Rossby wave teleconnections to rainfall anomalies over Vietnam

Hong-Hanh LE[1], Nicholas HALL[1] and Thanh Ngo-Duc[2]
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(2) LOTUS, University of Science and Technology of Hanoi, Vietnam

1 Introduction

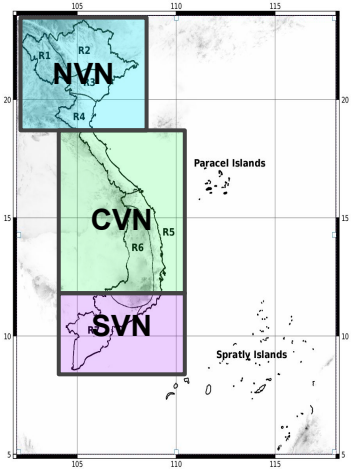
By OBSERVATION analysis:

Remote influence on Intraseasonal Variation (ISV) of rainfall over Vietnam subregions:

- Tropical factors: the MJO, Equatorial Rossby waves, Kelvin waves …
- Extratropical factors and their interactions

Remains:

- asymmetrics of large-scale precursors between opposite events
- pathways of influences by modelling study



Vietnam map and selected domains: North, Central and South of Vietnam - NVN,CVN and SVN, respectively.

2.1 Methods - Precursor Composites

$$\frac{dq}{dt} = S = E - P$$

$$\frac{\partial q}{\partial t} + \nabla \cdot (qV) = E - P$$

TIMC - VIMC = E - P

$$VIMC = -\int_{P_s}^{P_0} \nabla(V.q)\, dp$$

$$TIMC = \frac{\partial}{\partial t}\left(\int_{P_s}^{P_0} q\, dp\right)$$

TIMC = Tendency of Integrated Moisture Column
VIMC = Vertically integrated Moisture Flux Convergence

ERA-Interim 1979-2016 summer time- MAY-OCT

The ISVs of VIMC

Daily Regional INDEX

WET and DRY events
Threshold value +/-3mm/day

Large-scale precursors

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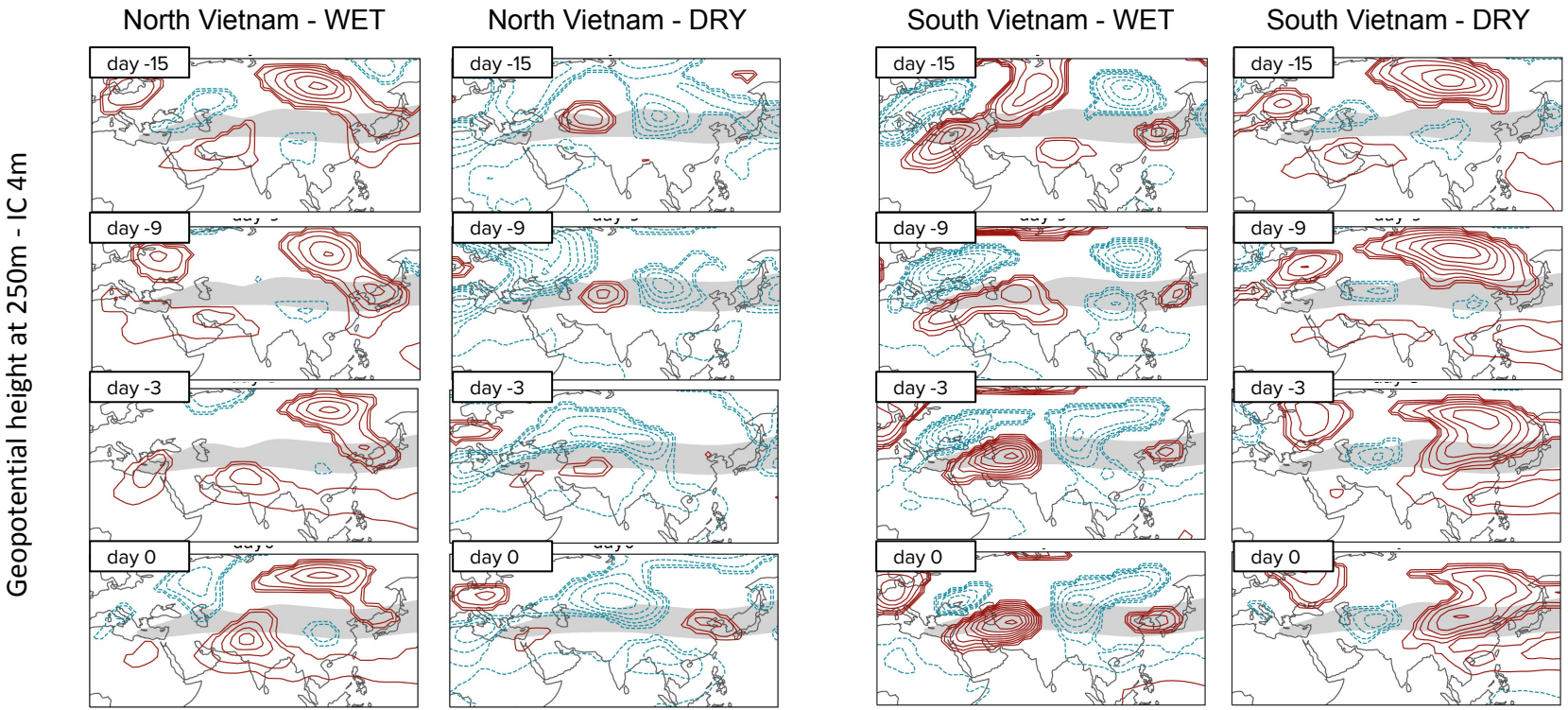
3 WET and DRY Composites



Asymmetrical precursors; Anomalies originate from Europe with different pathways of influence

Asymmetrical precursors; South-DRY/WET looks like North-WET/DRY

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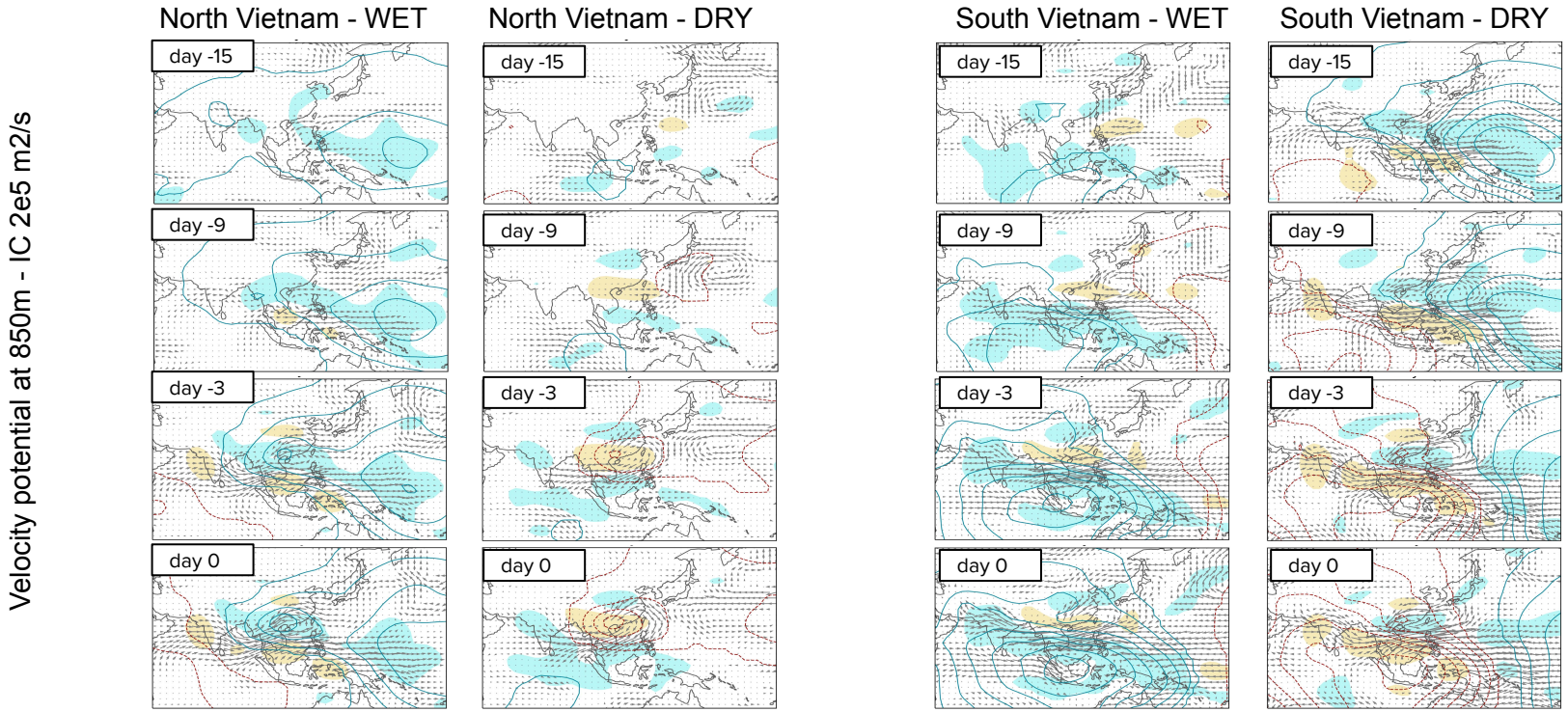

Convergence/Divergence area develops locally and asymmetrically

Observed tropical wave activities and its asymmetry

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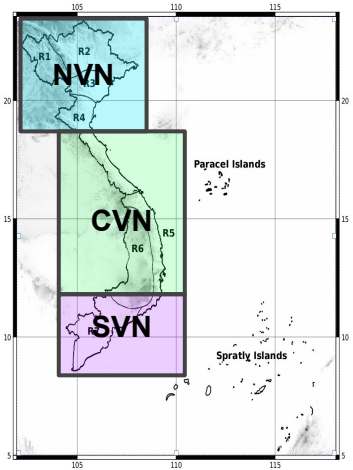

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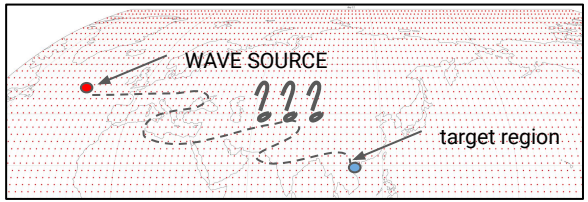
2.2 Methods - Stationary Wave Model

Perturbation Experiment



model state

forcing maintain IC as a basic state

$$\frac{d\Psi}{dt} + (\mathcal{A} + \mathcal{D})\Psi = g_{bs} +$$

A PULSE of HEATING PERTURBATION

advection

dissipation

WAVES SOURCE

The BASIC STATE: **summer climatology ERA-Interim 1979-2016**

INFLUENCE FUNCTION MAP (see later)

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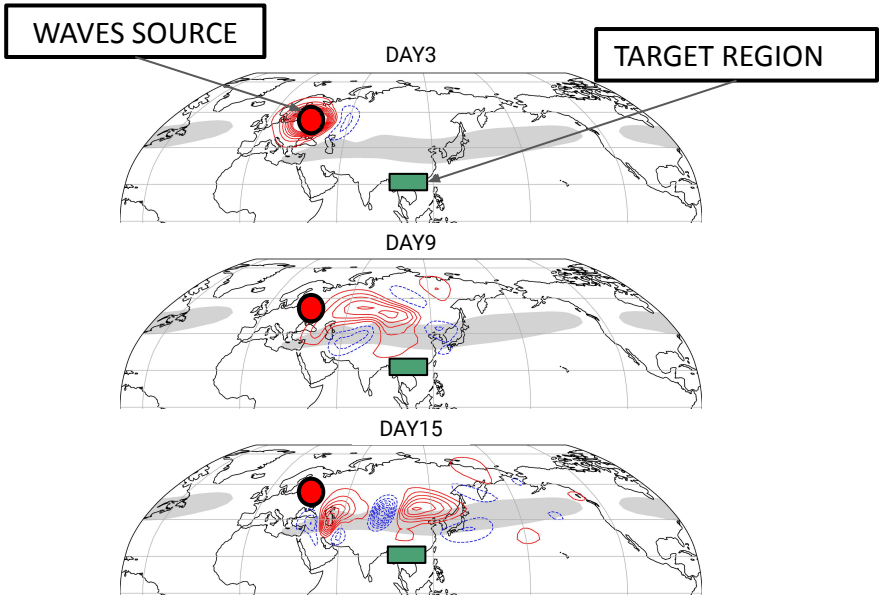
3 Stationary Wave Model - Perturbation experiments

Example of a SINGLE experiments



gph 250mb - IC 4m

- Plot the the CHANGE of INFLUENCE over TARGET region on PLACE OF WAVE SOURCE versus model running time
- DO a set of perturbation experiments all around the world

⇒ INFLUENCE FUNCTION MAP

2 Target regions: North and South Vietnam

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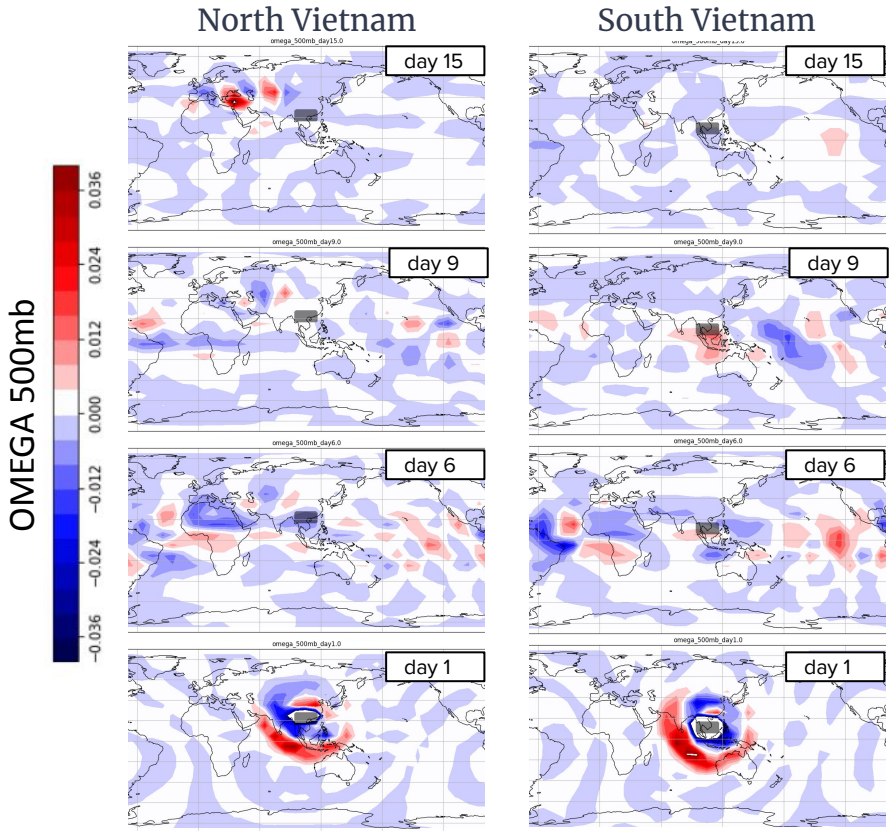

Vertical velocity over target region - 500mb

- North Vietnam: Heating sources over Europe take about 12 days to reach, then reinforce influence.
- South Vietnam: No heating outside Tropics gives significant influence; Kelvin waves in Tropics (day1-day9).

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4 Conclusion:

OBSERVATION: Rainfall extremes of opposing signs show:

- asymmetrical large scale precursors
- different pathways of influence from Extratropics
- strong tropical wave activity for South Vietnam

MODELLING: Two different pathways influence divergence flow over VN:

- North Vietnam: extratropical sources over Europe
- South Vietnam: tropical wave sources

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