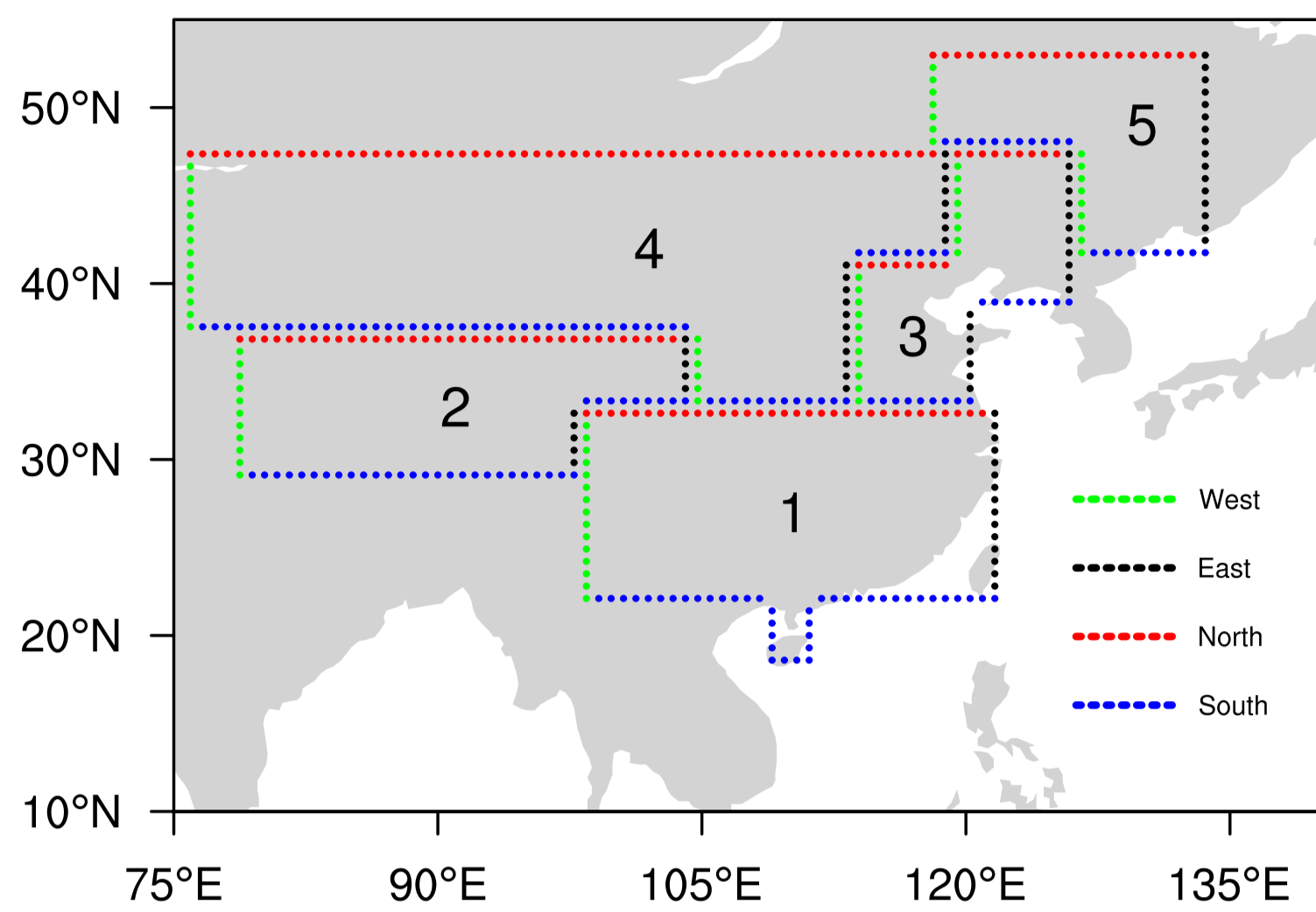


Relationships of regional China precipitation to moisture transport

Define regions over China for this study



China is divided into five regions according to P-E and topography.

- The hydrological cycles between these regions are different.
- Hydrological feature and topography within each region is consistent, even though it is not homogenous.
- Boundaries facing different directions are separated with different colours.

Introduction and Conclusion

- China covers several climatic zones with different hydrological features. Therefore, it is divided into five regions.
- The ERA-Interim monthly data is used (1979-2012).
- 2D Precipitation recycling (Brubaker et al. 1993) is used and is expanded to consider moisture influxes from different directions.
- Results show that the western and southern moisture influxes are major contributors to precipitation climatology.
- The major contributor to precipitation climatology is not necessarily the major contributor to precipitation inter-annual variation.

Precipitation recycling and Contribution from the moisture influxes

Precipitation recycling following Brubaker et al. (1993):

$$\rho = \frac{EA}{EA + 2I}$$

ρ – Regional mean evaporation
 E – Area of the region
 I – Total horizontal moisture influx.

Contribution from the moisture influx:

$$\alpha = 1 - \rho = \frac{2I}{EA + 2I}$$

Decomposition moisture influx into different directions, the contributions from the moisture of different directions:

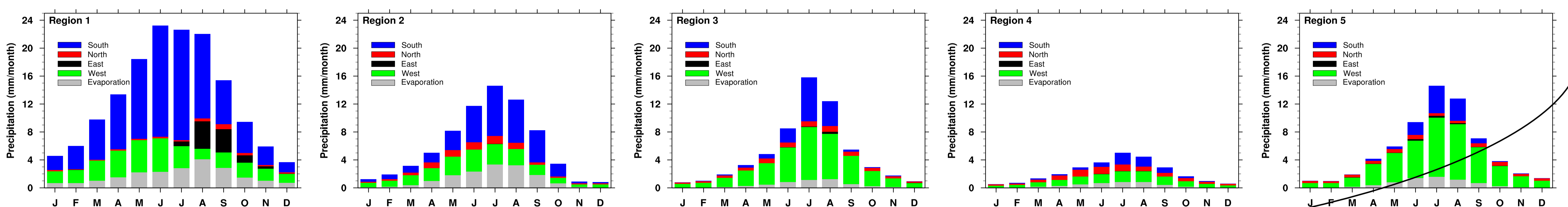
$$\alpha_W = \frac{2I_W}{EA + 2I}; \alpha_E = \frac{2I_E}{EA + 2I}; \alpha_N = \frac{2I_N}{EA + 2I}; \alpha_S = \frac{2I_S}{EA + 2I}$$

Therefore, the relationship between precipitation and moisture transport can be decomposed into:

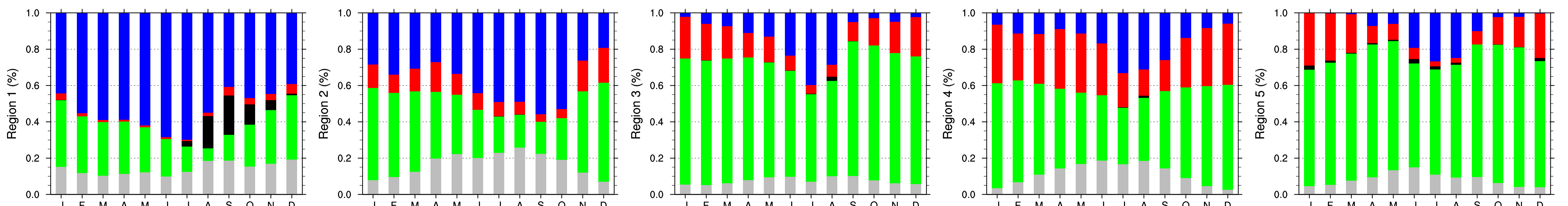
$$\rho + \alpha_W + \alpha_E + \alpha_N + \alpha_S = 1$$

$$\text{and } P(\rho + \alpha_W + \alpha_E + \alpha_N + \alpha_S) = P$$

Monthly precipitation and its amount related to moisture influx from different directions.



Contribution of moisture influxes from different directions to monthly precipitation.



Different relationships between moisture influxes to precipitation climatology and the inter-annual variation.

	R1	R2	R3	R4	R5
DJF	S,W	W,S	W	W,N	W
MAM	S	W,S	W	W,N	W
JJA	S	S,Ev	W,S	W,S	W,S
SON	S,W	S,W	W	W,N	W

Major moisture influx contributing to the precipitation climatology (the combined percentage of contribution $\geq 60\%$).

	R1	R2	R3	R4	R5
DJF	S,N	Ev	S	W	W,N
MAM	S	Ev	S,Ev	Ev,S,W	S
JJA	Ev,S	S	S	Ev	Ev,S
SON	S	S	S,Ev	W,S,Ev	S

Major moisture influx contributing to the precipitation inter-annual variation (the absolute value of correlation coefficient between moisture influx and monthly precipitation ≥ 0.5 for 1979-2012).

Reference:

Brubaker, K. L., D. Entekhabi, and P. S. Eagleson, 1993: Estimation of Continental Precipitation Recycling. Journal of Climate, 6, 1077–1089,