Three monsoon indices and their relationship to JJA rainfall predictability in Viet Nam

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OUTLINE

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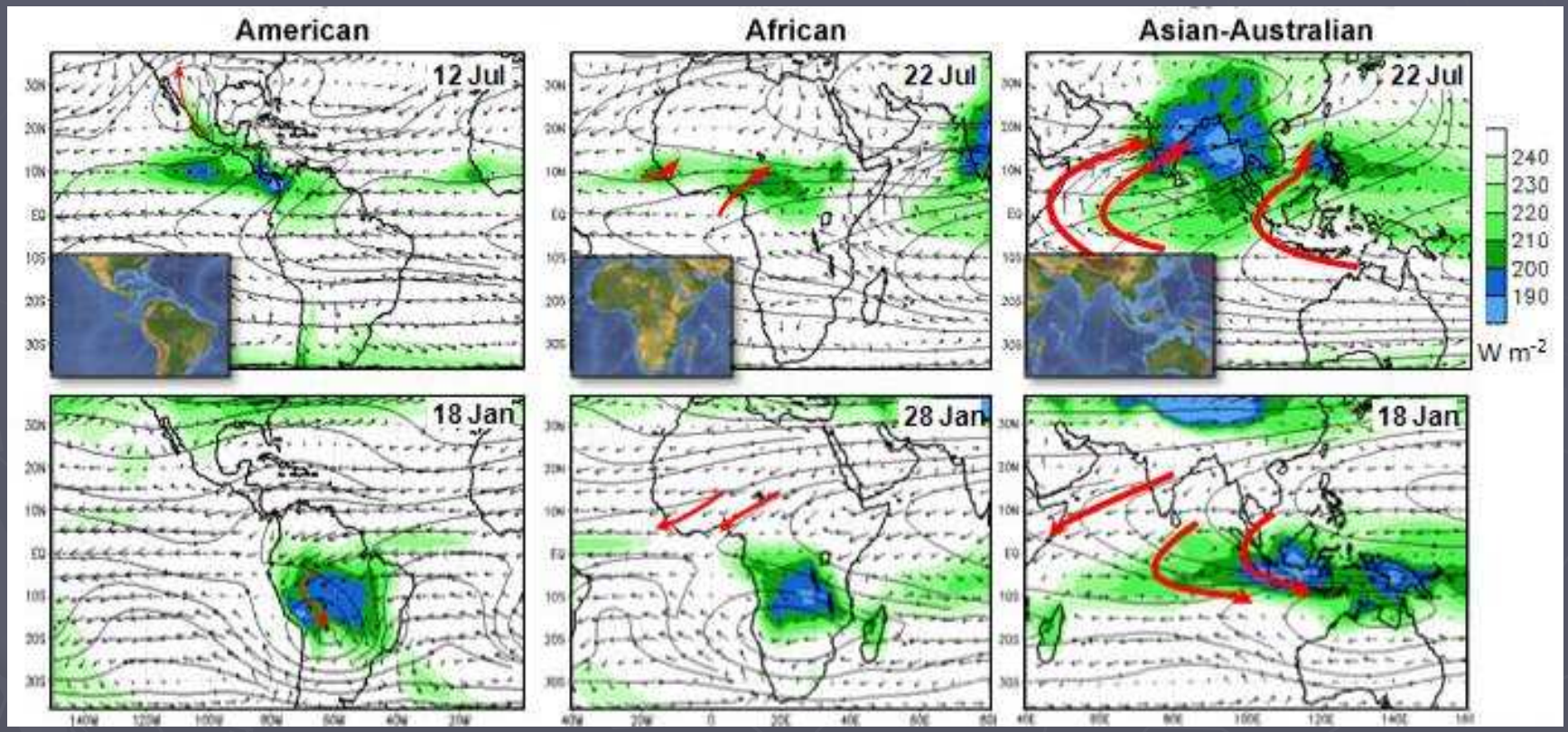
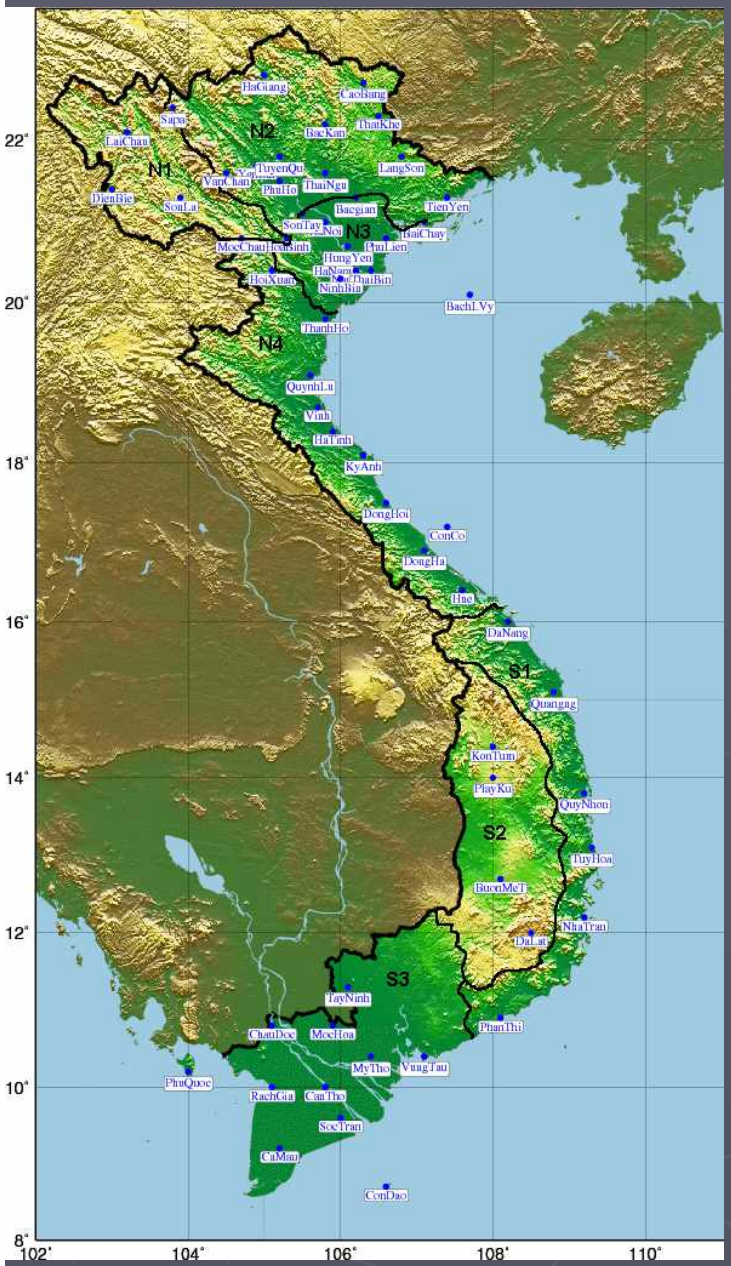
Motivation



Monsoon systems: OLR, 200hPa streamlines, 850 hPa wind climatology (1979-1995). (NOAA/NWS/CPC)



- >3000 kms of coast line, highly vulnerable to typhoons, floods and droughts.
- Agriculture country.

→ Climate outlooks, prediction on month-to-month play a crucial role in food security n production planning.

→ Understanding nat. variab. of the climate system: interactions btwn {South Asian, Southeast Asian, Cross-equatorial flows}

Objectives

Analysis the applicability of some robust monsoonal indices in the connection with rainfall over Viet Nam.

Establish the relationships leading to optimal prediction equations in statistical downscaling.

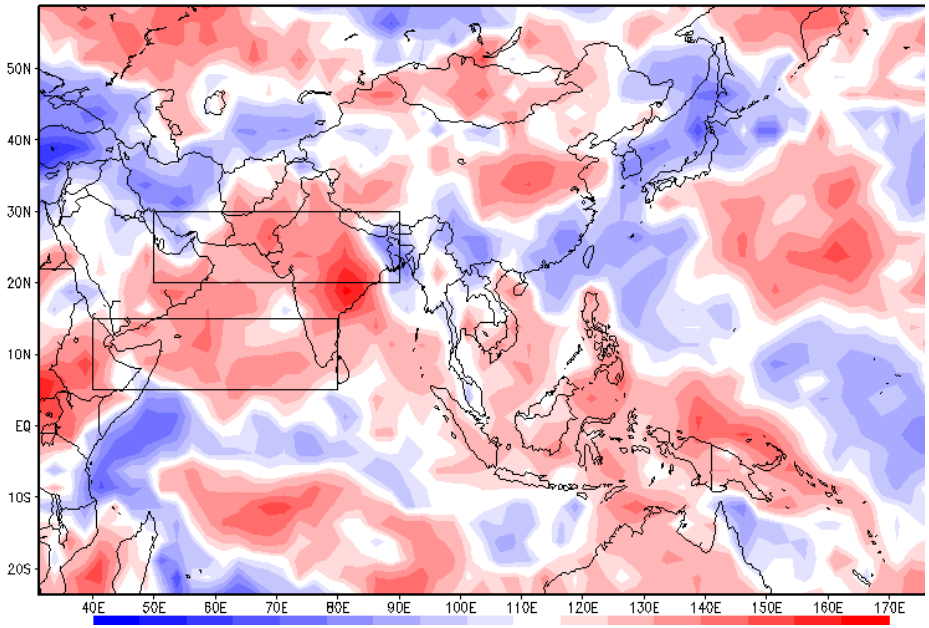
Selected monsoon indices

- Bin Wang et al, 2008 "Defining the intensity of the East Asian summer monsoon has been extremely controversial". ~ 25 existing EASM indices !!!!

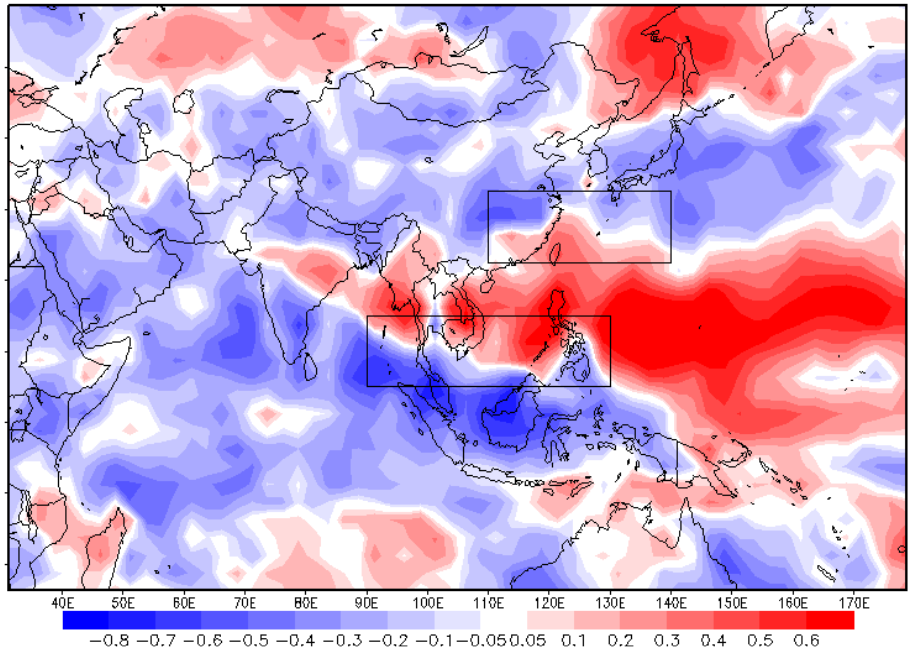
- Among 5 categories: East-West thermal constrast, north-south thermal, shear vorticity of zonal winds, southwesterly monsoon, and South China Sea monsoon → this study re-used {MHI-Goswami, 1999; ISM and SEASM convection index by Wang and Fan, 1999}.

- MHI = V850-V200 (10S-25N, 100-130E)
- WSI = U850 (5-15N, 40-80E) – (20-30N, 50-90E)
- DU2 = U850 (5-15N, 90-130E) – (22.5-32.5N, 110-140E)

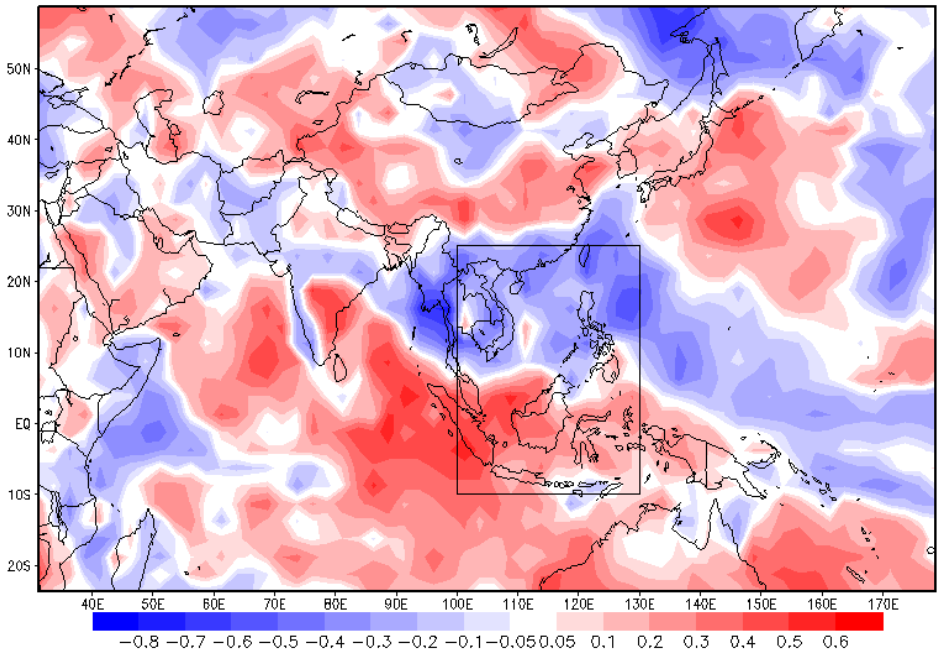
31JJA: Corel. WSI1 – GCPC

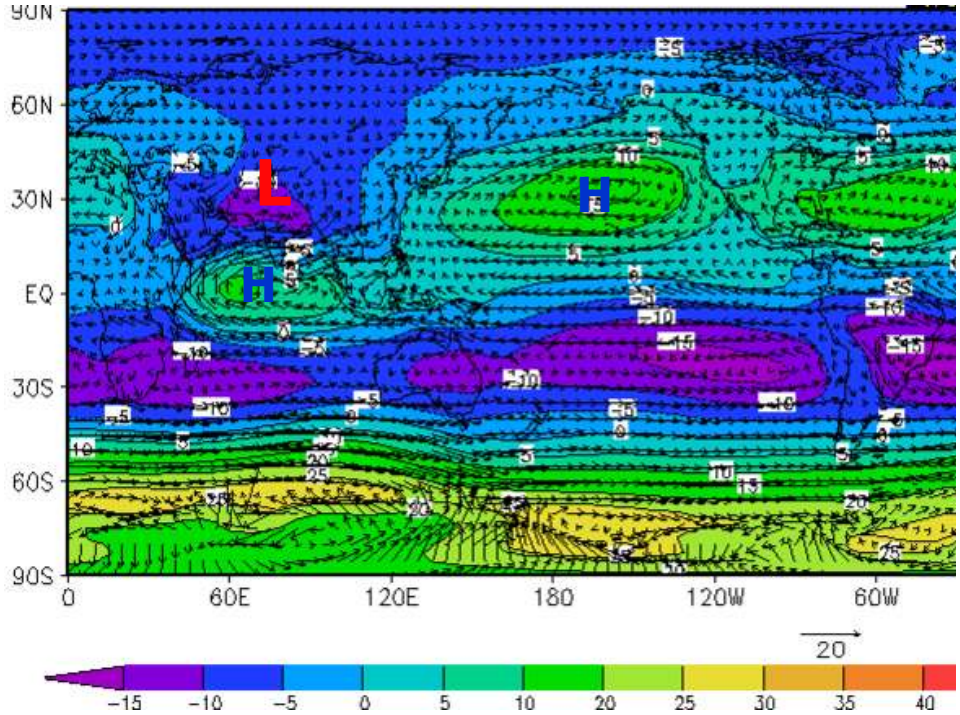


31JJA: Corel. DU2 – GCPC

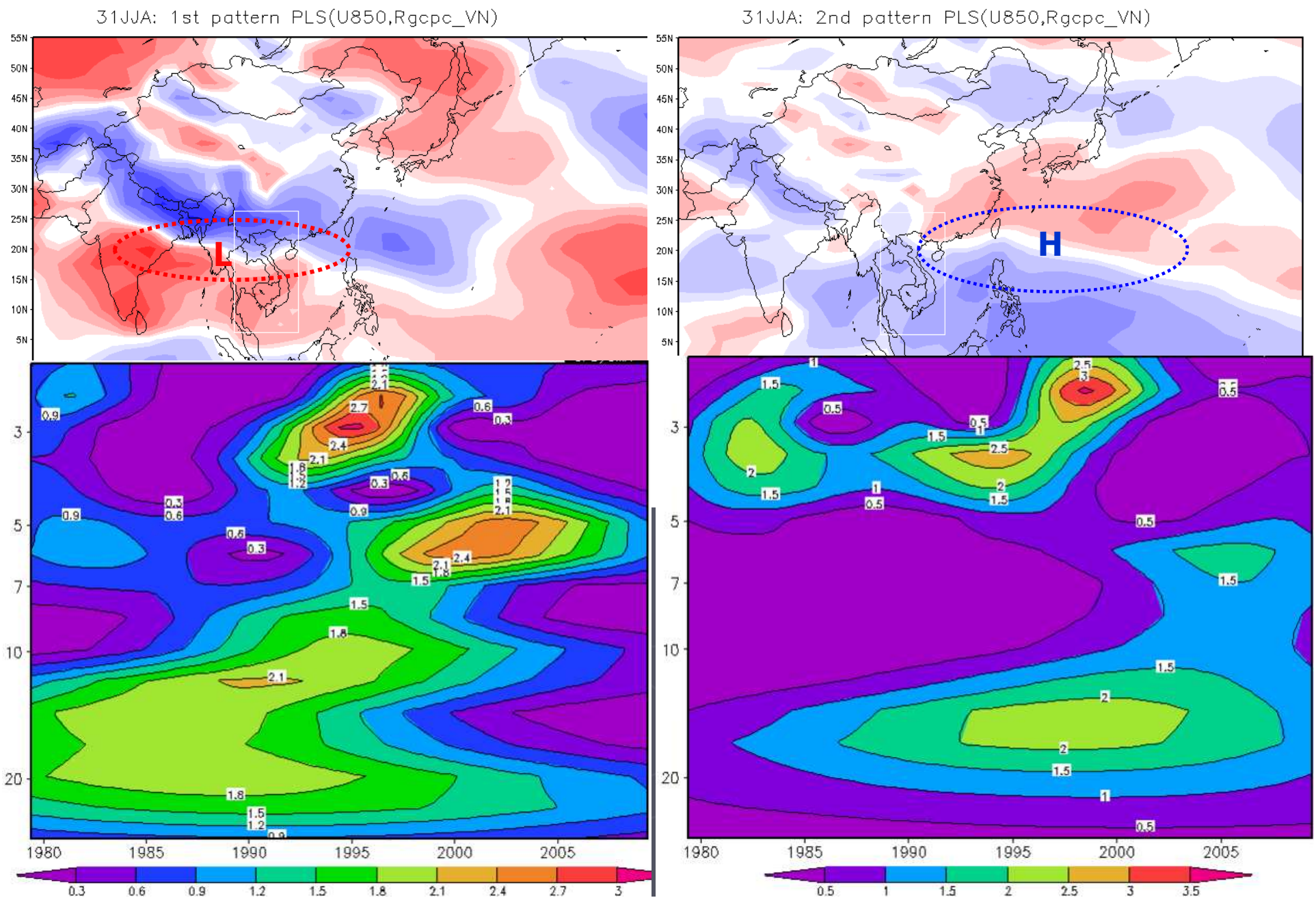


31JJA: Corel. MHI – GCPC

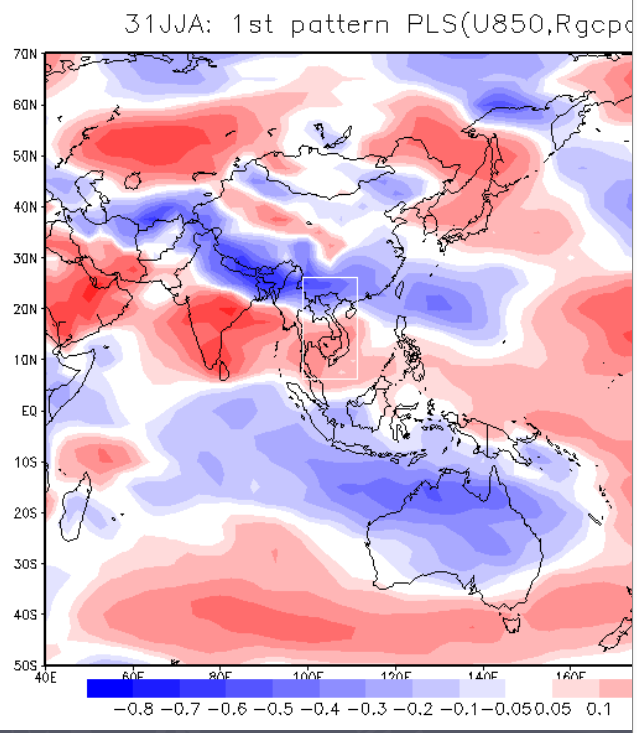


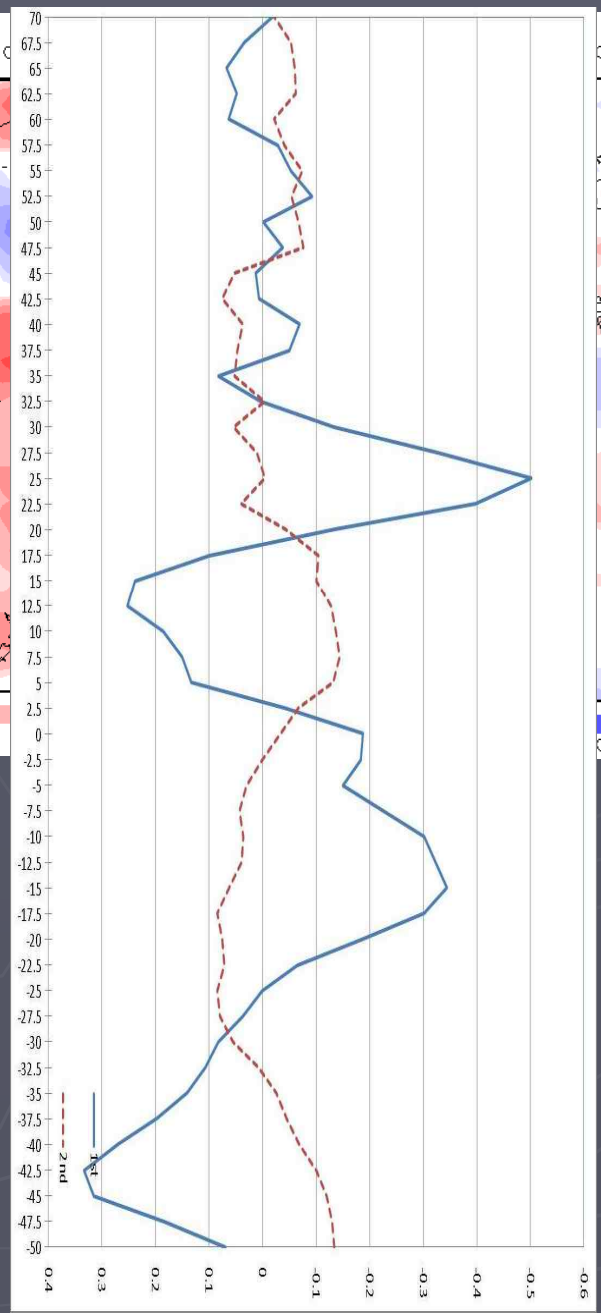


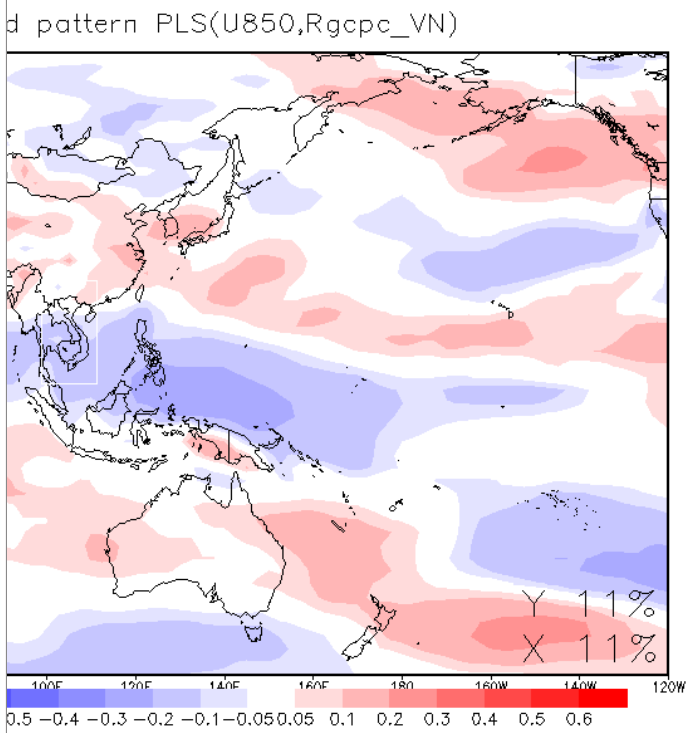
PLS and Wavelet analysis



Longwave propagations







Cross section ave. lon. over 100-110E.

Correlation coefficients

	Robs	MHI	DU2	WSI	NINO3.4
1st	0.754	0.66	0.539	-0.012	0.474
2nd	0.263	-0.364	-0.706	0.128	-0.373

Simple linear pred. equ.

$$Y = a_o + \Sigma a_i X_i$$

where X_i is DU2, MHI, WSI, individually as well as multi-combinations from those indices. Lagged season connections, btwn JJA indices and DJF rainfall, also take into account.

Simple assess. to 2010-2011 JJA rainfall over each sub-climate region and VN.

➔ The combination of DU2 and MHI gave promising results.

Conclusion and Discussion

- Convection index DU2 and MHI shows closed relationships to summer rainfall over VN, being potential indices for summer rainfall prediction.
- The two robust patterns in U850 are identified that, in combination, account for about 80% the variance of total JJA rainfall during 1979-2009.
- In the normal condition (clim.) NWP Sub-tropical High decides ~ 20% the JJA rainfall, whilst much rainfall variability will be controlled by the strengthened South Asian Low.
- Discussion:

  The activity mechanism of each leading pattern, dominant time-scale, requires further studies.

  The mechanism of the Rossby wave evolution, especially the contrast in wave's amplitude between North and South Hemisphere.

Thank you !