BMKG HEADQUARTERS IN JAKARTA,
INDONESIA & ONLINE (VIA ZOOM)

Dr Donaldi Permana

AGENCY FOR METEOROLOGY,
CLIMATOLOGY AND GEOPHYSICS
OF THE REPUBLIC OF INDONESIA

Wavy Tropics

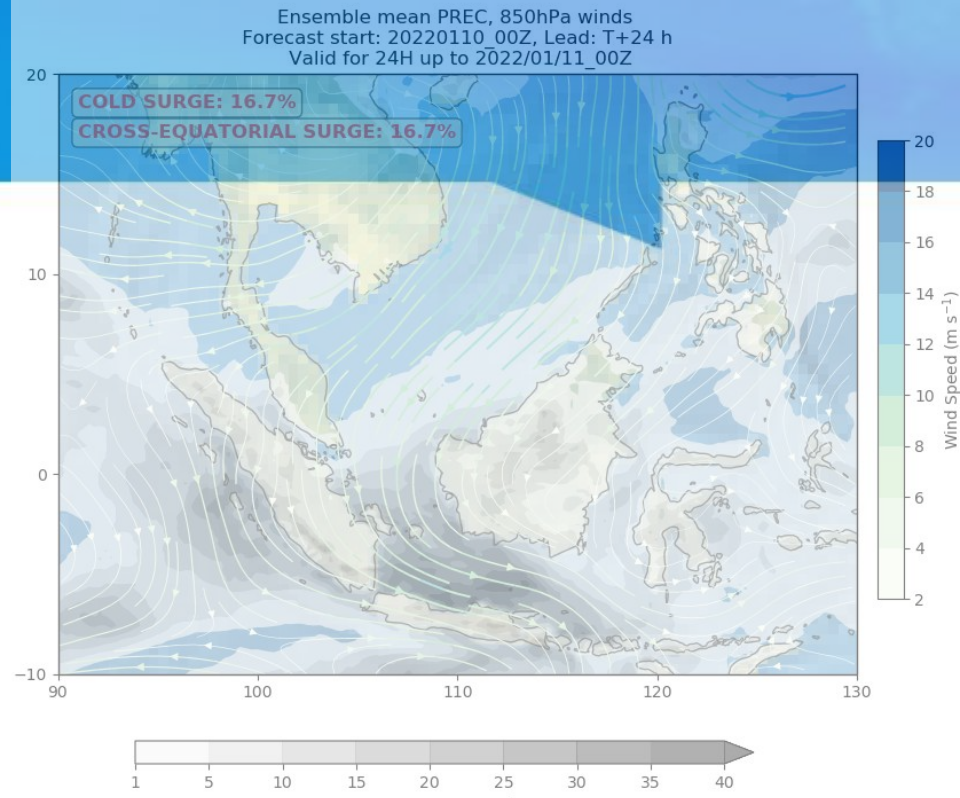
"Interaction of waves with
cold surges"
[PRCTICAL SESSION]

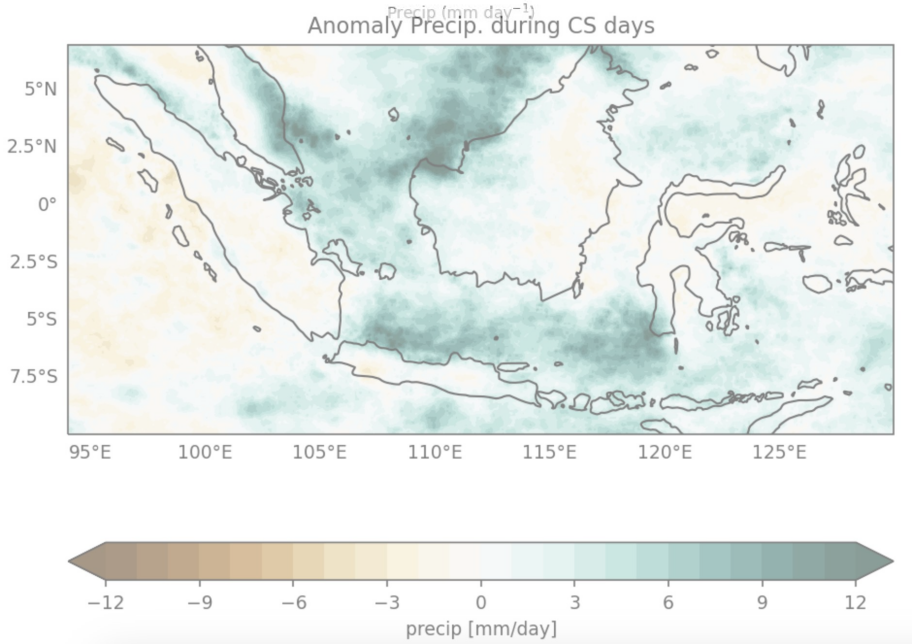
FRIDAY
24 NOVEMBER 2023

BMKG

Interaction of waves with cold surges [practical session]

Donaldi Permana
Indonesia Agency for Meteorology Climatology and Geophysics (BMKG)





WavyTropics

November 20-24, 2023

BMKG Jakarta & online

BMKG

Code :
https://github.com/donaldisp/wavytropics

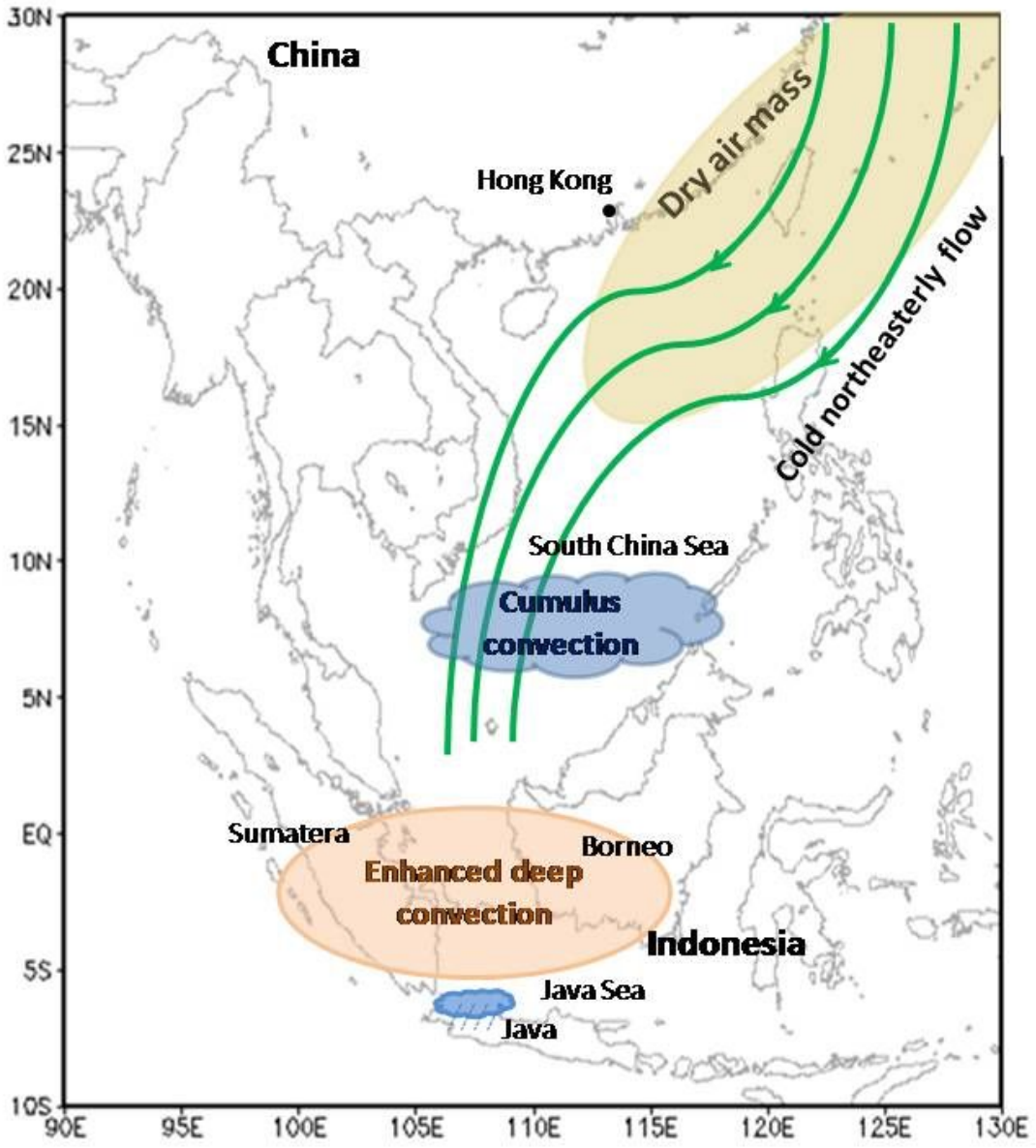
Dataset :
https://link.bmkg.go.id/vy4c8

BMKG

Outline

- Cold Surge Life Cycle
- Cold Surge Definition
- Obtaining CS and CENS indices
- Interaction CS and MJO
  - Calculating Days with CS
  - Calculating days with MJO
  - Calculating days with CS + MJO
  - Investigating their impact to rainfall anomaly

Cold Surge Life Cycle



https://resources.eumetrain.org/satmanu/CM4SH/InNCS/index.htm

Cold surges Definition

BMKG

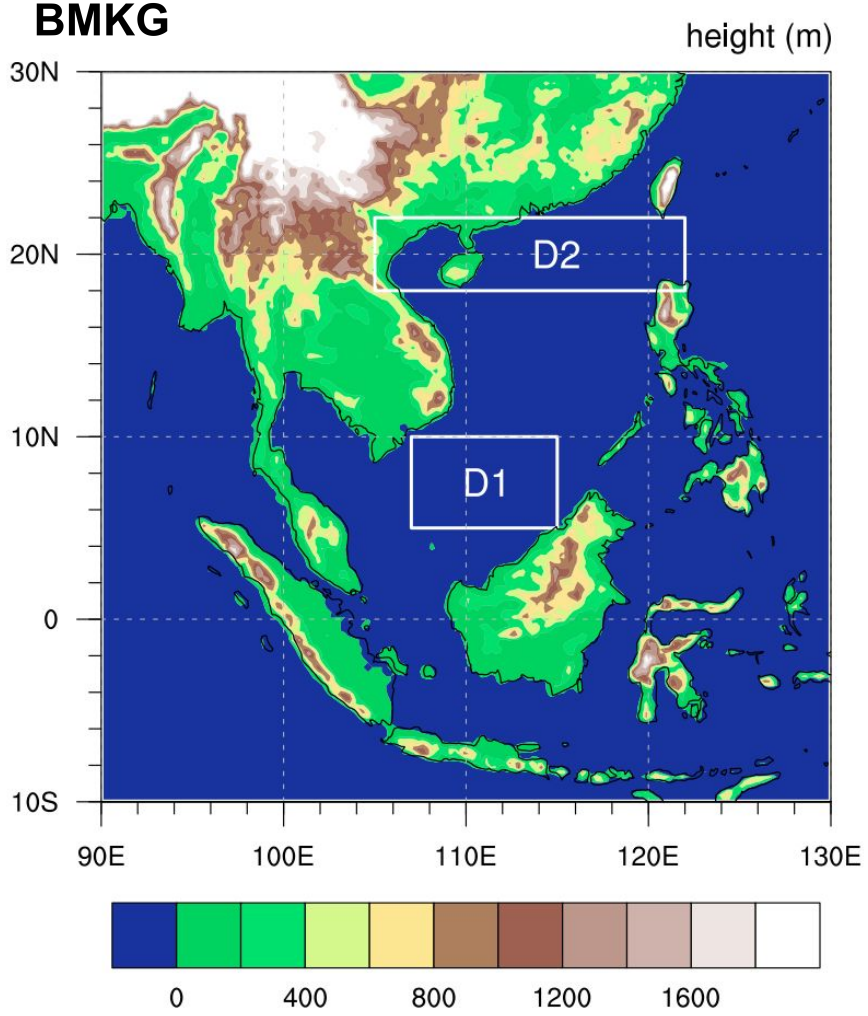


FIG. 1. Topography map (m) for Southeast Asia. The cold surge indices are defined in the two rectangular boxes: northerly or northeasterly wind speed in domain D1 (5°–10°N, 107°–115°E) and MSLP in domain D2 (18°–22°N, 105°–122°E).

TABLE 1. Summary of cold surge indices based on the area-average 850-hPa winds and maximum MSLP over the domain indicated. Here u and v are zonal and meridional winds, respectively, $\overline{V}$ denotes long-term average, and σ_V the standard deviation of the meridional wind speed V.

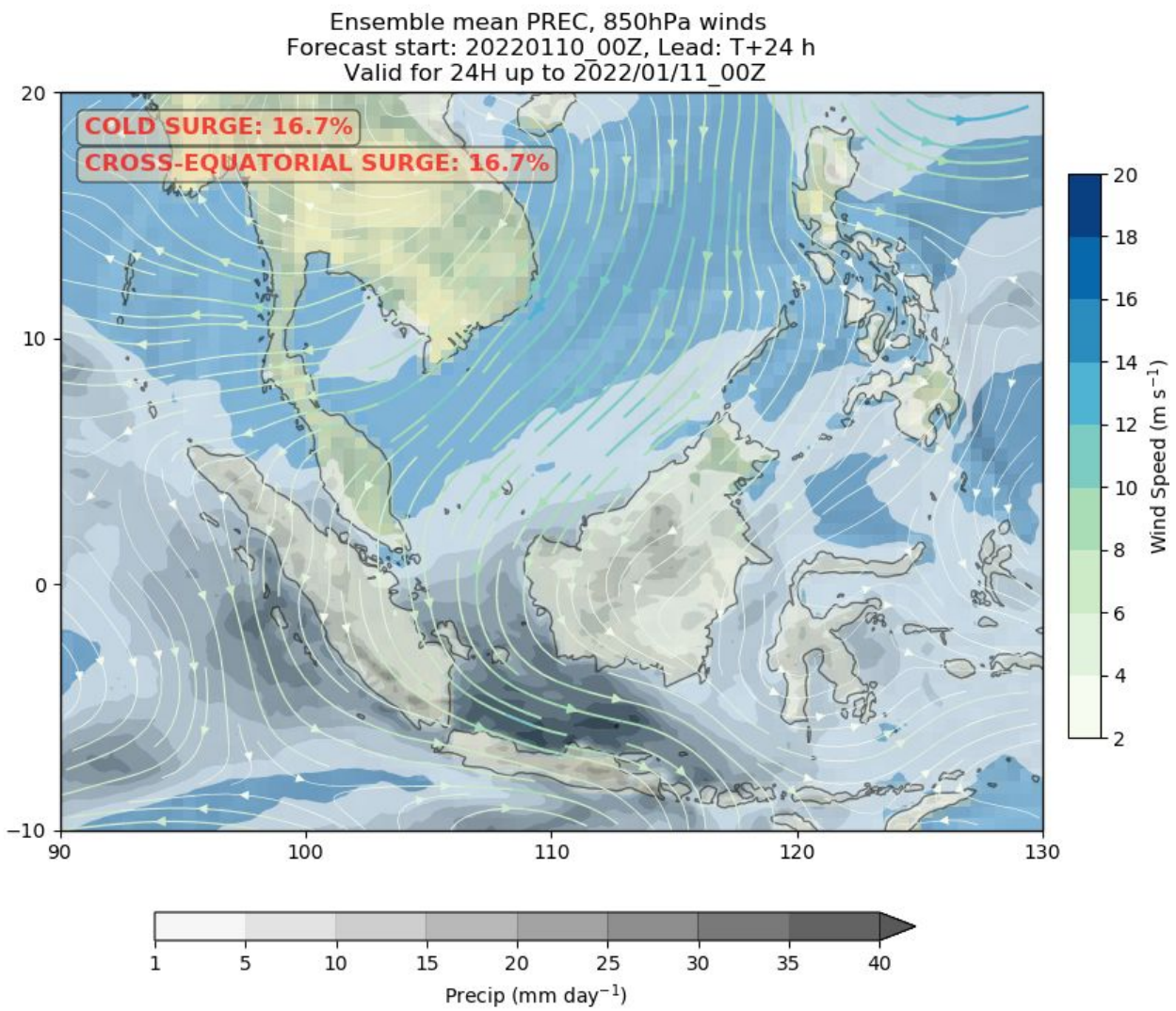
Variable	Criteria		Lat	Lon
850 hPa wind averaged over domain D1	Calm to easterly wind	$u \le 0\,\mathrm{m\,s^{-1}}$	5°–10°N	107°–115°E
	Northerly wind	$v < 0\,\mathrm{m\,s^{-1}}$		
	Normalized wind speed at least 0.75 standard deviations above long-term mean	$\frac{V-\overline{V}}{\sigma_V} \ge 0.75$		
Max MSLP in domain D2	MSLP at least 1020 hPa	MSLP ≥ 1020 hPa	18°–22°N	105°–122°E

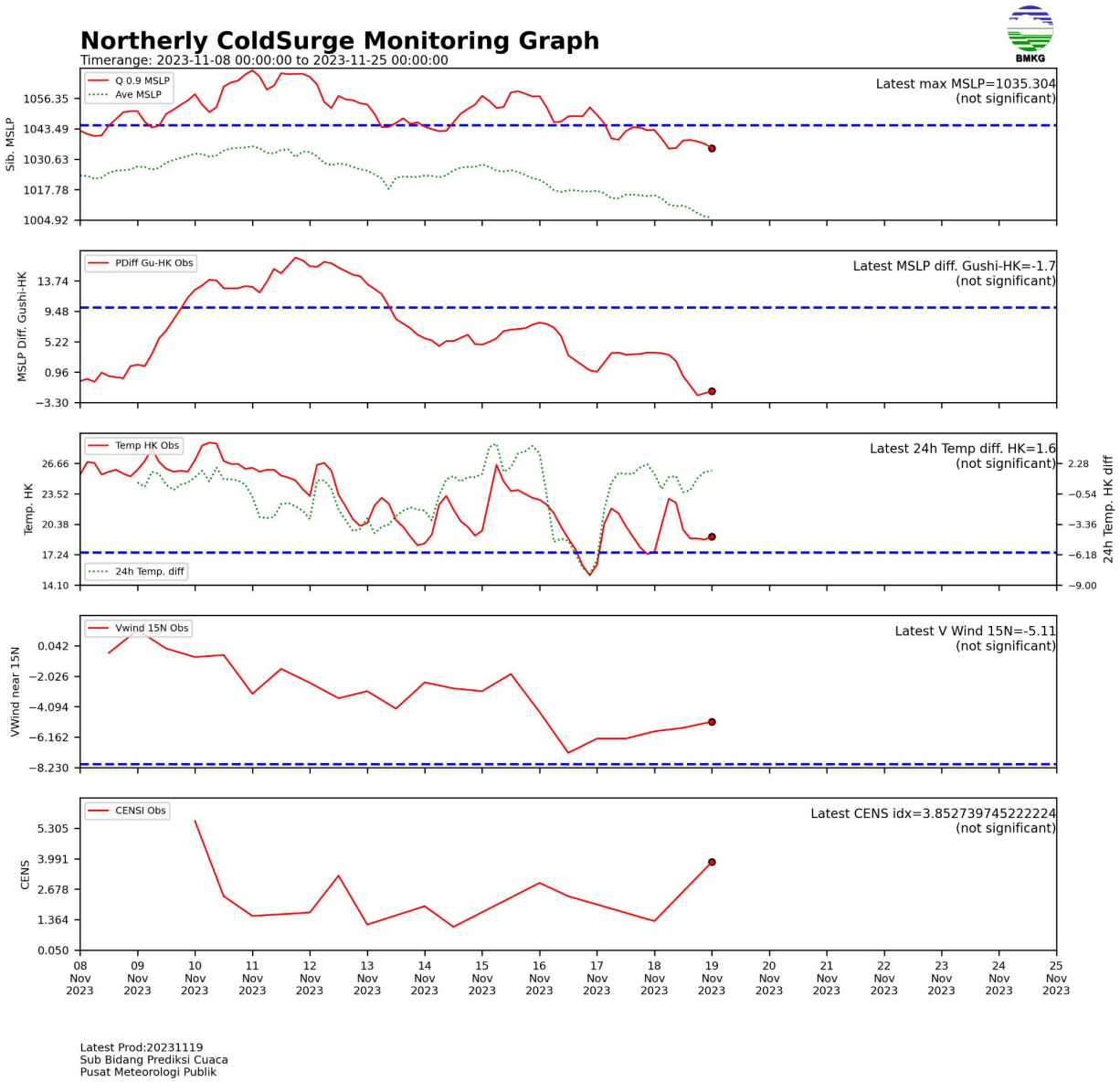
A single event includes a minimum duration of 2 days with a maximum allowable gap of 2 days between cold surge days.

Lim et al (2017)

Cold surges monitoring

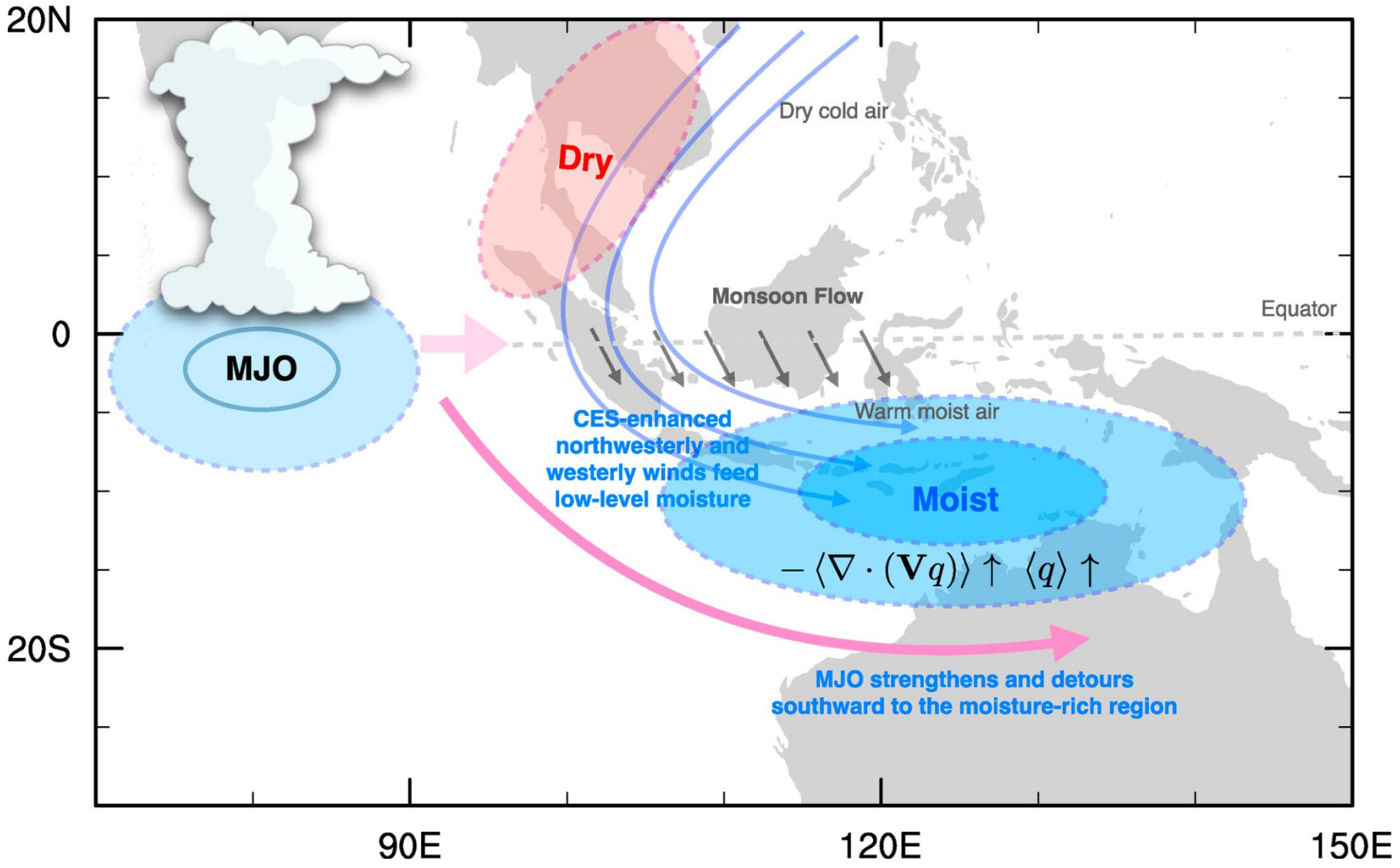
BMKG



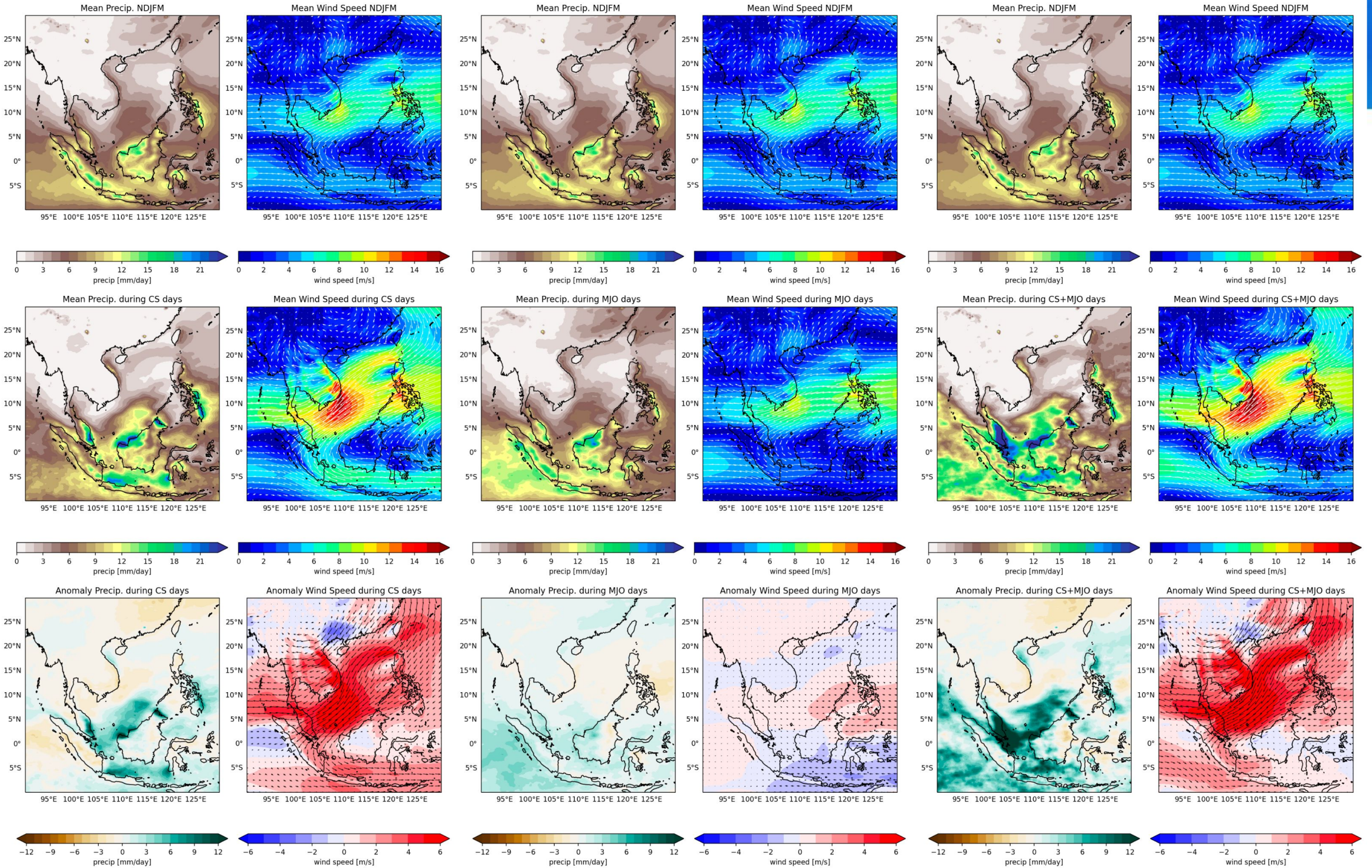


https://web.meteo.bmkg.go.id//media/data/bmkg/mfy/sur_idx.png

Cold surges interaction with MJO



Lubis et al (2023)


Mean Precip. NDJFM
Mean Wind Speed NDJFM
Mean Precip. NDJFM
Mean Wind Speed NDJFM
Mean Precip. NDJFM
Mean Wind Speed NDJFM
25°N 20°N 15°N 10°N 5°N 0° 5°S
95°E 100°E 105°E 110°E 115°E 120°E 125°E
0 3 6 9 12 15 18 21
precip [mm/day]
0 2 4 6 8 10 12 14 16
wind speed [m/s]
Mean Precip. during CS days
Mean Wind Speed during CS days
Mean Precip. during MJO days
Mean Wind Speed during MJO days
Mean Precip. during CS+MJO days
Mean Wind Speed during CS+MJO days
Anomaly Precip. during CS days
Anomaly Wind Speed during CS days
Anomaly Precip. during MJO days
Anomaly Wind Speed during MJO days
Anomaly Precip. during CS+MJO days
Anomaly Wind Speed during CS+MJO days
−12 −9 −6 −3 0 3 6 9 12
precip [mm/day]
−6 −4 −2 0 2 4 6
wind speed [m/s]

BMKG

Let’s try on Jupyter-notebook !!

Code :
https://github.com/donaldisp/wavytropics

Dataset :
https://link.bmkg.go.id/vy4c8

BMKG

Thanks for your attention

Questions ??

Contact me : donaldi.permana@bmkg.go.id

- Lead of Working Package 1, WCSSP SEA-Indonesia
- Member of the WGNE – MJO Task Force
- Member of Asian-Australian Monsoon WG
- Member of EC-PHORS