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The intraseasonal forecast project

Hai Lin

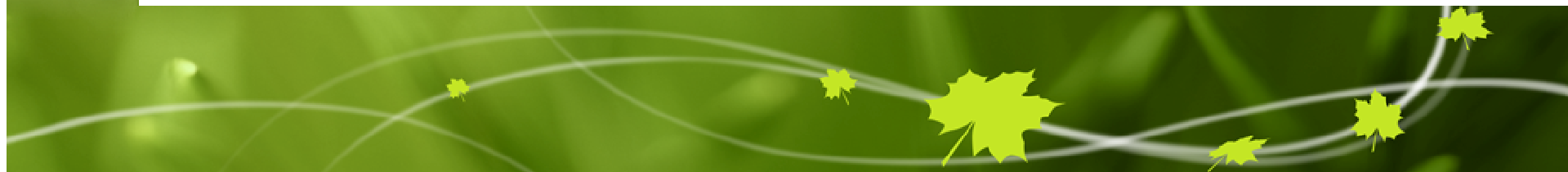
Collaborators: G. Brunet, B. Dugas, J.-S. Fontecilla

Thanks to: M. Charron, P. Houtekamer, N. Gagnon, K. Winger, X. Deng,
B. Brasnett, A. Methot, B. Denis, and more

NAEFS Workshop

May 17-19, 2010

Cuernavaca, MX



Outlines

- MJO influence
- Intraseasonal forecast project



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Outlines

- MJO influence
 - on Canadian surface air temperature
 - on Canadian precipitation
- Intraseasonal forecast project



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Outlines

- Intraseasonal forecast project
 - Monthly forecasts --- based on EPS
 - 24-year hindcast --- with GEMclim



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TARGET:

Range of 10-30 days, between medium-range and seasonal forecasts

PRODUCTS:

forecasts of monthly, 10-day, 7-day and 5-day means (for surface air temperature, precipitation, 500 hPa height, etc)

Source of skill:

initial condition (e.g. state of MJO)

anomaly in boundary condition (e.g. SST)

Current monthly forecasting system

- Based on seasonal forecasting system
- 4 models (GEM, SEF, GCM2 and GCM3)
- persistent boundary anomaly (from last month)
- 10 members for each model
- 12-hour lagged initial conditions

Main shortcoming: initial conditions

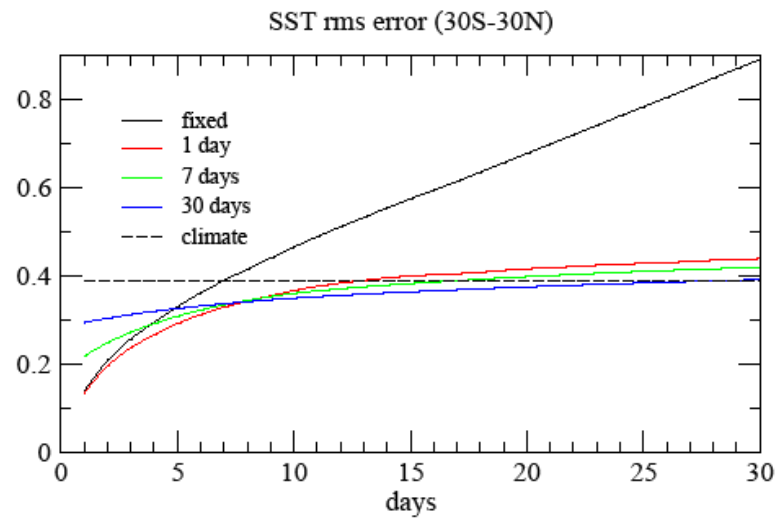
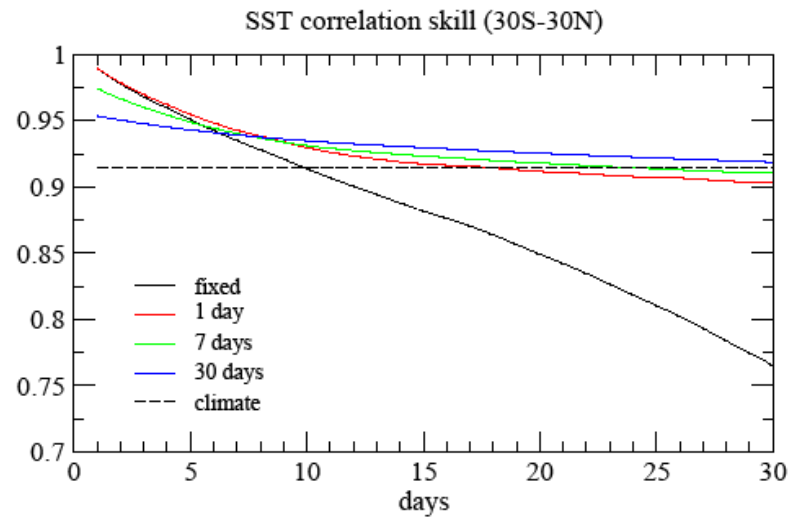
Current medium range forecasts (EPS)

- GEM global
- 21 member, kalman filter
- fixed boundary
- 16 day integrations

Main shortcoming: boundary conditions

For forecasts beyond 16 days

SST skill with persistent anomaly



Proposed monthly forecasts

- EPS initial conditions → kalman filter generated 21 members
- persistent SST anomaly (1-day to 30-day)
- 35 day integrations
- forecast frequency: 3 times a month (1st, 11th, 21st)
- GEM global, perturbed physics

Status:

- It is running in experimental mode since May 1, 2009

Verification for the recent 6 months,
with comparison to the current monthly forecasts

May-December 2009: 24 cases



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Correlations of Surface Air Temp.

Table 1: Correlation skill for 30-day mean SAT over different regions by different model configurations. Numbers listed are the percentage of area that is significant at the 0.05 level. Shown in parentheses are average correlations. GCM2, GCM3, SEF and GEMCLIM are for 10-member ensemble of each single model of the operational seasonal forecasting system. “Operational” is for the operational 40-member ensemble of the four models. “60-member ensemble” is for the super ensemble of all the available members of both the operational and EPS-based MFS. The numbers in bold font are the maximum value in the group.

	global	North of 30°N	Tropics	South of 30°S
GCM2	32%(0.19)	30%(0.18)	35%(0.21)	29%(0.14)
GCM3	30%(0.19)	19%(0.11)	36%(0.23)	30%(0.19)
SEF	32%(0.16)	33%(0.20)	30%(0.12)	35%(0.23)
GEMCLIM	33%(0.23)	29%(0.16)	33%(0.21)	37%(0.27)
Operational	37%(0.24)	34%(0.20)	38%(0.24)	38%(0.25)
EPS-based	54%(0.39)	48%(0.30)	54%(0.38)	63%(0.44)
60-member ensemble	45%(0.32)	42%(0.26)	45%(0.31)	50%(0.35)

Correlations of Surface Air Temp.

Table 2: Correlation skill for 10-day mean SAT over different regions by different model configurations. Numbers listed are the percentage of area that is significant at the 0.05 level. Shown in parentheses are average correlations. The numbers in bold font are the maximum value in the group.

	global	North of 30°N	Tropics	South of 30°S
Operational days 1-10	54%(0.40)	53%(0.31)	47%(0.36)	69%(0.49)
EPS-based days 1-10	89%(0.66)	95%(0.70)	82%(0.59)	99%(0.76)
60-member day1 1-10	74%(0.53)	75%(0.48)	65%(0.47)	91%(0.65)
Operational days 11-20	27%(0.21)	23%(0.12)	29%(0.22)	26%(0.19)
EPS-based days 11-20	42%(0.32)	39%(0.22)	41%(0.32)	46%(0.36)
60-member day1 11-20	34%(0.27)	31%(0.17)	34%(0.27)	35%(0.27)
Operational days 21-30	23%(0.17)	17%(0.09)	25%(0.18)	24%(0.19)
EPS-based days 21-30	29%(0.21)	24%(0.14)	31%(0.23)	28%(0.20)
60-member day1 21-30	27%(0.20)	21%(0.12)	29%(0.21)	27%(0.21)

Conclusions

- A new monthly forecast system is proposed, which is running in an experimental mode
- Preliminary assessment shows much better skill than the current operational monthly forecast system



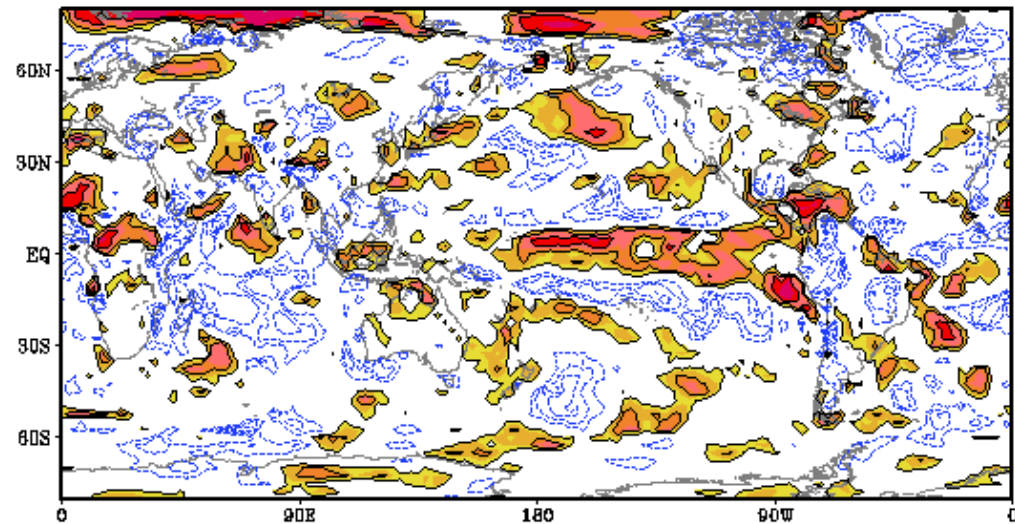
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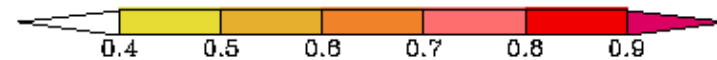
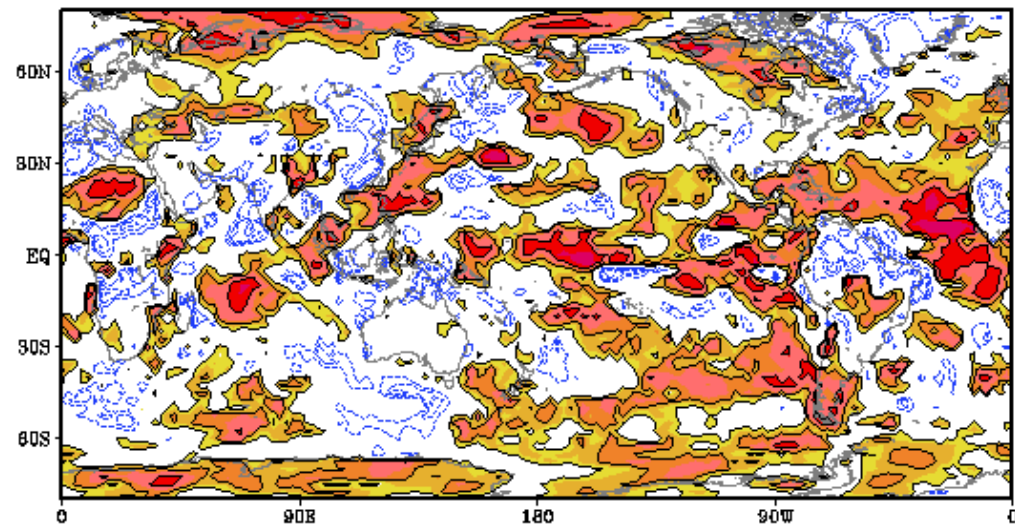
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Correlation skill for 30-day mean SAT forecast

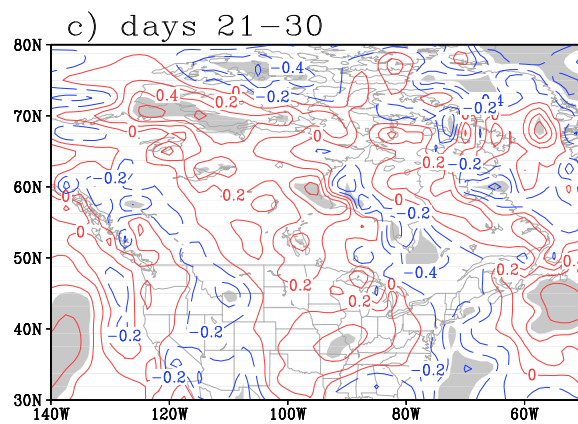
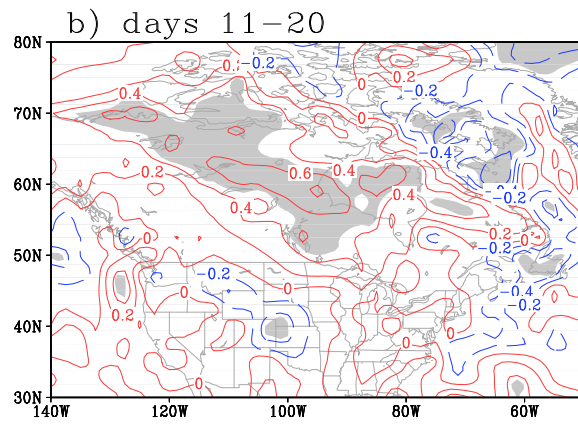
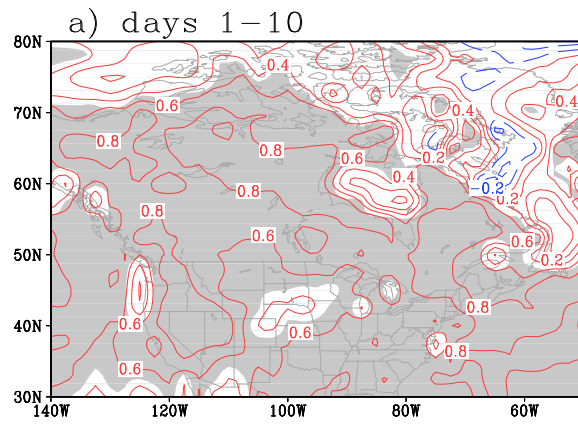
Operational
10-member GEMCLIM



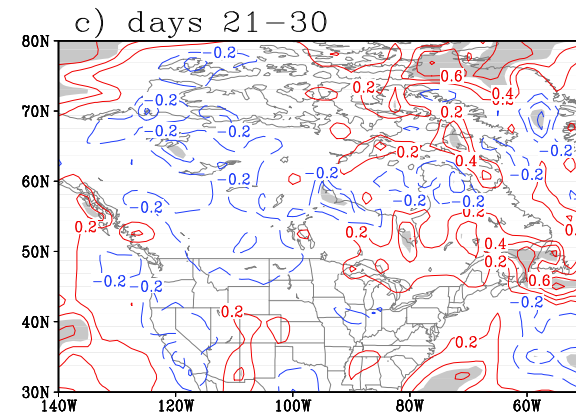
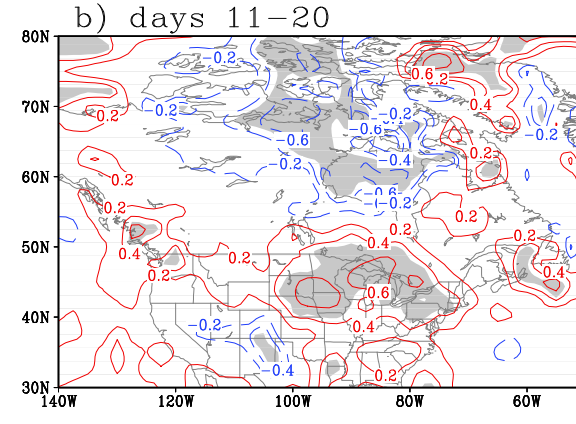
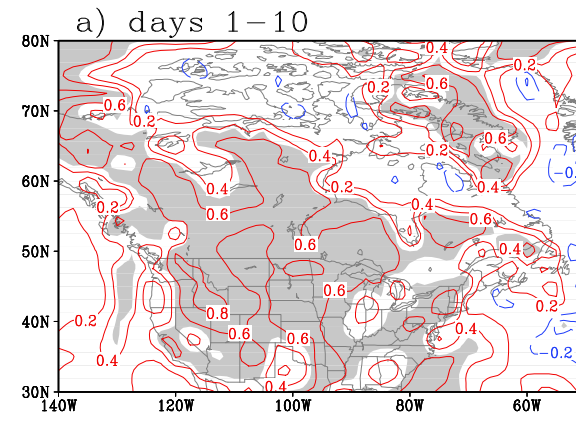
Proposed
20-member



proposed



operational





Thank you!



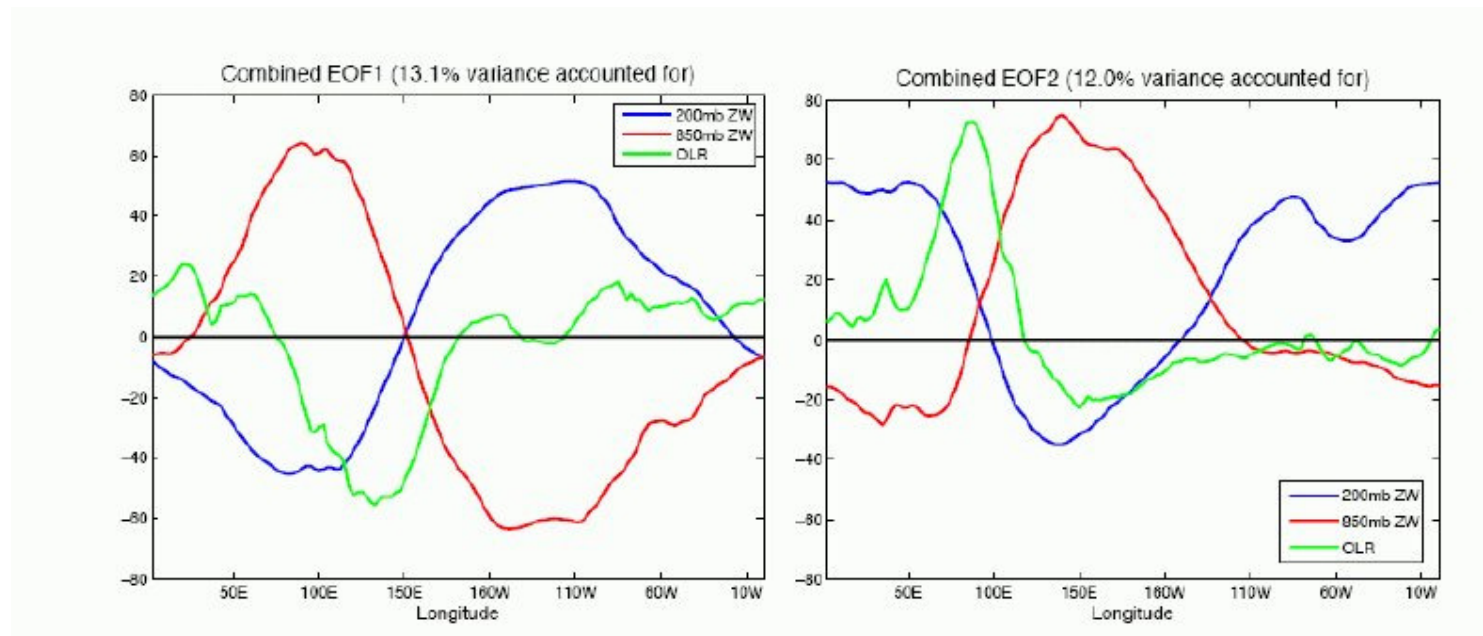
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Definition of MJO index

Combined EOF of OLR, u200 and u850 in the band of 15°S – 15°N (Wheeler and Hendon, 2004)



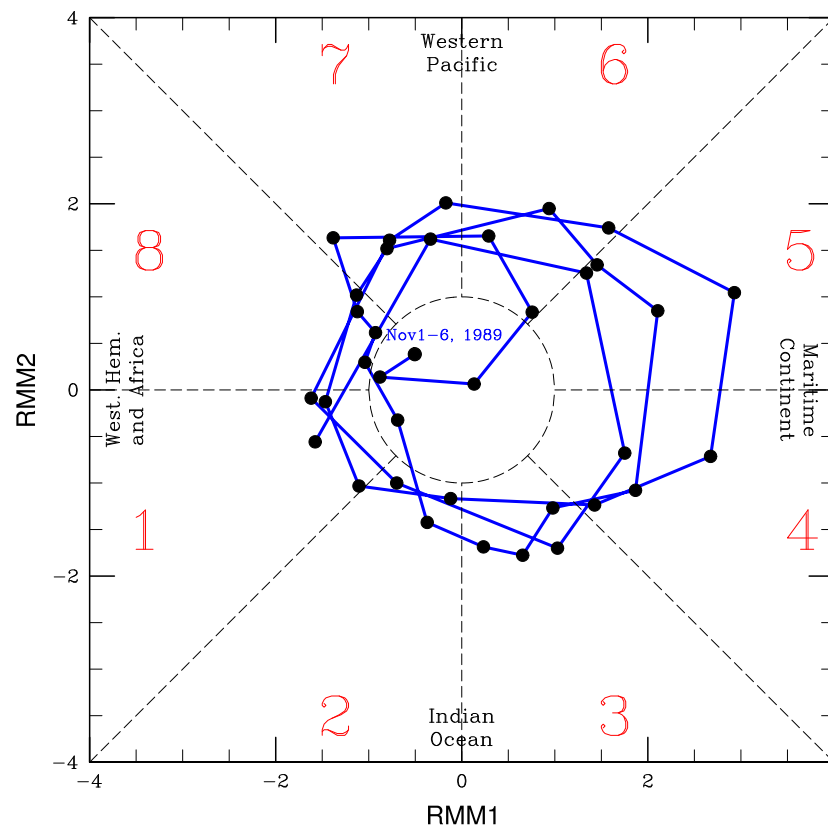
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Definition of MJO index

Definition of the MJO: combined EOF of OLR, u200 and u850 in the band of 15°S – 15°N (Wheeler and Hendon, 2004)



MJO index: RMM1 and RMM2

Period: 1979-2003

Extended winter, November to April
(36 pentads)



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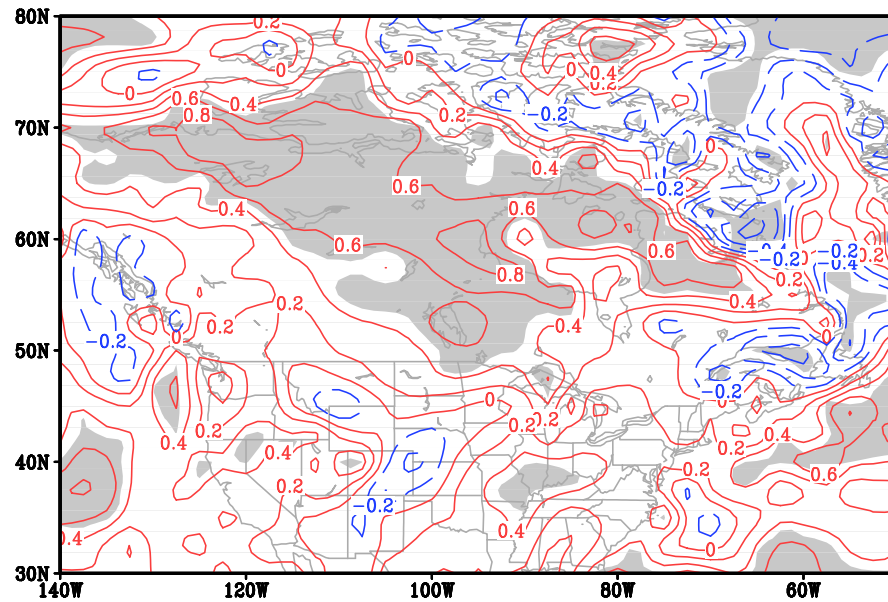
Pentads in MJO phases

Extended winter from 1979 to 2004

Phase	1	2	3	4	5	6	7	8
Number of pentads	55	79	78	78	63	71	87	66
Mean amplitude	1.67	1.66	1.81	1.78	1.66	1.70	1.62	1.75

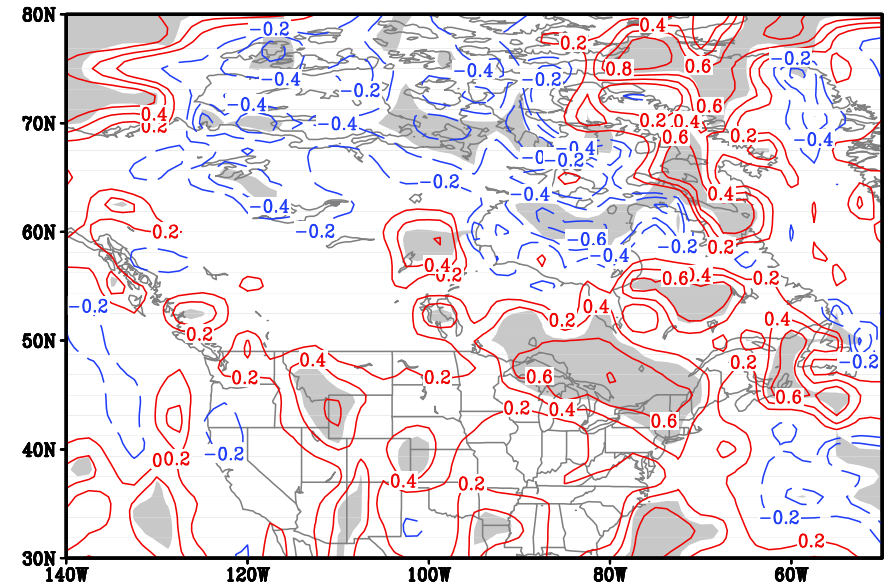
SAT correlation skill

skill of 30-day mean T2m



Proposed
20-member

skill of 30-day mean T2m



Operational
10-member GEMCLIM