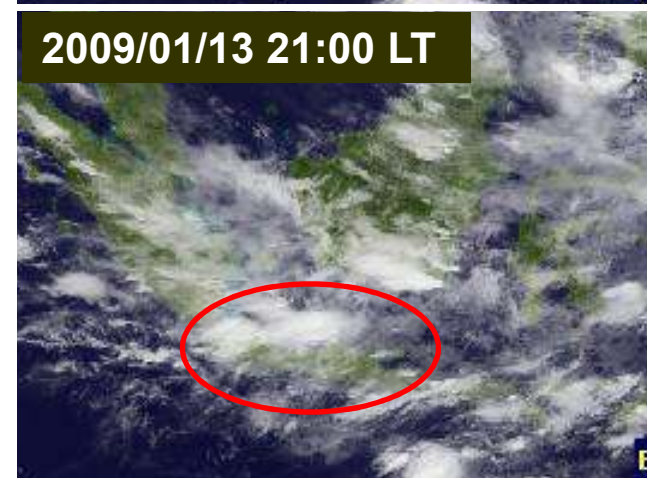
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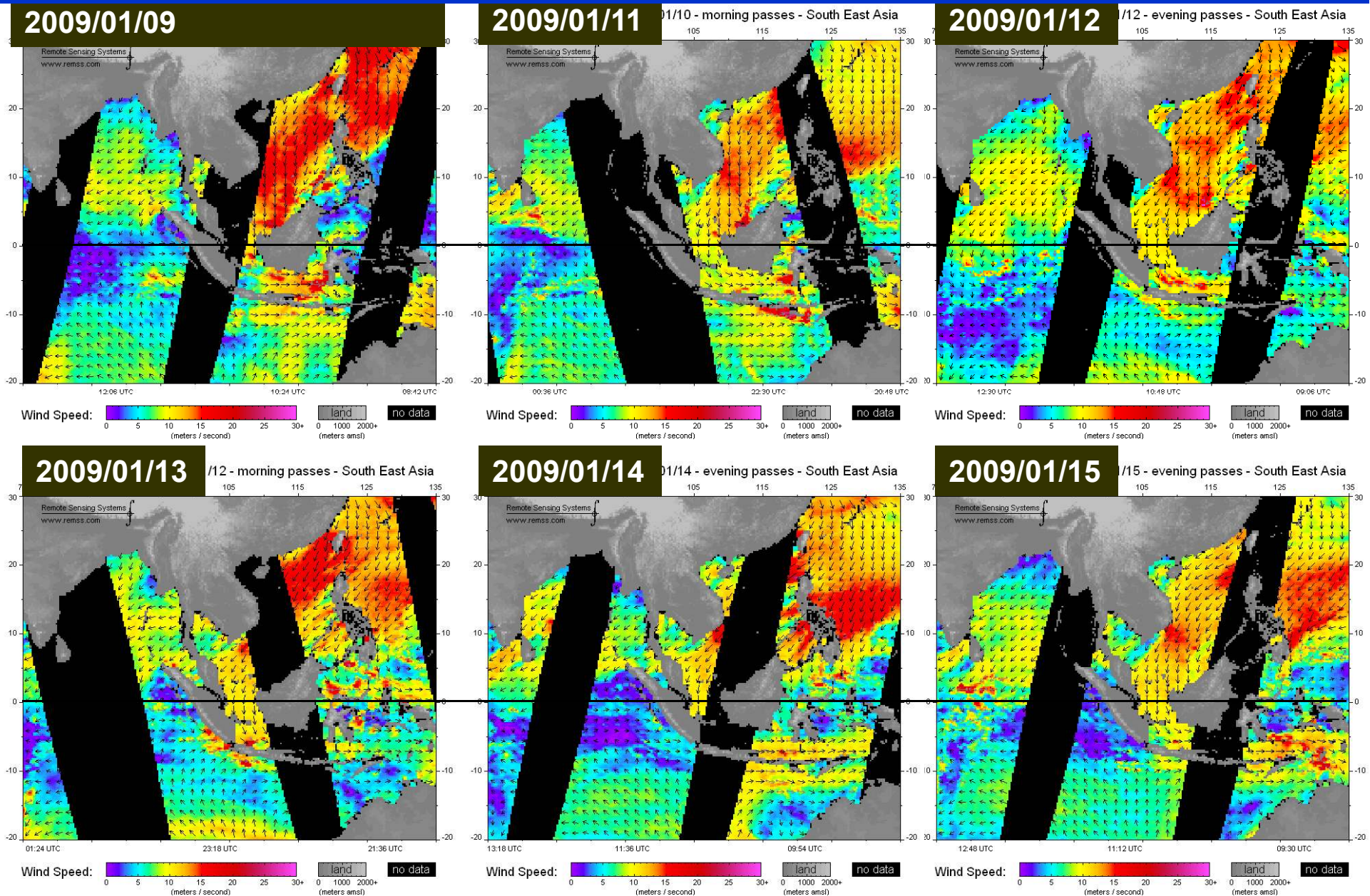
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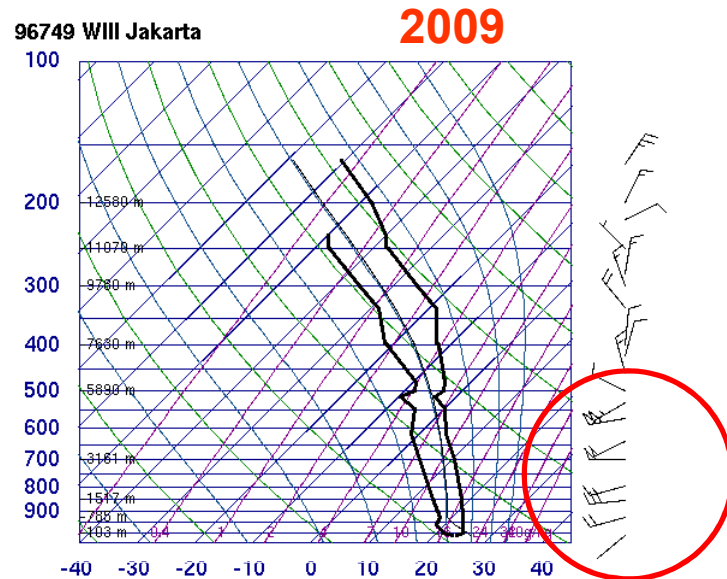
2009/01/13 21:00 LT



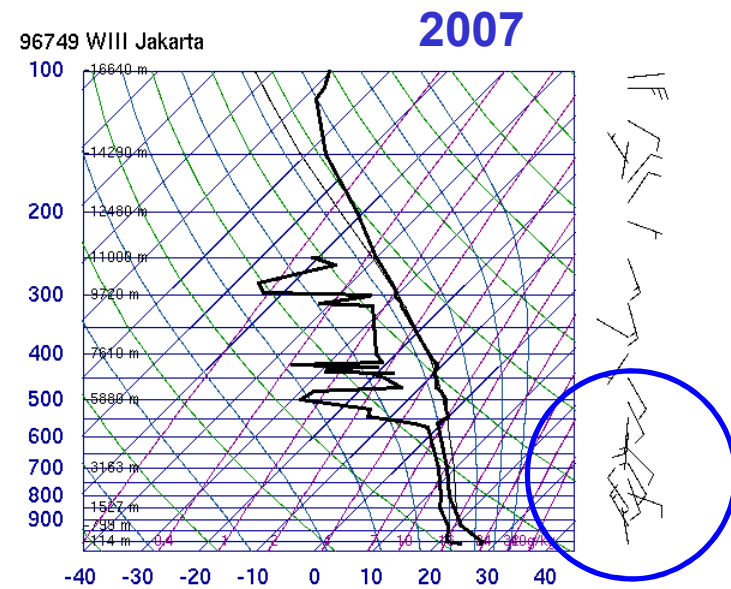
1. The strong trans-equatorial monsoon flow persisted for more than one week, similar to 2007 .



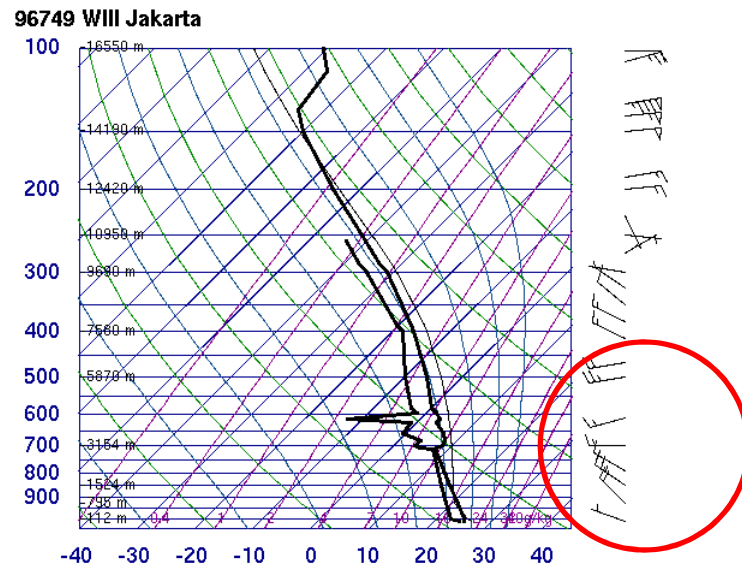
4. The strong prevailing upper winds suppress the diurnal cycle of convection over the island.



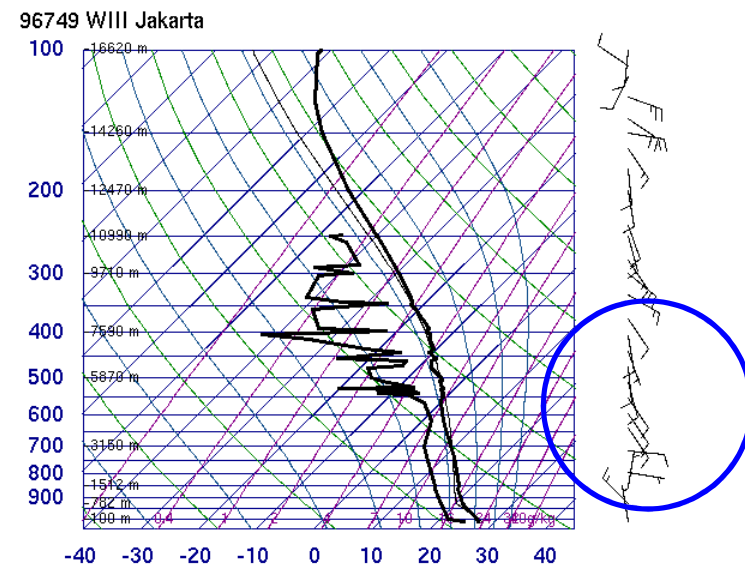
12Z 13 Jan 2009



12Z 31 Jan 2007



12Z 14 Jan 2009



12Z 01 Feb 2007