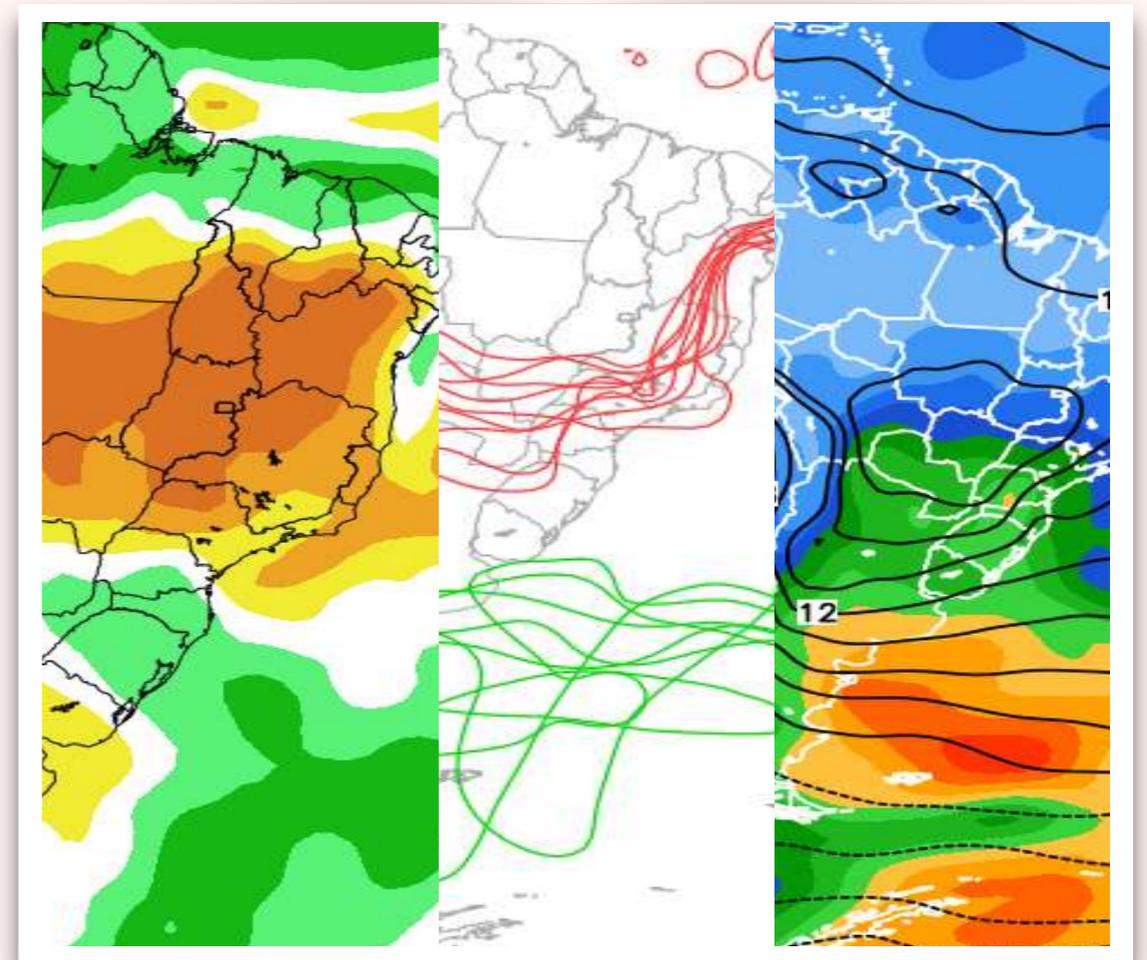

DIMNT - DIVISÃO DE MODELAGEM DO SISTEMA TERRESTRE

PREVISÃO POR CONJUNTOS GLOBAL

Transição Cray XE6 - Cray XC50



Carlos Frederico Bastarz
10 de Dezembro de 2020

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- Testes de estabilidade e reprodutibilidade numérica

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- Configurações para o BAM TQ0126L028

3. Transição parcial dos produtos da suíte de previsão por conjuntos

- Exemplos análises e previsões de 7 e 15 dias

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- Verificação objetiva da parte determinística (BAM Vs. MCGA)
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- Verificação do espalhamento do conjunto
 - Comparação do RMSE da média dos membros com o espalhamento
- Verificação objetiva da parte probabilística (BAM Vs. MCGA)
 - CRPSS - *Continuous Ranked Probability Skill Score*

5. Considerações

- Desempenho
- Produtos
- Ajustes

TRANSIÇÃO DO MÉTODO DE PERTURBAÇÃO PARA O XC50

TRANSIÇÃO MB09 PARA XC50

- **Compilação dos módulos do método de perturbação MB09 utilizando o compilador GNU:**

- **fftpln:** FTNFLAG = -g -fconvert=big-endian -fdefault-real-8
- **recanl:** FTNFLAG = -g -fconvert=big-endian -fdefault-real-8
- **rdpert:** FTNFLAG = -g -fconvert=big-endian -fdefault-real-8
- **decanl:** FTNFLAG = -g -fconvert=big-endian -fdefault-real-8
- **recfct:** FTNFLAG = -g -fconvert=big-endian -fdefault-real-8
- **eof[prs,tem,hum,win]:** FTNFLAG = -g -fconvert=big-endian
- **deceof:** FTNFLAG = -g -fconvert=big-endian -fdefault-real-8

- **Em submissões consecutivas, as EOFs falhavam:**

- Para as EOFs a opção -fdefault-real-8 causava problemas na escrita; os campos devem ser lidos e escritos como R4 (embora não seja explícito). Para o deceof, é necessário utilizar esta opção.

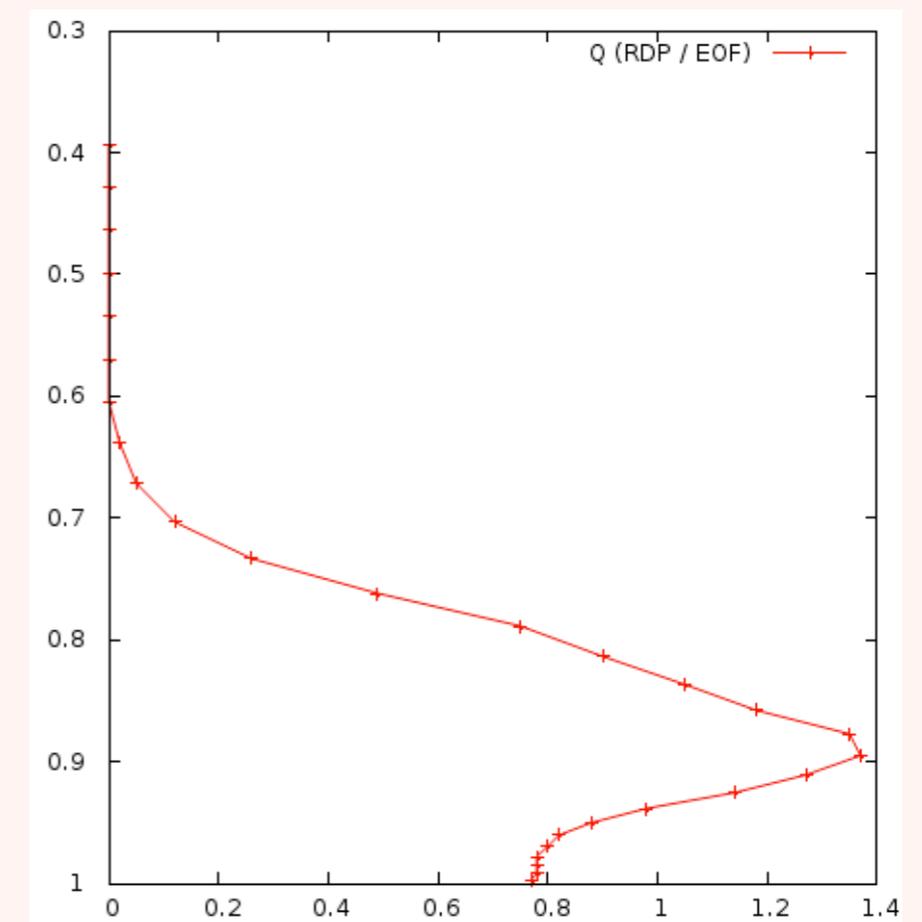
TRANSIÇÃO MBO9 PARA XC50

- Foi detectado que o cálculo do **espalhamento do conjunto no XE6 considerava 7 membros** ao invés de 15 (corrigido na versão do XC50);
- Compilação dos códigos dos produtos foi feita também com o GNU (incluindo a w3lib para a leitura dos arquivos GRIB);
- Foram feitos os scripts de submissão para os produtos mostrados;
- Cálculo da média do conjunto é feito em paralelo (foi feito o script de submissão e foi determinada a quantidade de processadores em uso);
- Foi feita a transição do *grid history* do TQ0126L028, para uso com o cálculo das plumas de probabilidade (para outros produtos do centro, é mostrado de forma diferente);
- Processo mais lento do método de perturbação: **recfct** (recomposição do espaço espectral para a grade) - é feito antes das EOFs, já com as séries de previsões perturbadas randomicamente.

CONFIGURAÇÕES PRINCIPAIS

Método de Perturbação

Descrição	Variável	Valor
Perturbação Randômica	U	3 m/s
	V	3 m/s
	T	0,6 K
	Q	(variável)
	Ps	1 hPa
Desvio padrão para ponderar as EOFs	U	5 m/s
	V	5 m/s
	T	1,5 K
	Q	(variável)
	Ps	1 hPa



ATUALIZAÇÃO PREVISÃO POR CONJUNTO PARA O BAM OPERACIONAL

ATUALIZAÇÃO PARA BAM

- Utilização dos **executáveis operacionais do BAM** no XC50 (pré/model/pós);
- Configuração BAM específica para TQ0126L028;
- Pós-processamento com 9 níveis (1000, 925, 850, 700, 500, 300, 250, 200 e 50 hPa) e 34 variáveis;
- Foram testados o novo pré-processamento e o pré-processamento operacional:
 - Novo pré-processamento: foram identificados problemas com as dimensões de algumas máscaras (informado ao grupo e depois corrigido);
 - Pré-processamento operacional: Chopping_parallel com iter=100 e SmootPertCut=0.18 e depois com iter=10 e SmoothPertCut=0.12
- **Simulações avaliadas consideram Chopping_parallel com iter=100 e SmootPertCut=0.18**
- Arquivos SSTWeeklyYYYYMMDDHH.G00192 e SnowYYYYMMDDHHS.unf.G00192 foram gerados pelo novo pré-processamento;
- Arquivos traçadores e de ozônio para cada membro, são os mesmos do controle (*link* simbólico);
- Nas comparações, as análises controle foram executadas **sem a suavização a topografia**.

CONFIGURAÇÕES PRINCIPAIS

Modelo

Descrição	Opção	BAM (XC50)	MCGA (XE6)
Dinâmica Euleriana	slagr	Euleriano	Euleriano
Transporte de Umidade	slhum	Semi-Lagrangeano	Euleriano
Microfísica	microphys	TRUE	—
Conservação de Massa	MasCon	TRUE	FALSE
Física Unificada	UNIFIED	TRUE	—
Radiação Onda Curta	ISWRAD	CRD	CRD
Radiação Onda Longa	ILWRAD	CRD	HRS
Convecção Cumulus	ICCON	ARA	KUO
Convecção Rasa	ISCON	TIED	TIED
Cond. Larga Escala	ILCON	HUMO	YES
Onda Gravidade	IGWD	GMB	YES
Esquema Nuvens	CRDCLD	6 (GFS)	1 ('Old')
Esquema Superfície	schemes	3 (Ibis)	1 (SSiB)

TRANSIÇÃO PRODUTOS SUÍTE DE PREVISÕES POR CONJUNTO

TRANSIÇÃO PRODUTOS

- **Produtos que aparecem na página principal da previsão numérica:**

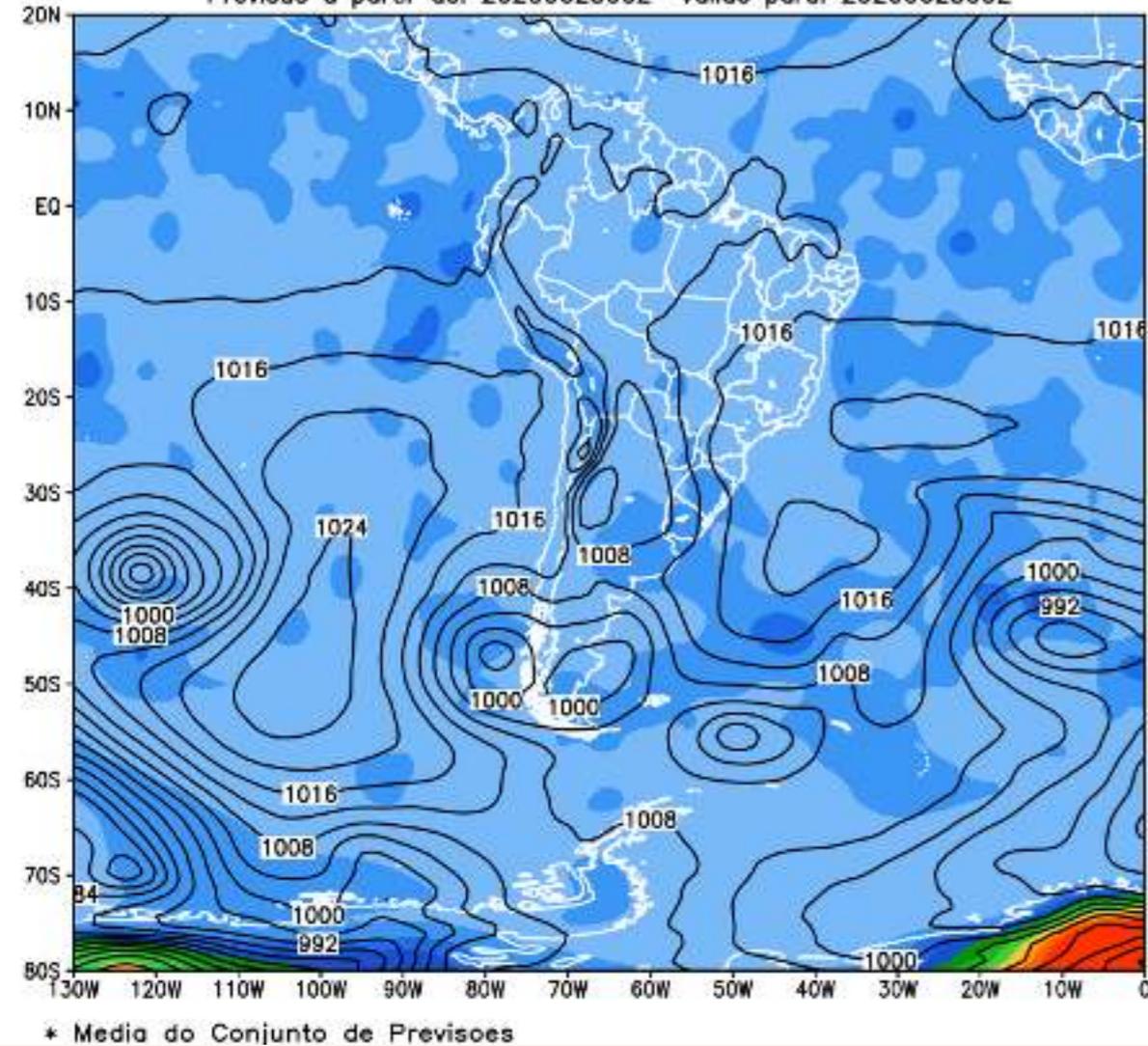
- <https://previsaonumerica.cptec.inpe.br>
 - Ensemble Médio e Espalhamento;
 - Diagrama de Espaguete;
 - Análise de Agrupamento (Clusters);
 - Previsões de Probabilidades;
 - Perturbações Iniciais;
 - Potencial de Velocidade em Altos Níveis;
- Foram feitos os scripts de submissão desses produtos para o XC50, alguns possuem rotinas em Fortran e todos possuem scripts do GrADS para plotagem;
 - Há outros produtos que (códigos/scripts) que provavelmente foram descontinuados (não aparecem na página).

MÉDIA E ESPALHAMENTO

- Cálculo da média do conjunto e do espalhamento;
- Figuras com a média e o espalhamento sobre a América do Sul:
 - Pressão ao Nível Médio do Mar;
 - Altura Geopotencial em 500 e 250 hPa;
 - Temperatura do Ar em 850 hPa;
- Na Tupã, foi verificado que o espalhamento do conjunto estava sendo calculado com base em 7 membros ao invés de 15;
- Exemplos a seguir mostram a média e o espalhamento da análise e previsões de 7 e 15 dias, para a data de verificação 2020070100 (01/Julho/2020).

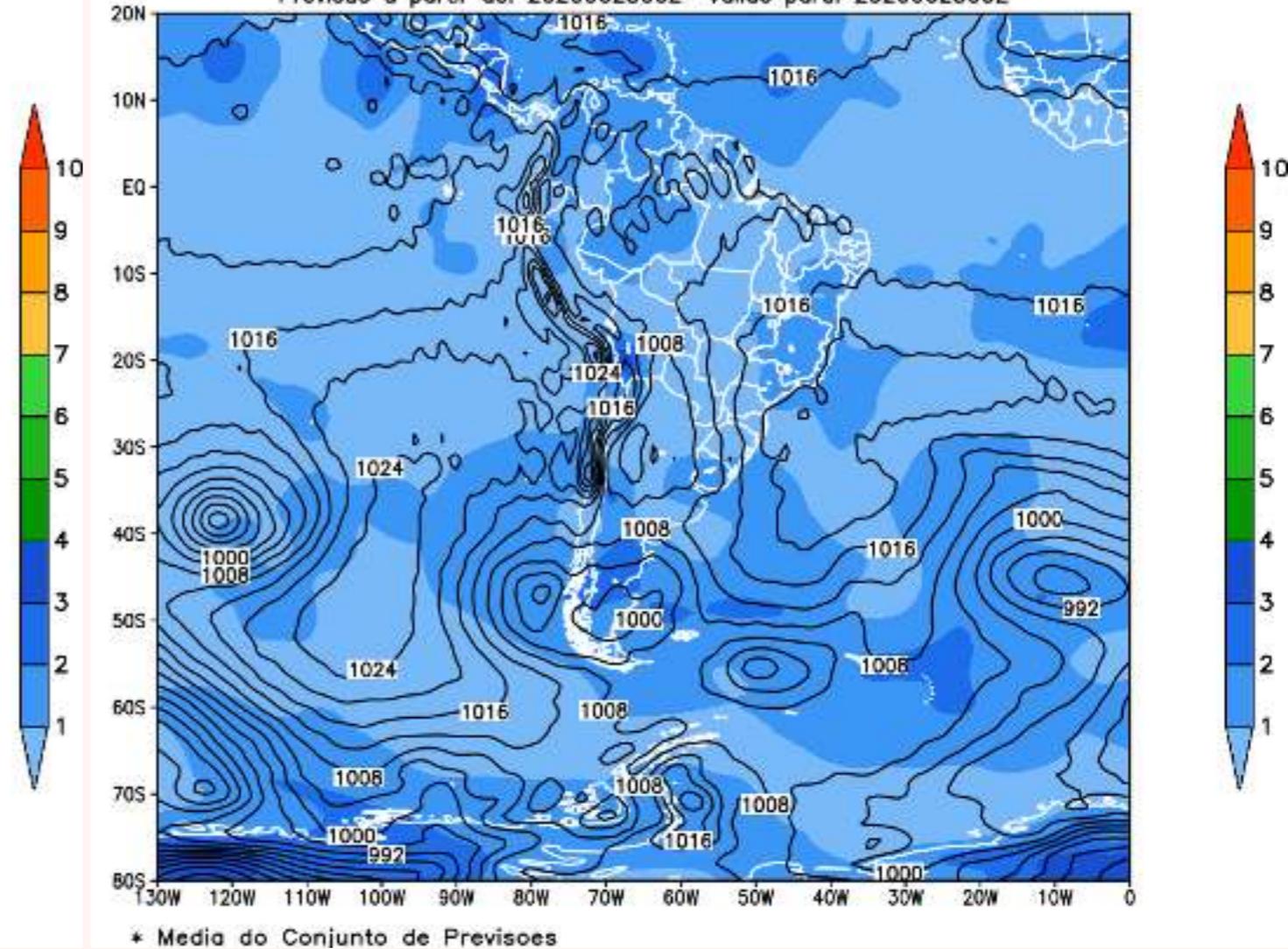
BAM XC50

CPTEC/INPE/MCT – PREVISÃO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Pressão ao Nível Medio do Mar * (hPa) [contorno] – Espalhamento do Ensemble (hPa) [cores]
Previsão a partir de: 2020062300Z Valido para: 2020062300Z



MCGA XE6

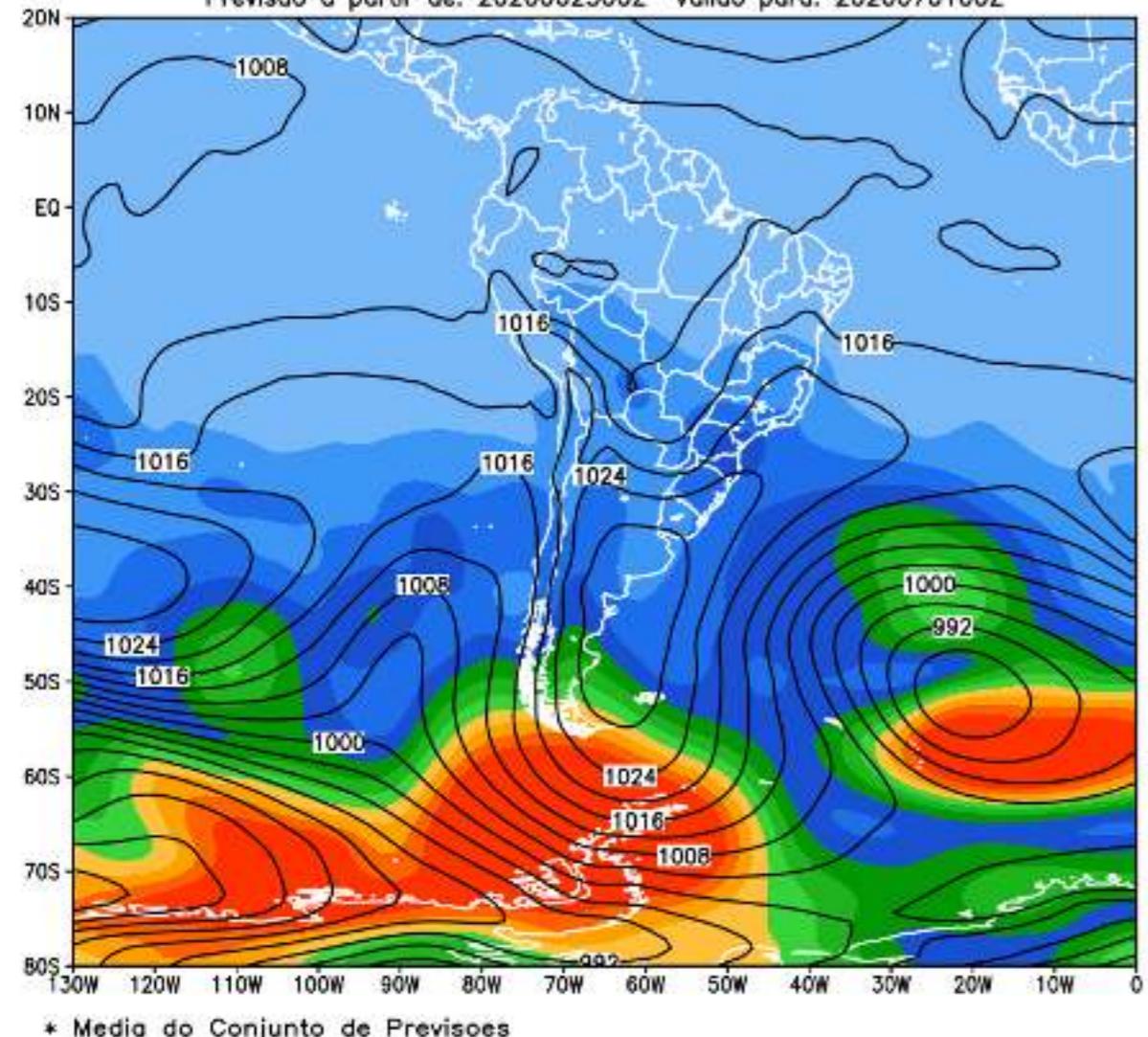
CPTEC/INPE/MCT – PREVISÃO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Pressão ao Nível Medio do Mar * (hPa) [contorno] – Espalhamento do Ensemble (hPa) [cores]
Previsão a partir de: 2020062300Z Valido para: 2020062300Z



Análise 2020062300

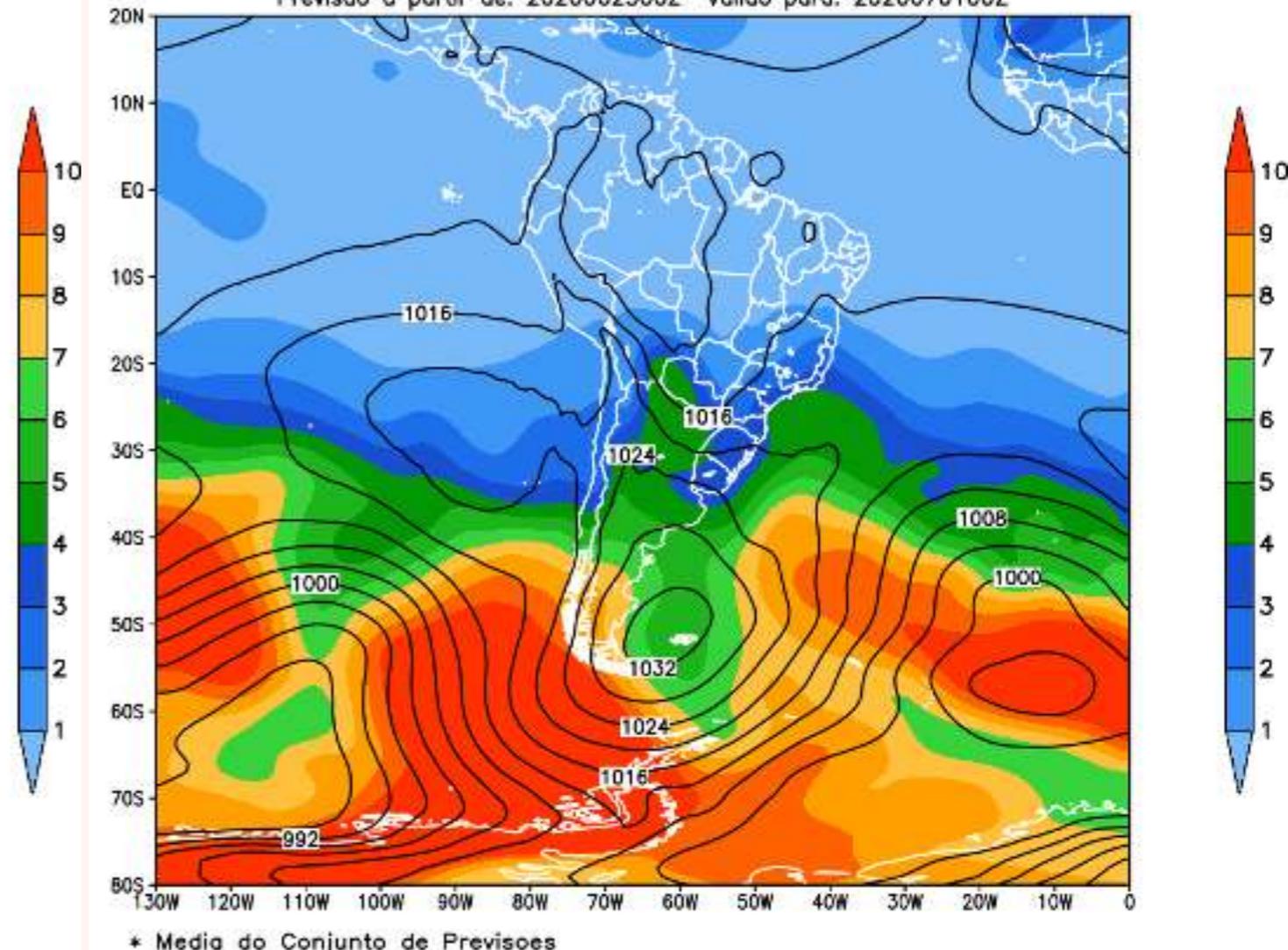
BAM XC50

CPTEC/INPE/MCT – PREVISÃO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Pressão ao Nível Medio do Mar * (hPa) [contorno] – Espalhamento do Ensemble (hPa) [cores]
Previsão a partir de: 2020062300Z Valido para: 2020070100Z



MCGA XE6

CPTEC/INPE/MCT – PREVISÃO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Pressão ao Nível Medio do Mar * (hPa) [contorno] – Espalhamento do Ensemble (hPa) [cores]
Previsão a partir de: 2020062300Z Valido para: 2020070100Z

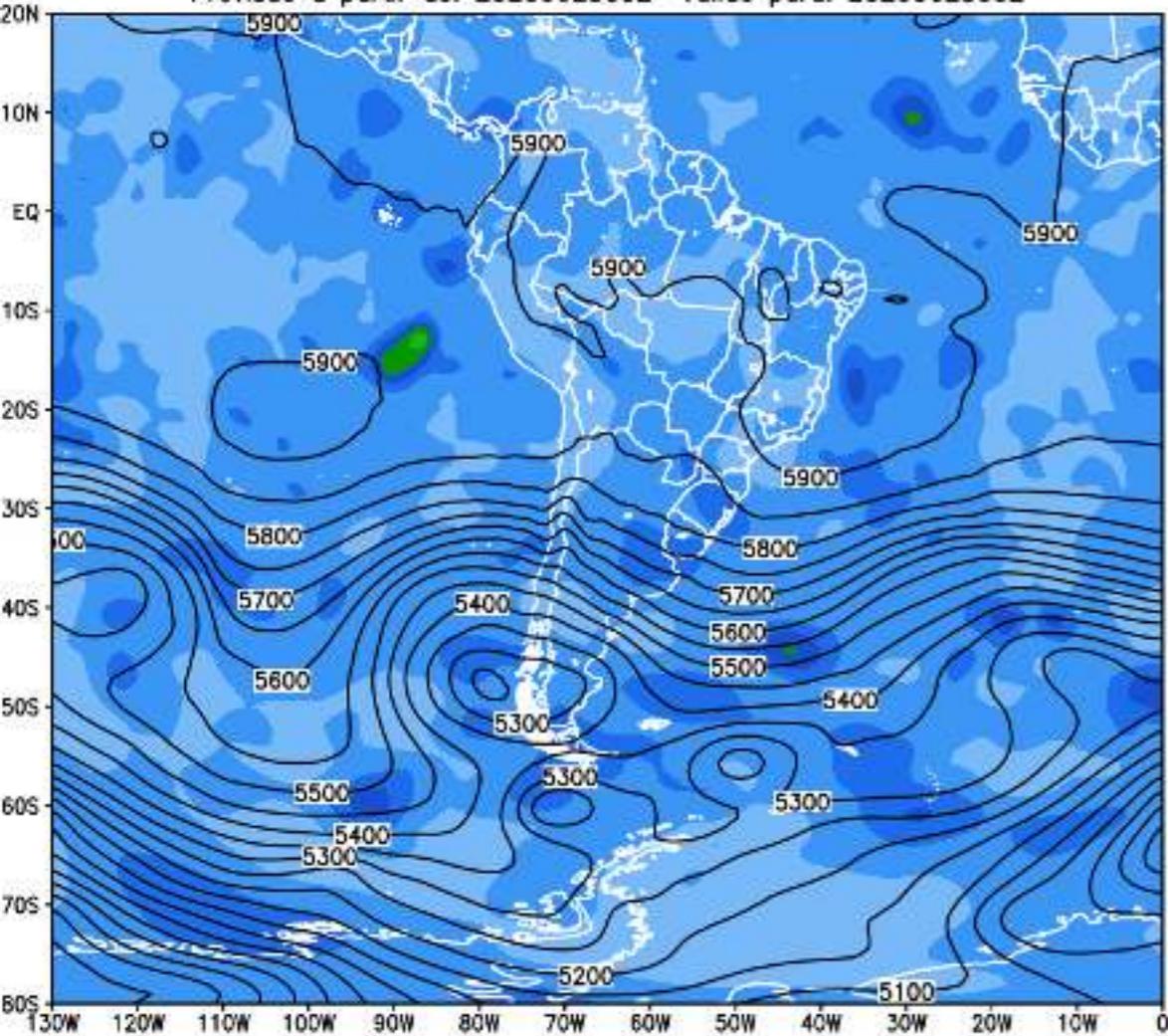


Previsão 7 dias

BAM XC50

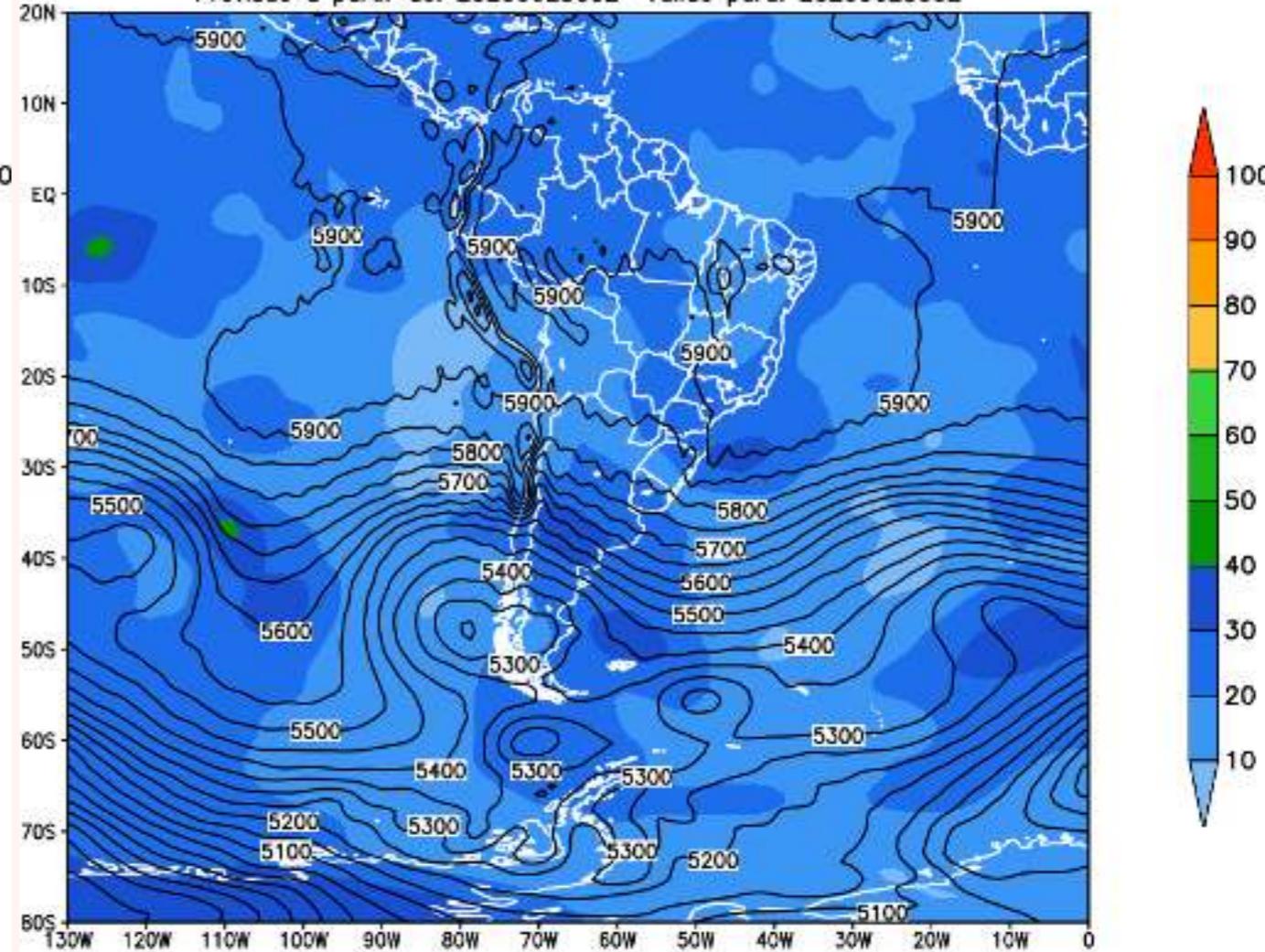
MCGA XE6

CPTEC/INPE/MCT – PREVISÃO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Altura Geopotencial + (m) – 500 hPa [contorno] – Espalhamento do Ensemble (m) [cores]
Previsão a partir de: 2020062300Z Valido para: 2020062300Z



* Media do Conjunto de Previsoes

CPTEC/INPE/MCT – PREVISÃO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Altura Geopotencial + (m) – 500 hPa [contorno] – Espalhamento do Ensemble (m) [cores]
Previsão a partir de: 2020062300Z Valido para: 2020062300Z

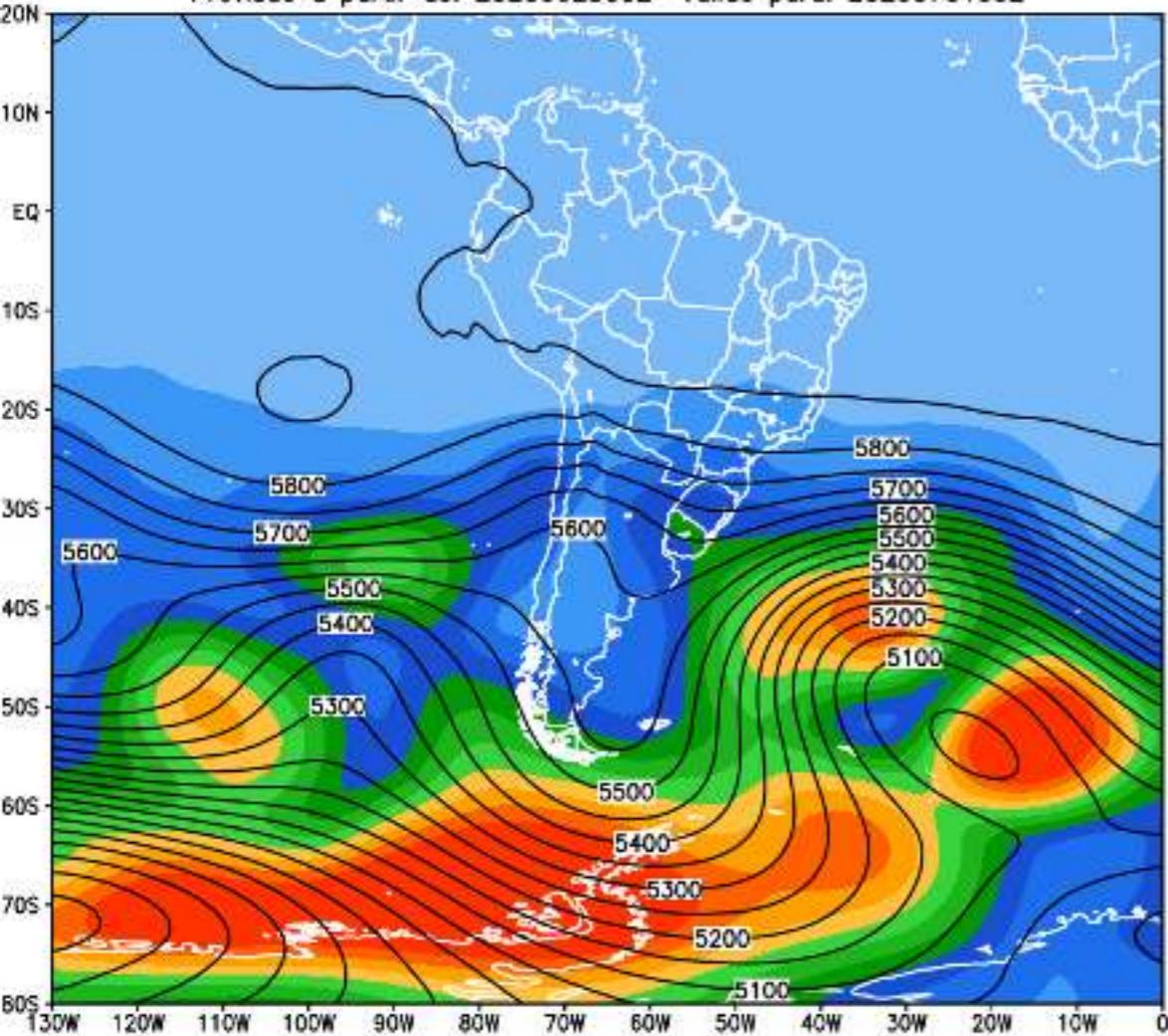


* Media do Conjunto de Previsoes

Análise 2020062300

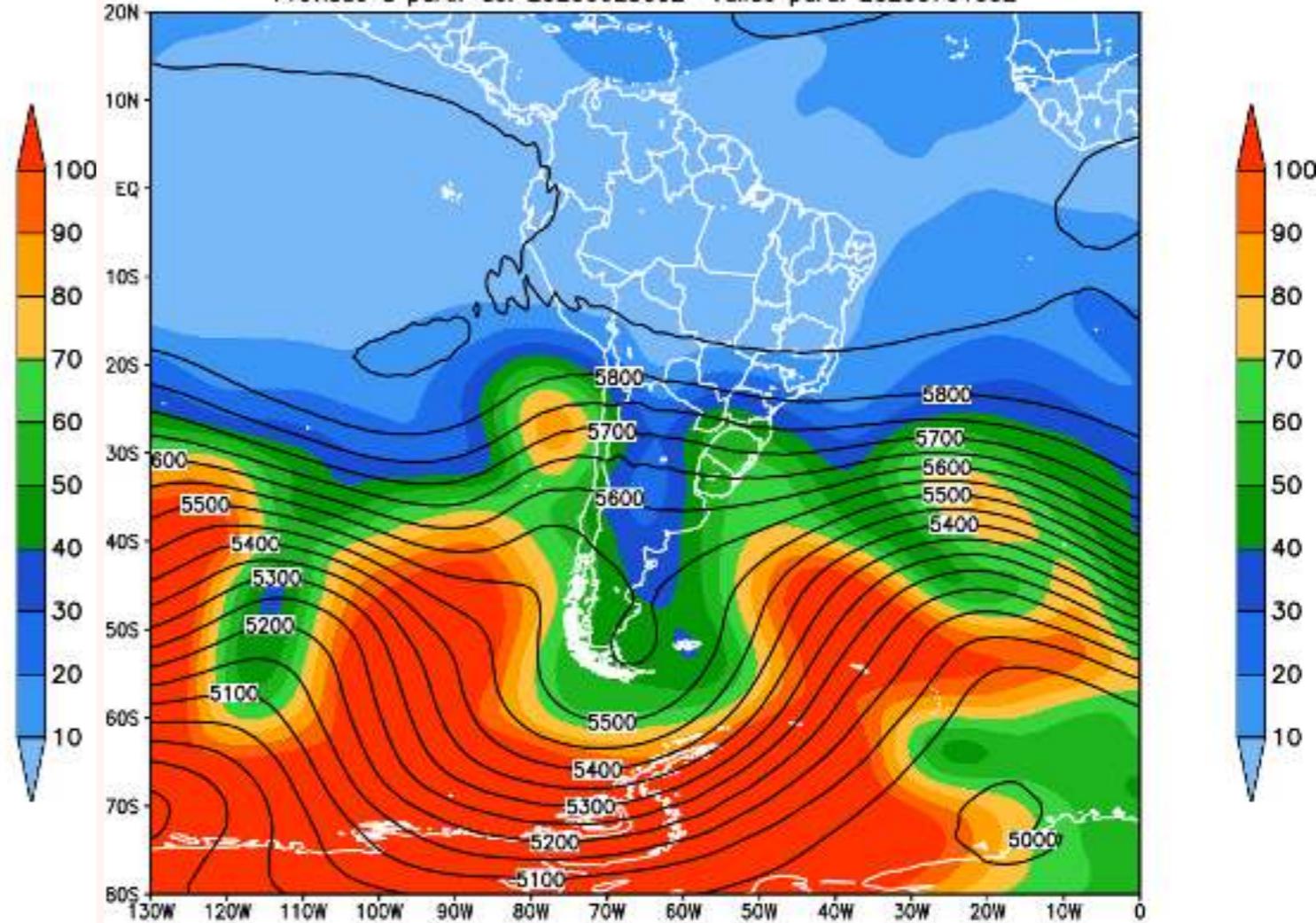
BAM XC50

CPTEC/INPE/MCT – PREVISÃO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Altura Geopotencial + (m) – 500 hPa [contorno] – Espalhamento do Ensemble (m) [cores]
Previsão a partir de: 2020062300Z Valido para: 2020070100Z



MCGA XE6

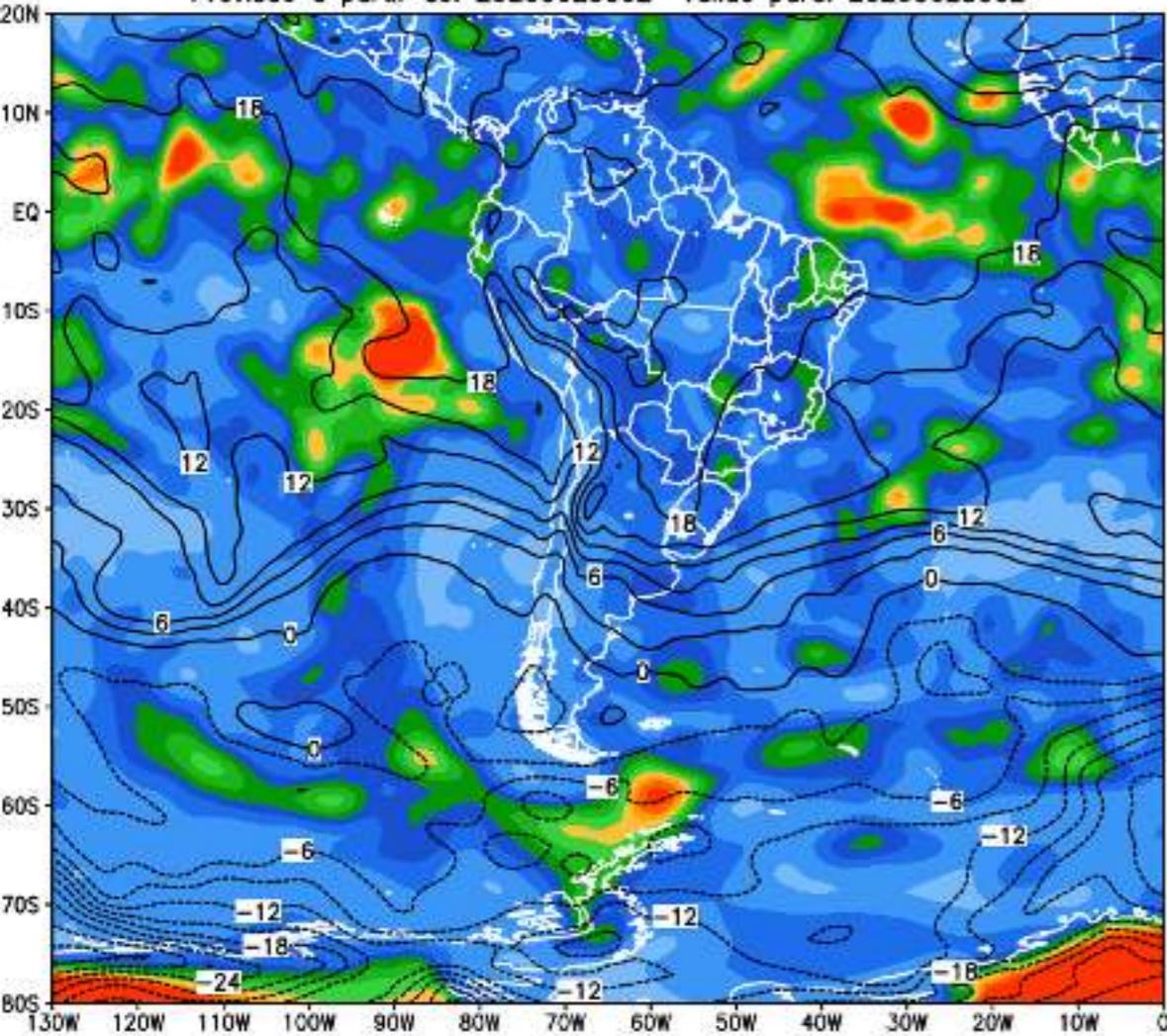
CPTEC/INPE/MCT – PREVISÃO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Altura Geopotencial + (m) – 500 hPa [contorno] – Espalhamento do Ensemble (m) [cores]
Previsão a partir de: 2020062300Z Valido para: 2020070100Z



Previsão 7 dias

BAM XC50

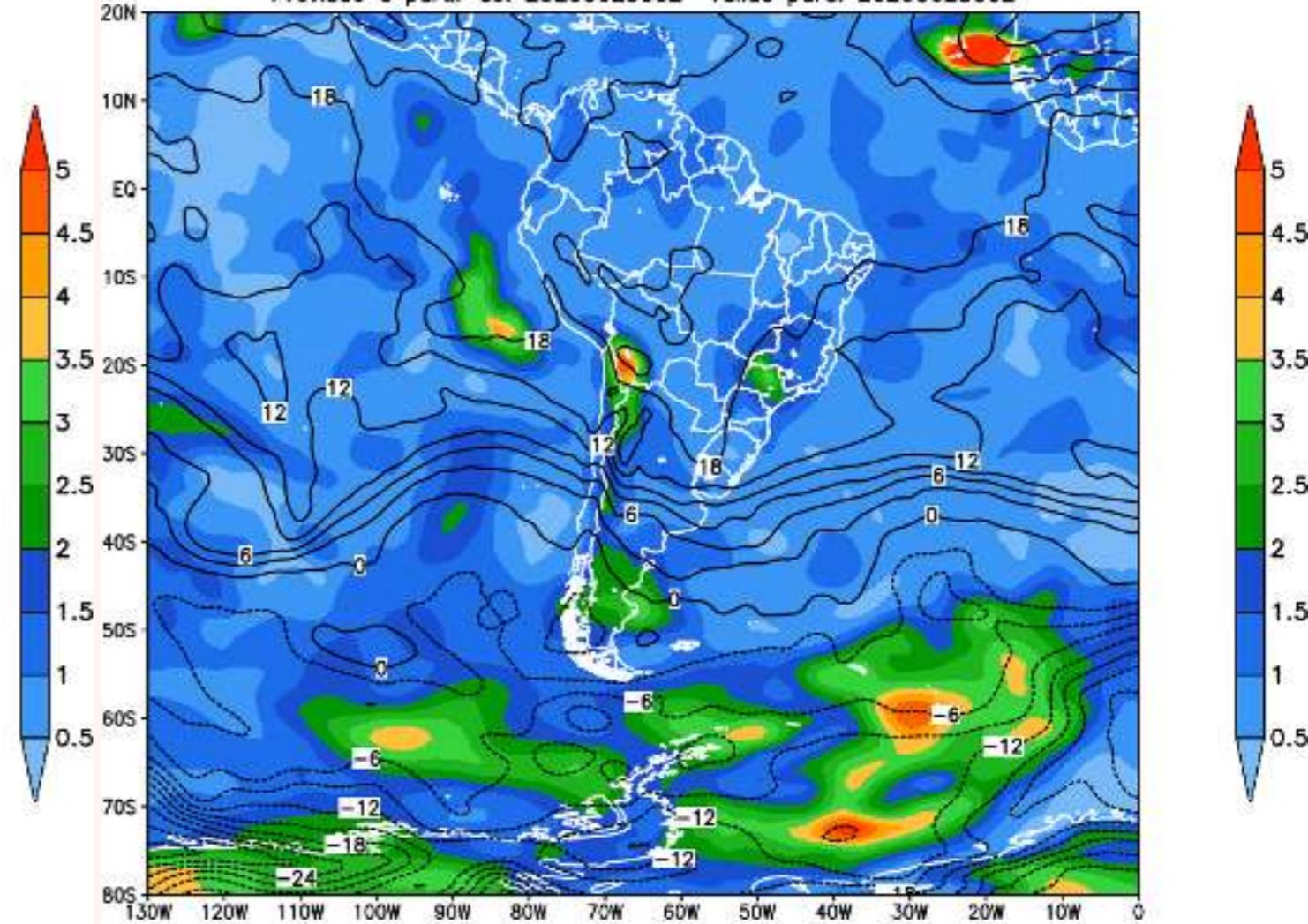
CPTEC/INPE/MCT – PREVISÃO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Temperatura do Ar * (C) – 850 hPa [contorno] – Espalhamento do Ensemble (C) [cores]
Previsão a partir de: 2020062300Z Valido para: 2020062300Z



• Média do Conjunto de Previsões

MCGA XE6

CPTEC/INPE/MCT – PREVISÃO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Temperatura do Ar * (C) – 850 hPa [contorno] – Espalhamento do Ensemble (C) [cores]
Previsão a partir de: 2020062300Z Valido para: 2020062300Z



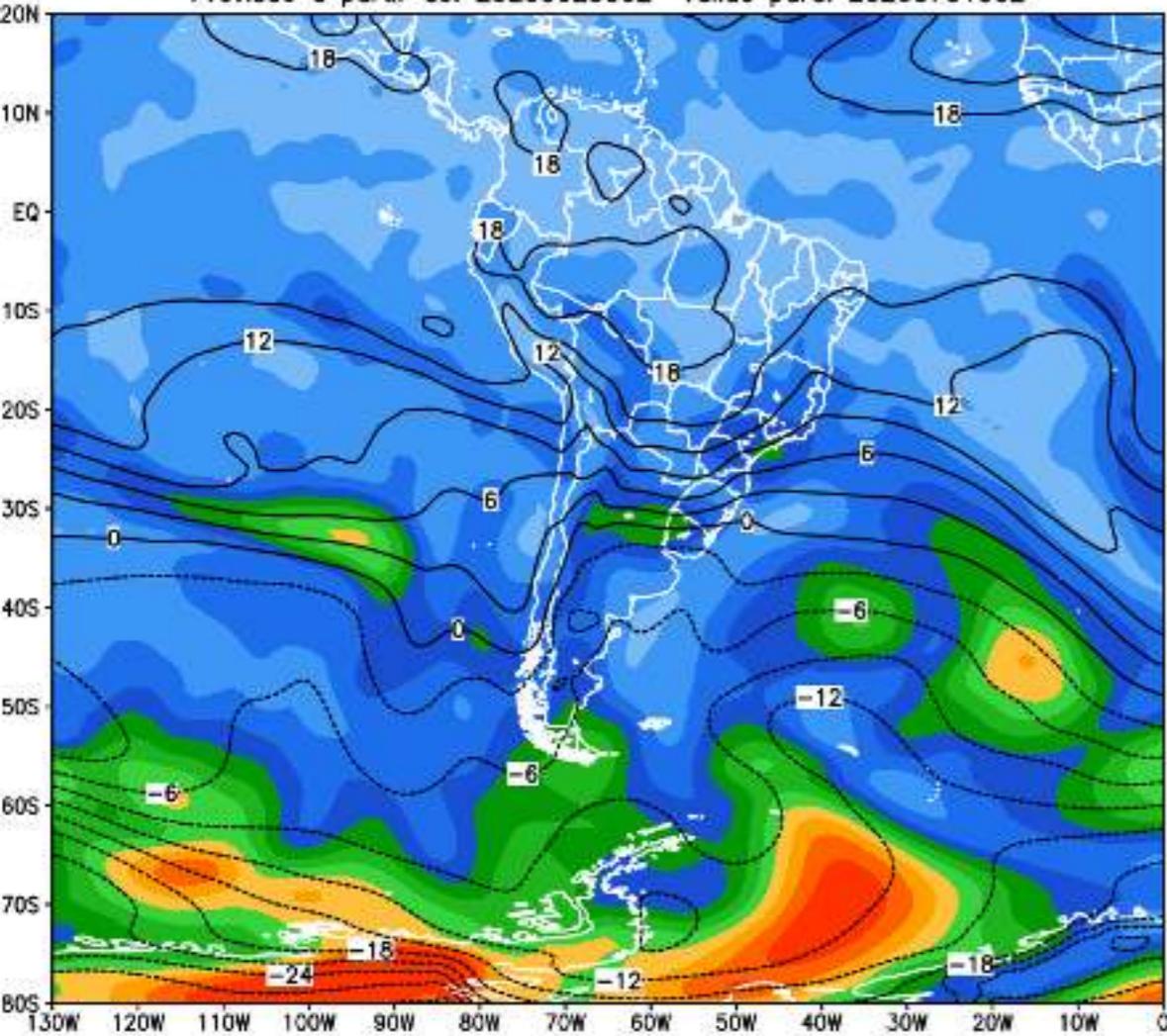
• Média do Conjunto de Previsões

Análise 2020062300

BAM XC50

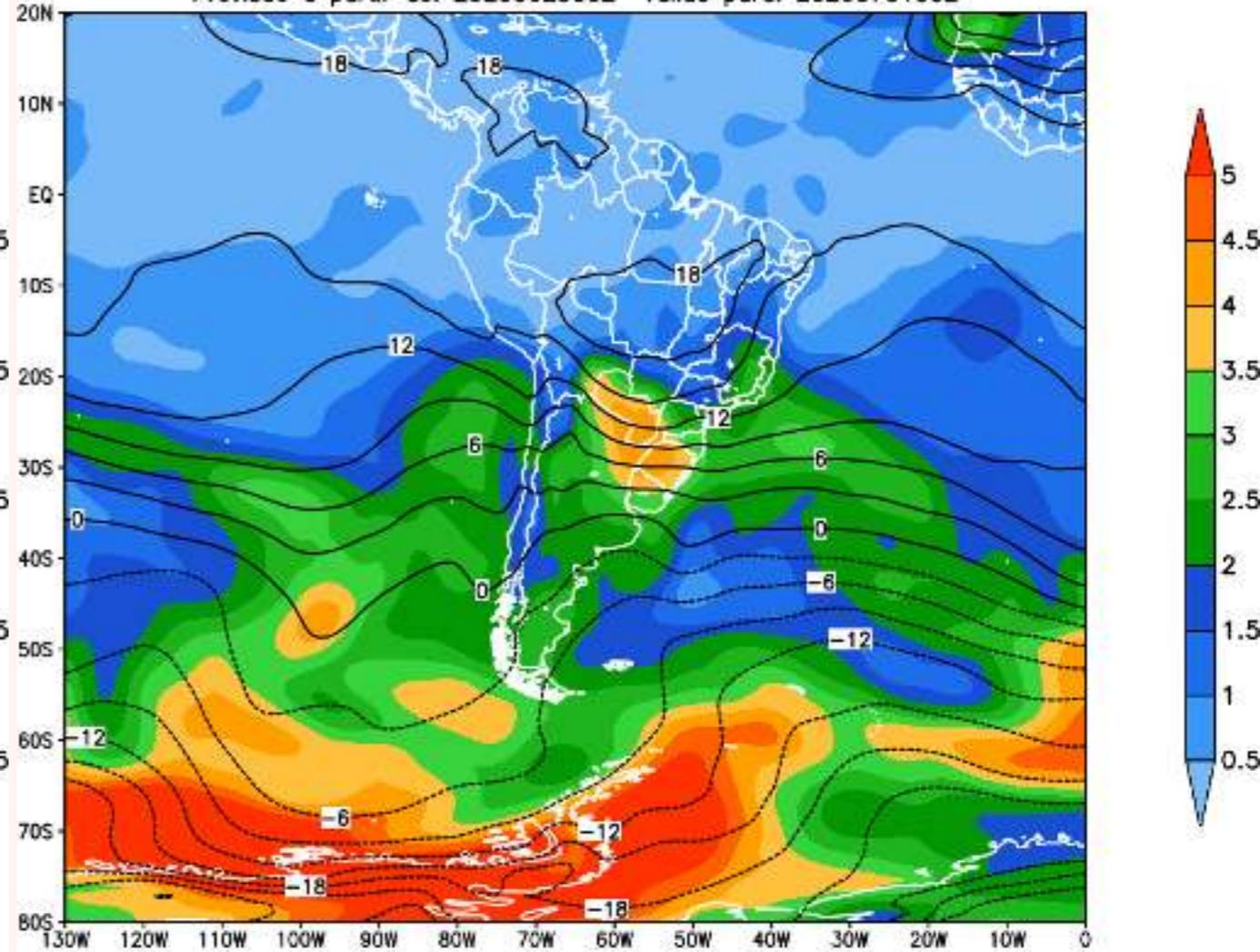
MCGA XE6

CPTEC/INPE/MCT – PREVISÃO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Temperatura do Ar * (C) – 850 hPa [contorno] – Espalhamento do Ensemble (C) [cores]
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Temperatura do Ar * (C) – 850 hPa [contorno] – Espalhamento do Ensemble (C) [cores]
Previsão a partir de: 2020062300Z Valido para: 2020070100Z

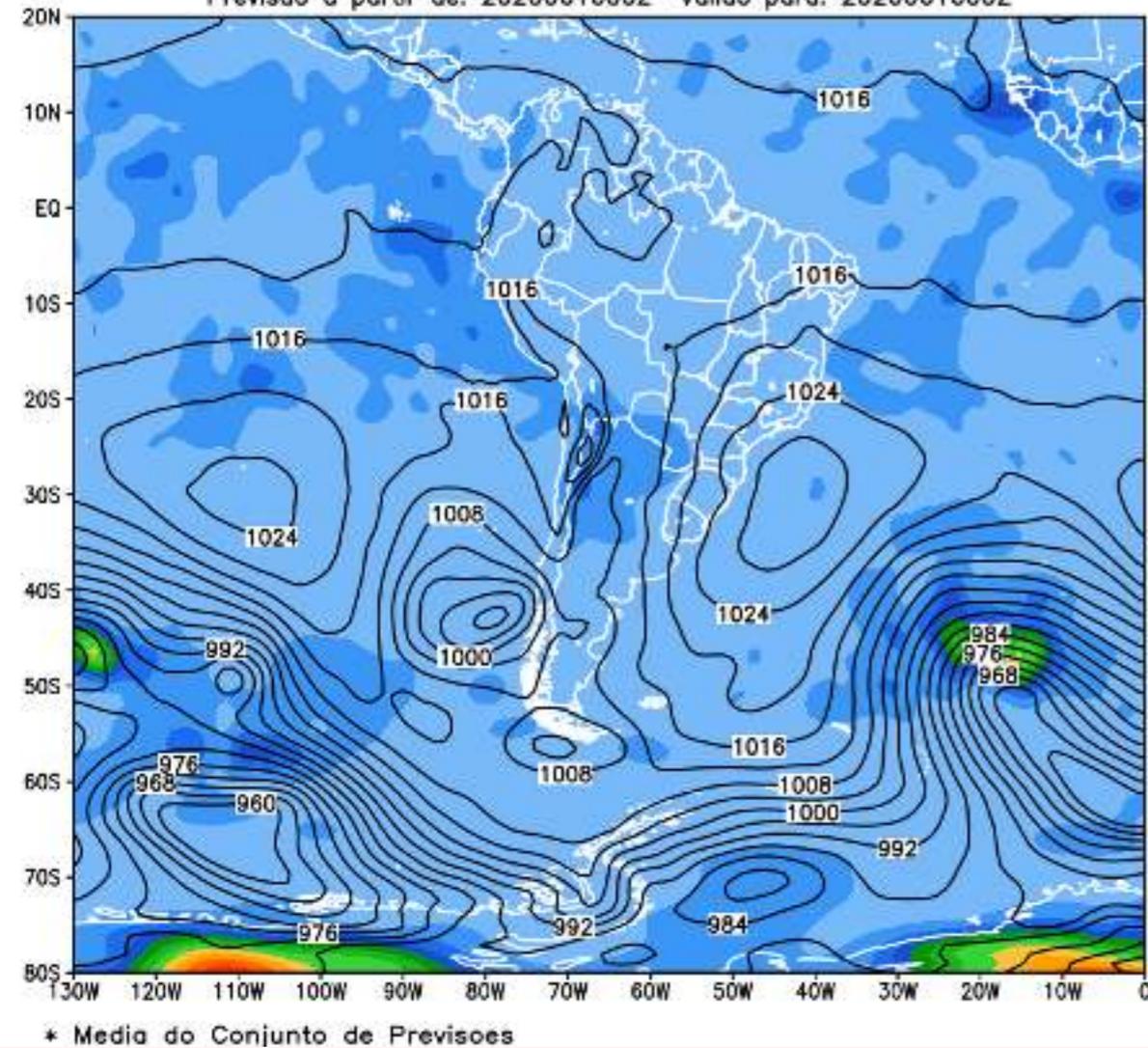


• Média do Conjunto de Previsões

Previsão 7 dias

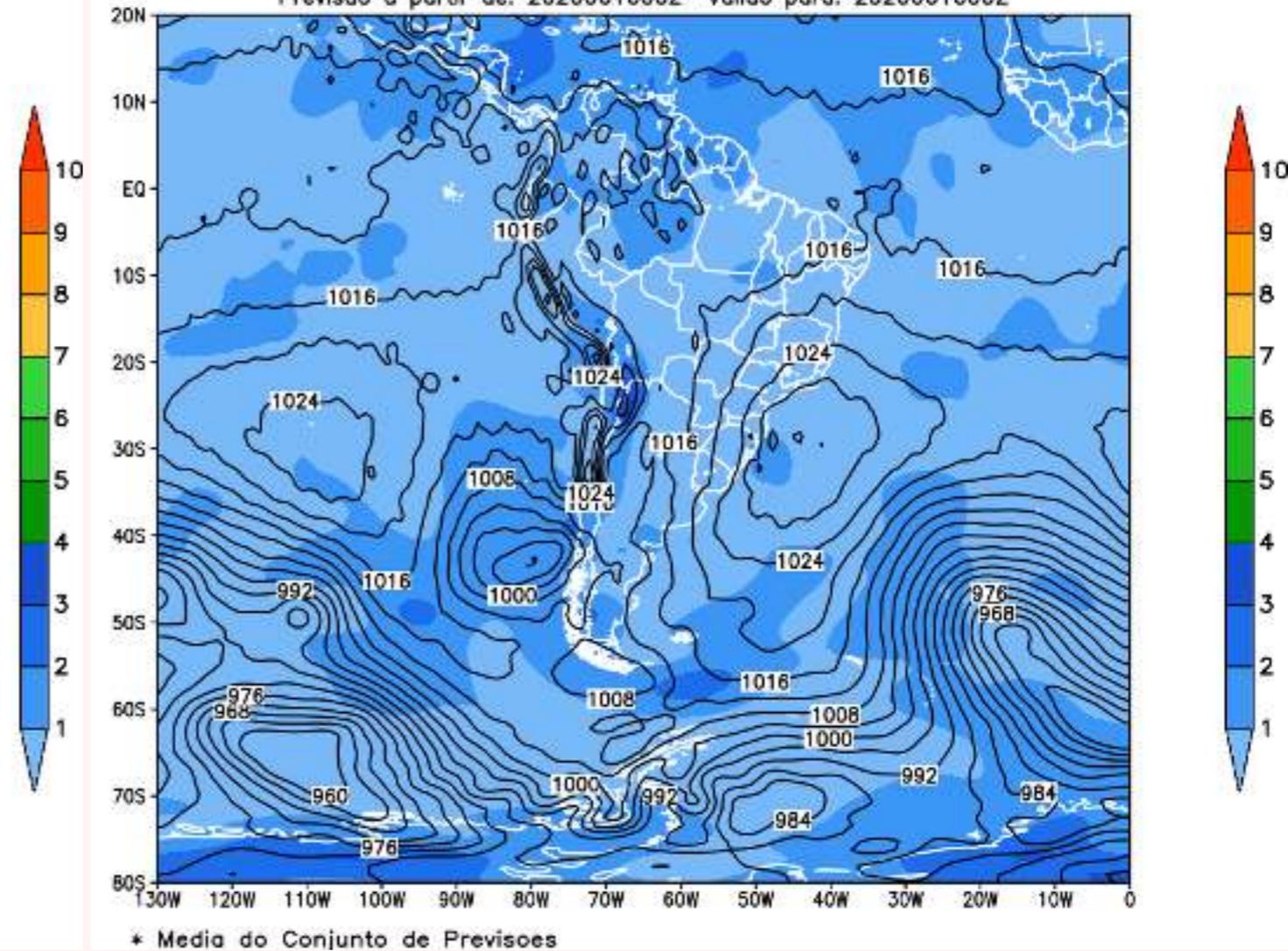
BAM XC50

CPTEC/INPE/MCT – PREVISÃO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Pressão ao Nível Medio do Mar * (hPa) [contorno] – Espalhamento do Ensemble (hPa) [cores]
Previsão a partir de: 2020061600Z Valido para: 2020061600Z



MCGA XE6

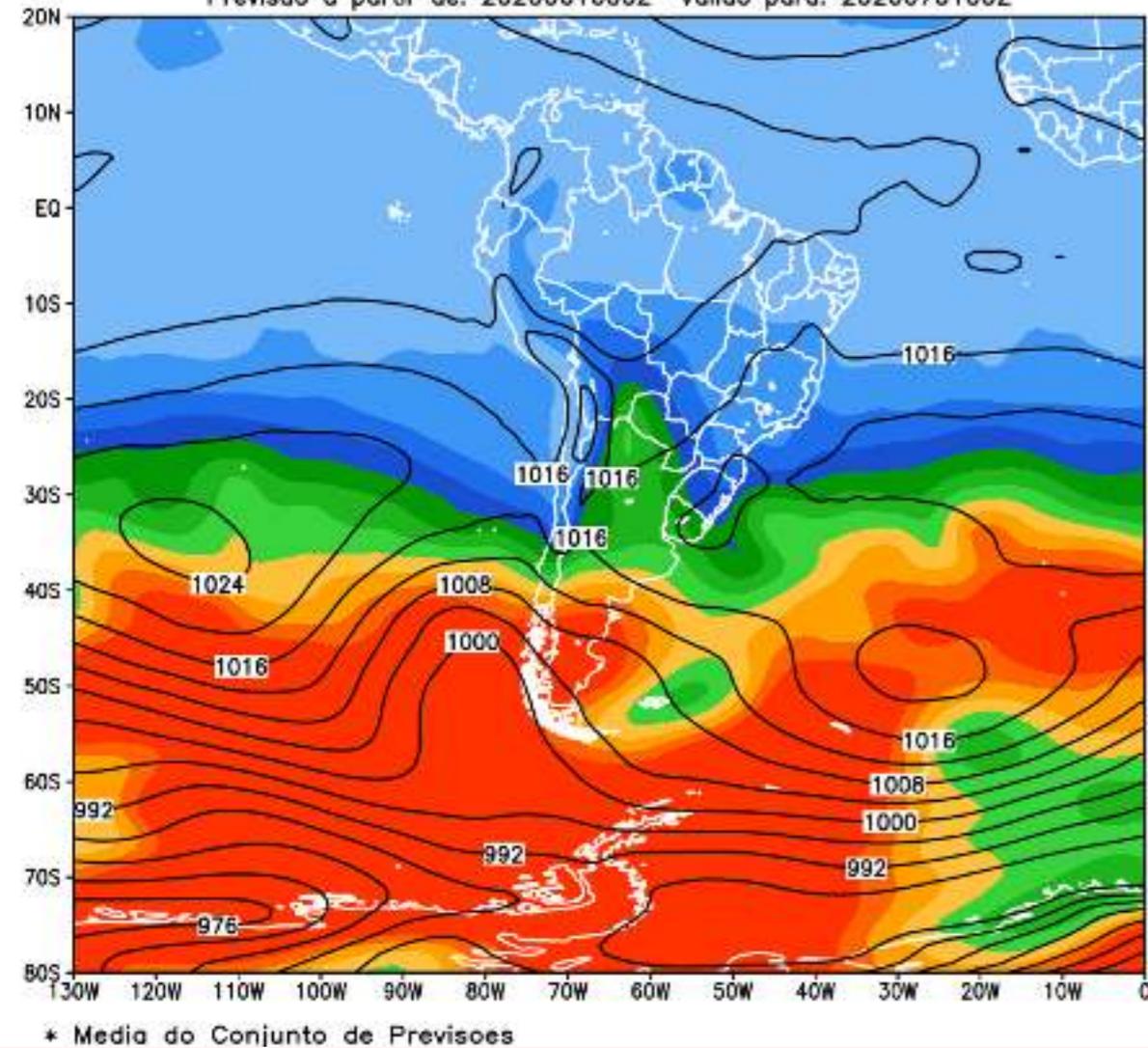
CPTEC/INPE/MCT – PREVISÃO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Pressão ao Nível Medio do Mar * (hPa) [contorno] – Espalhamento do Ensemble (hPa) [cores]
Previsão a partir de: 2020061600Z Valido para: 2020061600Z



Análise 2020061600

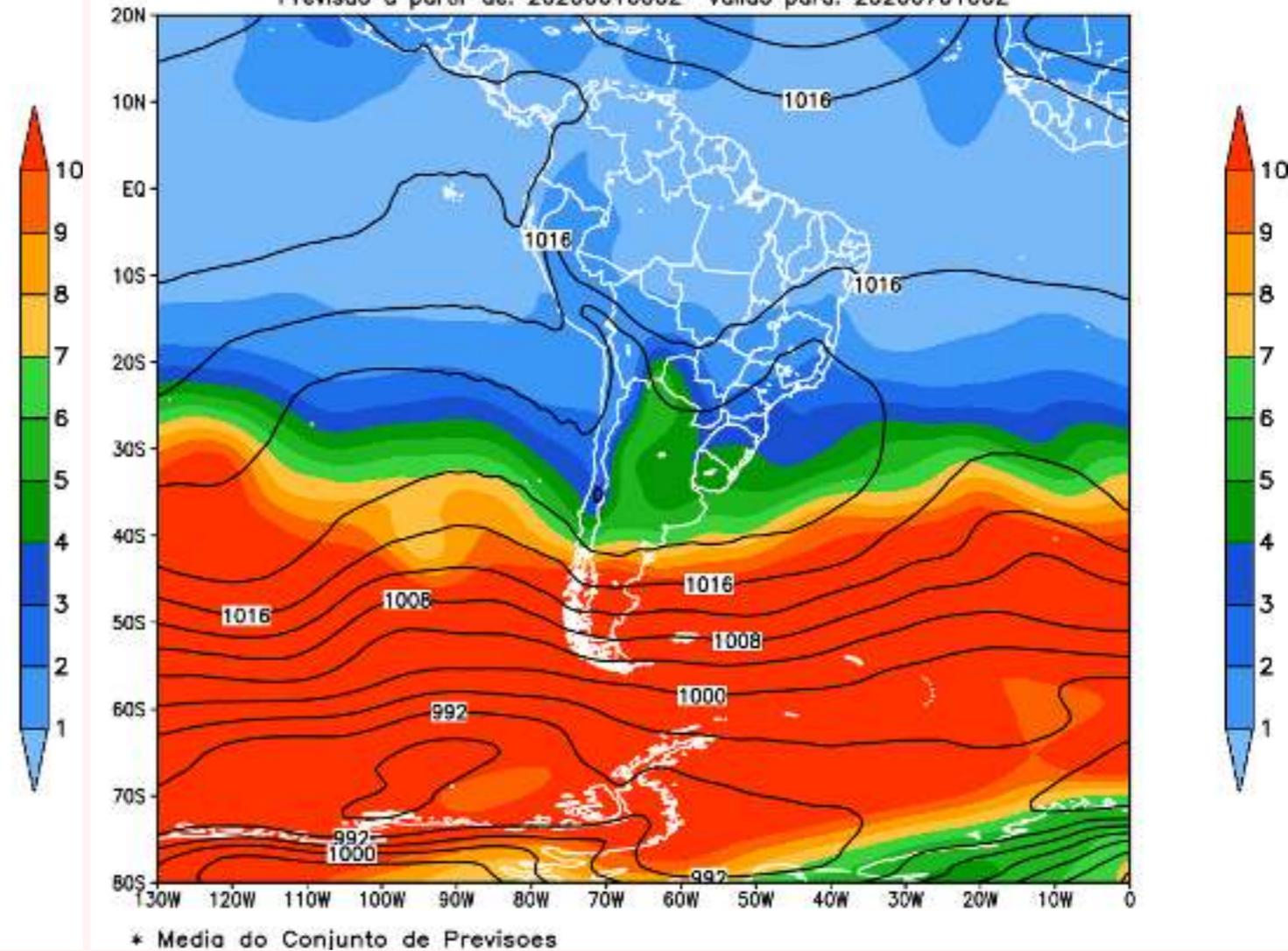
BAM XC50

CPTEC/INPE/MCT – PREVISÃO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Pressão ao Nível Medio do Mar * (hPa) [contorno] – Espalhamento do Ensemble (hPa) [cores]
Previsão a partir de: 2020061600Z Valido para: 2020070100Z



MCGA XE6

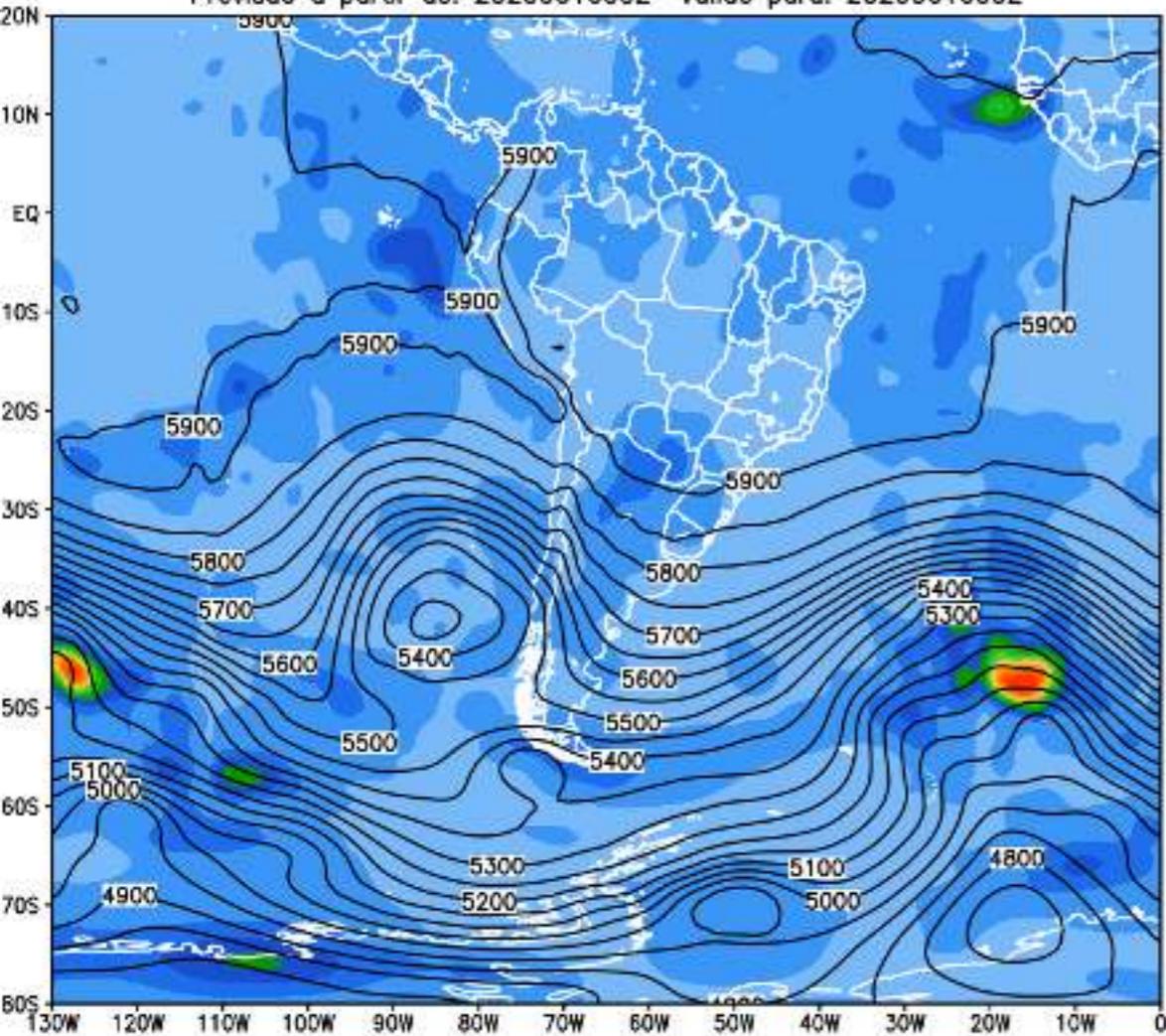
CPTEC/INPE/MCT – PREVISÃO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Pressão ao Nível Medio do Mar * (hPa) [contorno] – Espalhamento do Ensemble (hPa) [cores]
Previsão a partir de: 2020061600Z Valido para: 2020070100Z



Previsão 15 dias

BAM XC50

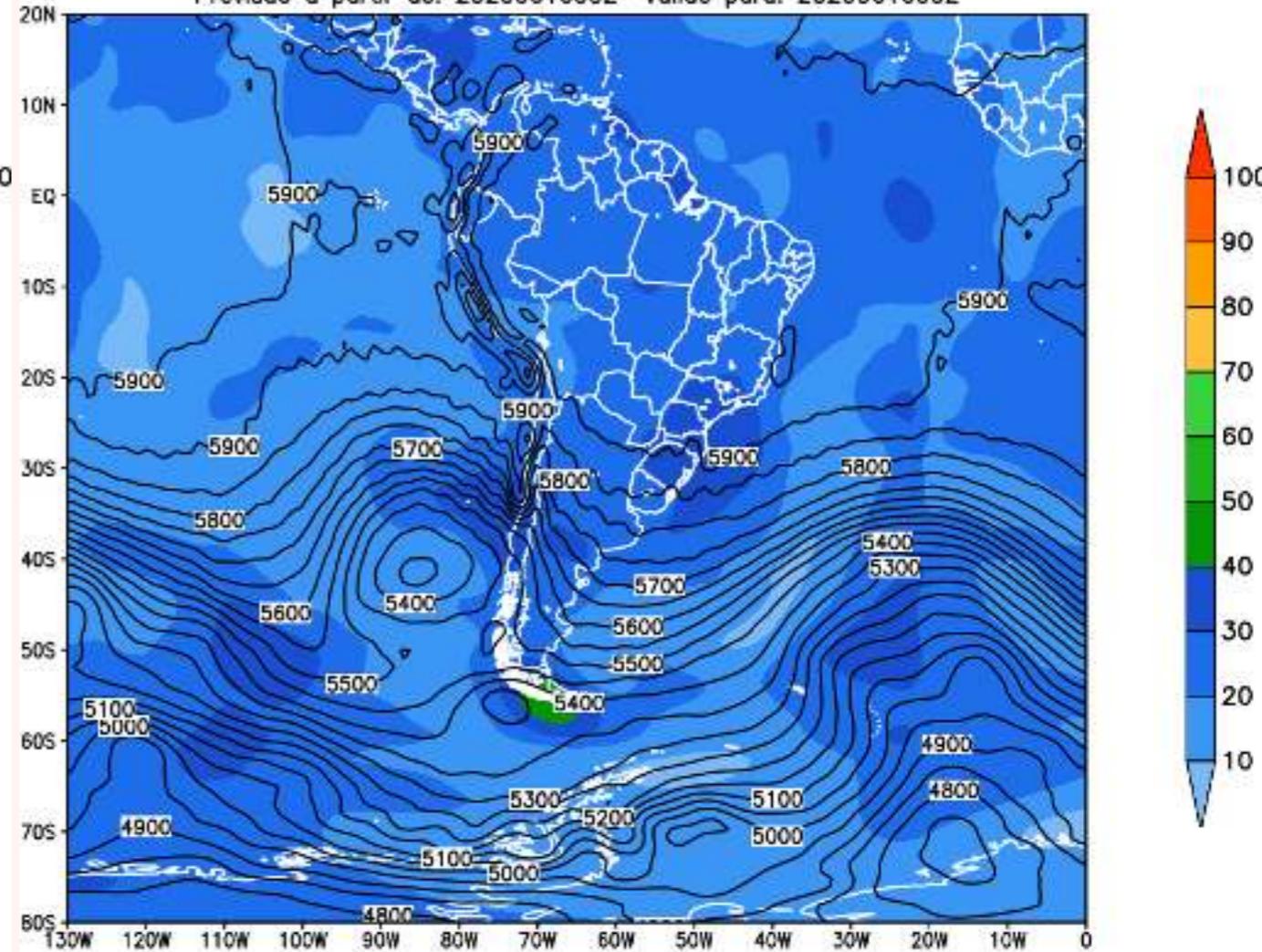
CPTEC/INPE/MCT – PREVISÃO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Altura Geopotencial + (m) – 500 hPa [contorno] – Espalhamento do Ensemble (m) [cores]
Previsão a partir de: 2020061600Z Valido para: 2020061600Z



* Media do Conjunto de Previsoes

MCGA XE6

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Altura Geopotencial + (m) – 500 hPa [contorno] – Espalhamento do Ensemble (m) [cores]
Previsão a partir de: 2020061600Z Valido para: 2020061600Z

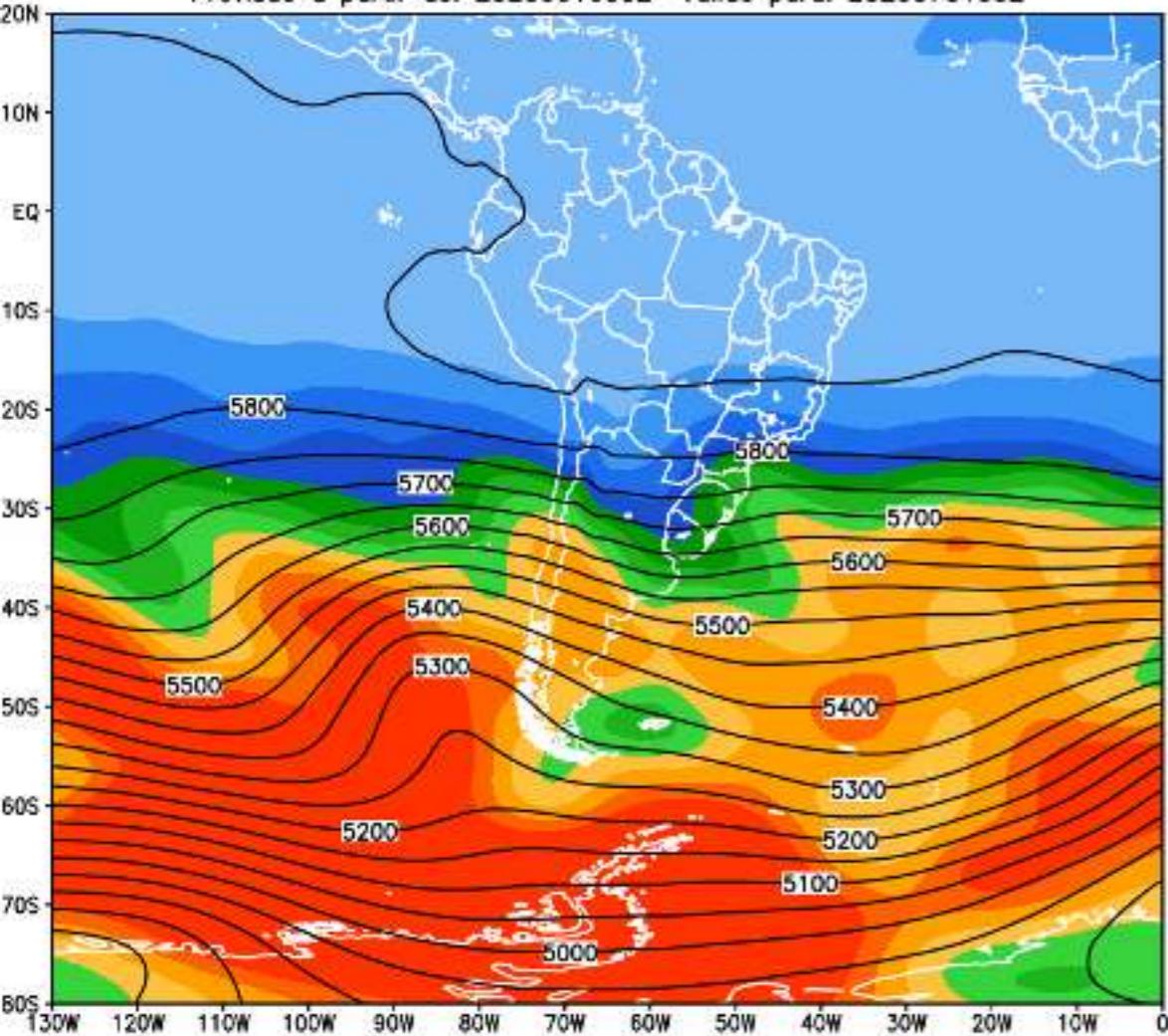


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Análise 2020061600

BAM XC50

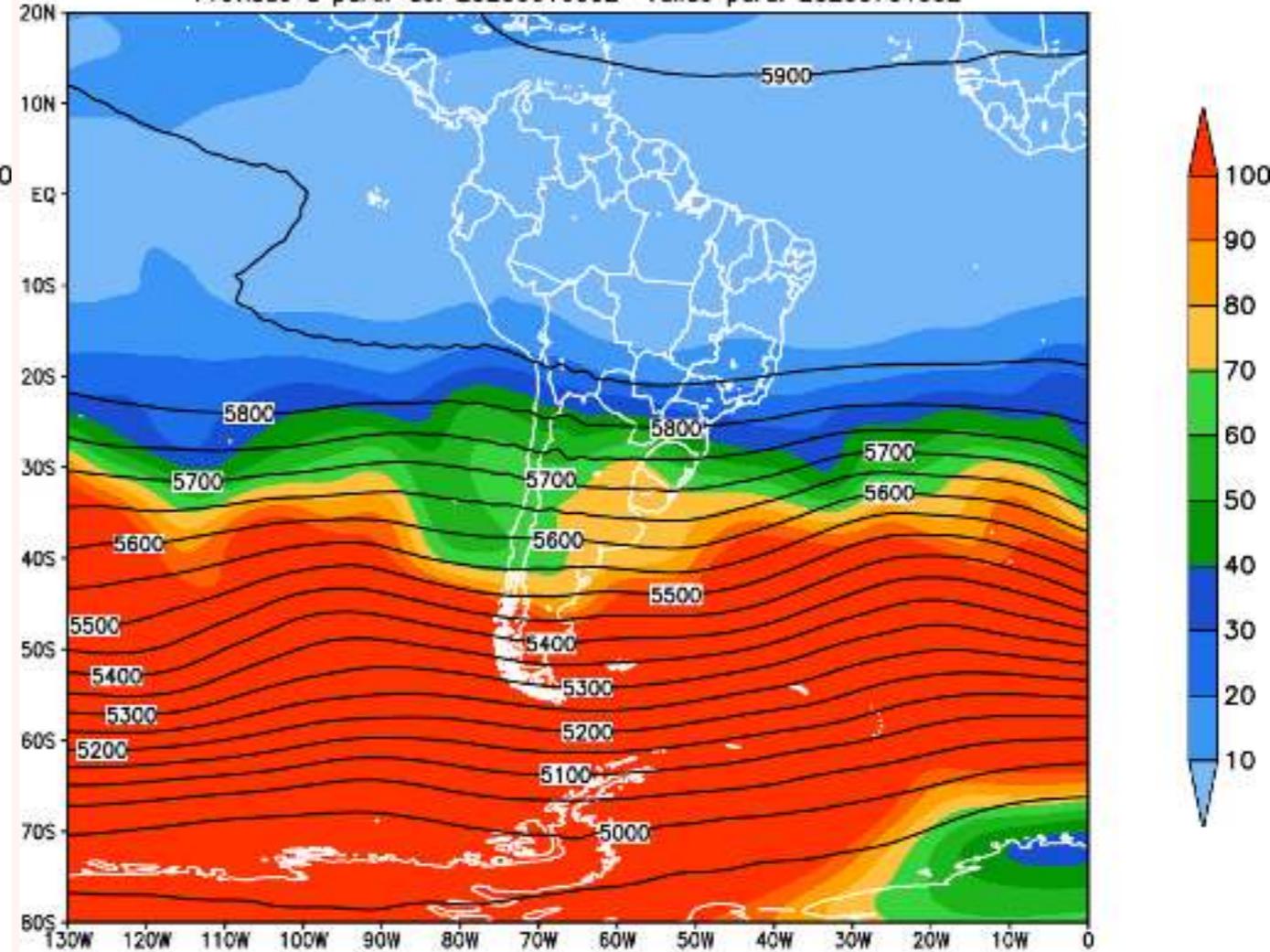
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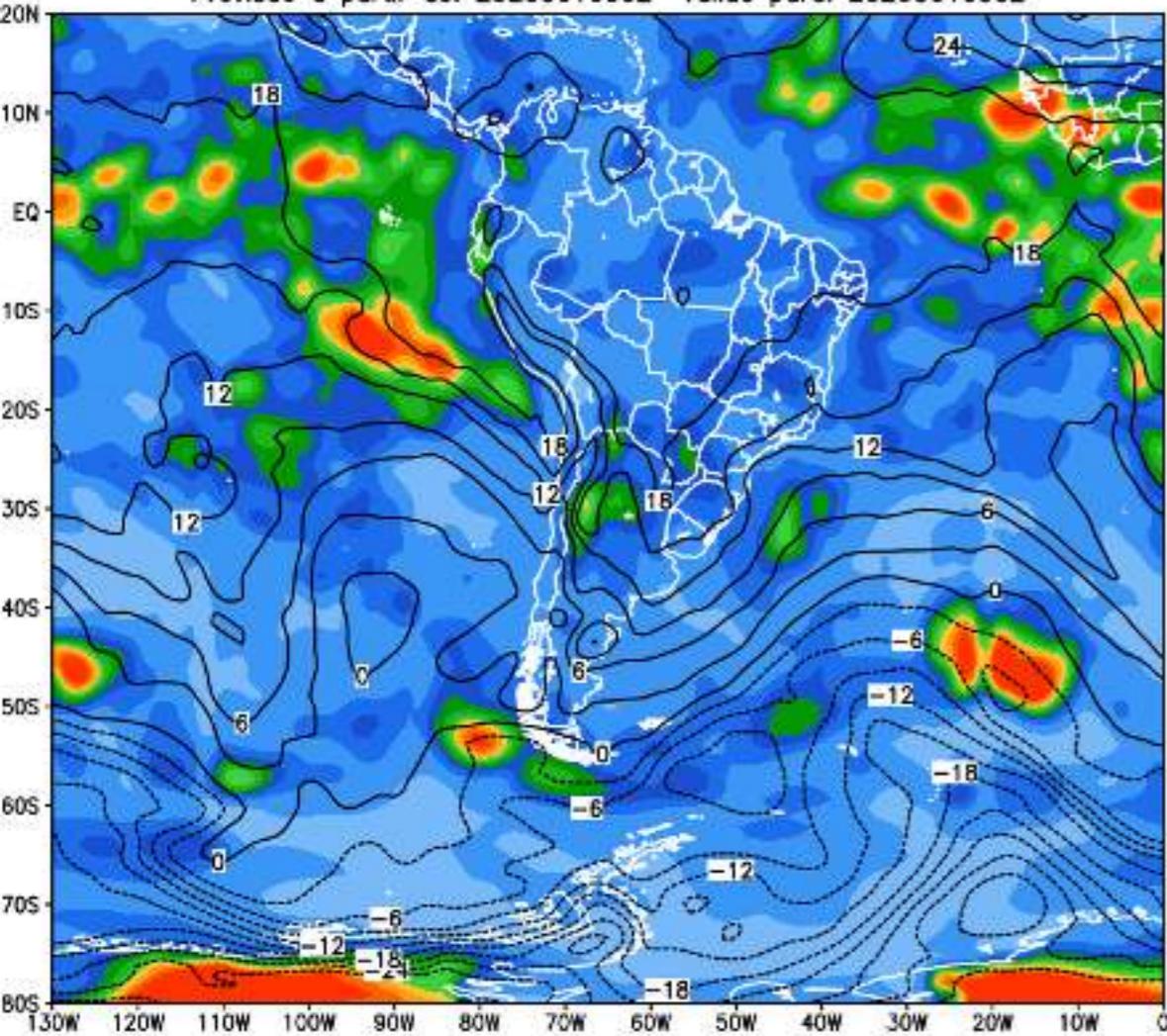


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Previsão 15 dias

BAM XC50

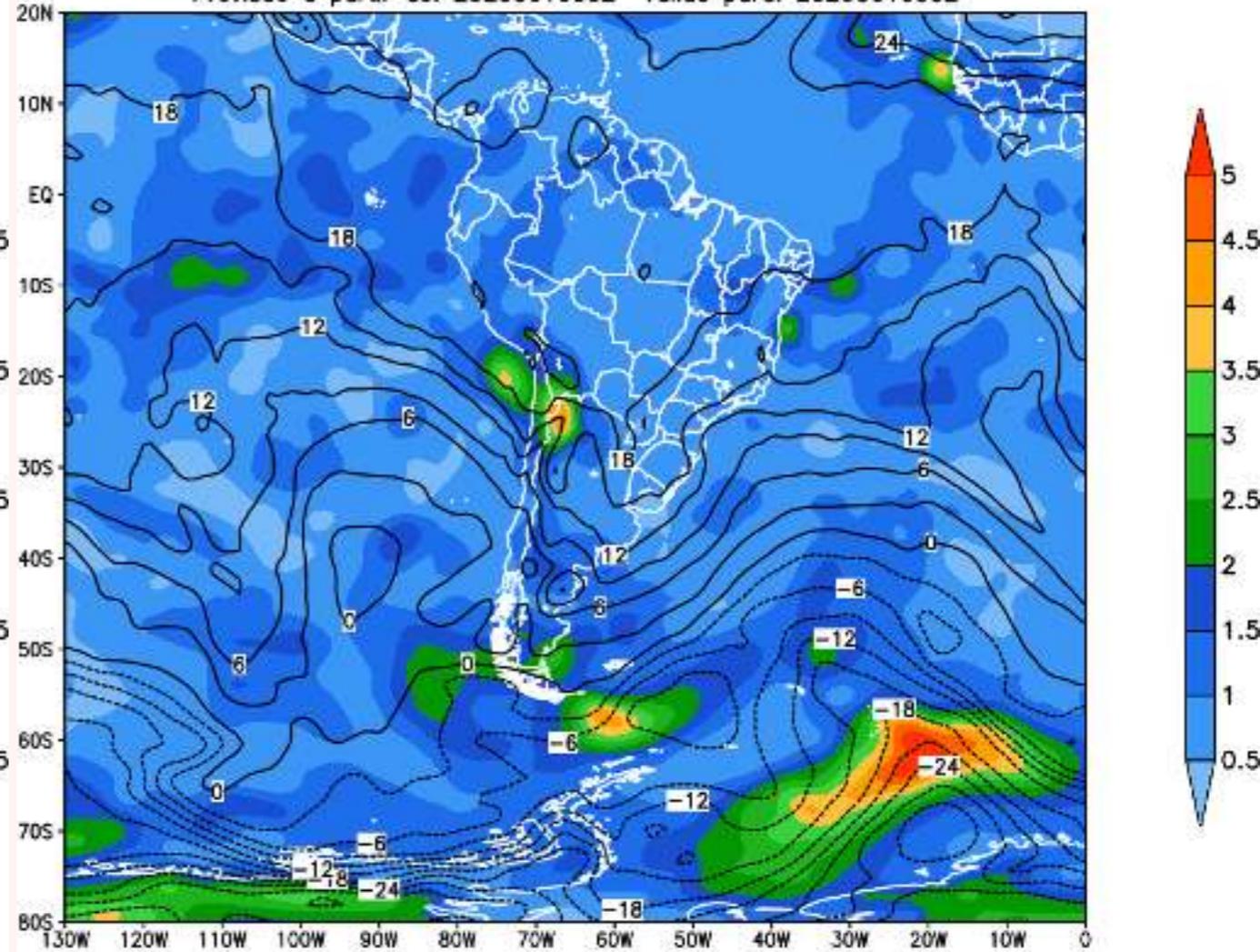
CPTEC/INPE/MCT – PREVISÃO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Temperatura do Ar * (C) – 850 hPa [contorno] – Espalhamento do Ensemble (C) [cores]
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• Média do Conjunto de Previsões

MCGA XE6

CPTEC/INPE/MCT – PREVISÃO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Temperatura do Ar * (C) – 850 hPa [contorno] – Espalhamento do Ensemble (C) [cores]
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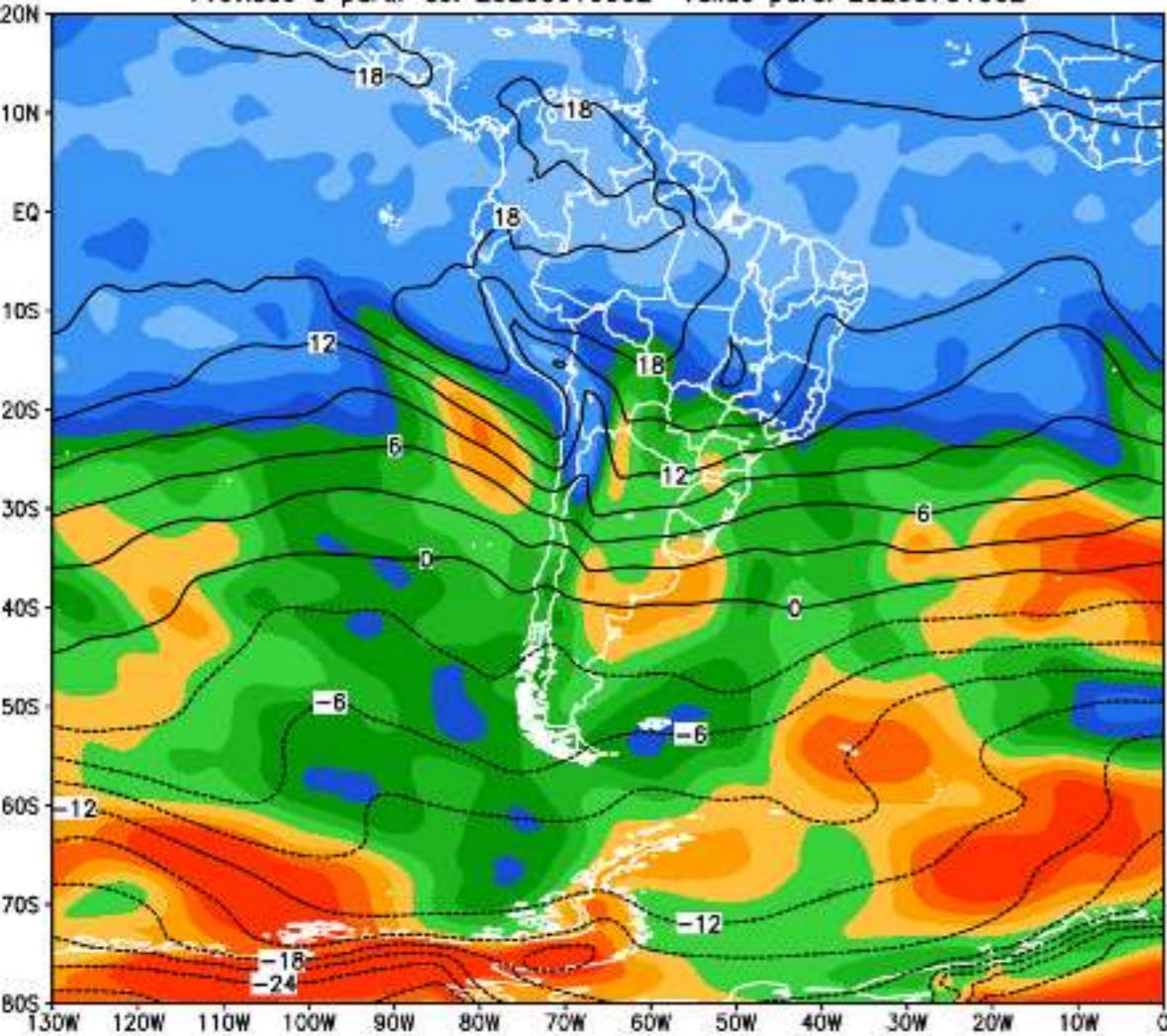


• Média do Conjunto de Previsões

Análise 2020061600

BAM XC50

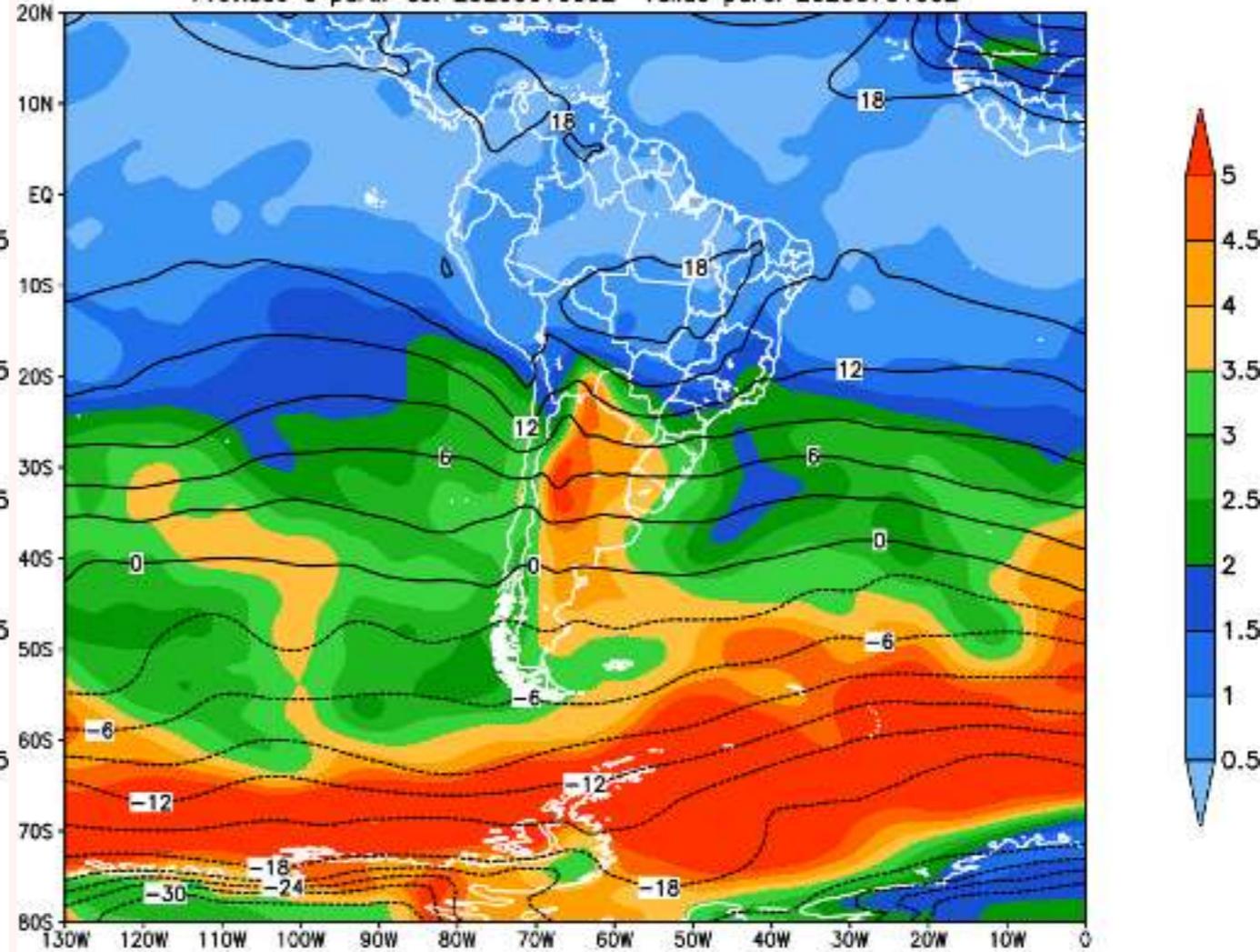
CPTEC/INPE/MCT – PREVISÃO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Temperatura do Ar * (C) – 850 hPa [contorno] – Espalhamento do Ensemble (C) [cores]
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MCGA XE6

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Temperatura do Ar * (C) – 850 hPa [contorno] – Espalhamento do Ensemble (C) [cores]
Previsão a partir de: 2020061600Z Valido para: 2020070100Z



• Média do Conjunto de Previsões

Previsão 15 dias

PROBABILIDADE DE PRECIPITAÇÃO ACUMULADA ACIMA DE 10MM

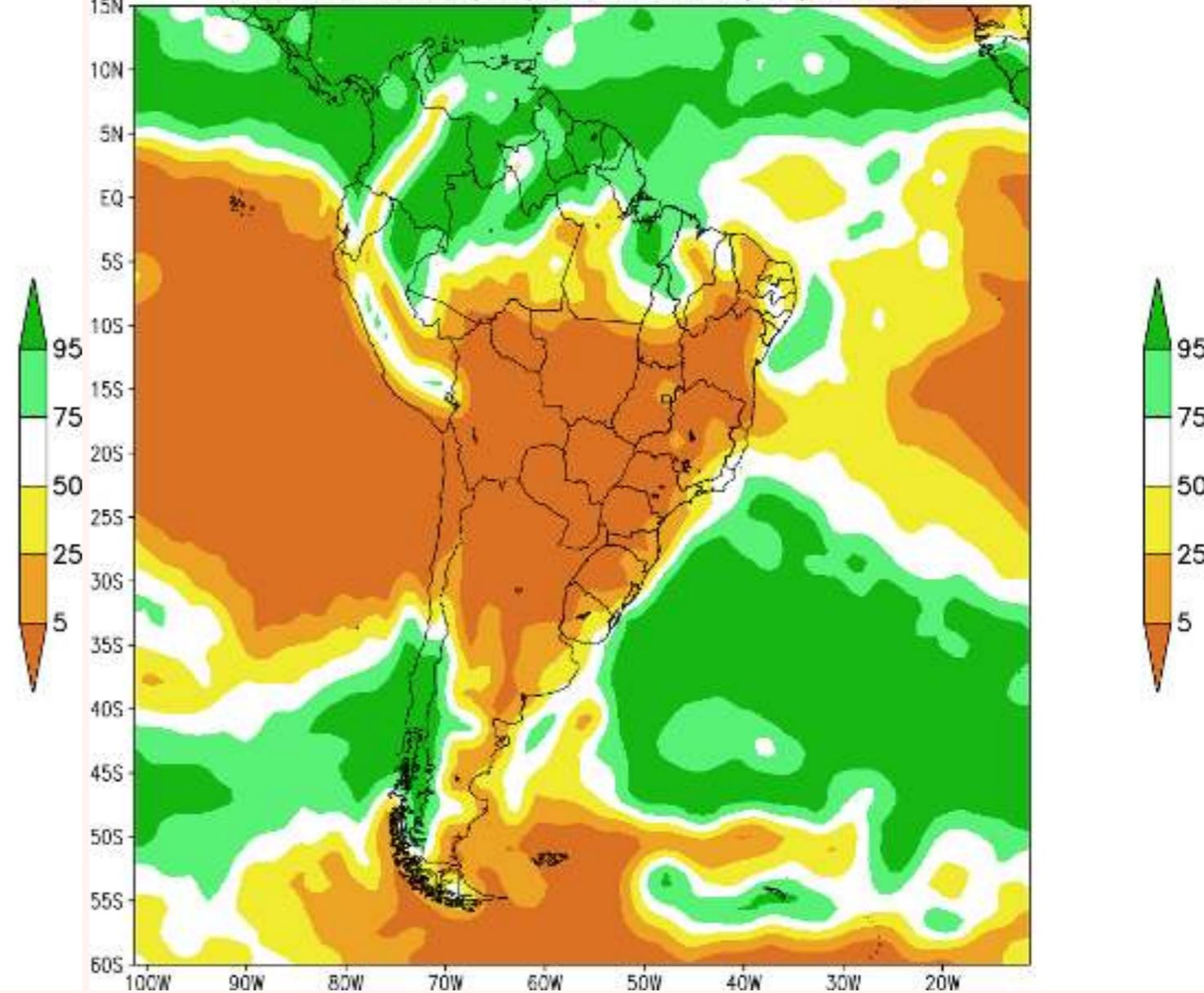
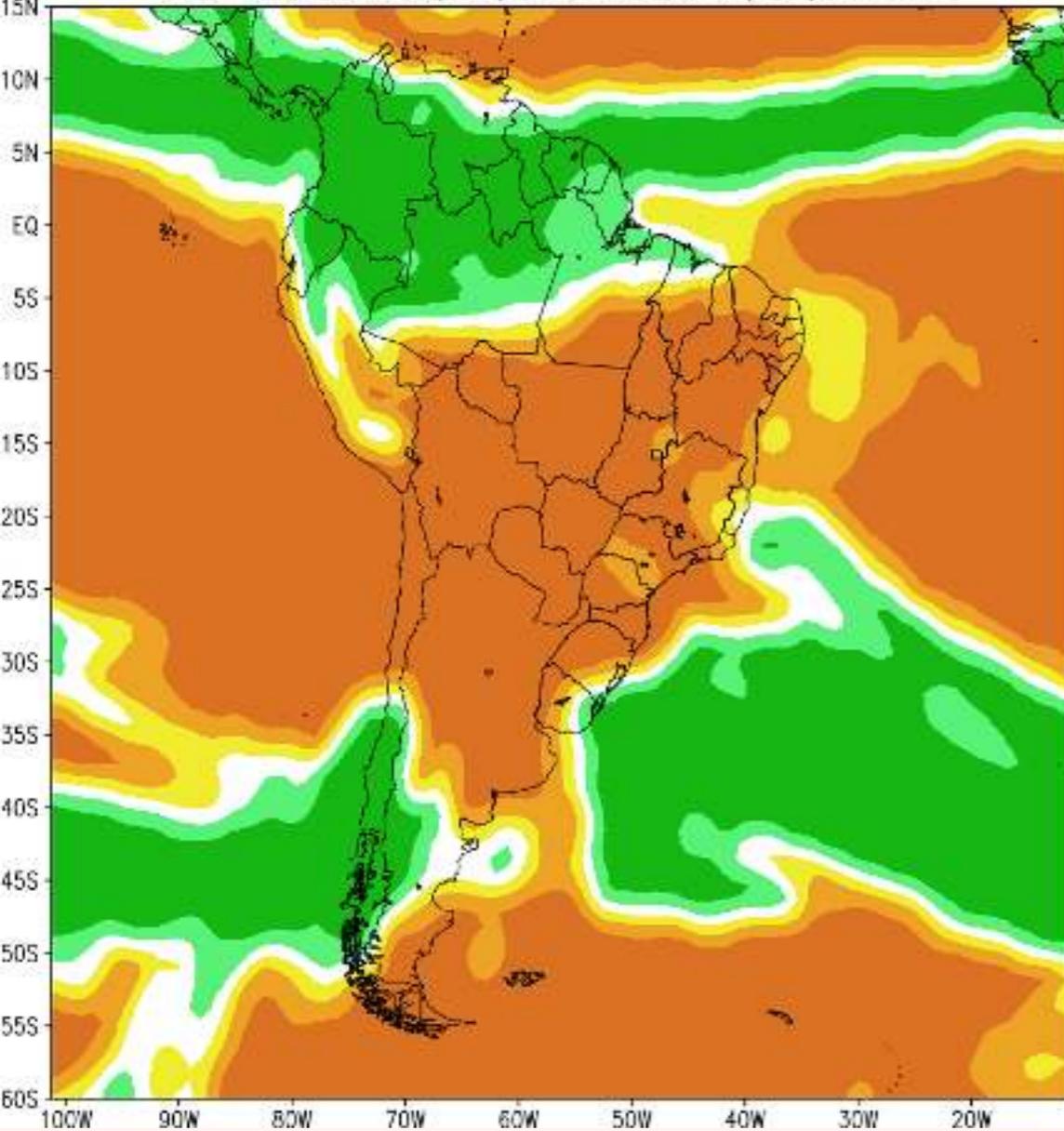
- **Cálculo da probabilidade de precipitação acumulada acima de 10mm para 5, 10 e 15 dias sobre a América do Sul;**

BAM XC50

MCGA XE6

CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR CONJUNTO – TQ0126L028
Probabilidade de Acumulo de Precipitacao acima de 10 mm em 5 dias
Acumulado entre: 02/JUL/2020 06Z e 06/JUL/2020 00Z

CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR CONJUNTO – TQ0126L028
Probabilidade de Acumulo de Precipitacao acima de 10 mm em 5 dias
Acumulado entre: 02/JUL/2020 06Z e 06/JUL/2020 00Z

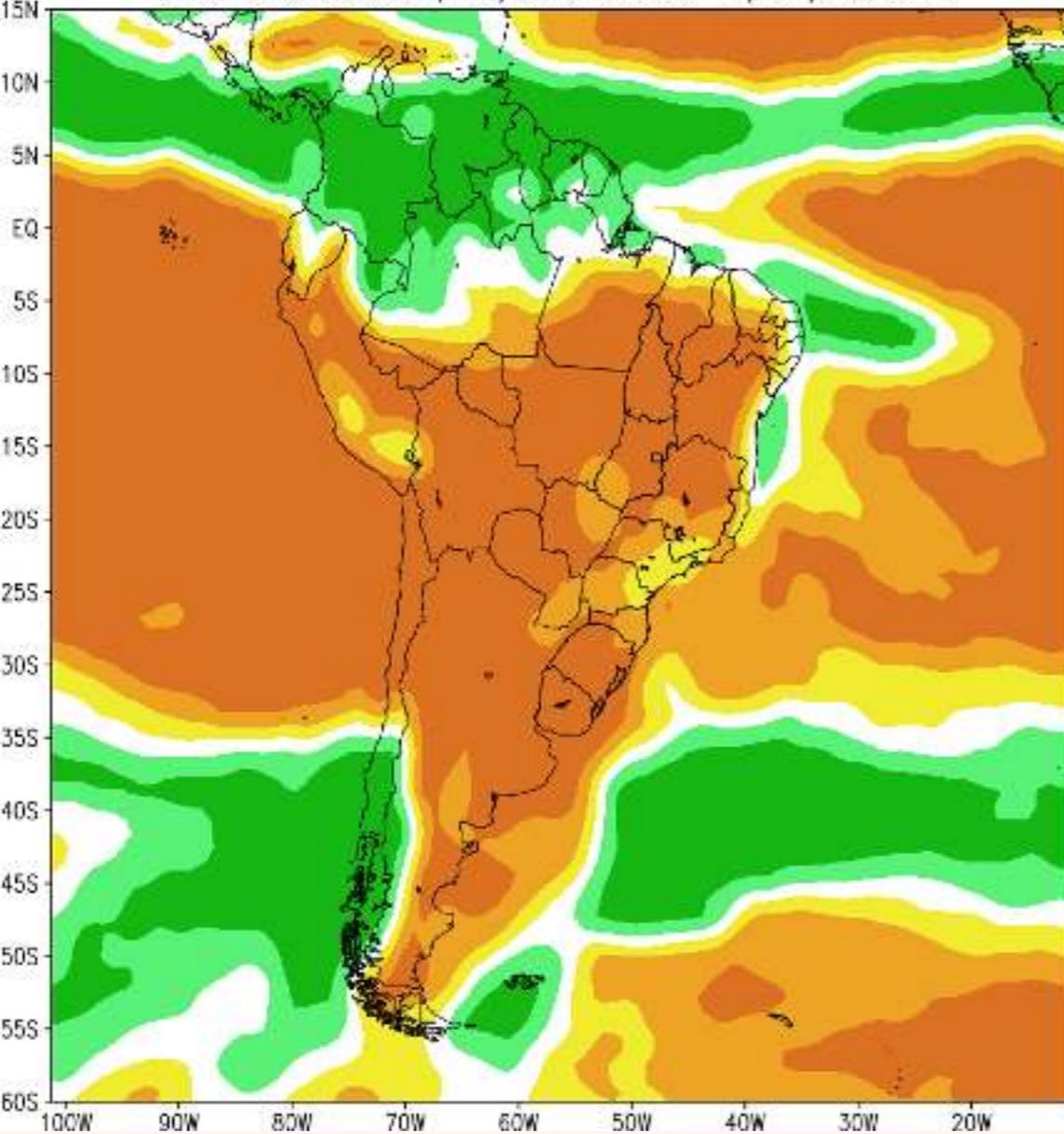


Análise 2020070100

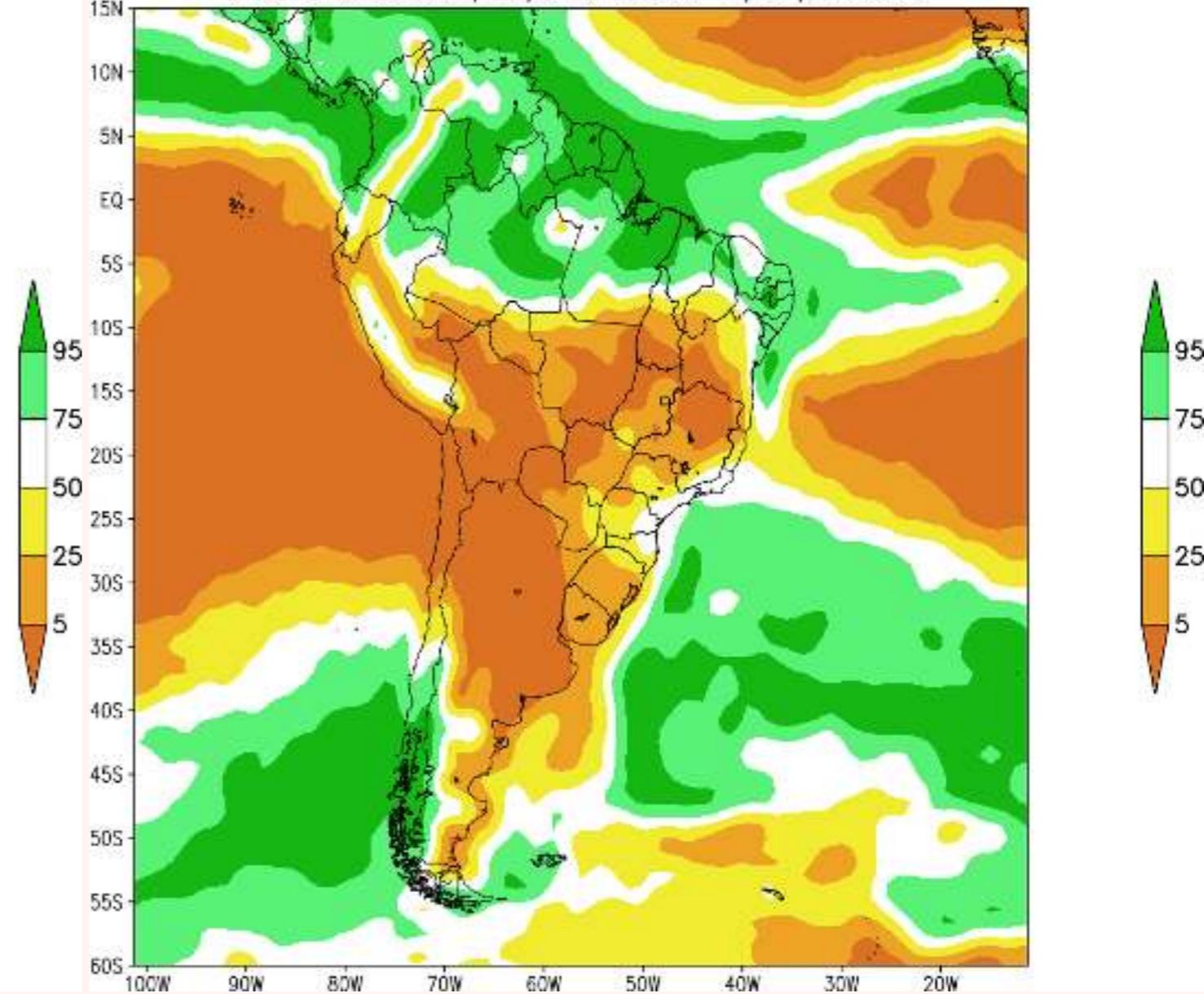
BAM XC50

MCGA XE6

CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR CONJUNTO – TQ0126L028
Probabilidade de Acumulo de Precipitacao acima de 10 mm em 5 dias
Acumulado entre: 07/JUL/2020 06Z e 11/JUL/2020 00Z



CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR CONJUNTO – TQ0126L028
Probabilidade de Acumulo de Precipitacao acima de 10 mm em 5 dias
Acumulado entre: 07/JUL/2020 06Z e 11/JUL/2020 00Z



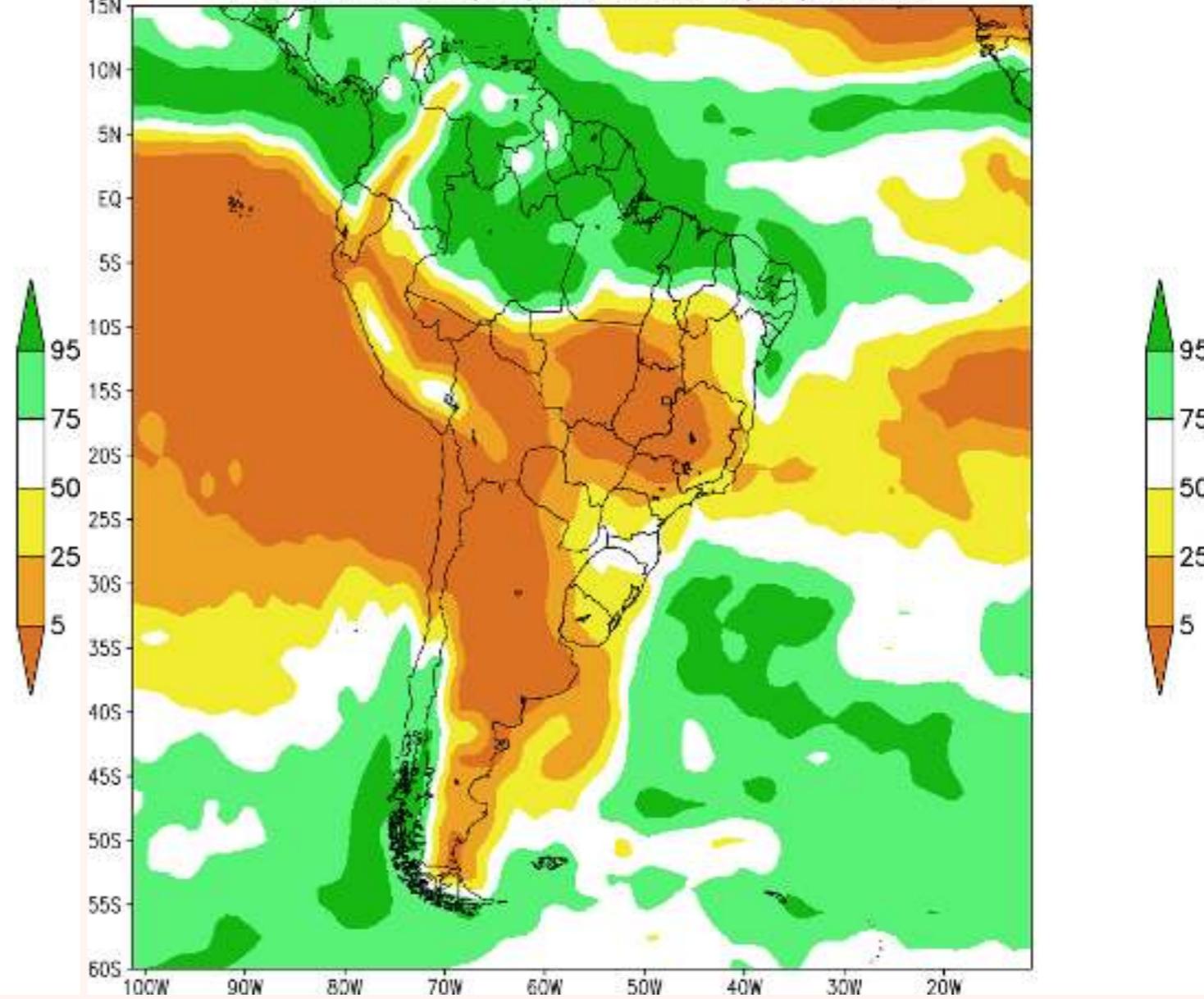
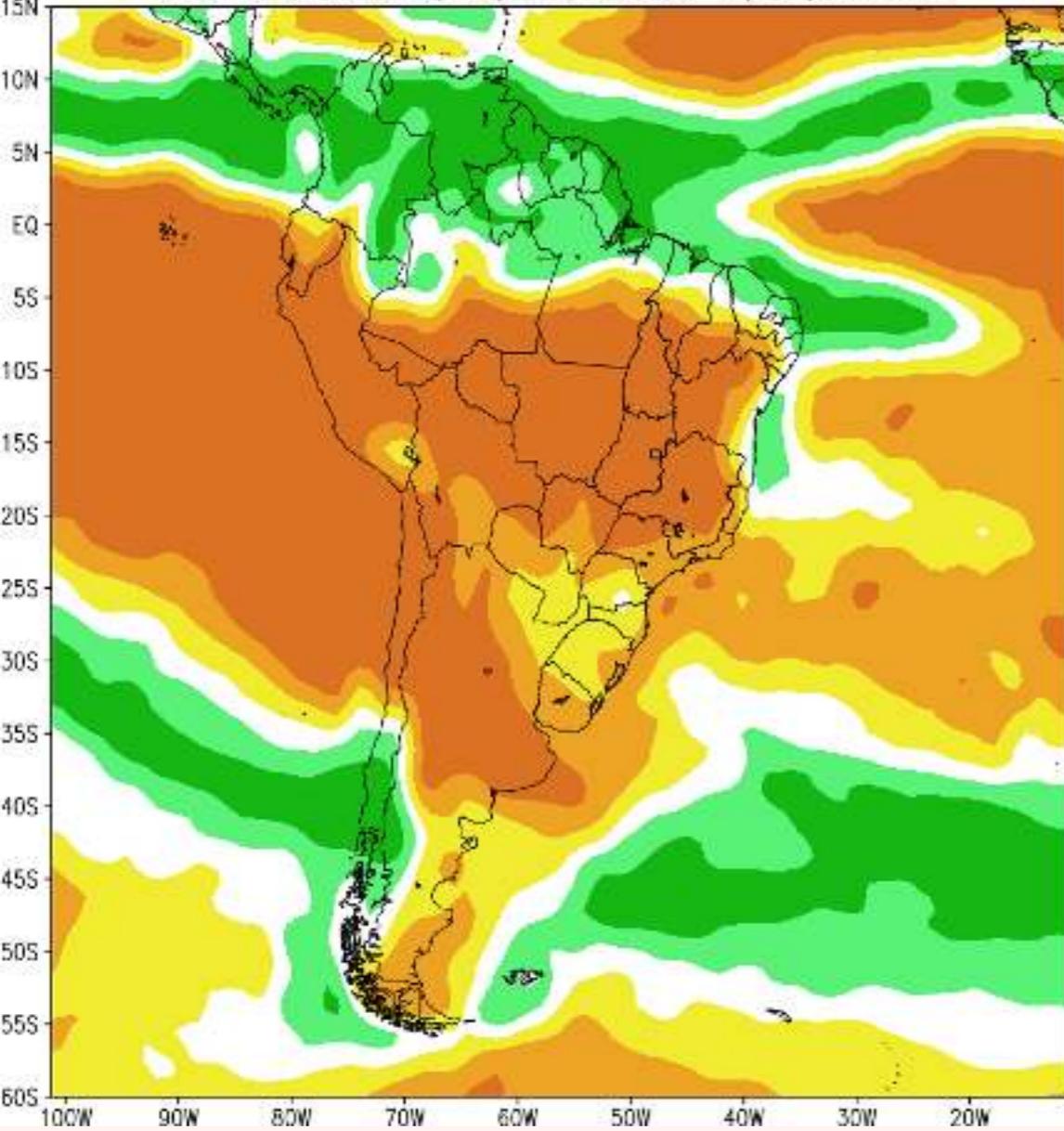
Análise 2020070100

BAM XC50

MCGA XE6

CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR CONJUNTO – TQ0126L028
Probabilidade de Acumulo de Precipitacao acima de 10 mm em 5 dias
Acumulado entre: 12/JUL/2020 06Z e 16/JUL/2020 00Z

CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR CONJUNTO – TQ0126L028
Probabilidade de Acumulo de Precipitacao acima de 10 mm em 5 dias
Acumulado entre: 12/JUL/2020 06Z e 16/JUL/2020 00Z



Análise 2020070100

CLUSTER MÉDIO, PREVISÕES DE 7 E 15 DIAS

- Campos representam as médias dos membros agrupados sobre a América do Sul;
 - Quanto maior o número de grupos, menor a confiabilidade e vice-versa;
 - Grupos com poucos membros, podem indicar situações extremas;
- **Depende do RMSE da climatologia da altura geopotencial em 500 hPa para a versão atualizada do modelo (arquivos MonthlyMeanRmsGCMTQ0126L028_[00,12]Z);**
- Variáveis:
 - Temperatura do Ar em 1000, 925, 850 e 700 hPa;
 - Altura Geopotencial em 500 e 200 hPa;
 - Precipitação e Pressão Reduzida ao Nível Médio do Mar em 1000 e 925 hPa;
 - Precipitação e velocidade do vento em 925 e 250 hPa;
 - Temperatura à superfície e variação da temperatura nas últimas 24 horas em 1000 hPa.

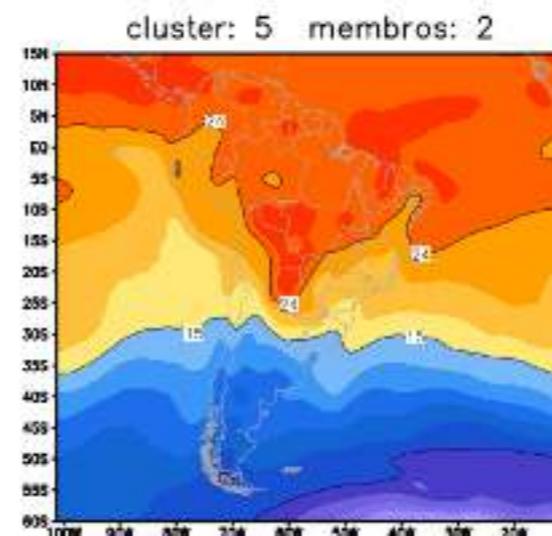
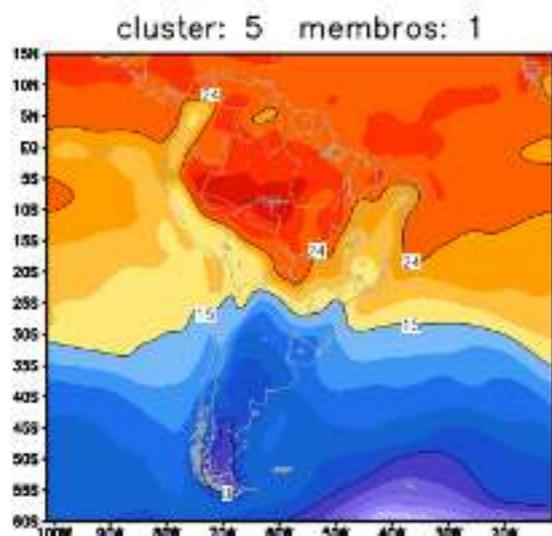
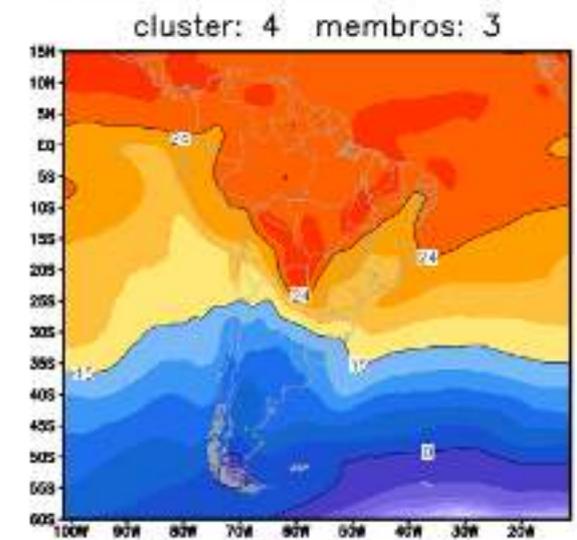
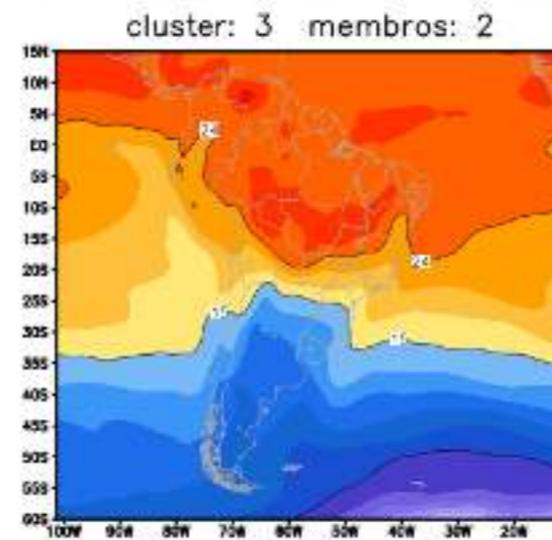
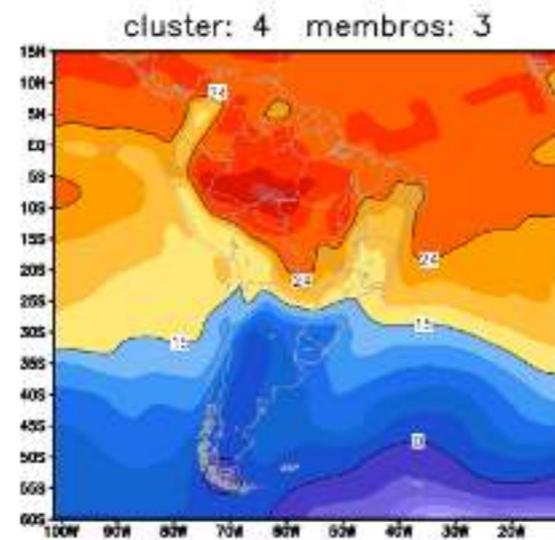
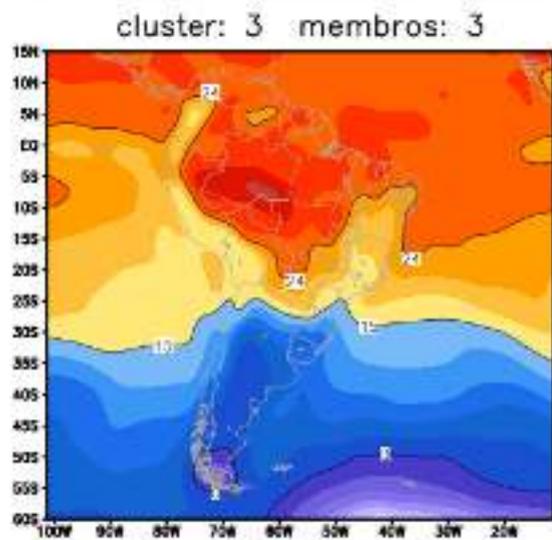
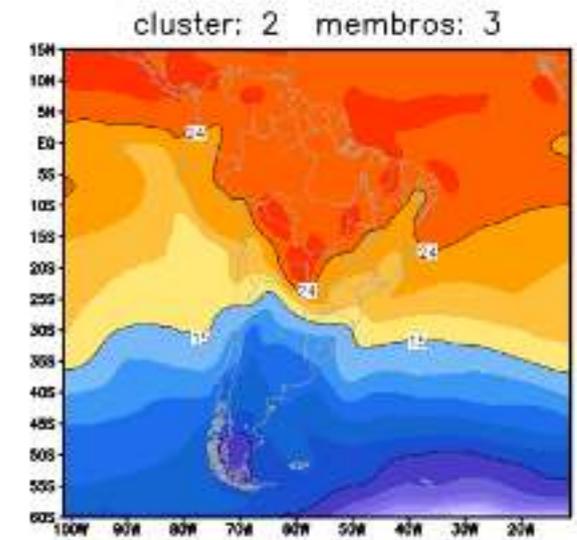
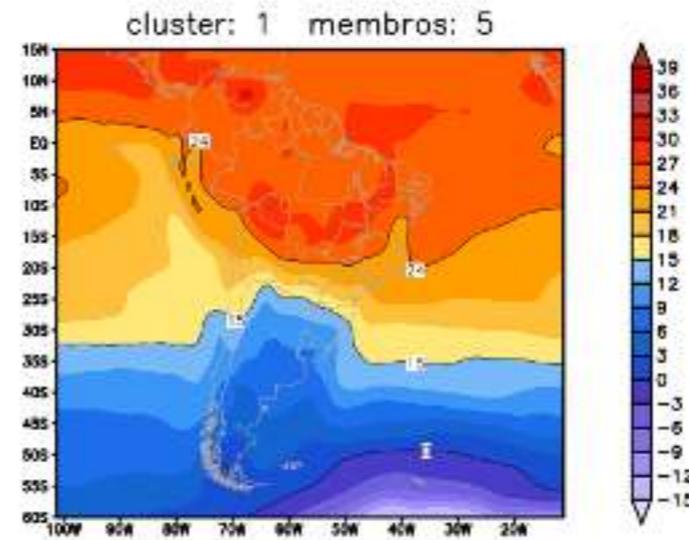
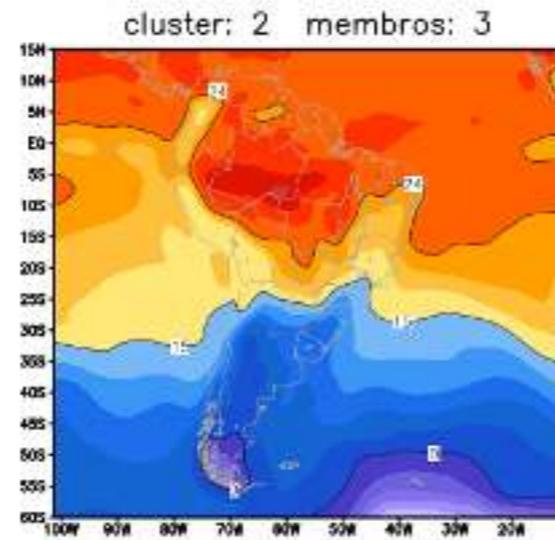
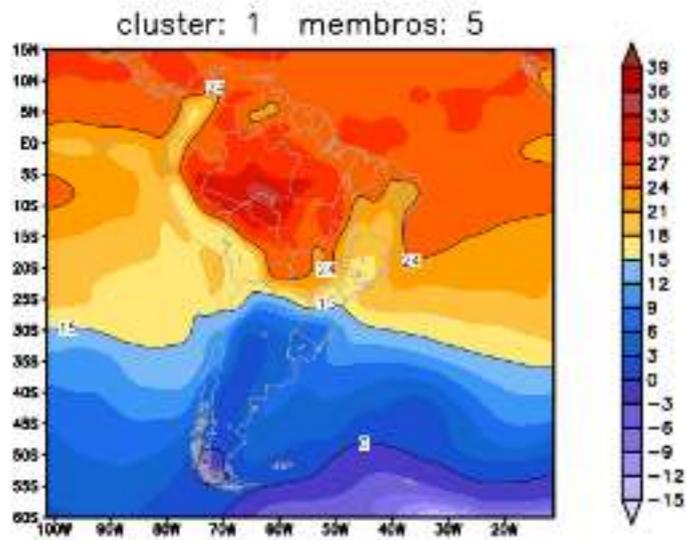
BAM XC50

Previsão 7 dias

MCGA XE6

CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Cluster Medio para a Temperatura (C) em 1000 hPa
Previsao de: 2020062300Z Valido para: 2020070100Z

CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Cluster Medio para a Temperatura (C) em 1000 hPa
Previsao de: 2020062300Z Valido para: 2020070100Z



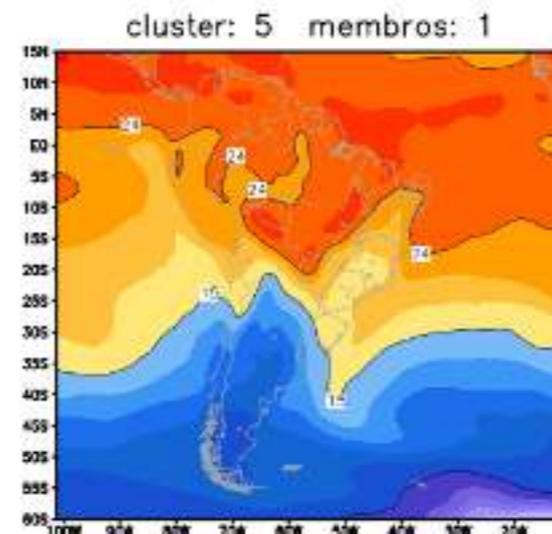
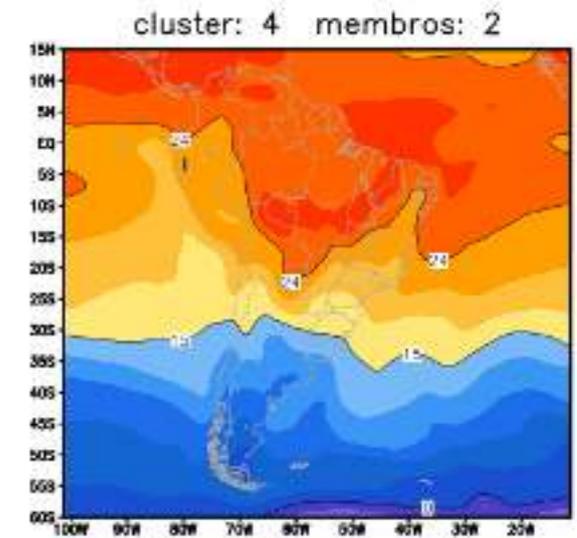
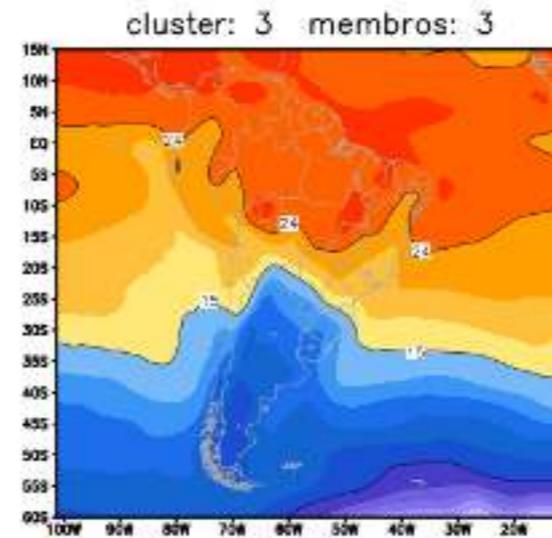
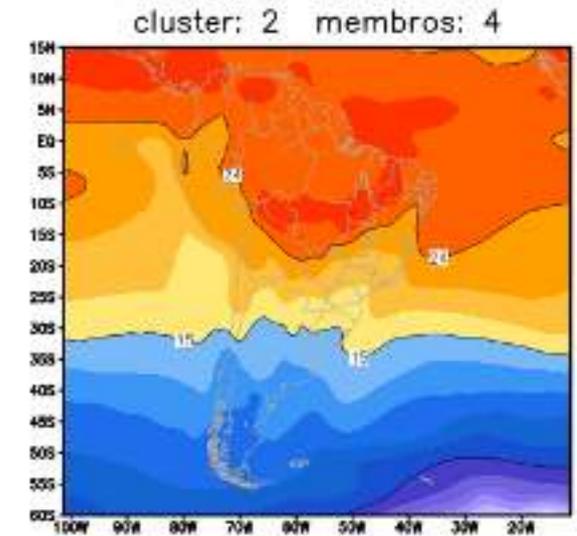
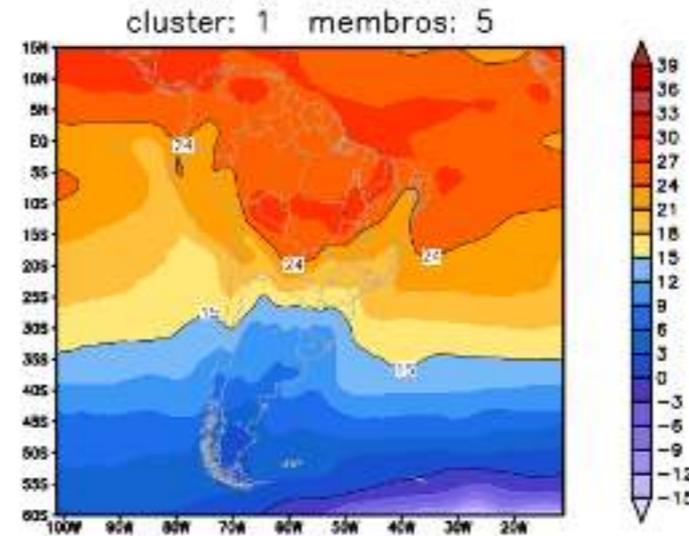
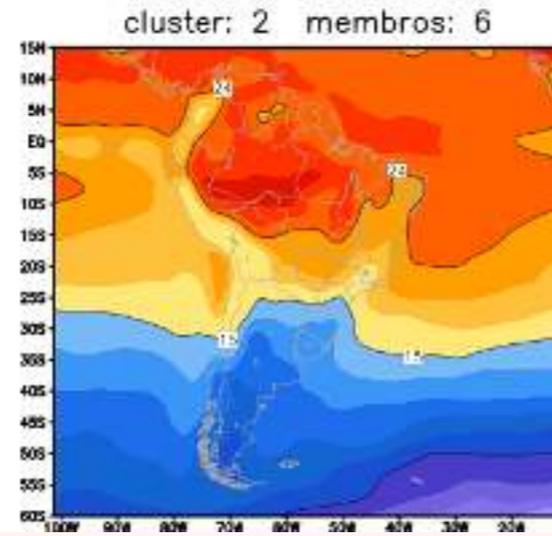
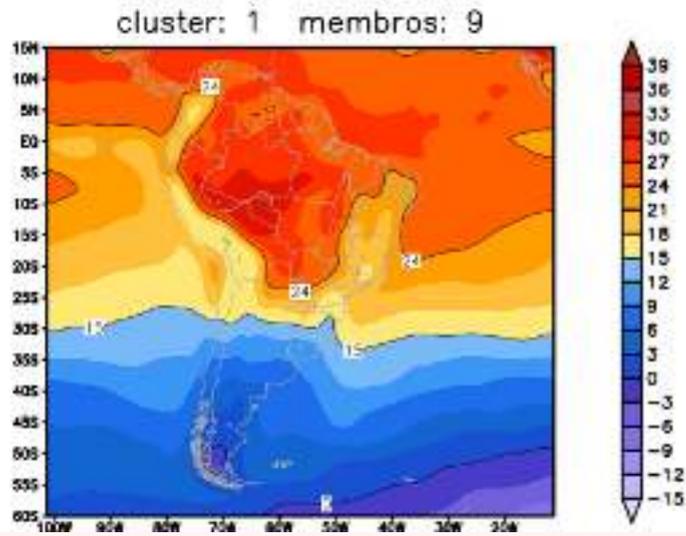
BAM XC50

Previsão 15 dias

MCGA XE6

CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Cluster Medio para a Temperatura (C) em 1000 hPa
Previsao de: 2020061600Z Valido para: 2020070100Z

CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Cluster Medio para a Temperatura (C) em 1000 hPa
Previsao de: 2020061600Z Valido para: 2020070100Z



BAM XC50

Previsão 7 dias

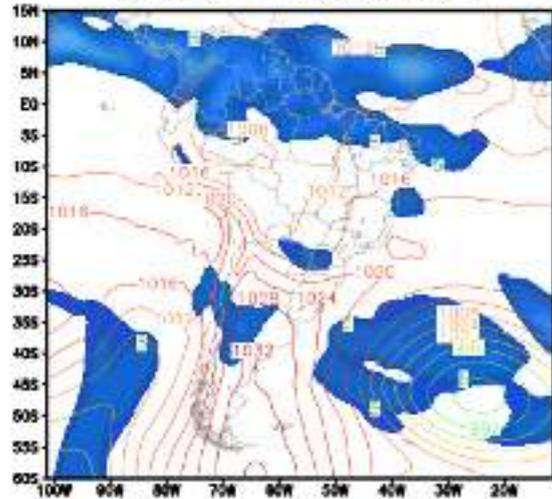
MCGA XE6

CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028

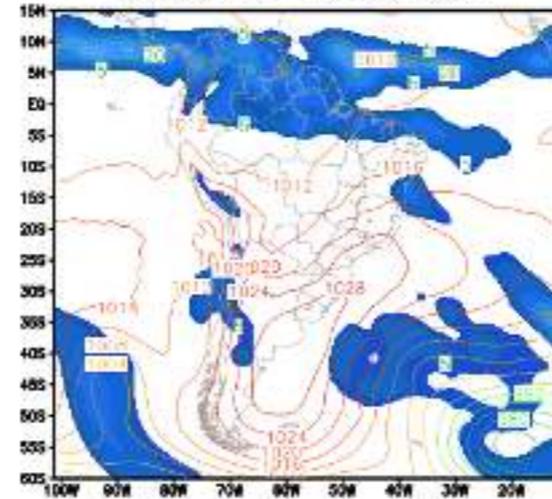
Cluster Medio para Pressao ao Nivel Medio do Mar (hPa) (Contornos)
e Precipitacao Acumulada em 24 horas (mm) (Cores)

Previsao de: 2020062300Z Valido para: 2020070100Z

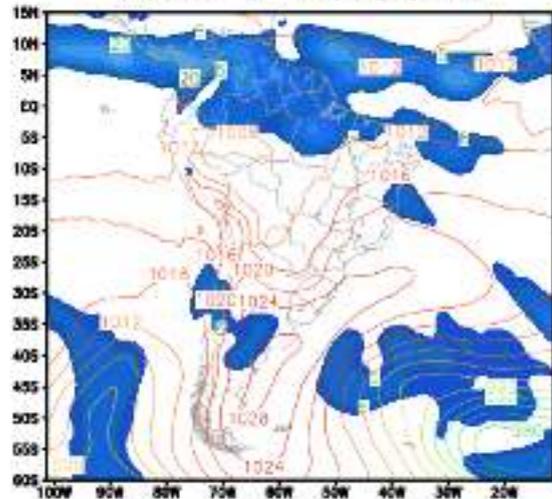
cluster: 1 membros: 5



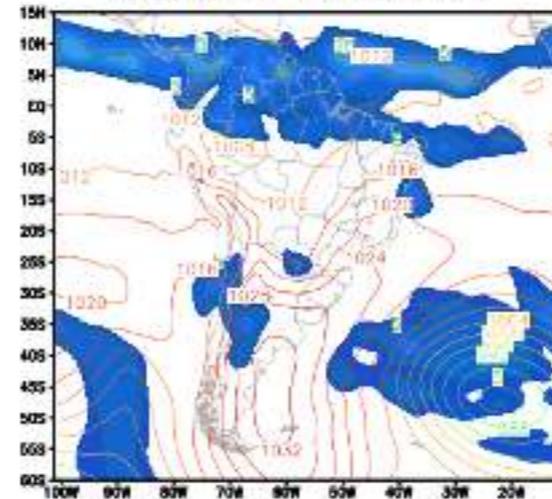
cluster: 2 membros: 3



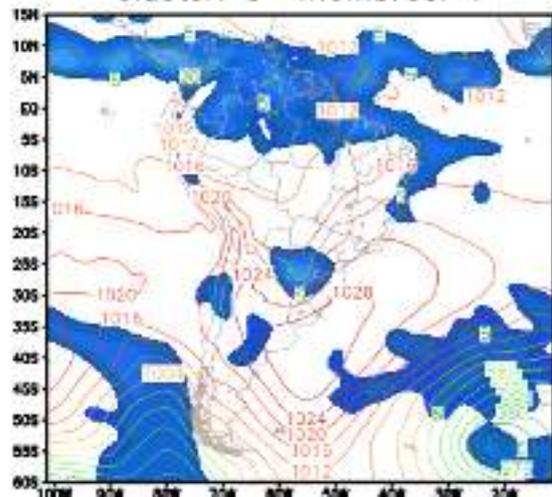
cluster: 3 membros: 3



cluster: 4 membros: 3



cluster: 5 membros: 1

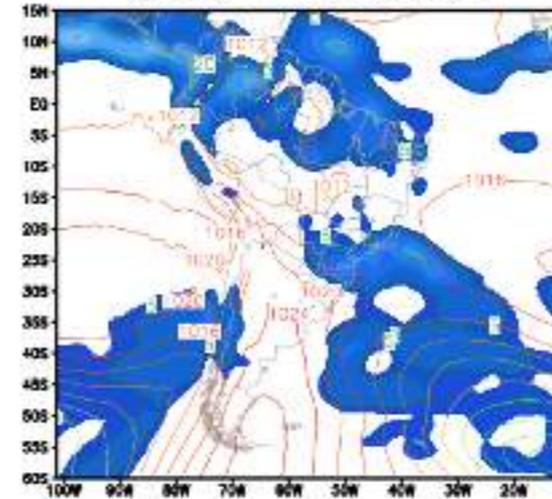


CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028

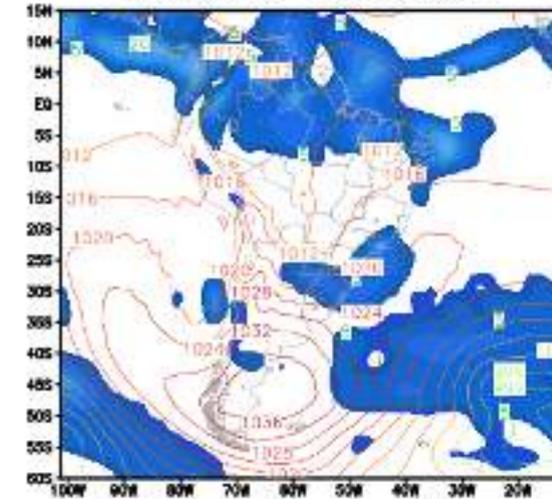
Cluster Medio para Pressao ao Nivel Medio do Mar (hPa) (Contornos)
e Precipitacao Acumulada em 24 horas (mm) (Cores)

Previsao de: 2020062300Z Valido para: 2020070100Z

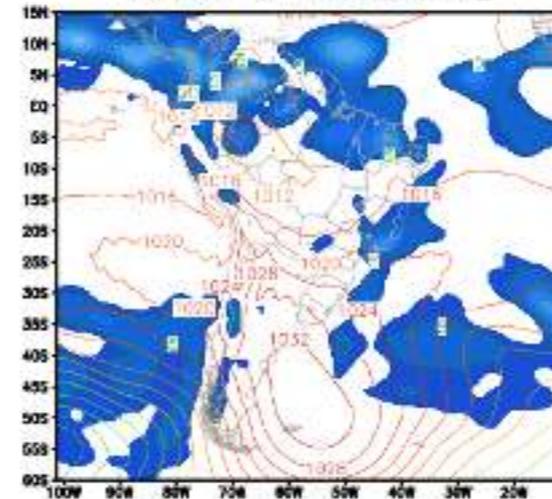
cluster: 1 membros: 5



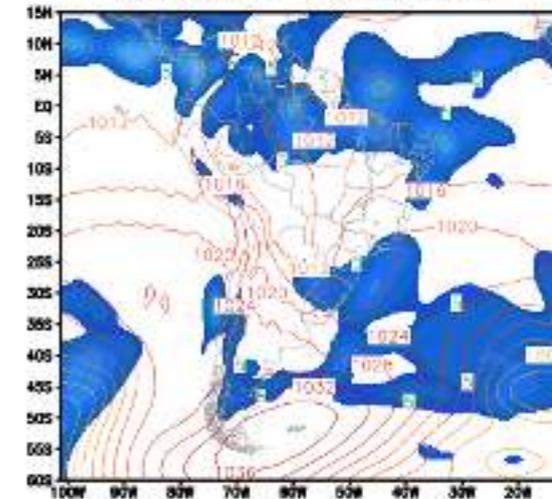
cluster: 2 membros: 3



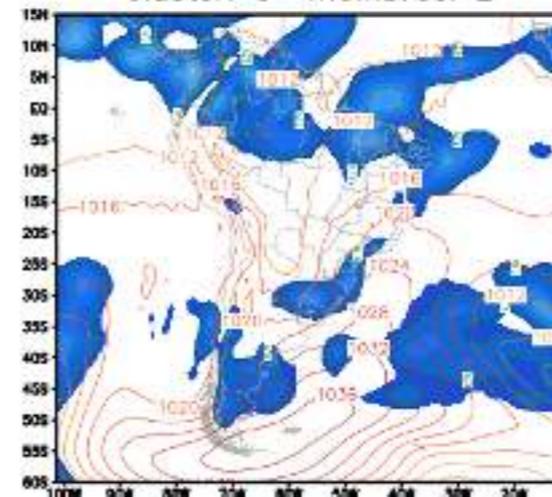
cluster: 3 membros: 2



cluster: 4 membros: 3



cluster: 5 membros: 2



BAM XC50

Previsão 15 dias

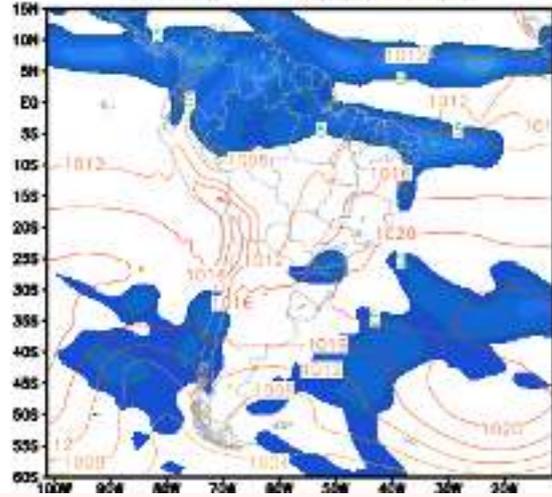
MCGA XE6

CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028

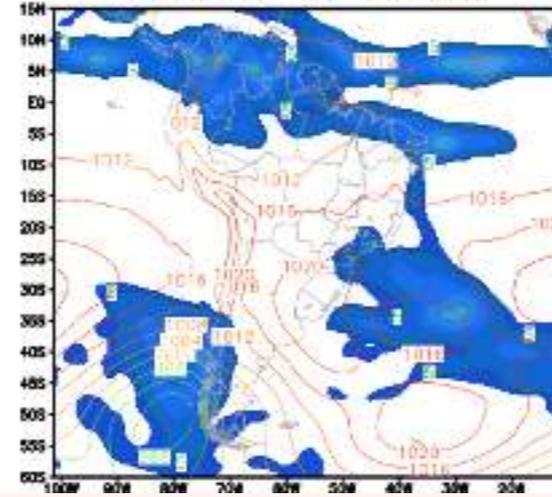
Cluster Medio para Pressao ao Nivel Medio do Mar (hPa) (Contornos)
e Precipitacao Acumulada em 24 horas (mm) (Cores)

Previsao de: 2020061600Z Valido para: 2020070100Z

cluster: 1 membros: 9



cluster: 2 membros: 6

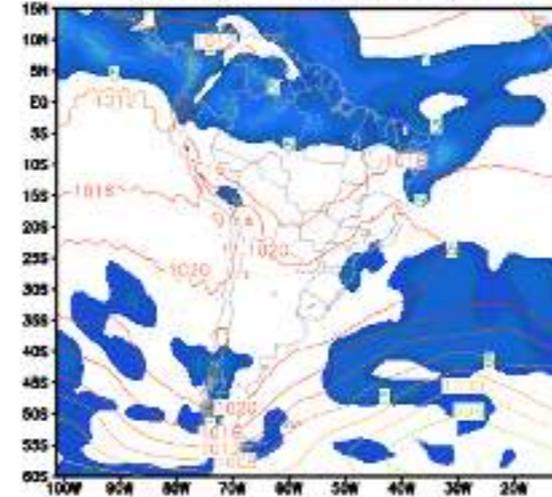


CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028

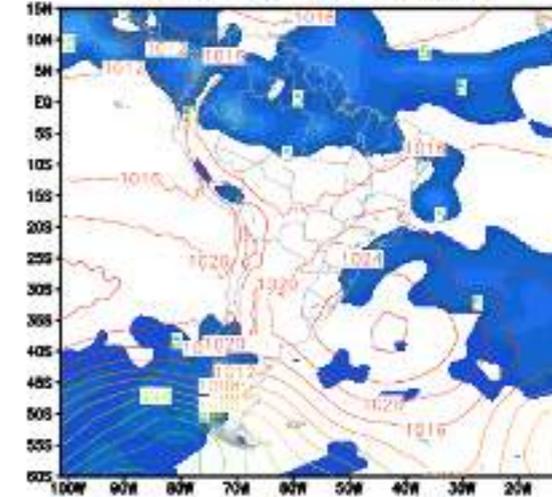
Cluster Medio para Pressao ao Nivel Medio do Mar (hPa) (Contornos)
e Precipitacao Acumulada em 24 horas (mm) (Cores)

Previsao de: 2020061600Z Valido para: 2020070100Z

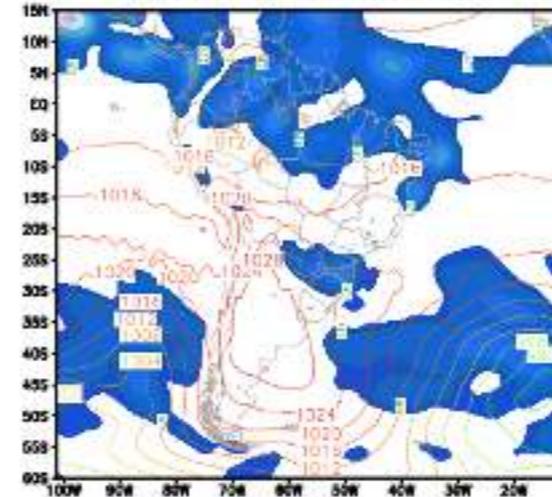
cluster: 1 membros: 5



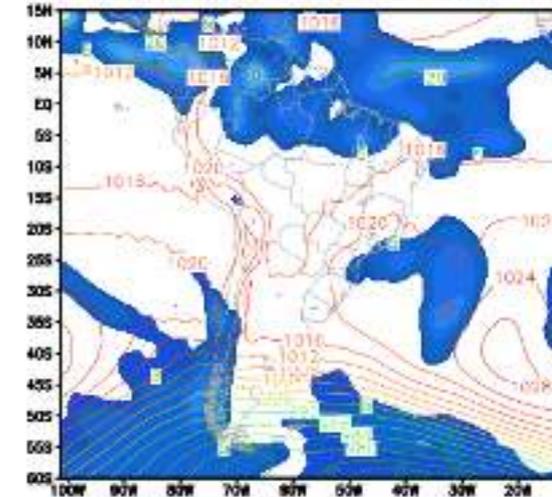
cluster: 2 membros: 4



cluster: 3 membros: 3



cluster: 4 membros: 2



cluster: 5 membros: 1

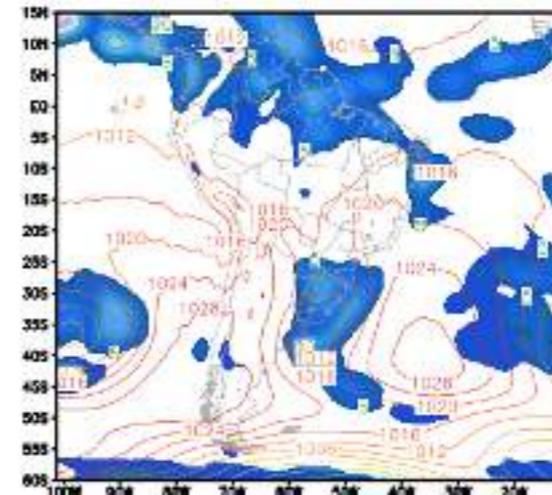


DIAGRAMA DE ESPAGUETE

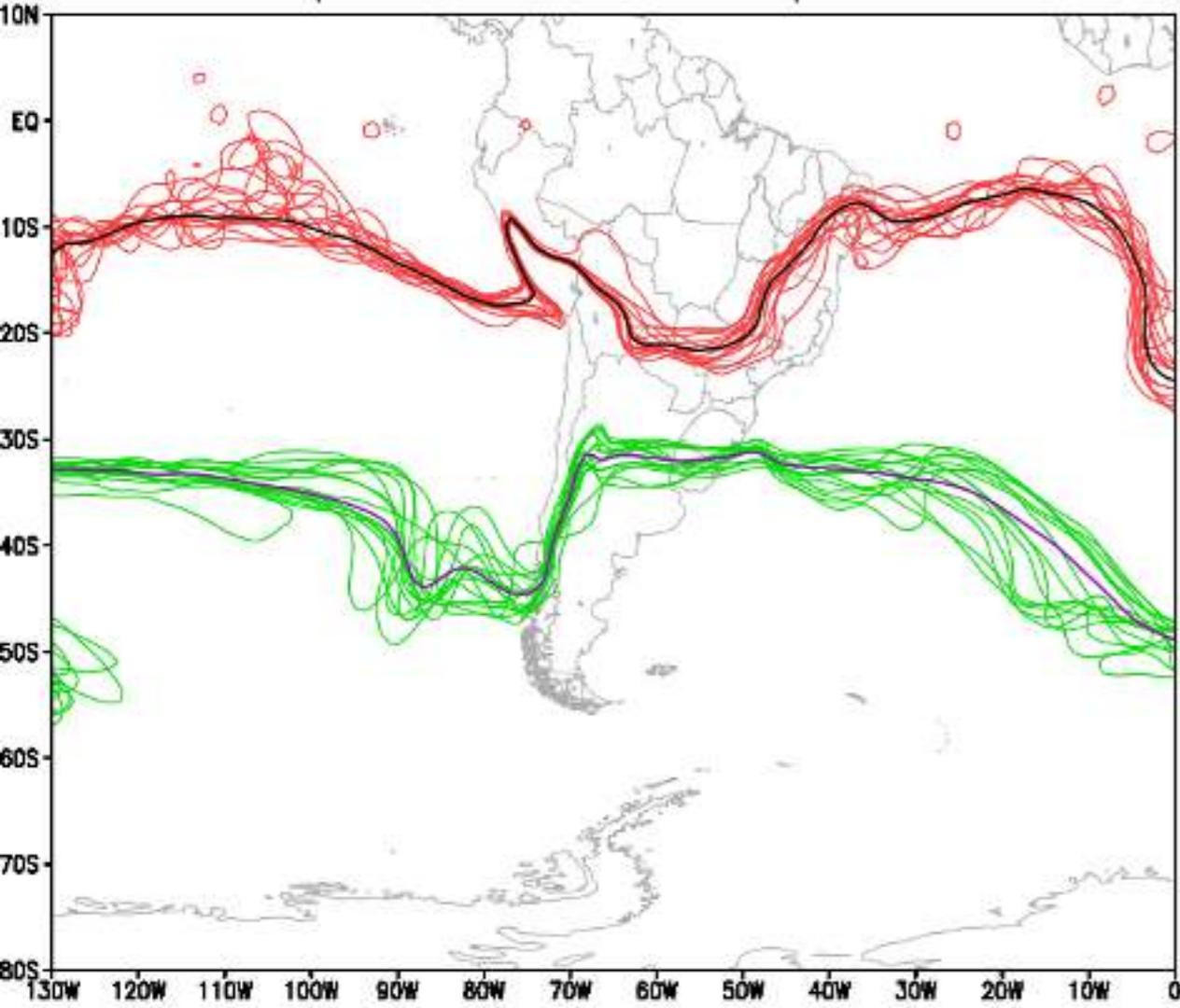
- Gráficos plotados sobre a América do Sul e sobre os Hemisférios Norte e Sul, para as seguintes variáveis:
 - Temperatura do Ar em 1000 (contornos de 10 e 20 C), 925 (5 e 15 C) e 850 hPa (0 e 15 C);
 - Altura Geopotencial em 500 hPa;

BAM XC50

CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028

Diagrama "Spaguetti" – Temperatura (C) (850 hPa)

Previsao a partir de: 2020062300Z Valido para: 2020070100Z



— Membros do Ensemble (15.0 graus) — Ensemble Medio (15.0 graus)

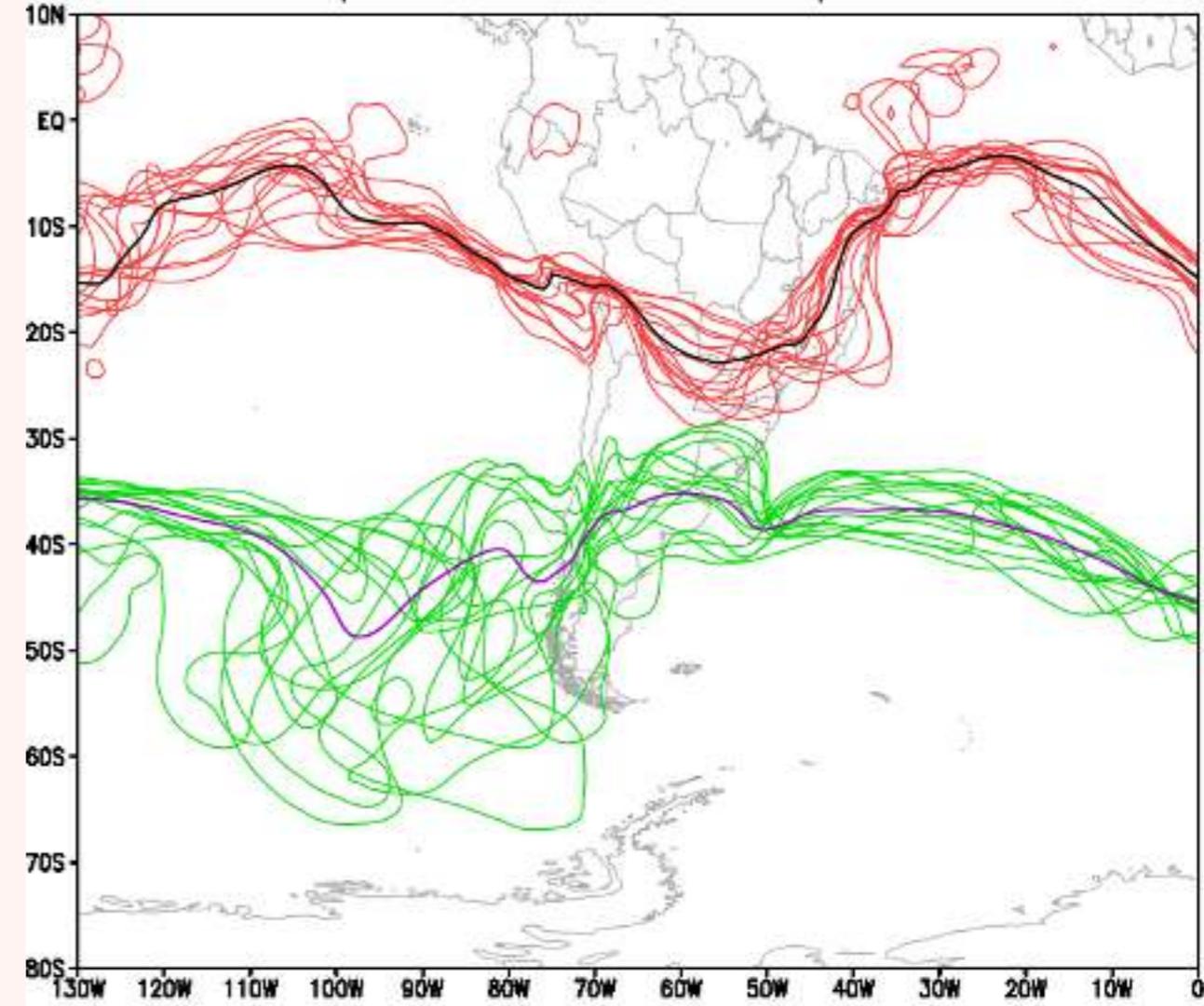
— Membros do Ensemble (0.0 graus) — Ensemble Medio (0.0 graus)

MCGA XE6

CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028

Diagrama "Spaguetti" – Temperatura (C) (850 hPa)

Previsao a partir de: 2020062300Z Valido para: 2020070100Z



— Membros do Ensemble (15.0 graus) — Ensemble Medio (15.0 graus)

— Membros do Ensemble (0.0 graus) — Ensemble Medio (0.0 graus)

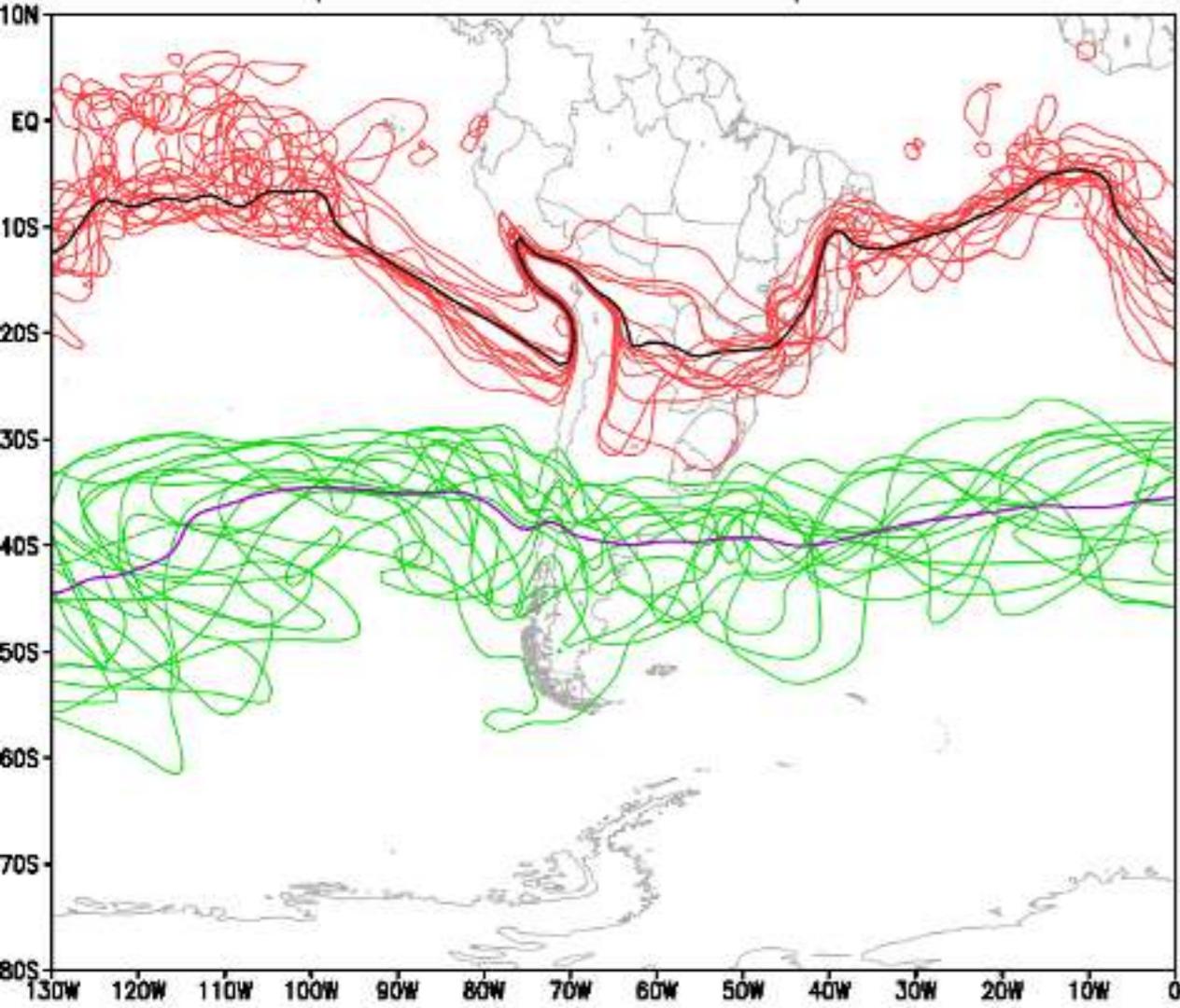
Previsão 7 dias

BAM XC50

CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028

Diagrama "Spaguetti" – Temperatura (C) (850 hPa)

Previsao a partir de: 2020061600Z Valido para: 2020070100Z



— Membros do Ensemble (15.0 graus) — Ensemble Medio (15.0 graus)

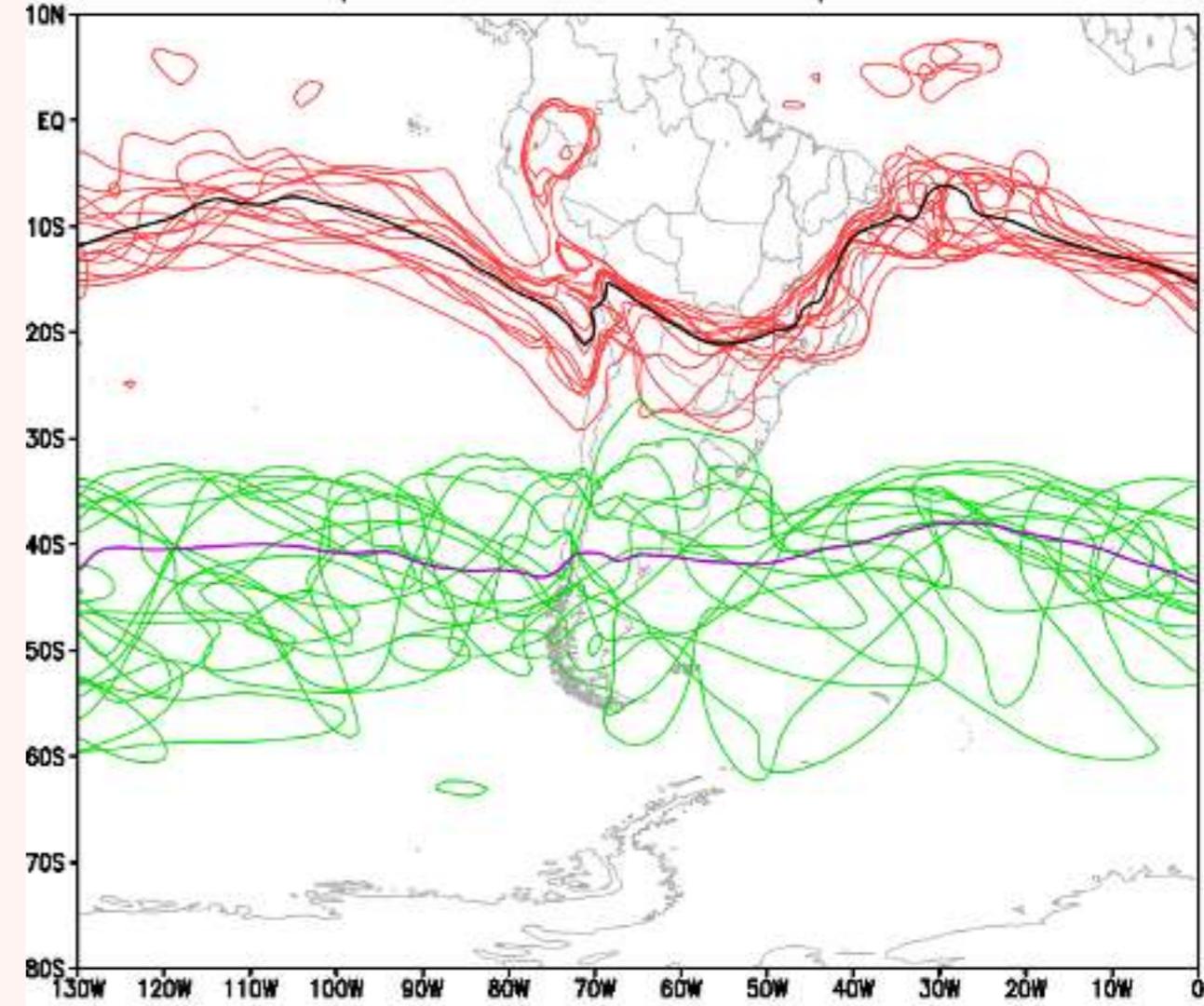
— Membros do Ensemble (0.0 graus) — Ensemble Medio (0.0 graus)

MCGA XE6

CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028

Diagrama "Spaguetti" – Temperatura (C) (850 hPa)

Previsao a partir de: 2020061600Z Valido para: 2020070100Z



— Membros do Ensemble (15.0 graus) — Ensemble Medio (15.0 graus)

— Membros do Ensemble (0.0 graus) — Ensemble Medio (0.0 graus)

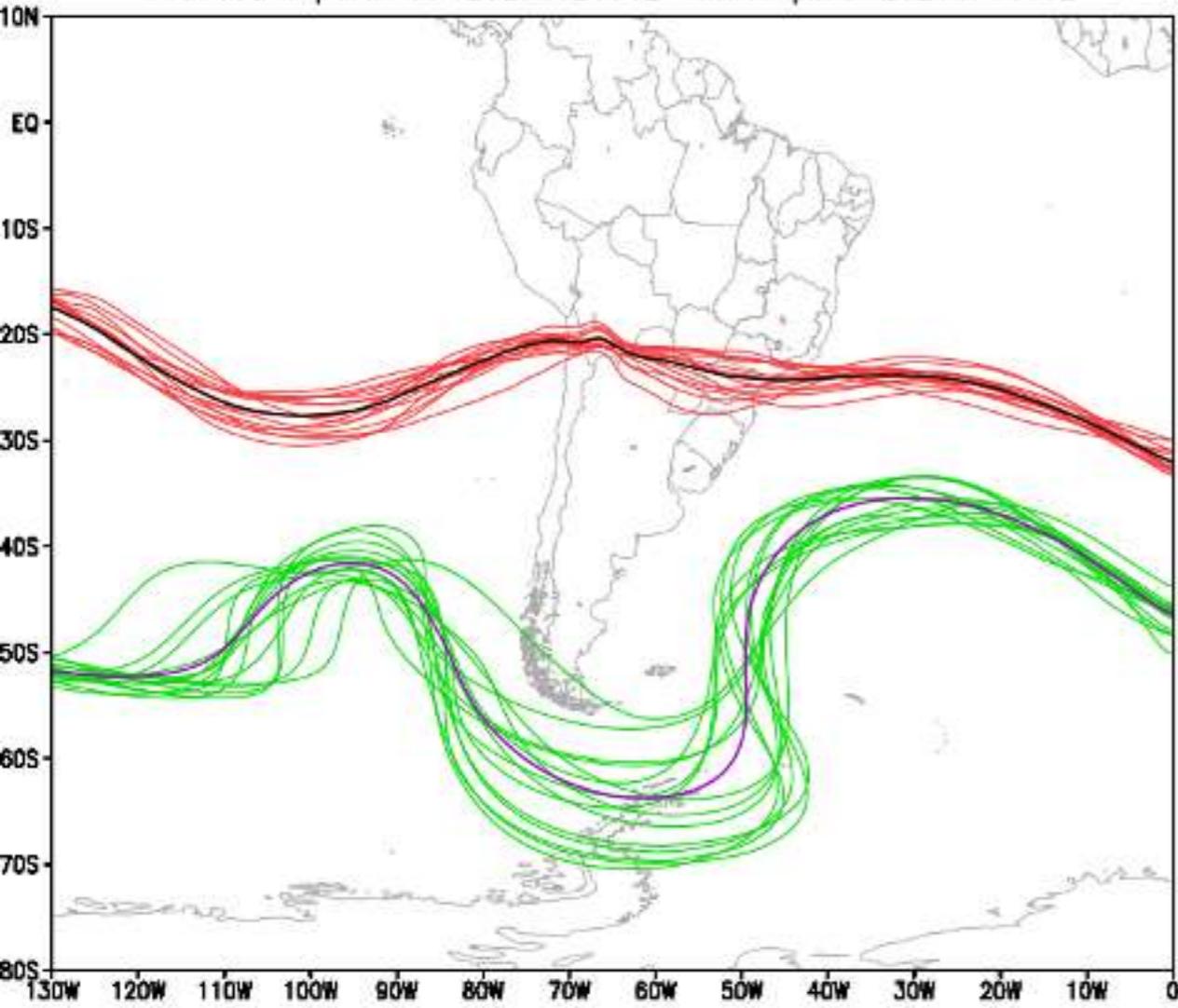
Previsão 15 dias

BAM XC50

CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028

Diagrama "Spaguetti" – Altura Geopotencial (m) (500 hPa)

Previsao a partir de: 2020062300Z Valido para: 2020070100Z



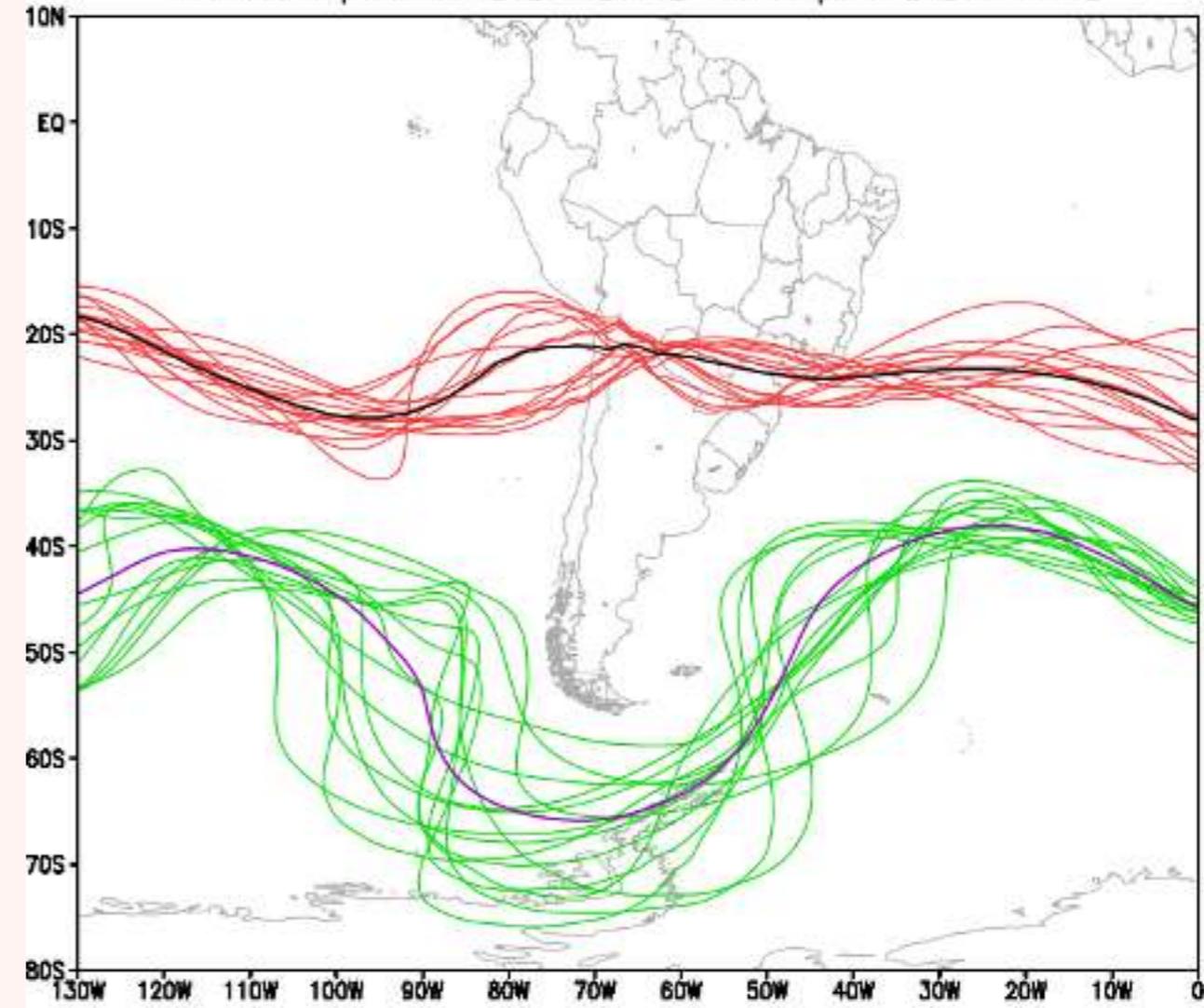
— Membros do Ensemble (5800.0 m) — Ensemble Medio (5800.0 m)
— Membros do Ensemble (5400.0 m) — Ensemble Medio (5400.0 m)

MCGA XE6

CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028

Diagrama "Spaguetti" – Altura Geopotencial (m) (500 hPa)

Previsao a partir de: 2020062300Z Valido para: 2020070100Z



— Membros do Ensemble (5800.0 m) — Ensemble Medio (5800.0 m)
— Membros do Ensemble (5400.0 m) — Ensemble Medio (5400.0 m)

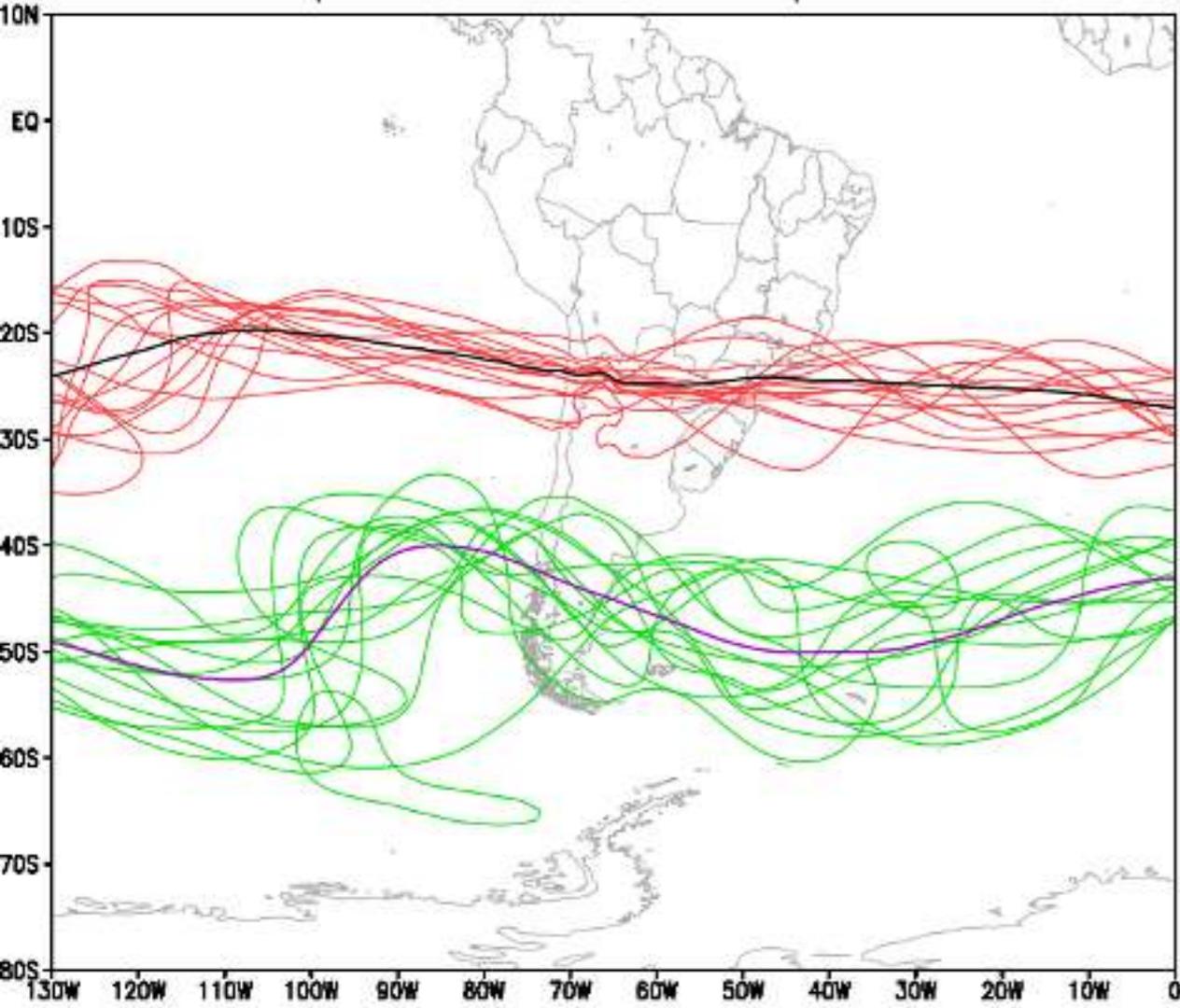
Previsão 7 dias

BAM XC50

CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028

Diagrama "Spaguetti" – Altura Geopotencial (m) (500 hPa)

Previsao a partir de: 2020061600Z Valido para: 2020070100Z



— Membros do Ensemble (5800.0 m) — Ensemble Medio (5800.0 m)

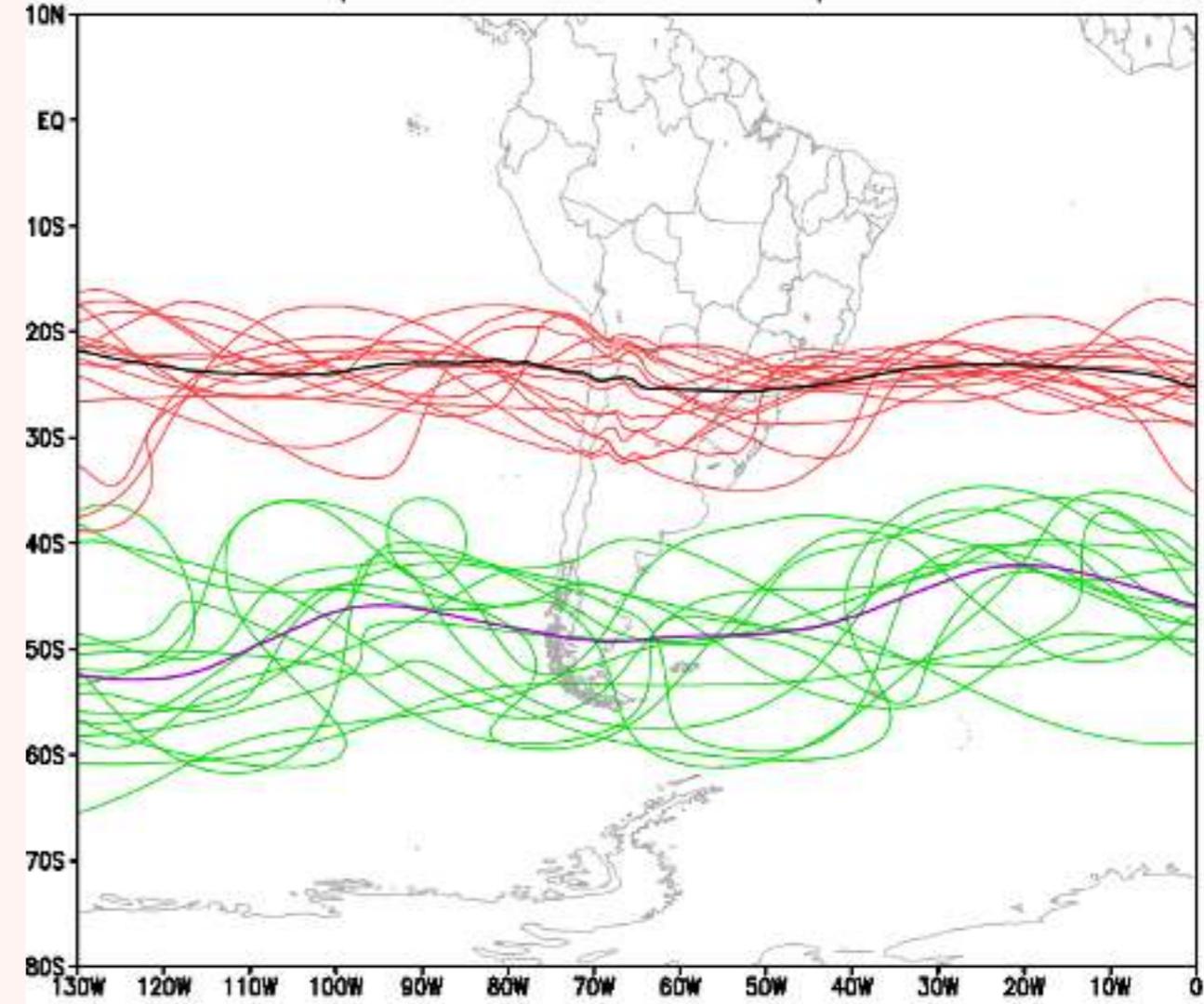
— Membros do Ensemble (5400.0 m) — Ensemble Medio (5400.0 m)

MCGA XE6

CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028

Diagrama "Spaguetti" – Altura Geopotencial (m) (500 hPa)

Previsao a partir de: 2020061600Z Valido para: 2020070100Z



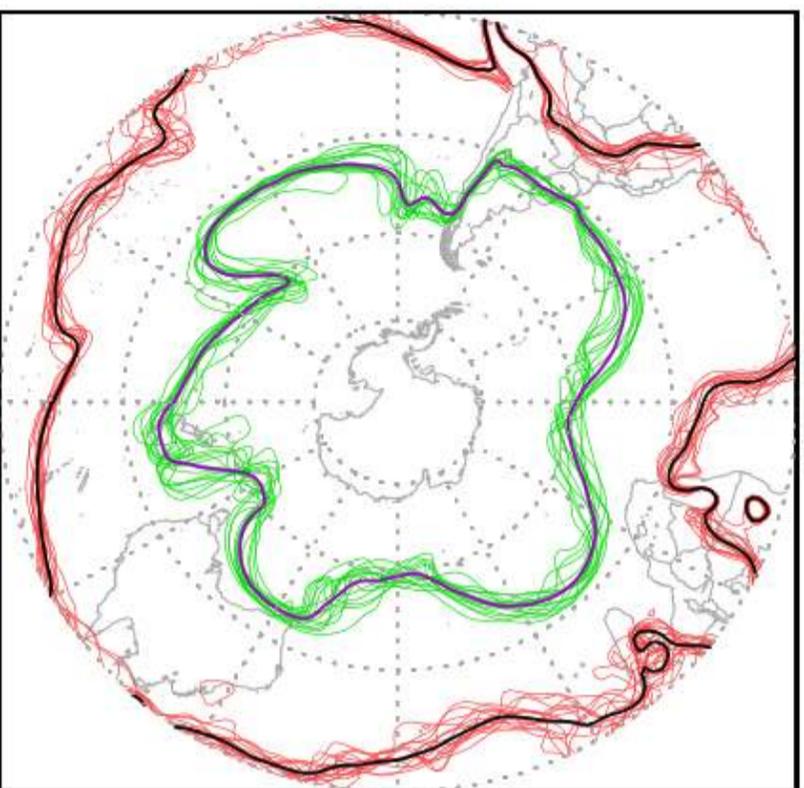
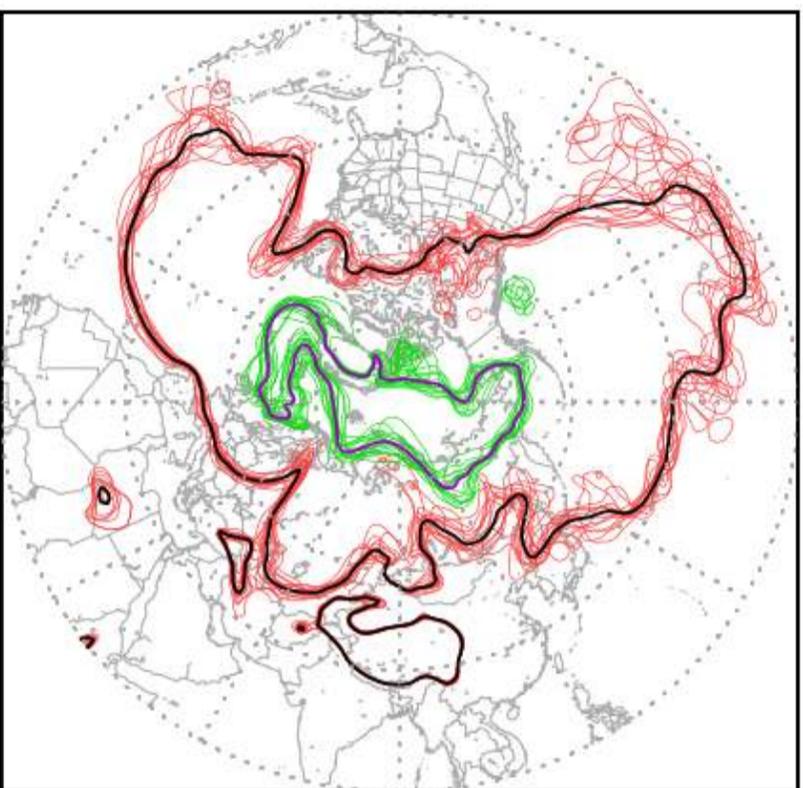
— Membros do Ensemble (5800.0 m) — Ensemble Medio (5800.0 m)

— Membros do Ensemble (5400.0 m) — Ensemble Medio (5400.0 m)

Previsão 15 dias

Previsão 7 dias

CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Diagrama "Spagueti" – Temperatura (C) (850 hPa)
Previsao a partir de: 2020062300Z Valido para: 2020070100Z

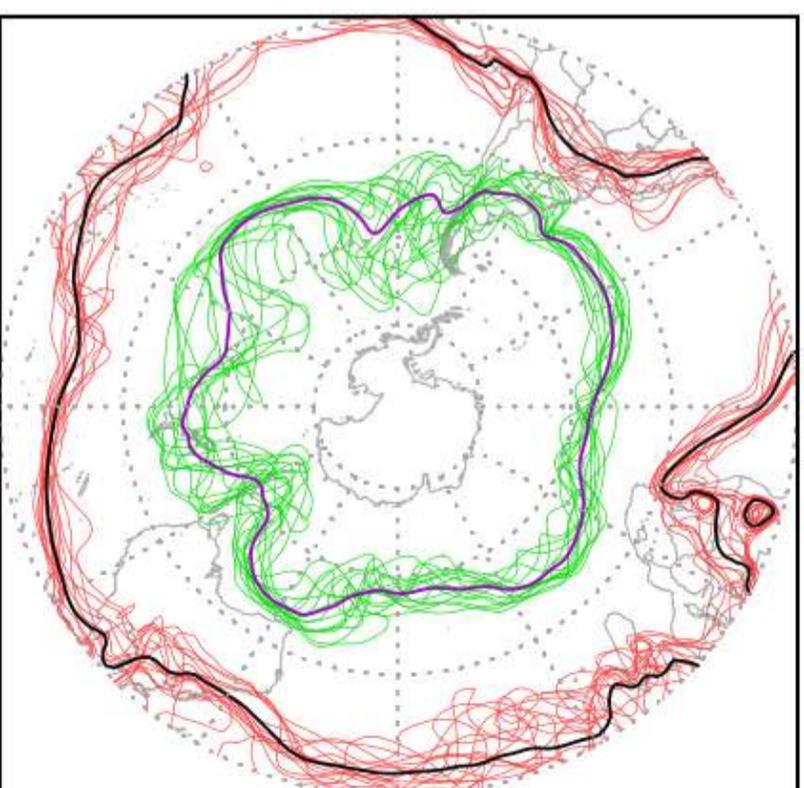
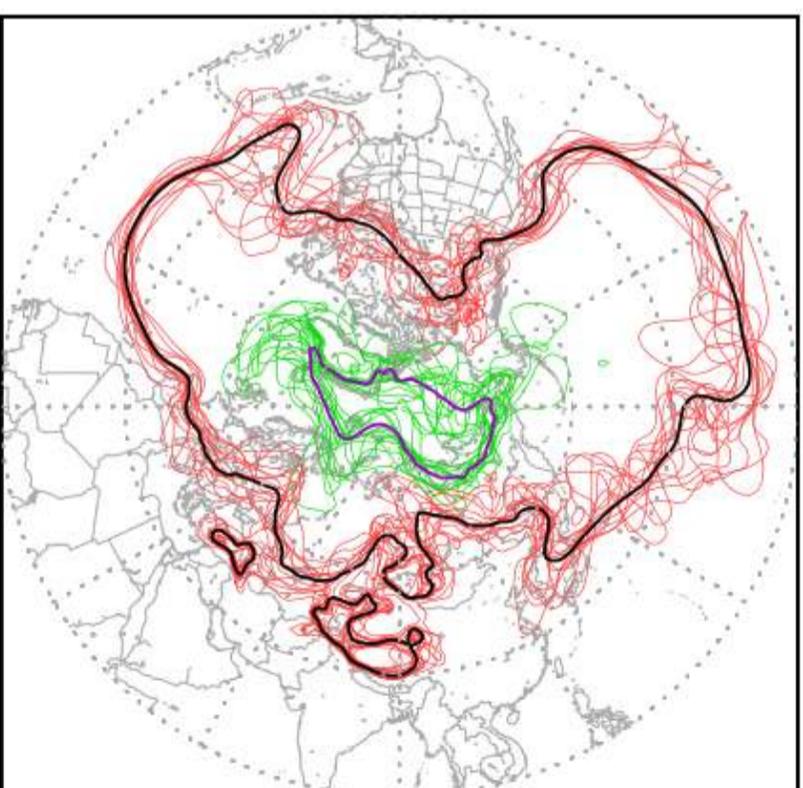


BAM XC50

— Members do Ensemble (15.0 graus) — Ensemble Medio (15.0 graus)

— Members do Ensemble (0.0 graus) — Ensemble Medio (0.0 graus)

CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Diagrama "Spagueti" – Temperatura (C) (850 hPa)
Previsao a partir de: 2020062300Z Valido para: 2020070100Z



MCGA XE6

— Members do Ensemble (15.0 graus) — Ensemble Medio (15.0 graus)

— Members do Ensemble (0.0 graus) — Ensemble Medio (0.0 graus)

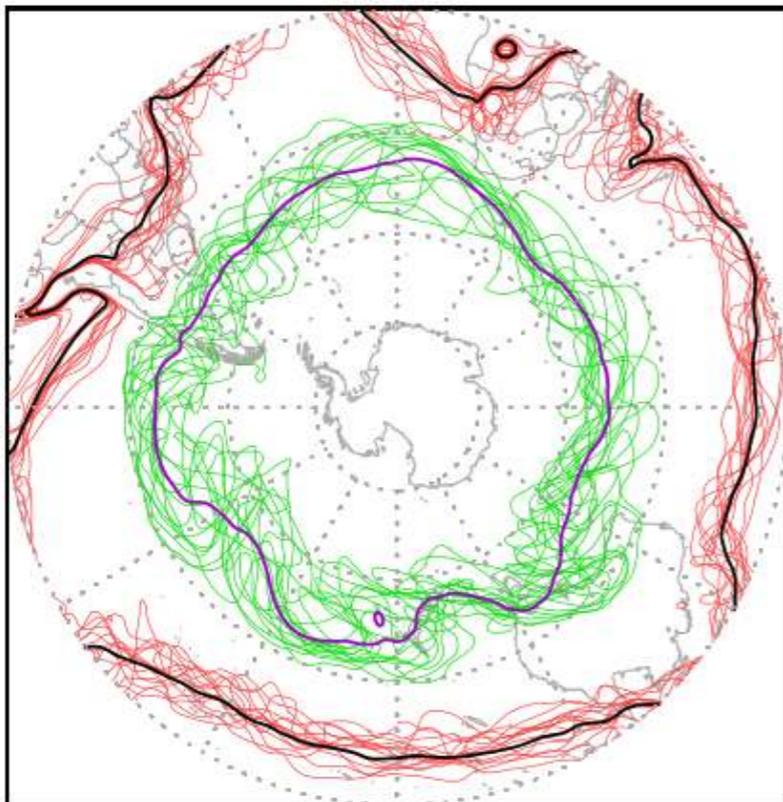
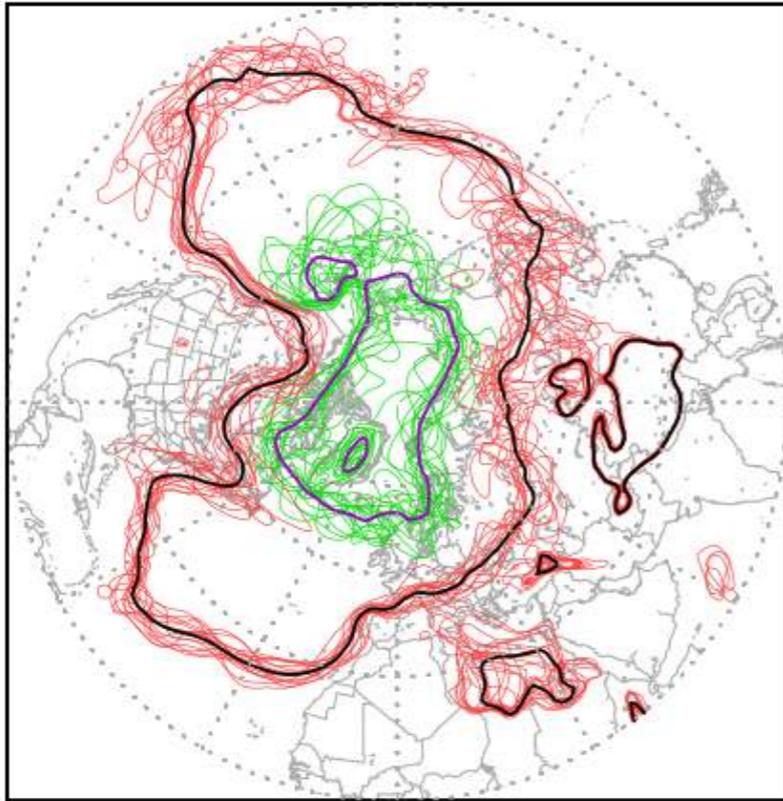
Previsão 15 dias

CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028 CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028

Diagrama "Spagueti" – Temperatura (C) (850 hPa)

Previsao a partir de: 2020061600Z Valido para: 2020070100Z

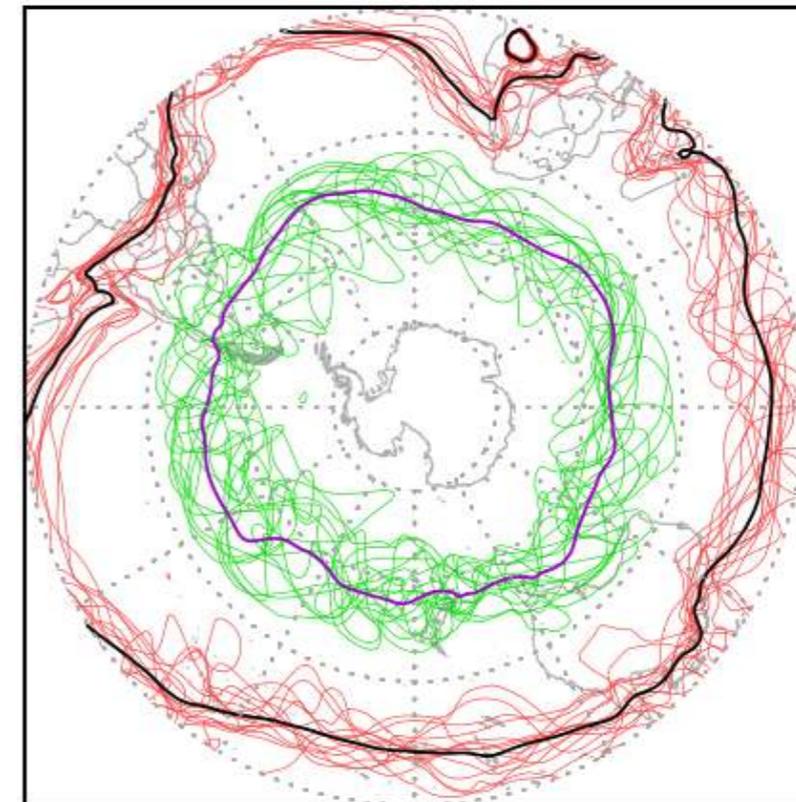
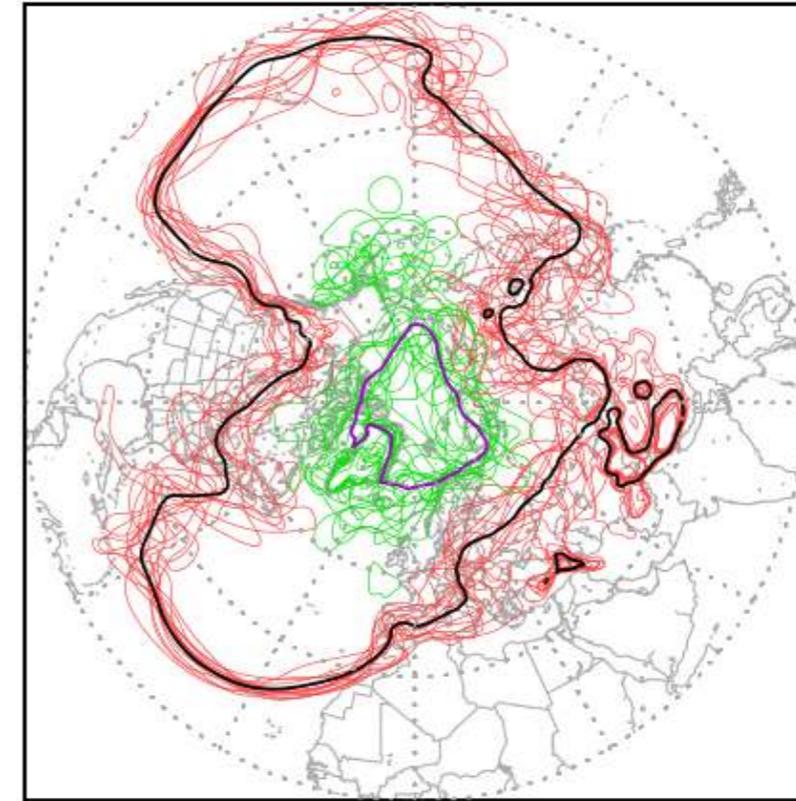
BAM XC50



Membros do Ensemble (15.0 graus) Ensemble Medio (15.0 graus)

Membros do Ensemble (0.0 graus) Ensemble Medio (0.0 graus)

MCGA XE6

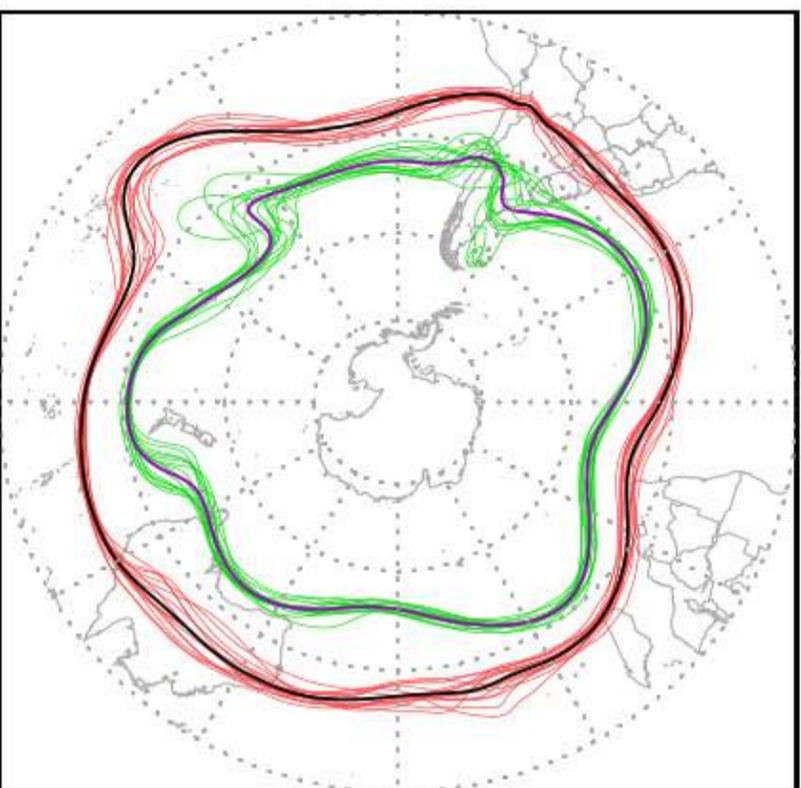
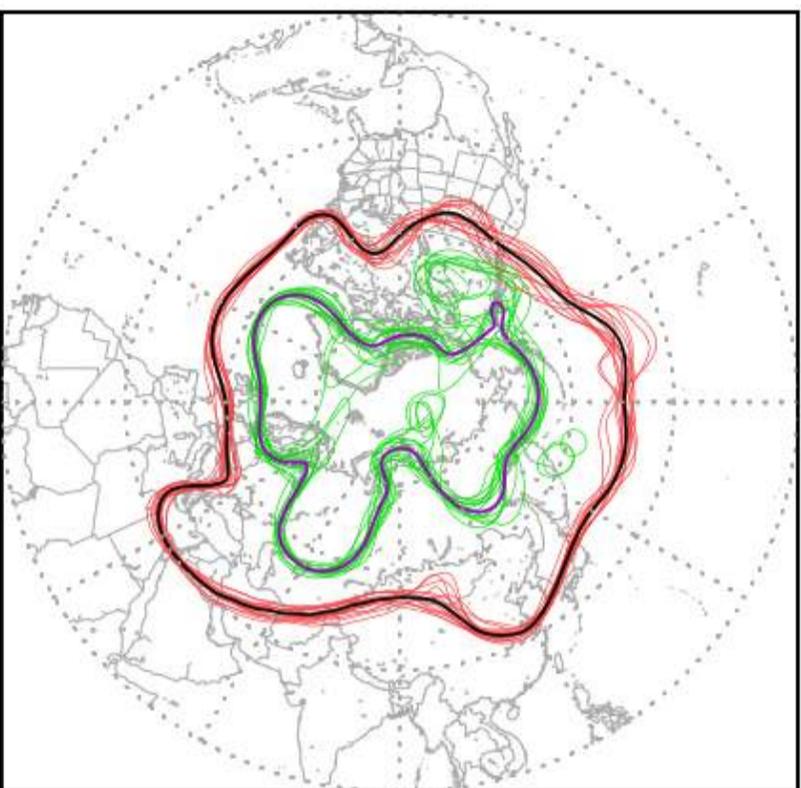


Membros do Ensemble (15.0 graus) Ensemble Medio (15.0 graus)

Membros do Ensemble (0.0 graus) Ensemble Medio (0.0 graus)

Previsão 7 dias

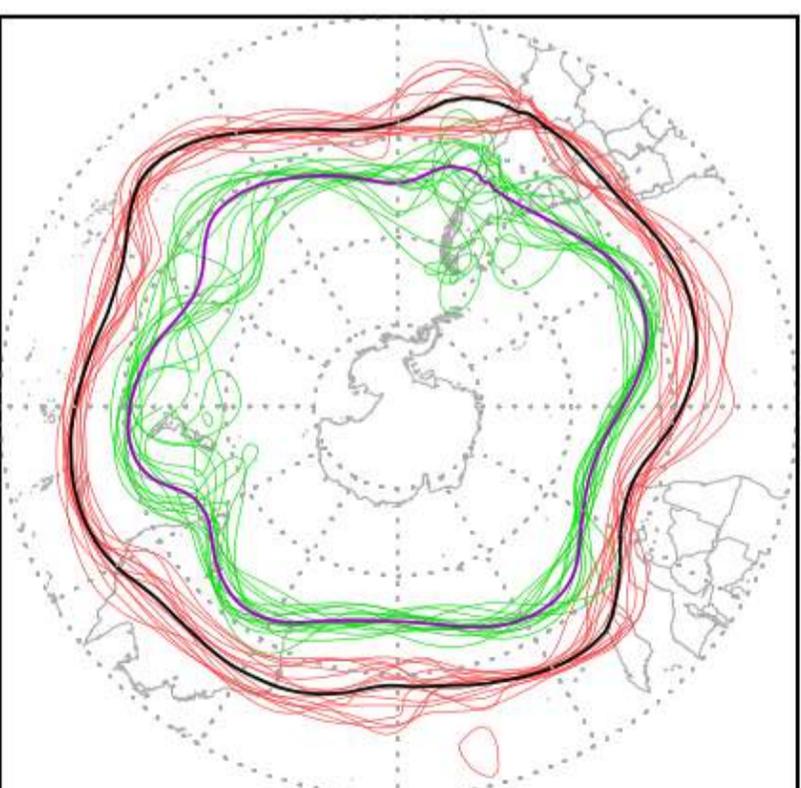
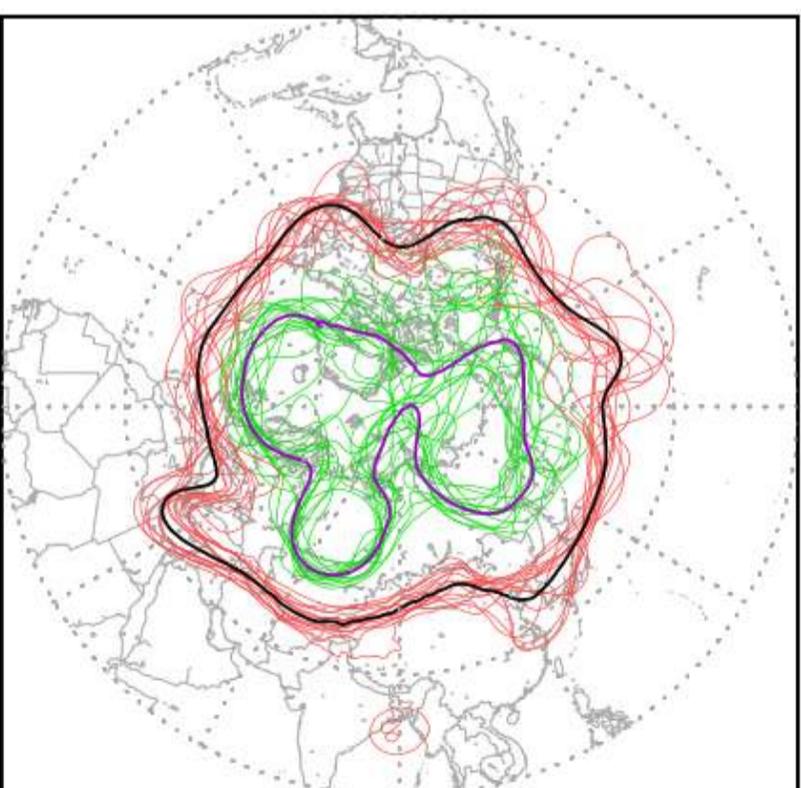
CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Diagrama "Spagueti" – Altura Geopotencial (m) (500 hPa)
Previsao a partir de: 2020062300Z Valido para: 2020070100Z



— Membros do Ensemble (5800.0 m) — Ensemble Medio (5800.0 m)

— Membros do Ensemble (5600.0 m) — Ensemble Medio (5600.0 m)

CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Diagrama "Spagueti" – Altura Geopotencial (m) (500 hPa)
Previsao a partir de: 2020062300Z Valido para: 2020070100Z



— Membros do Ensemble (5800.0 m) — Ensemble Medio (5800.0 m)

— Membros do Ensemble (5600.0 m) — Ensemble Medio (5600.0 m)

BAM XC50

MCGA XE6

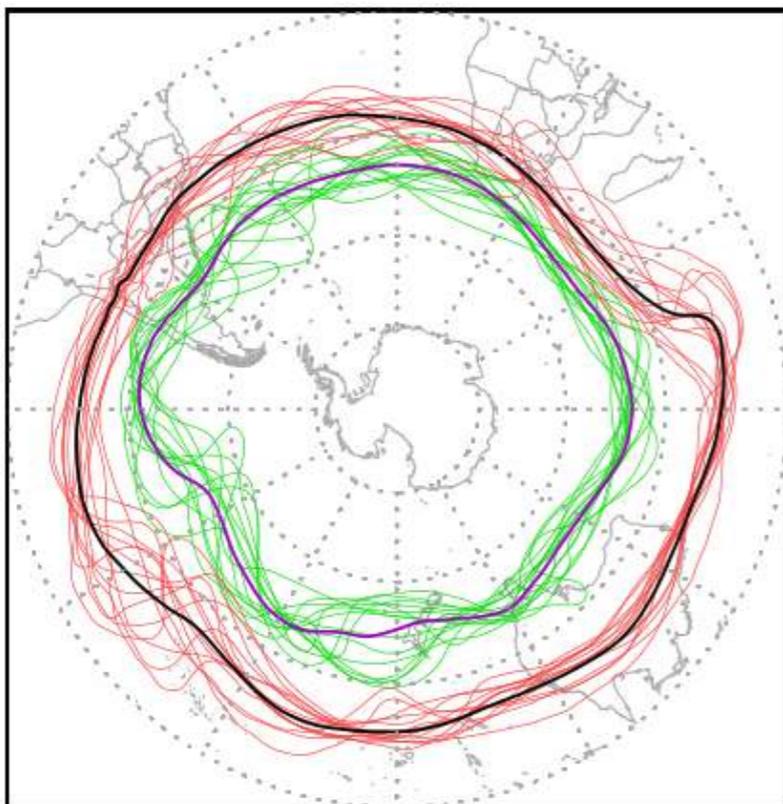
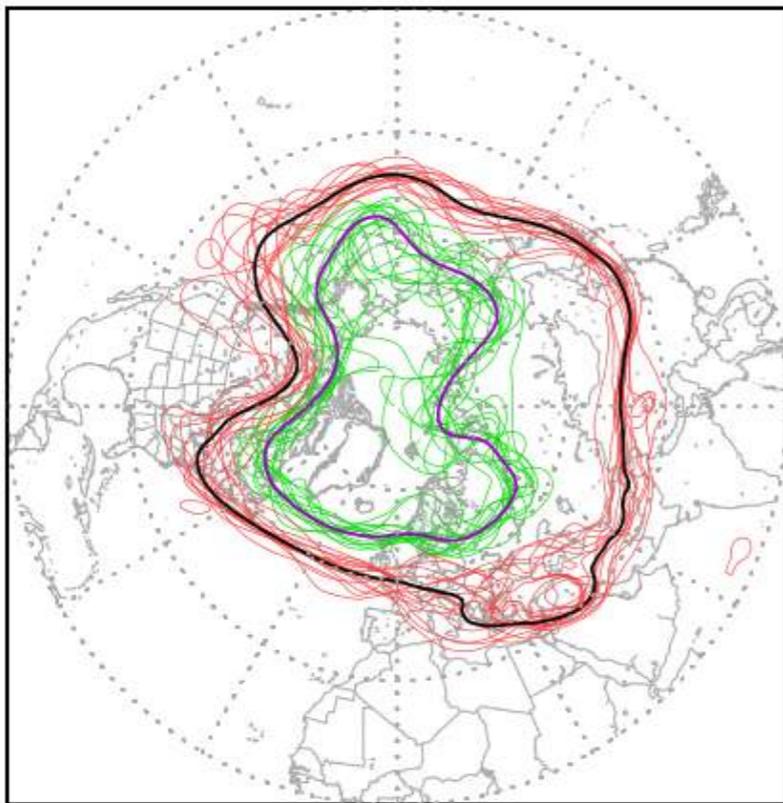
Previsão 15 dias

CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028 CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028

Diagrama "Spaguetti" – Altura Geopotencial (m) (500 hPa)

Previsao a partir de: 2020061600Z Valido para: 2020070100Z

BAM XC50



Membros do Ensemble (5800.0 m) Ensemble Medio (5800.0 m)

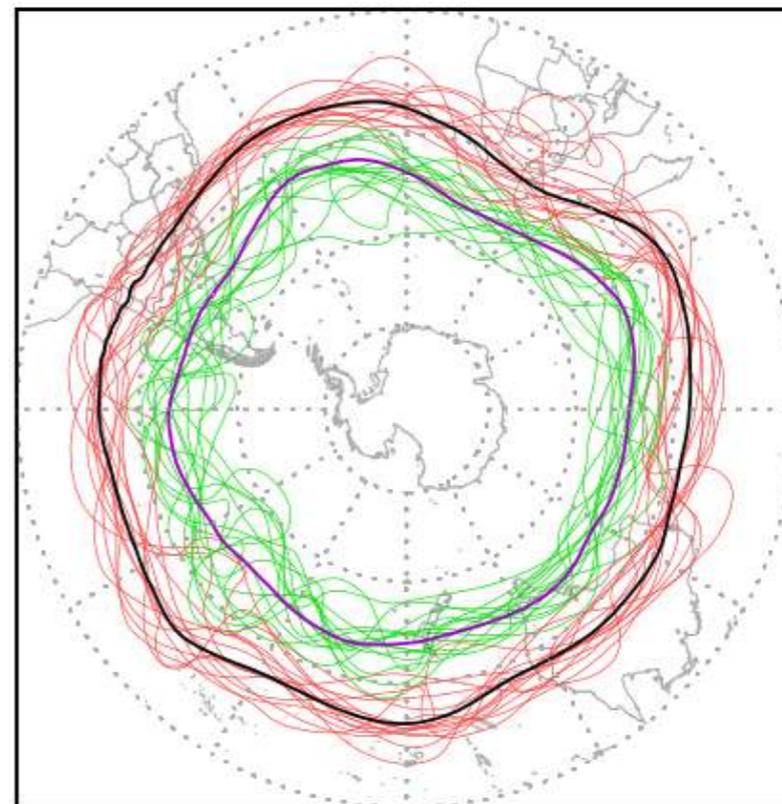
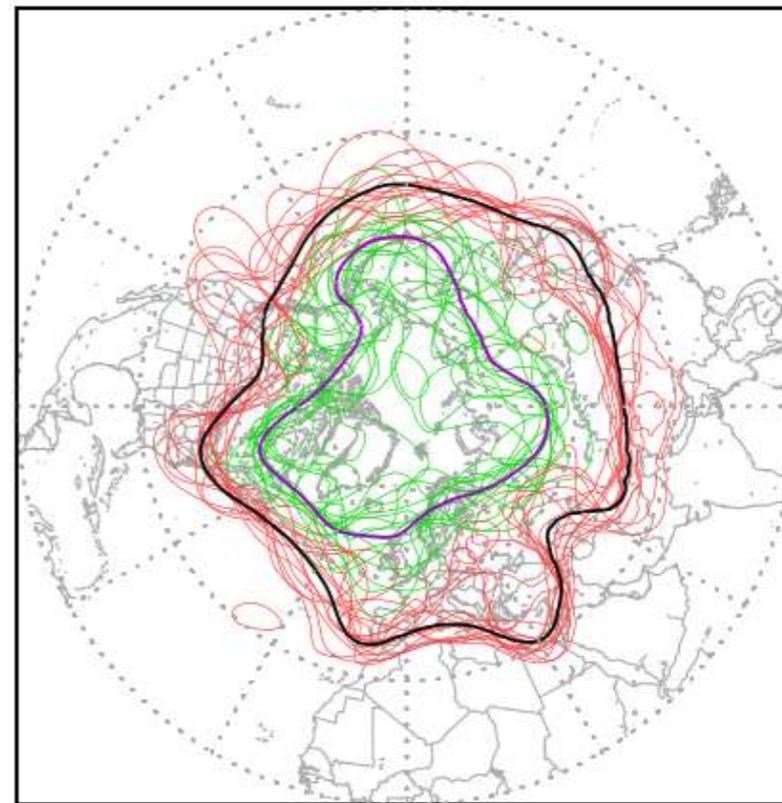
Membros do Ensemble (5600.0 m) Ensemble Medio (5600.0 m)

MCGA XE6

CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028

Diagrama "Spaguetti" – Altura Geopotencial (m) (500 hPa)

Previsao a partir de: 2020061600Z Valido para: 2020070100Z



Membros do Ensemble (5800.0 m) Ensemble Medio (5800.0 m)

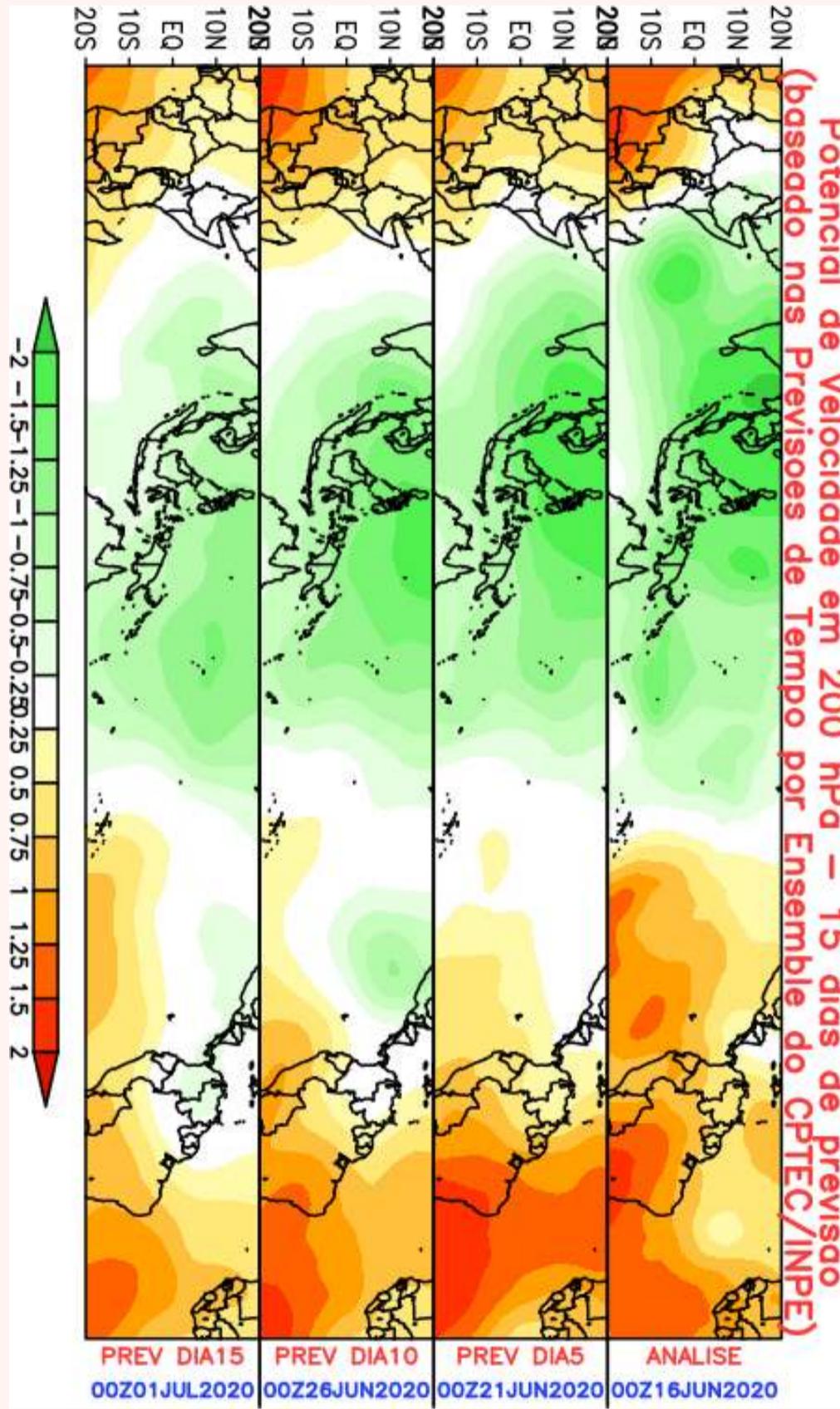
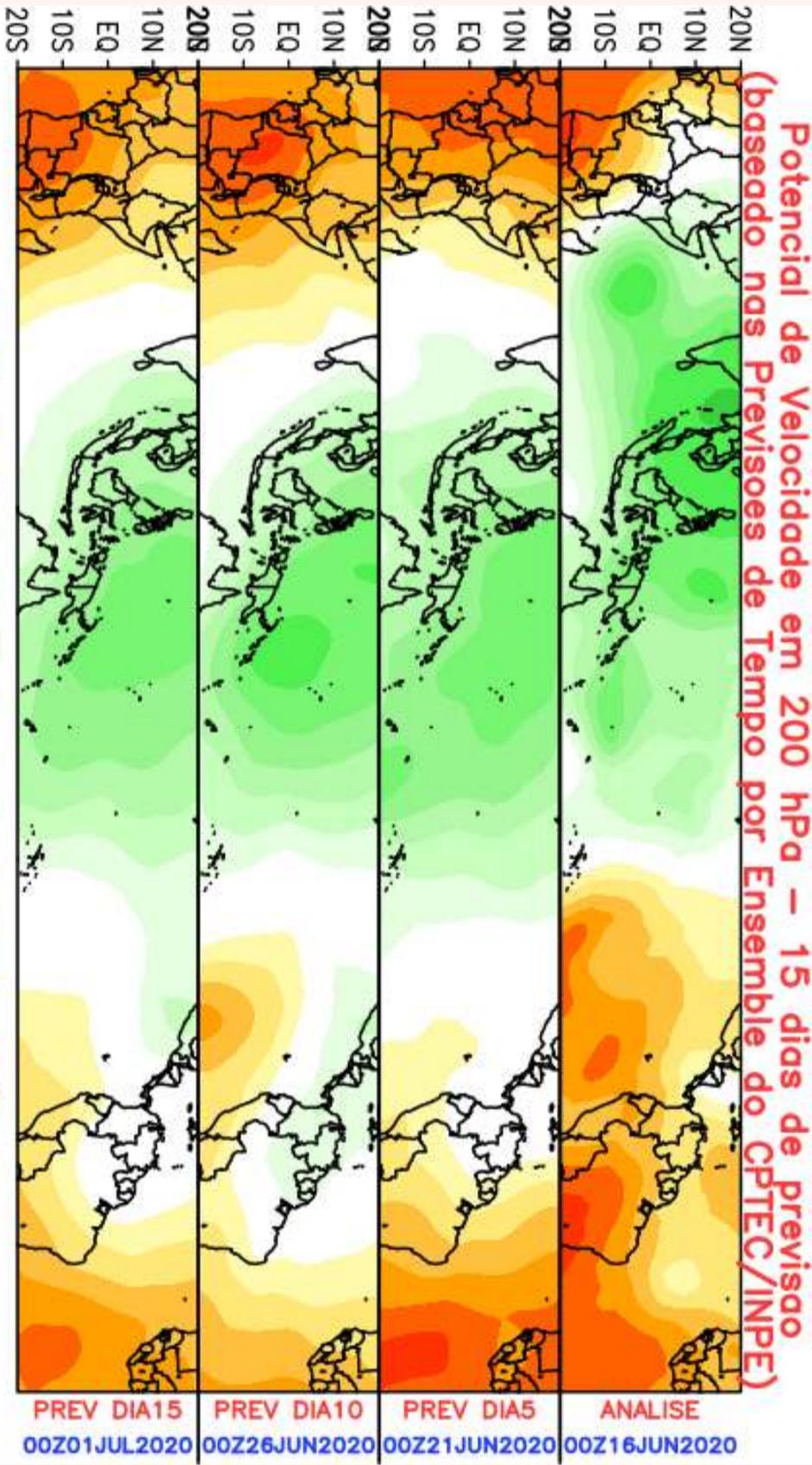
Membros do Ensemble (5600.0 m) Ensemble Medio (5600.0 m)

POTENCIAL DE VELOCIDADE EM 200 HPA

- Gráficos do Potencial de Velocidade em 200 hPa sobre a região Equatorial;
- Análise e previsões de 5, 10 e 15 dias;
- Baseado nas médias dos conjuntos;
- Áreas marcadas em tons verde indicam a convergência dos ventos em 200 hPa (subsidiência abaixo, inibe a convecção);
- Áreas marcadas em tons de marrom indicam a divergência dos ventos em 200 hPa (convergência abaixo, indica a convecção);

MCGA XE6

BAM XC50



PREVISÕES DE PROBABILIDADES

- Previsões de probabilidades de precipitação maior do que 1, 5, 10 e 20 mm;
- Figuras plotadas para a América do Sul;
- Chance acima de 65%:
 - Para 1 mm: alta possibilidade de algum tipo de precipitação;
- Chance abaixo de 35%:
 - Para 1mm: baixa possibilidade de algum tipo de precipitação;

Categorias	Limiares (mm)
Chuva/não chuva	1 mm
Fraca	5 mm
Moderada	10 mm
Forte	20 mm

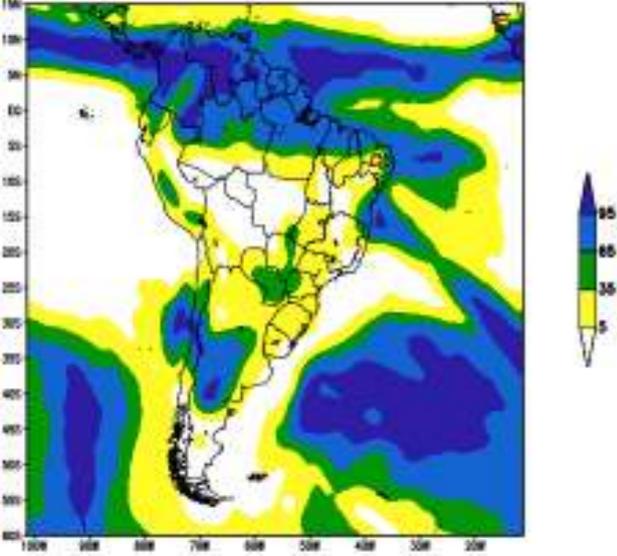
BAM XC50

MCGA XE6

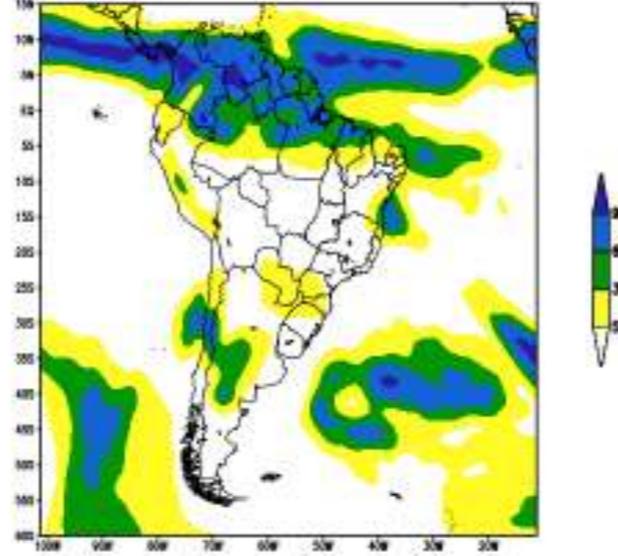
CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Previsao de Probabilidades (%) – A partir de: 2020062300Z Valido para: 2020070100Z

CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Previsao de Probabilidades (%) – A partir de: 2020062300Z Valido para: 2020070100Z

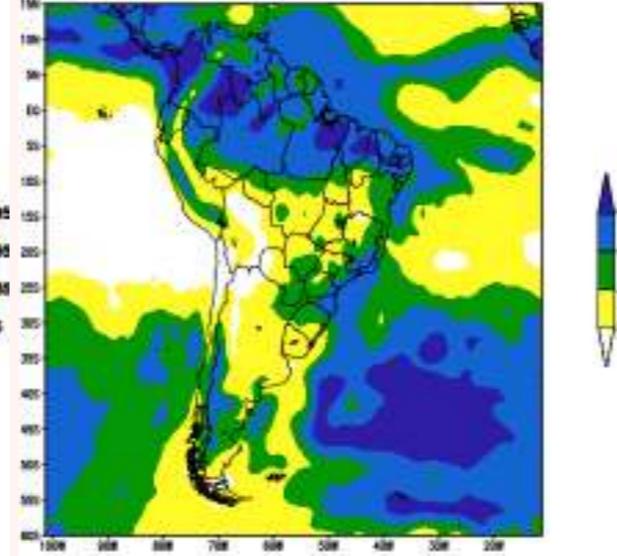
Precipitacao acumulada em 24 hrs > 1.0 mm



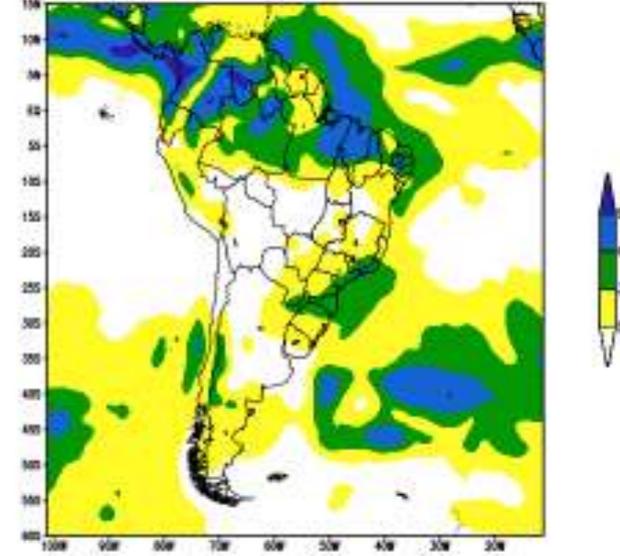
Precipitacao acumulada em 24 hrs > 5.0 mm



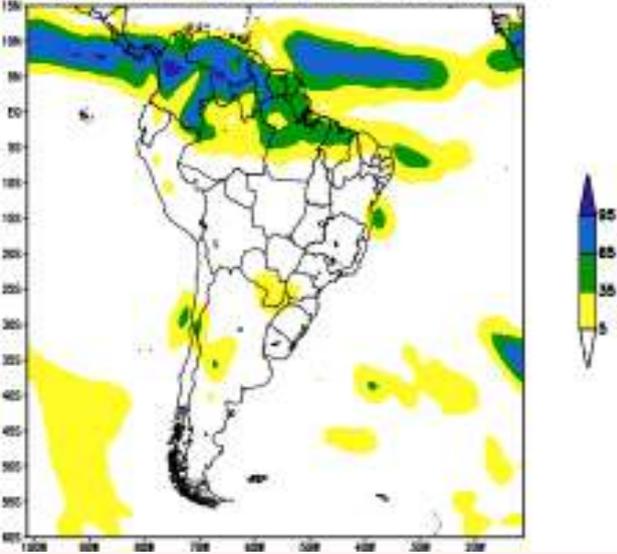
Precipitacao acumulada em 24 hrs > 1.0 mm



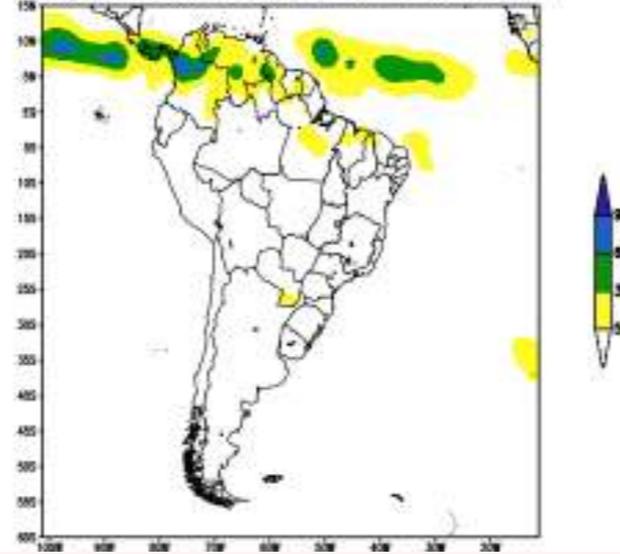
Precipitacao acumulada em 24 hrs > 5.0 mm



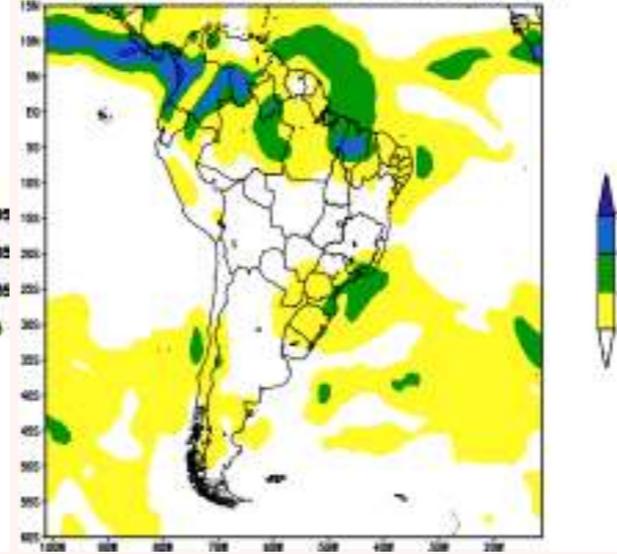
Precipitacao acumulada em 24 hrs > 10.0 mm



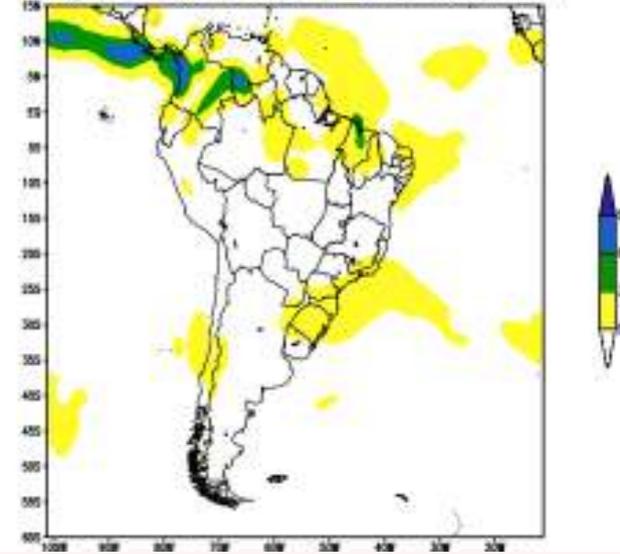
Precipitacao acumulada em 24 hrs > 20.0 mm



Precipitacao acumulada em 24 hrs > 10.0 mm



Precipitacao acumulada em 24 hrs > 20.0 mm



Previsão 7 dias

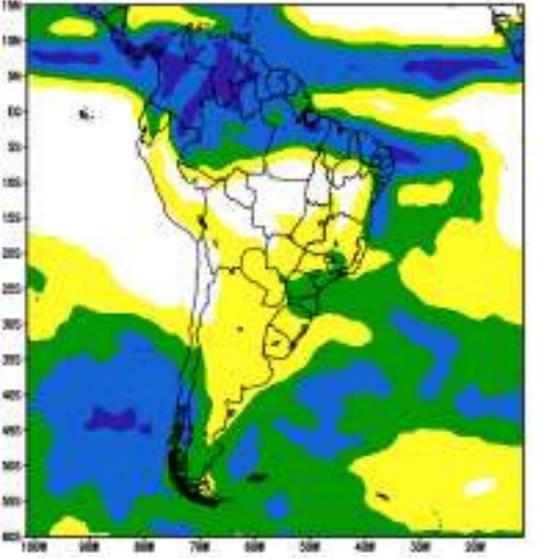
BAM XC50

MCGA XE6

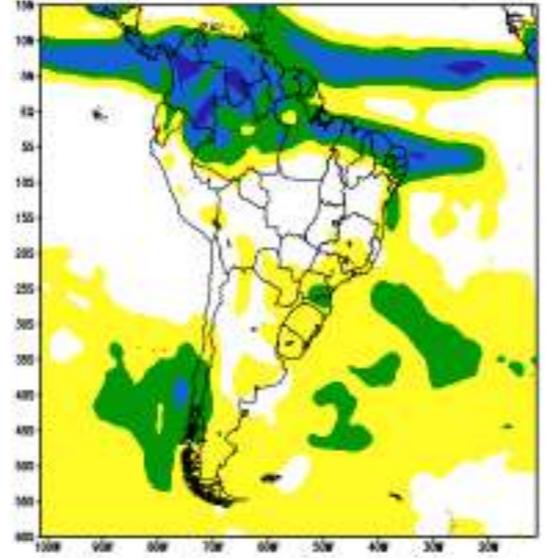
CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Previsao de Probabilidades (%) – A partir de: 2020061600Z Valido para: 2020070100Z

CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Previsao de Probabilidades (%) – A partir de: 2020061600Z Valido para: 2020070100Z

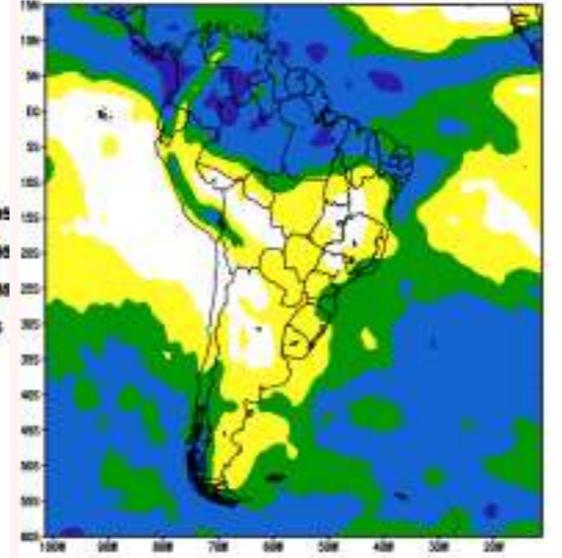
Precipitacao acumulada em 24 hrs > 1.0 mm



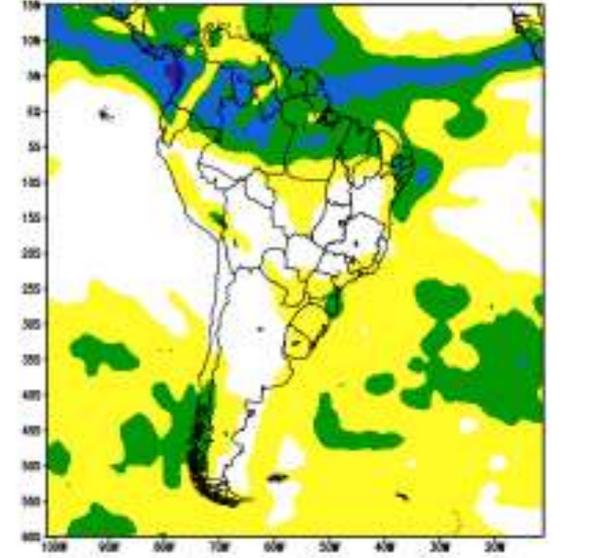
Precipitacao acumulada em 24 hrs > 5.0 mm



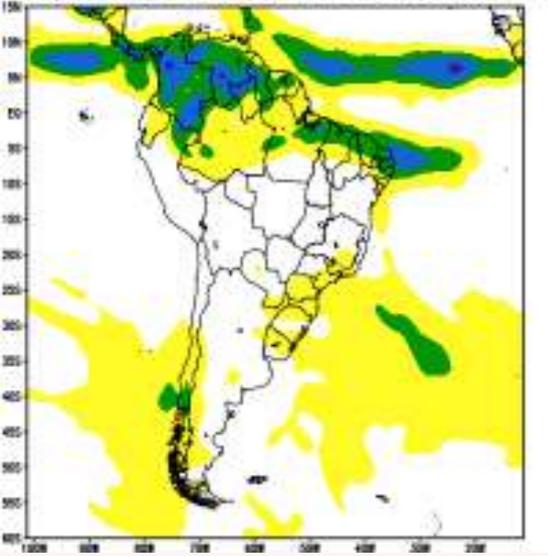
Precipitacao acumulada em 24 hrs > 1.0 mm



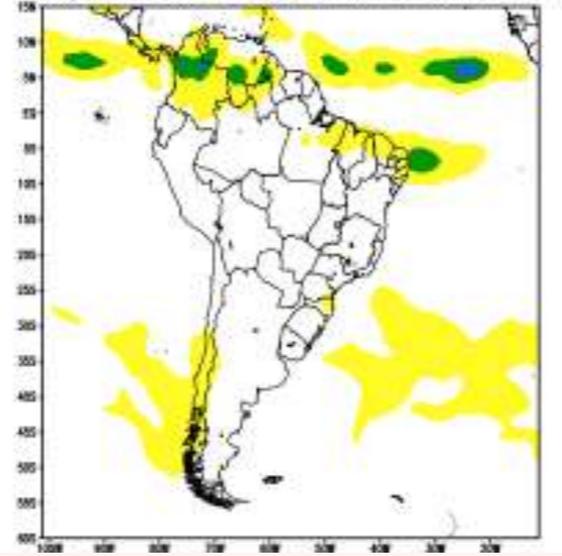
Precipitacao acumulada em 24 hrs > 5.0 mm



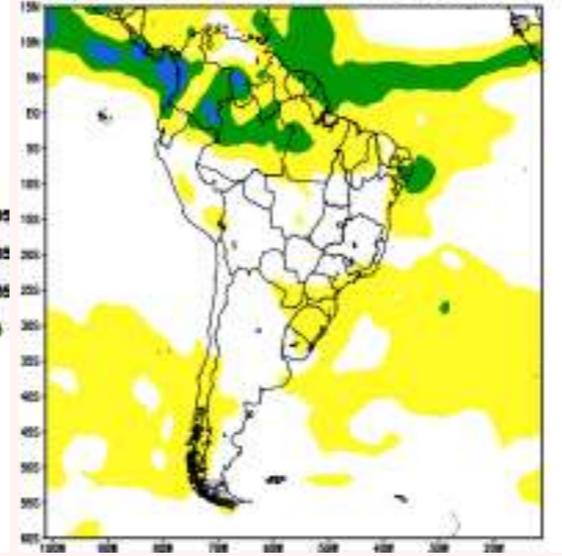
Precipitacao acumulada em 24 hrs > 10.0 mm



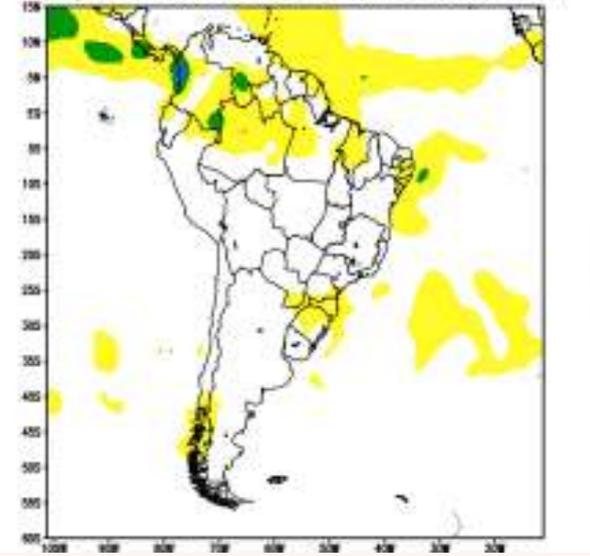
Precipitacao acumulada em 24 hrs > 20.0 mm



Precipitacao acumulada em 24 hrs > 10.0 mm



Precipitacao acumulada em 24 hrs > 20.0 mm

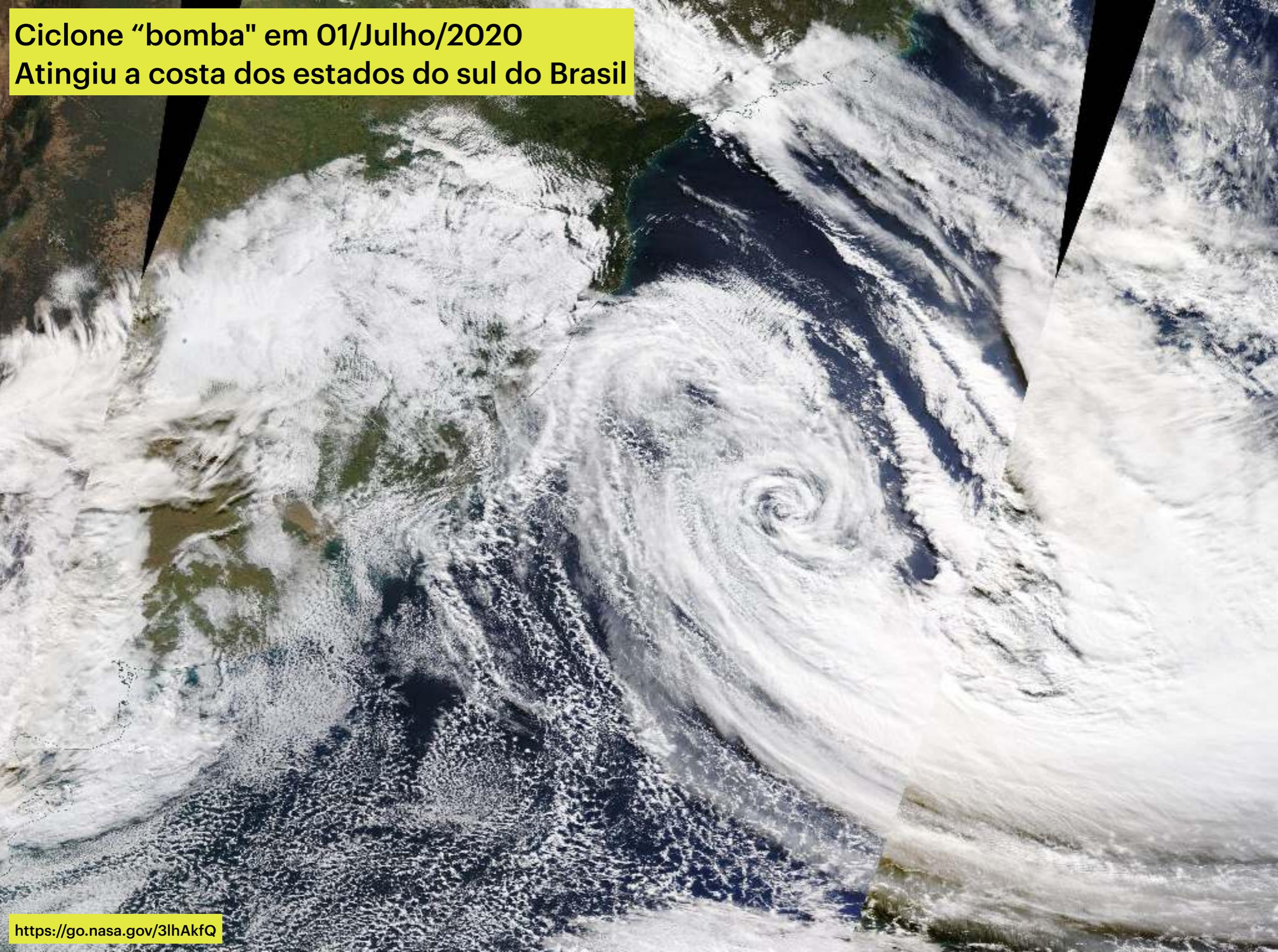


Previsão 15 dias

AVALIAÇÃO ESPACIAL DA PRECIPITAÇÃO

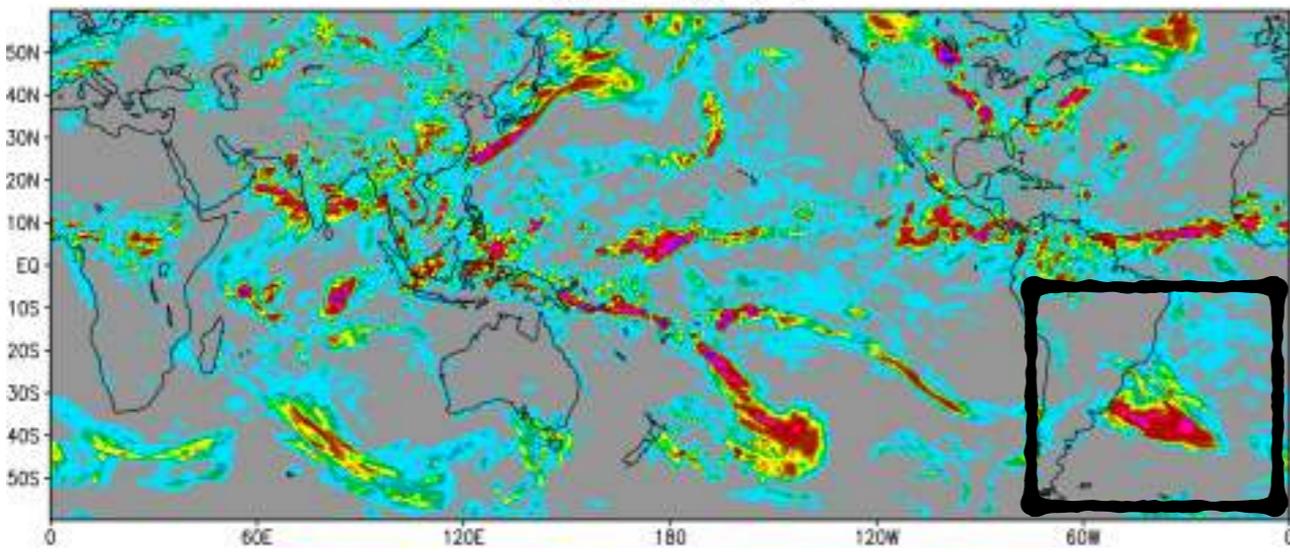
- Ciclone bomba ocorrido em 2020070100;
- Comparação das previsões de 48 horas 144 horas (6 dias) com as previsões do modelo BAM (~20 km) e GFS (~13 km) e CMORPH (~8 km);

**Ciclone "bomba" em 01/Julho/2020
Atingiu a costa dos estados do sul do Brasil**

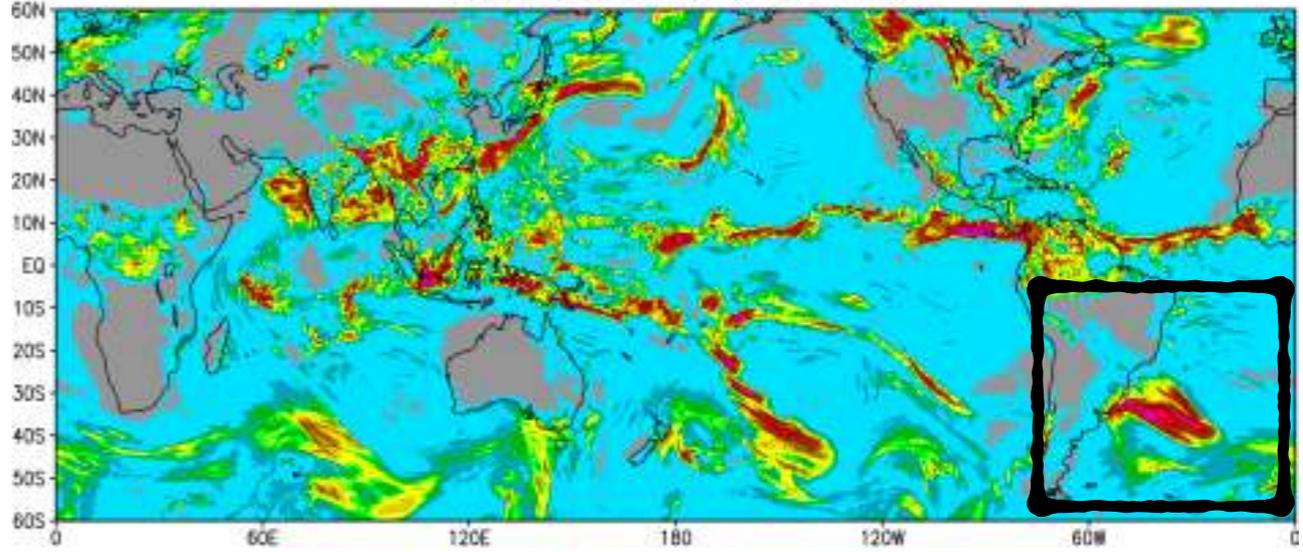


<https://go.nasa.gov/3lhAkfQ>

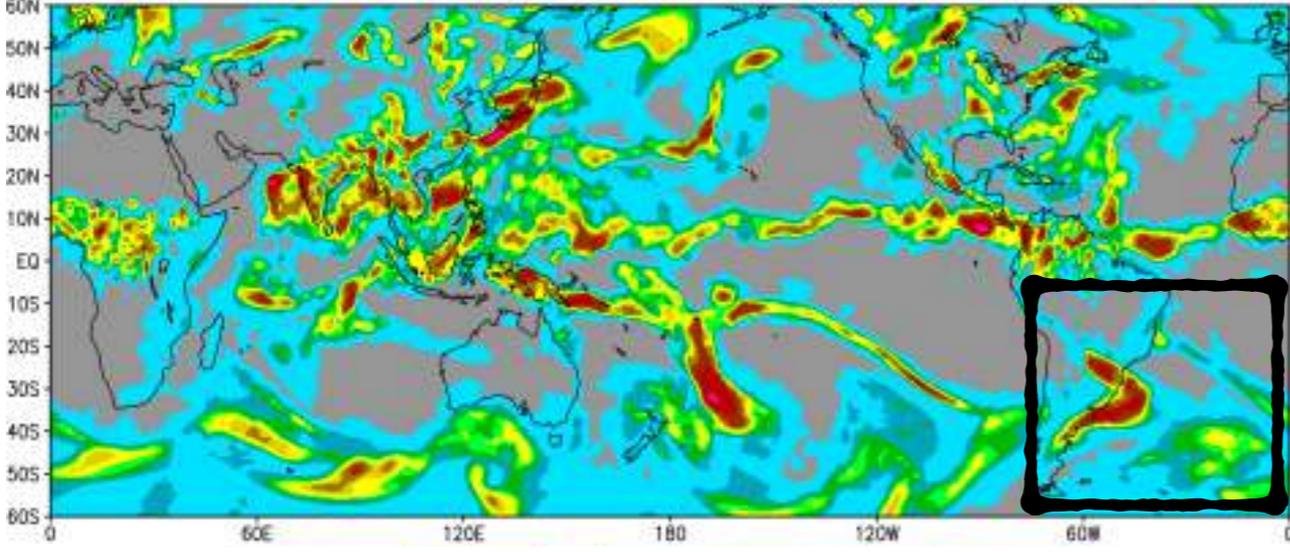
PRECIPITATION (mm/day) for 2020070100 (OBS) (análise: 2020062900) CMORPH (8 km)



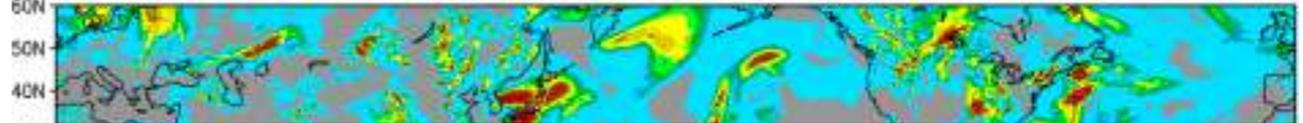
PRECIPITATION (mm/day) for 2020070100 (FCT 48h) NCEP GFS FV3 (~13 km)



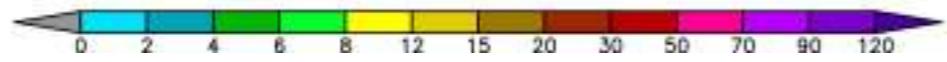
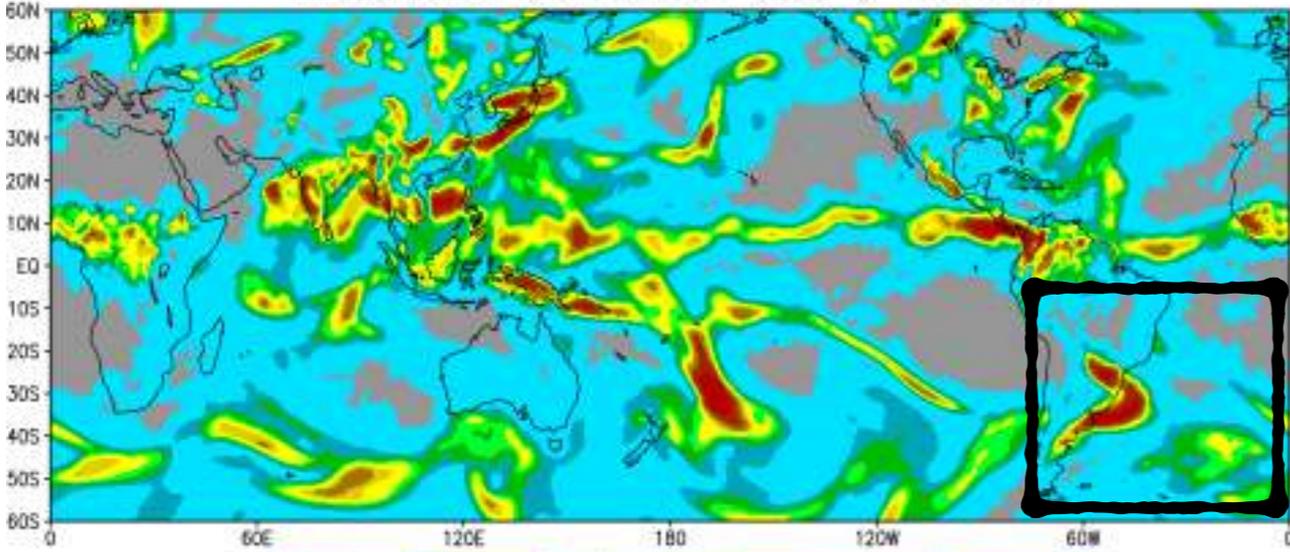
PRECIPITATION (mm/day) for 2020070100 (FCT 48h) OENS CTR TQ0126L028 XC50 (~100 km)



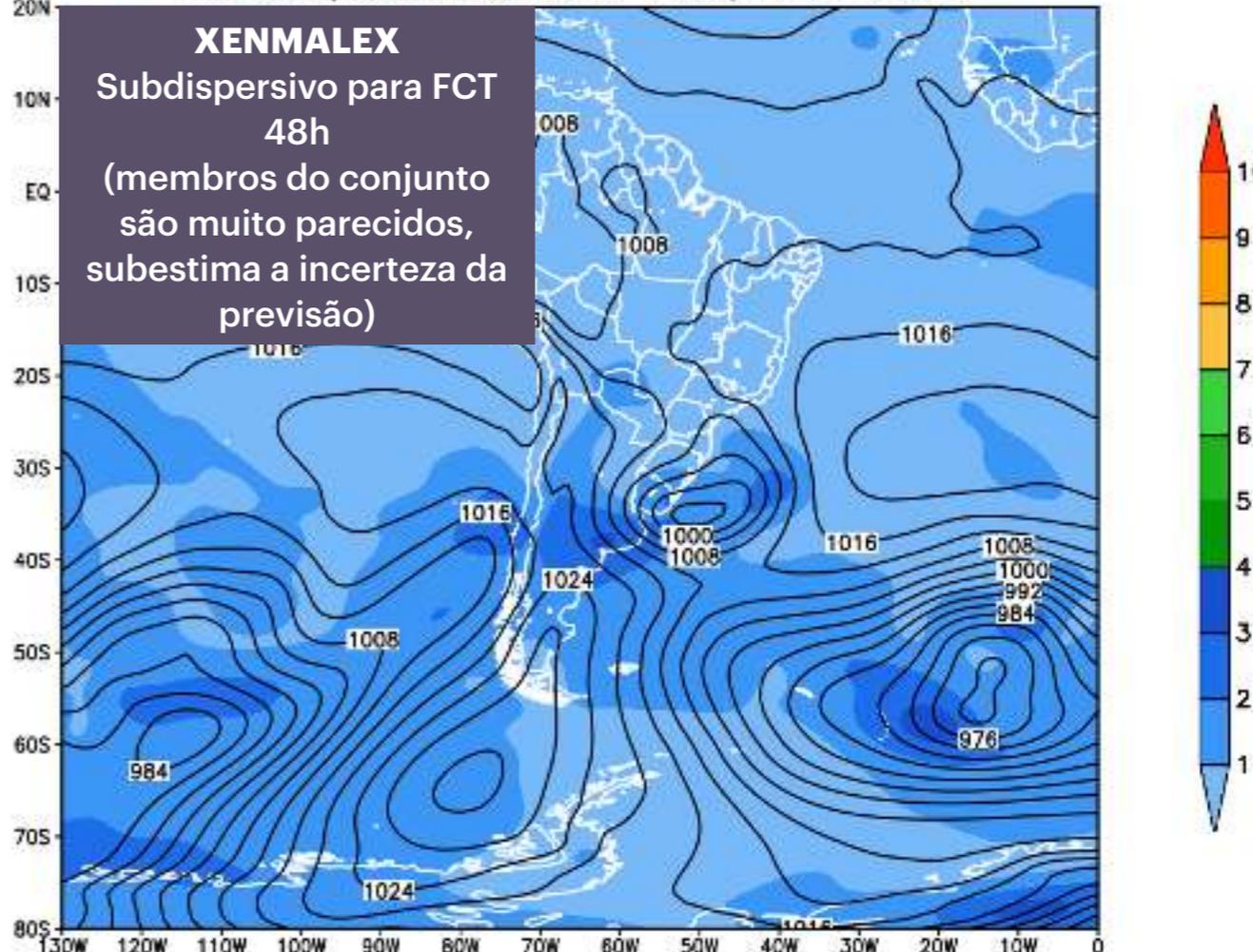
PRECIPITATION (mm/day) for 2020070100 (FCT 48h) BAM TQ0666L064 (~20 km)



PRECIPITATION (mm/day) for 2020070100 (FCT 48h) OENS MEAN TQ0126L028 XC50 (~100 km)



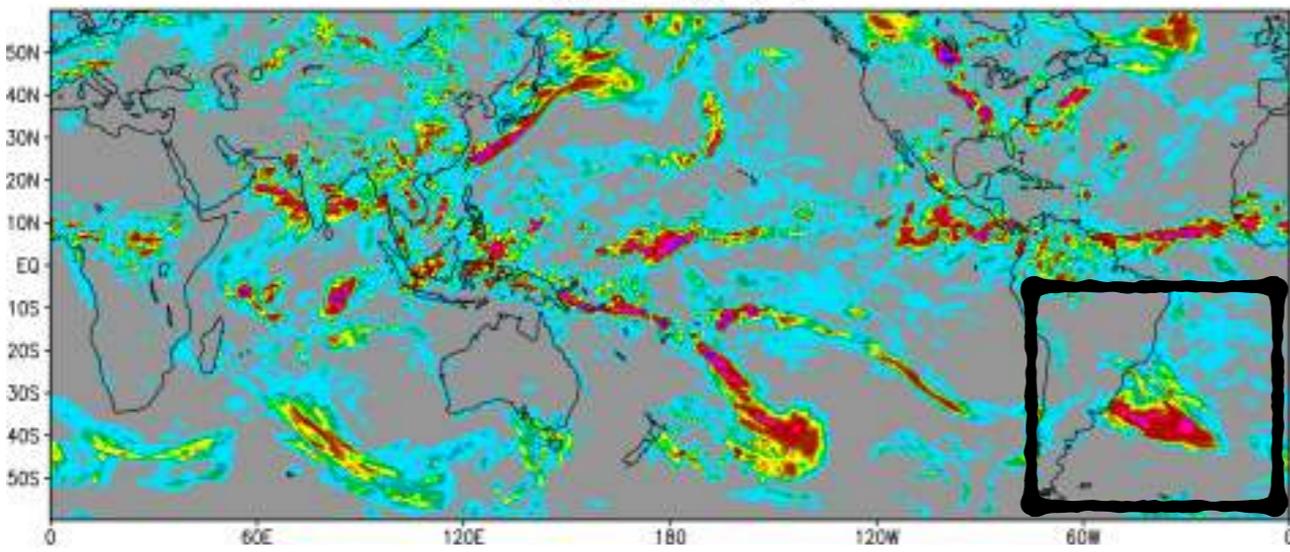
CPTEC/INPE/MCT – PREVISAO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028 Pressao ao Nivel Medio do Mar * (hPa) [contorno] – Espalhamento do Ensemble (hPa) [cores] Previsao a partir de: 2020062900Z Valido para: 2020070100Z



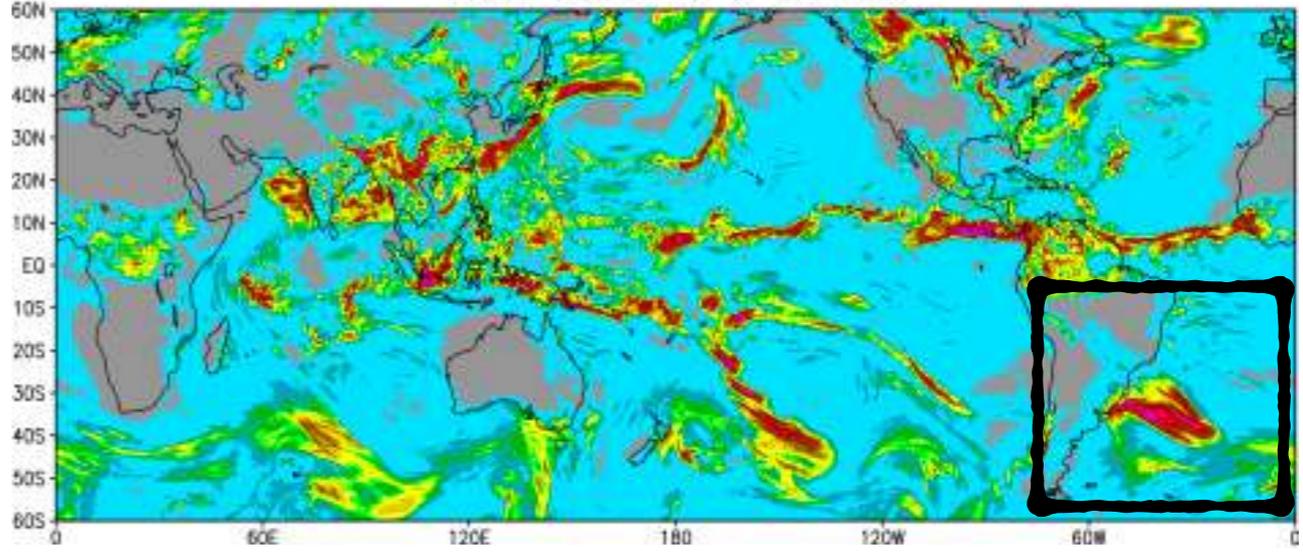
XENMALEX
 Subdispersivo para FCT 48h
 (membros do conjunto são muito parecidos, subestima a incerteza da previsão)

* Media do Conjunto de Previsoes

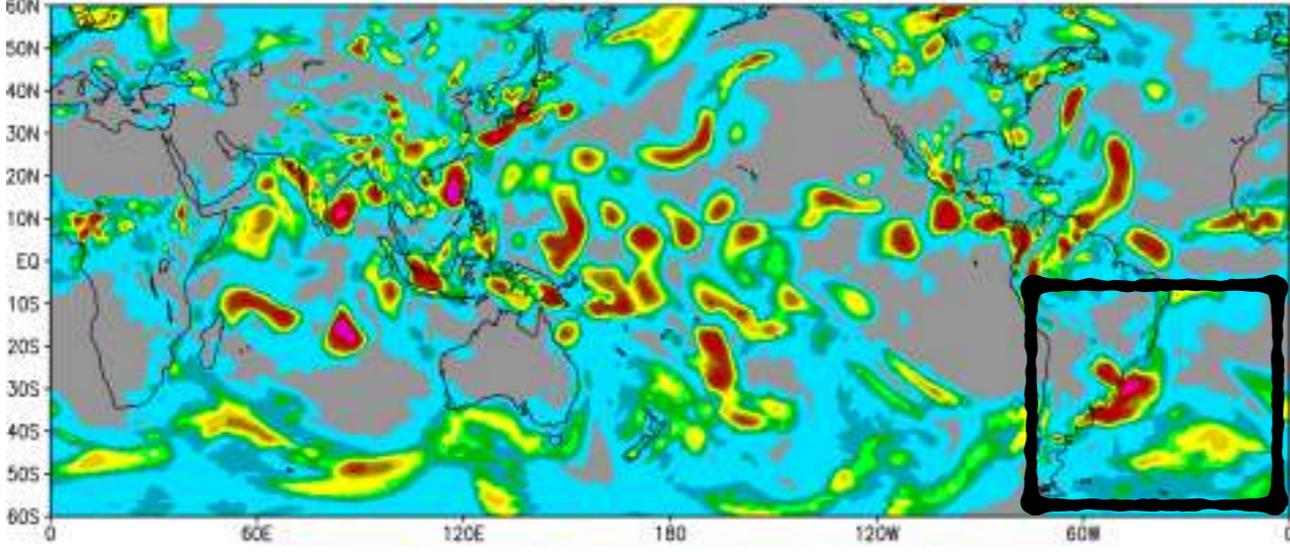
PRECIPITATION (mm/day) for 2020070100 (OBS) (análise: 2020062900) CMORPH (8 km)



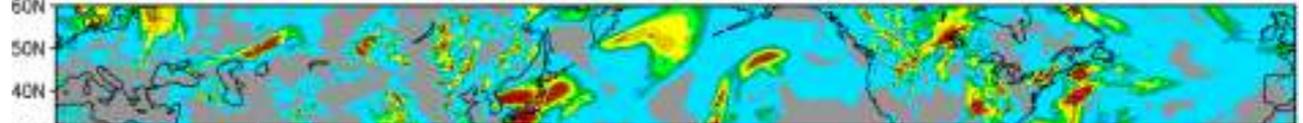
PRECIPITATION (mm/day) for 2020070100 (FCT 48h) NCEP GFS FV3 (~13 km)



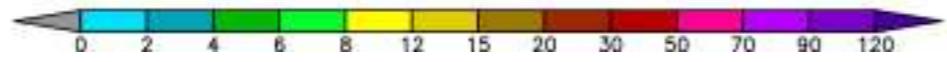
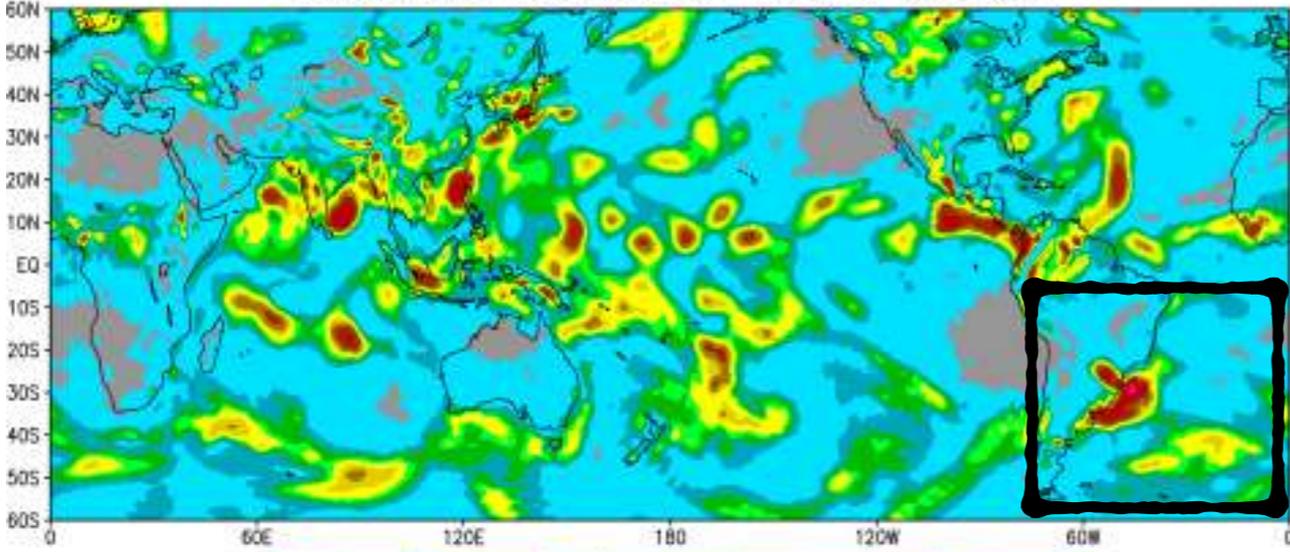
PRECIPITATION (mm/day) for 2020070100 (FCT 48h) OENS CTR TQ0126L028 TUPA (~100 km)



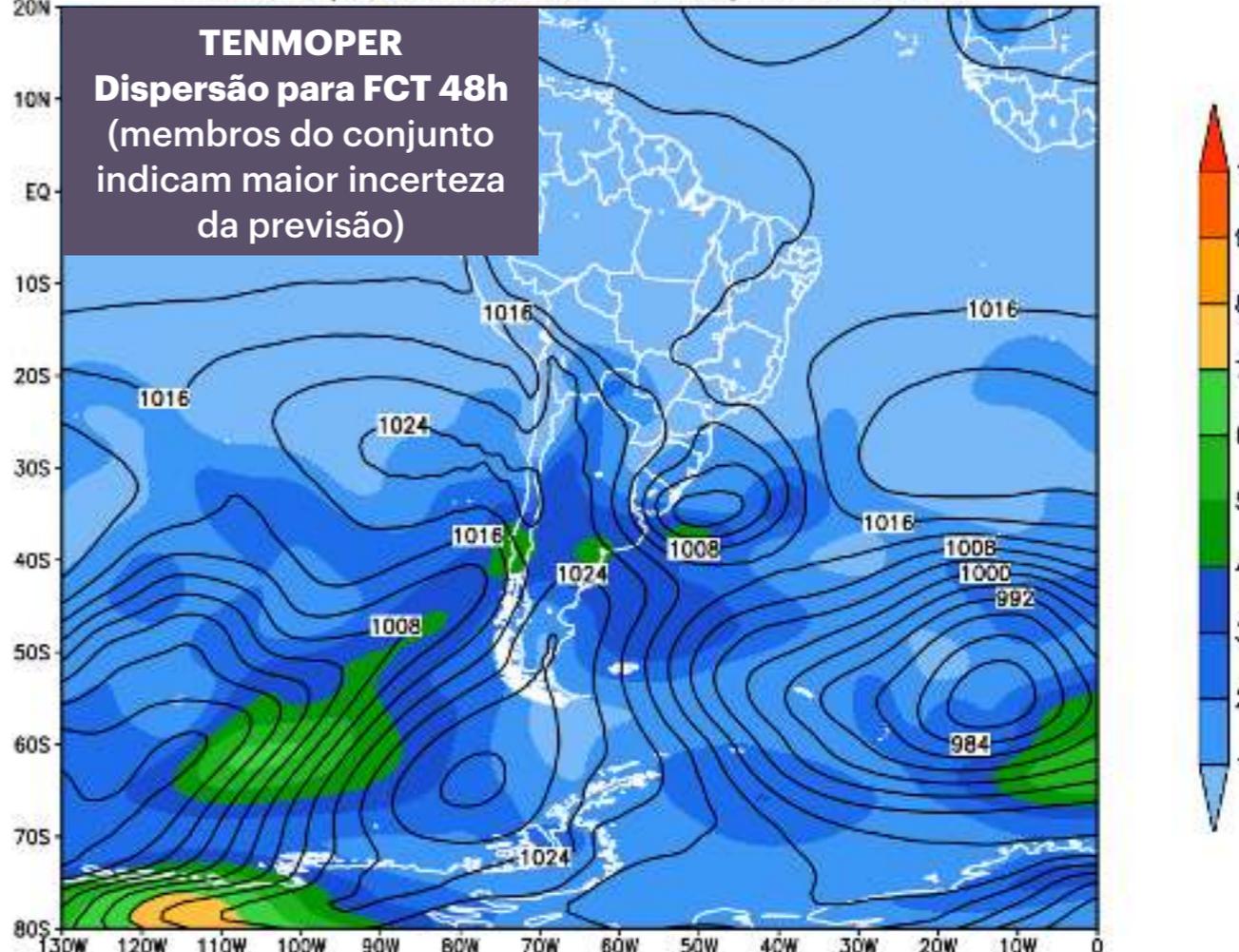
PRECIPITATION (mm/day) for 2020070100 (FCT 48h) BAM TQ0666L064 (~20 km)



PRECIPITATION (mm/day) for 2020070100 (FCT 48h) OENS MEAN TQ0126L028 TUPA (~100 km)



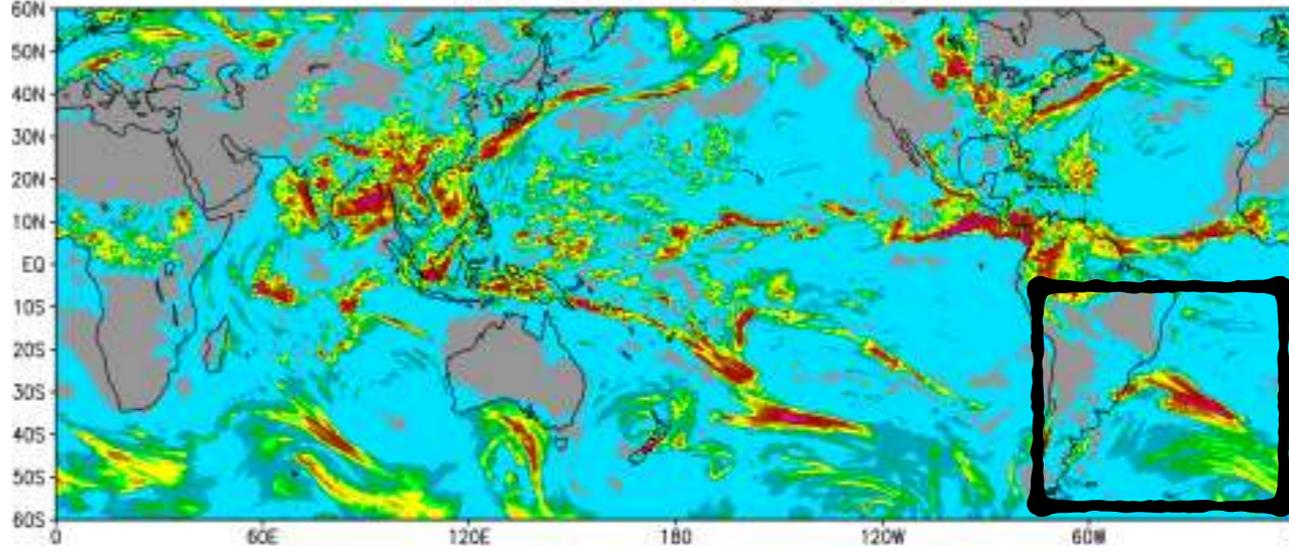
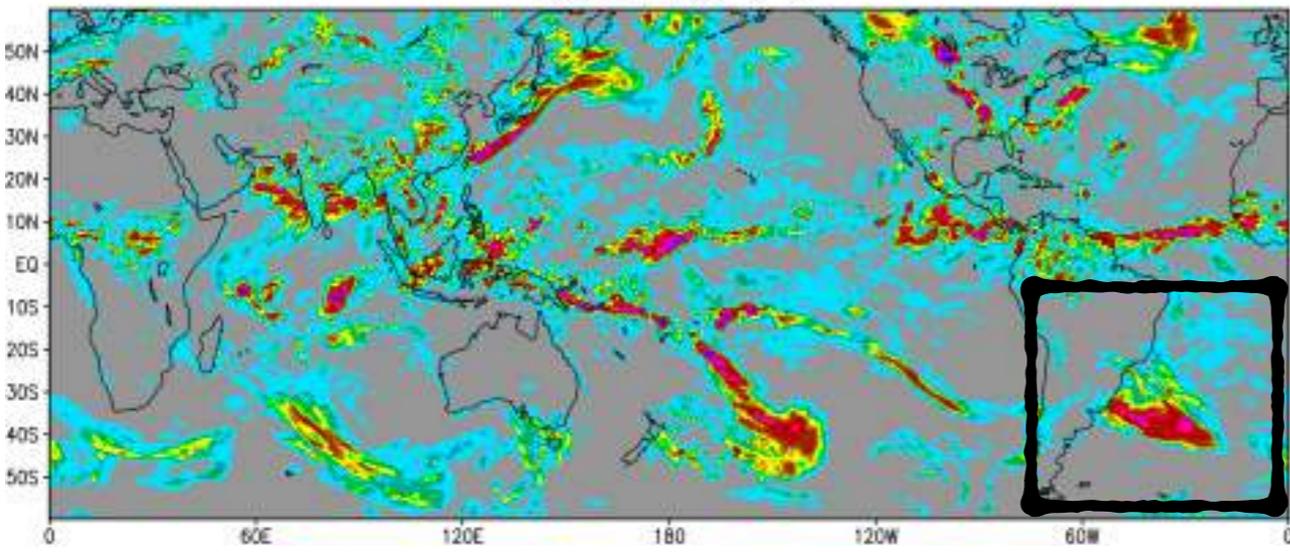
CPTEC/INPE/MCT – PREVISÃO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028 Pressão ao Nível Médio do Mar * (hPa) [contorno] – Espalhamento do Ensemble (hPa) [cores] Previsão a partir de: 2020062900Z Valido para: 2020070100Z



* Media do Conjunto de Previsões

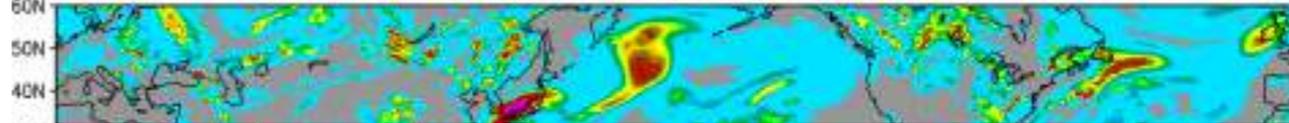
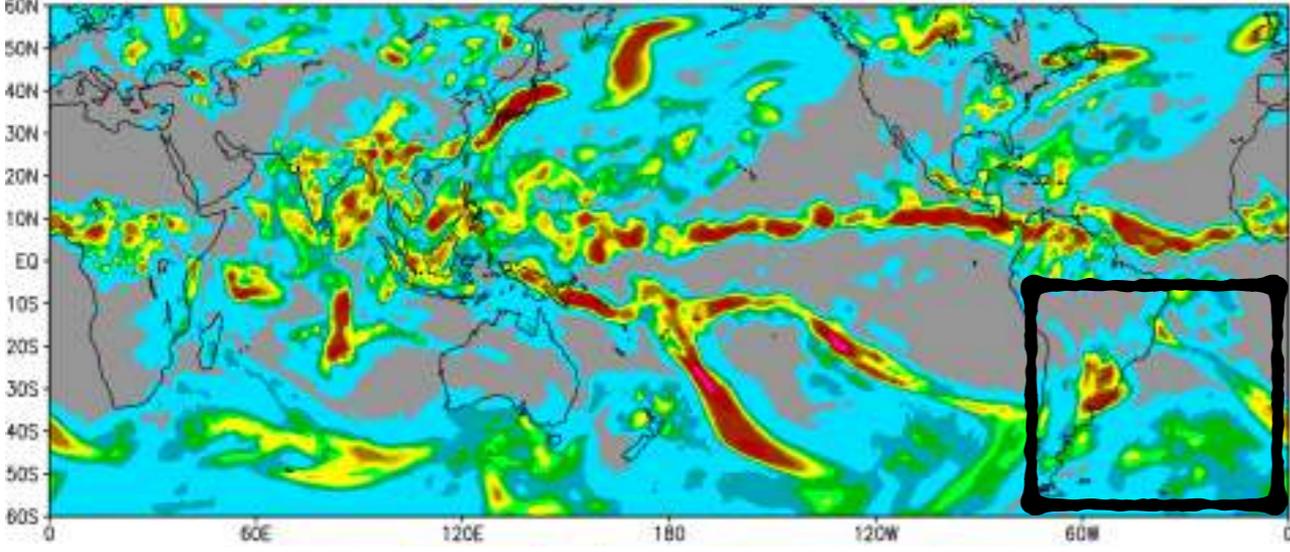
PRECIPITATION (mm/day) for 2020070100 (OBS) (análise: 2020062500) CMORPH (8 km)

PRECIPITATION (mm/day) for 2020070100 (FCT 144h) NCEP GFS FV3 (~13 km)

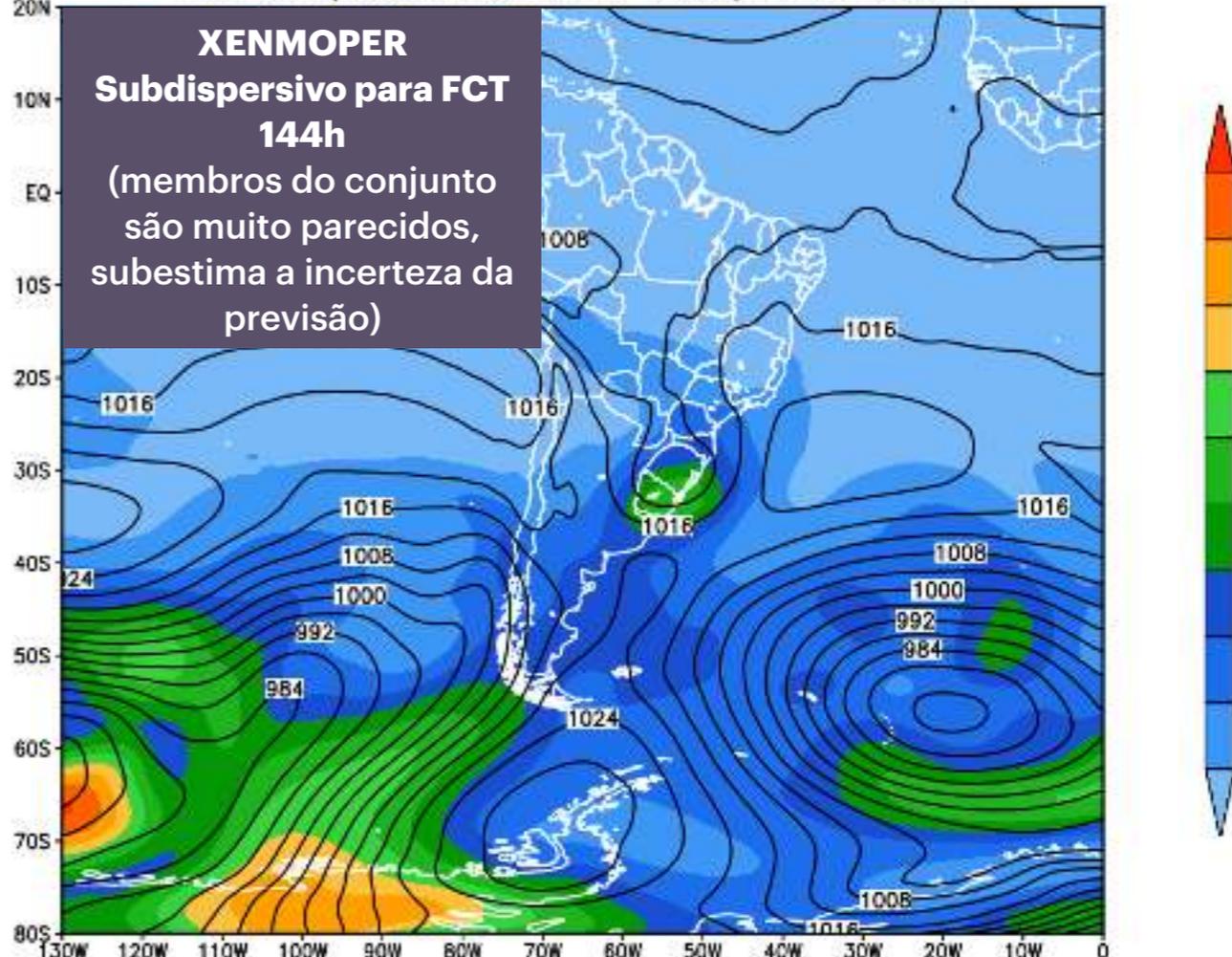


PRECIPITATION (mm/day) for 2020070100 (FCT 144h) OENS CTR TQ0126L028 XC50 (~100 km)

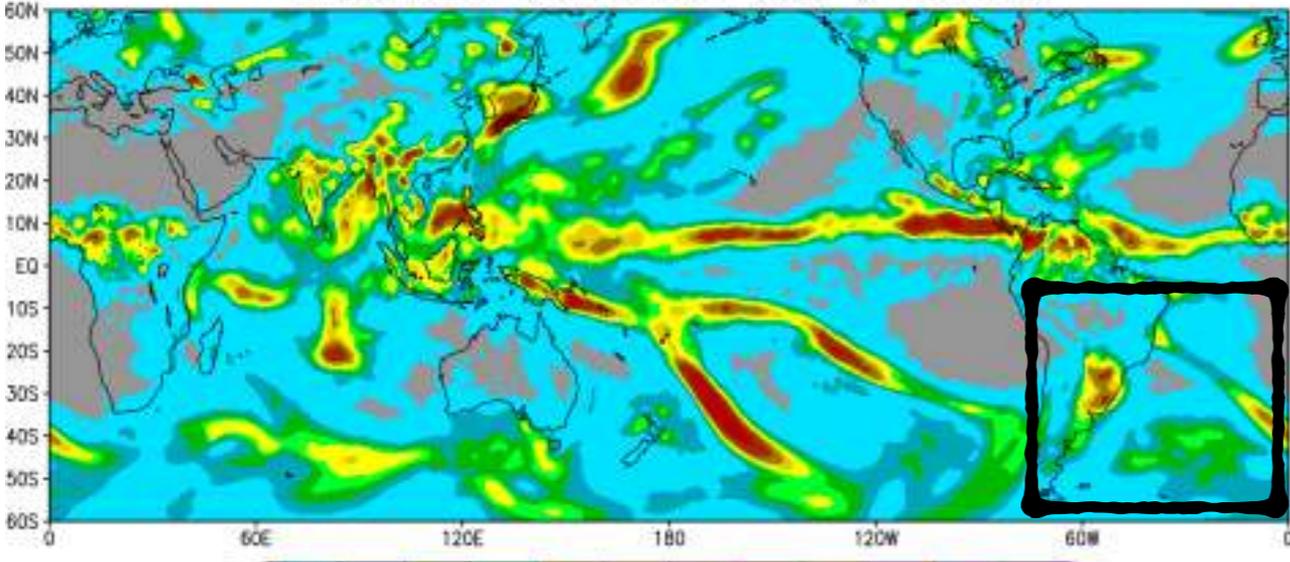
PRECIPITATION (mm/day) for 2020070100 (FCT 144h) BAM TQ0666L064 (~20 km)



CPTEC/INPE/MCT - PREVISAO DE TEMPO GLOBAL POR ENSEMBLE - TQ0126L028
Pressao ao Nivel Medio do Mar * (hPa) [contorno] - Espalhamento do Ensemble (hPa) [cores]
Previsao a partir de: 2020062500Z Valido para: 2020070100Z



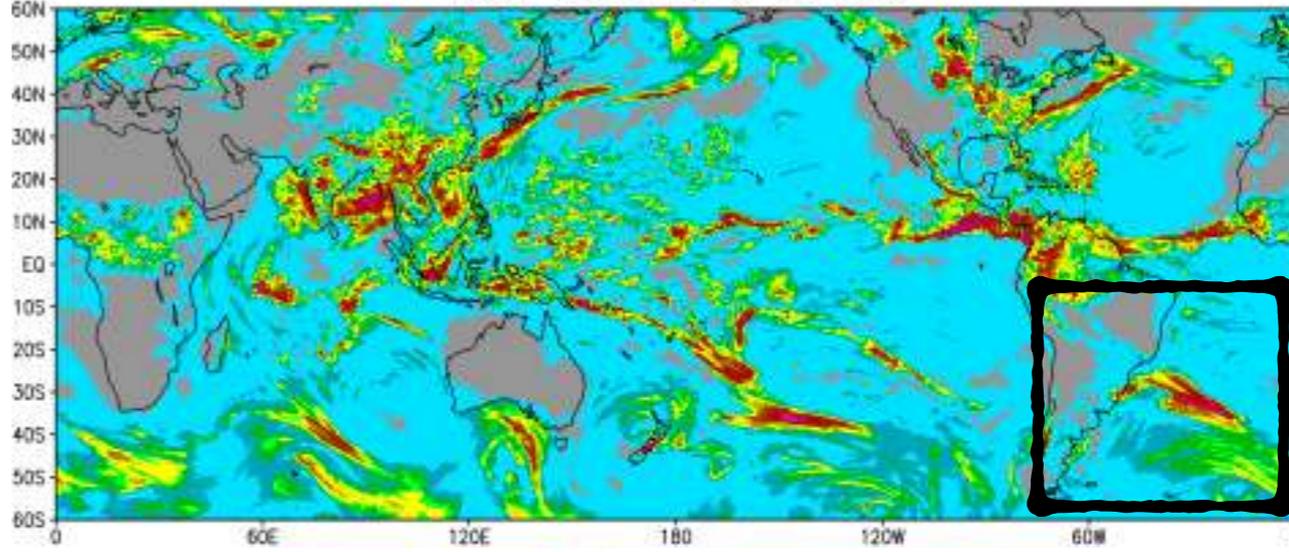
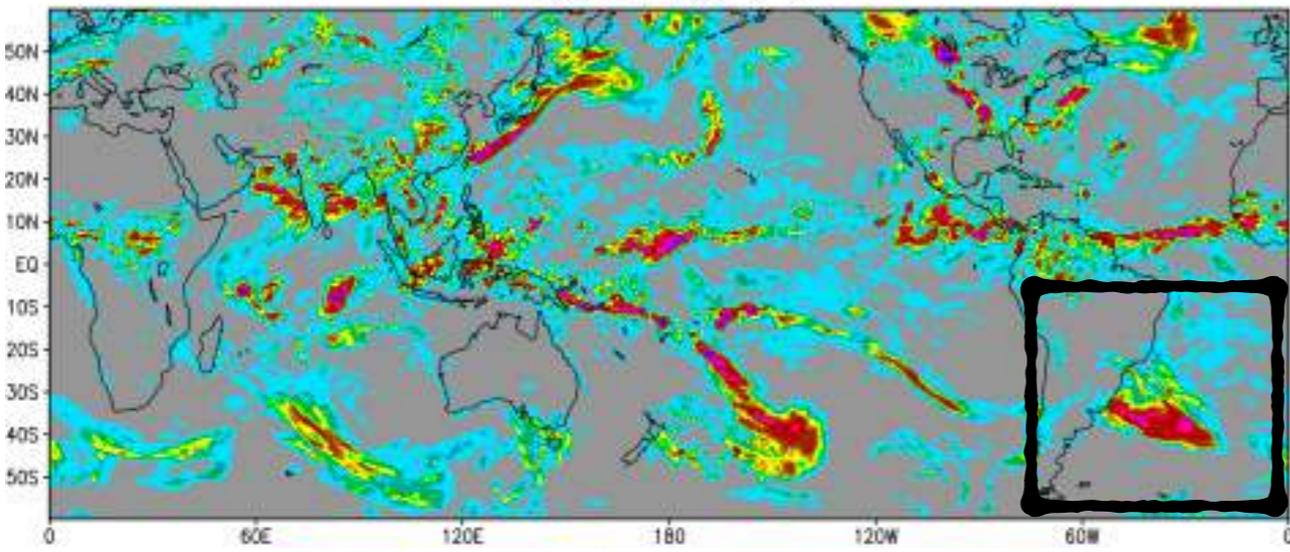
PRECIPITATION (mm/day) for 2020070100 (FCT 144h) OENS MEAN TQ0126L028 XC50 (~100 km)



* Media do Conjunto de Previsoes

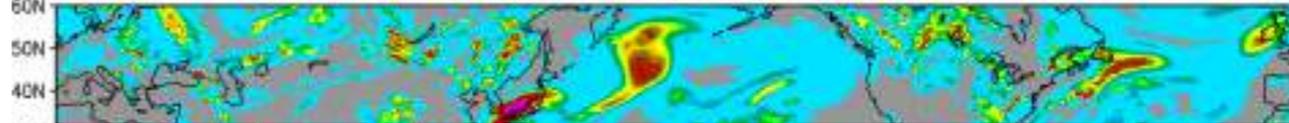
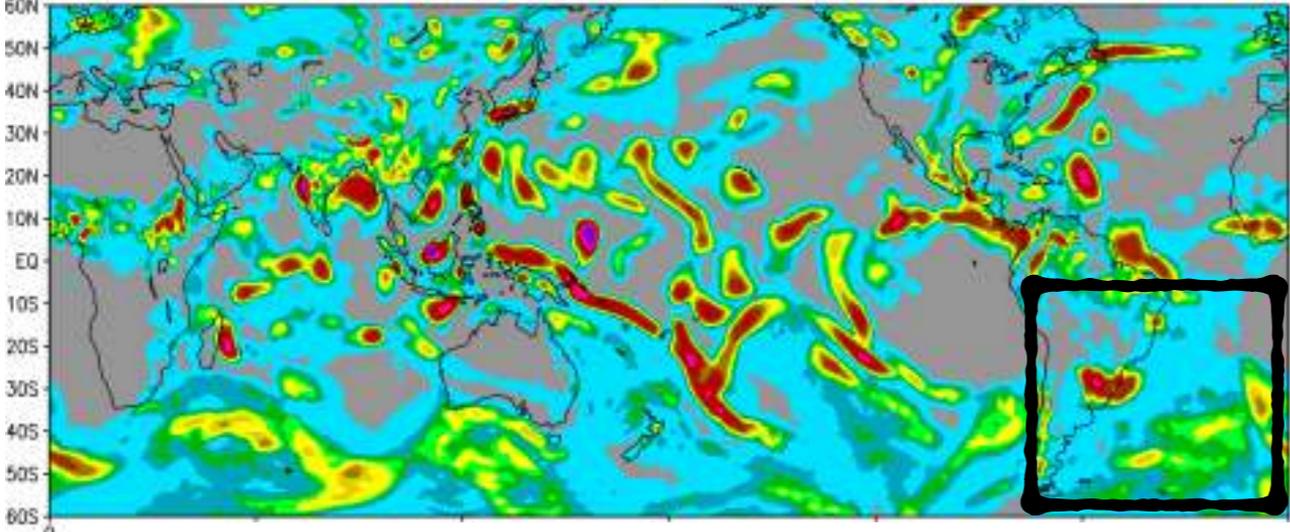
PRECIPITATION (mm/day) for 2020070100 (OBS) (análise: 2020062500) CMORPH (8 km)

PRECIPITATION (mm/day) for 2020070100 (FCT 144h) NCEP GFS FV3 (~13 km)



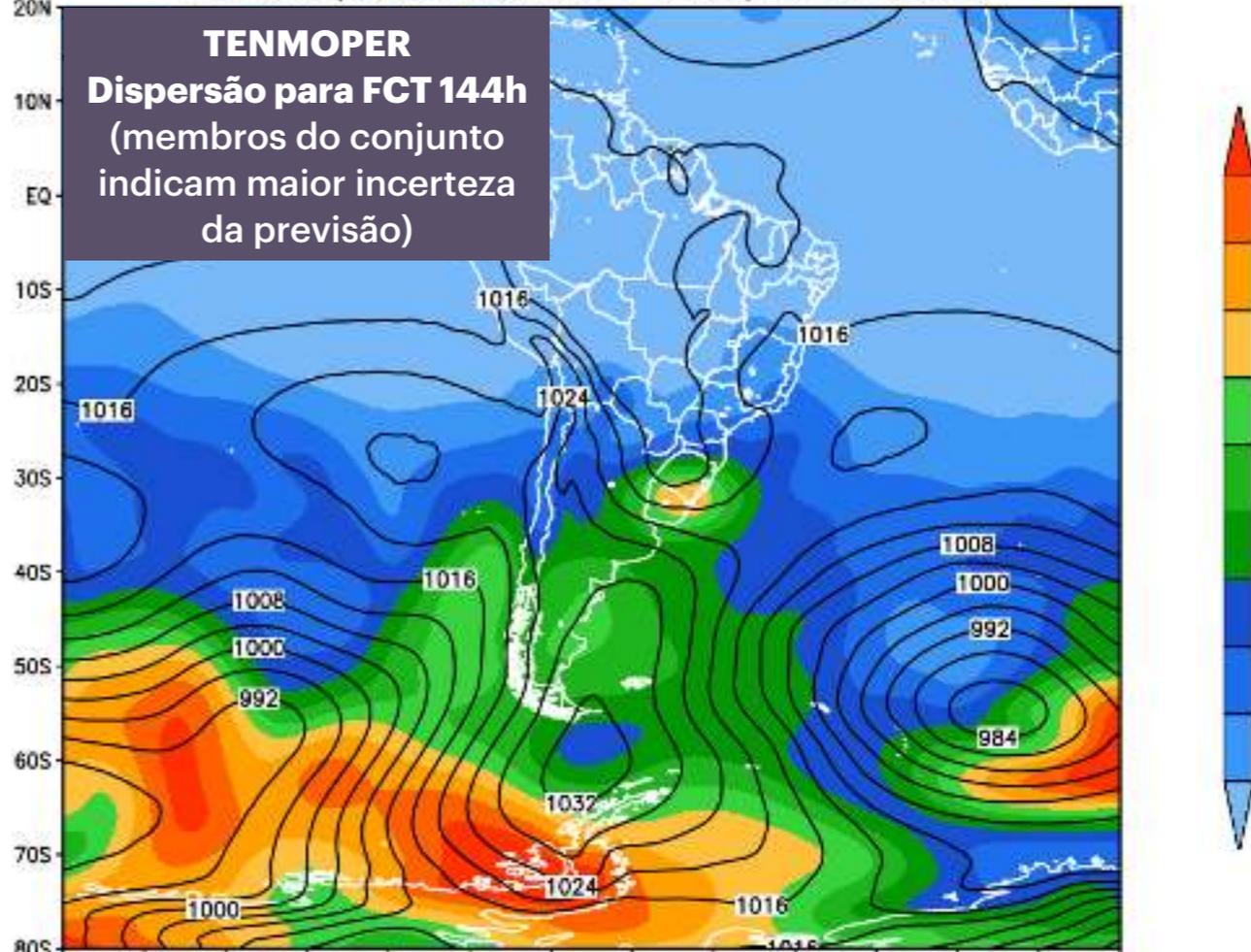
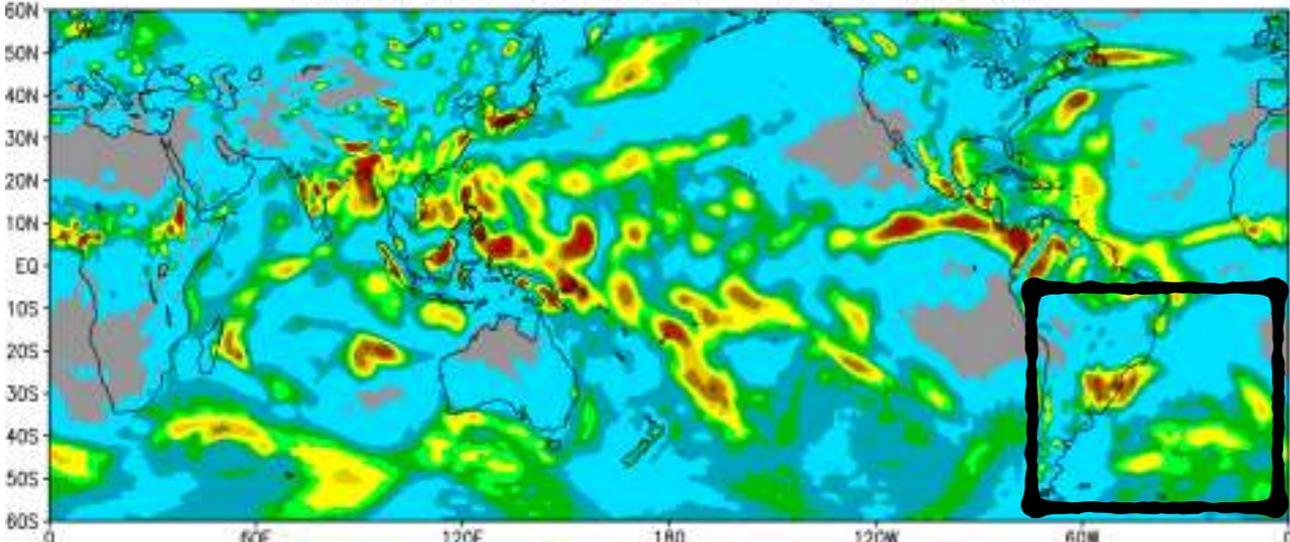
PRECIPITATION (mm/day) for 2020070100 (FCT 144h) OENS CTR TQ0126L028 TUPA (~100 km)

PRECIPITATION (mm/day) for 2020070100 (FCT 144h) BAM TQ0666L064 (~20 km)



CPTEC/INPE/MCT – PREVISÃO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
 Pressão ao Nível Médio do Mar * (hPa) [contorno] – Espalhamento do Ensemble (hPa) [cores]
 Previsão a partir de: 2020062500Z Valido para: 2020070100Z

PRECIPITATION (mm/day) for 2020070100 (FCT 144h) OENS MEAN TQ0126L028 TUPA (~100 km)



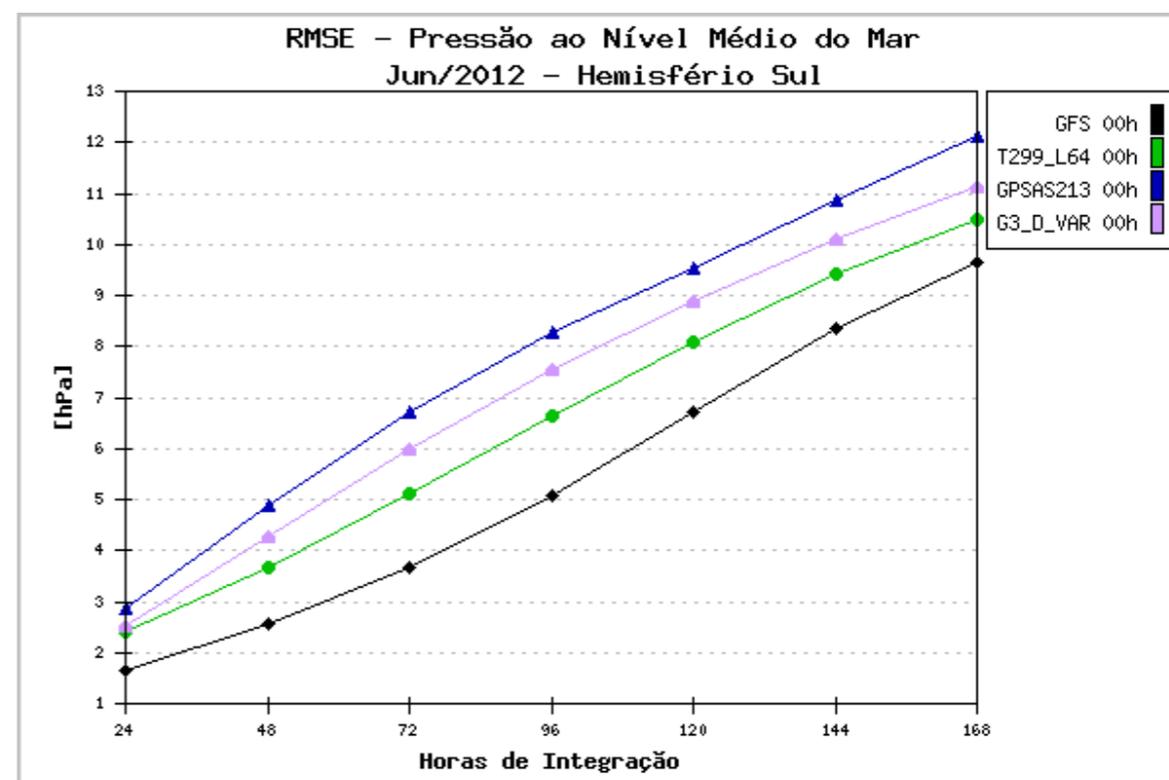
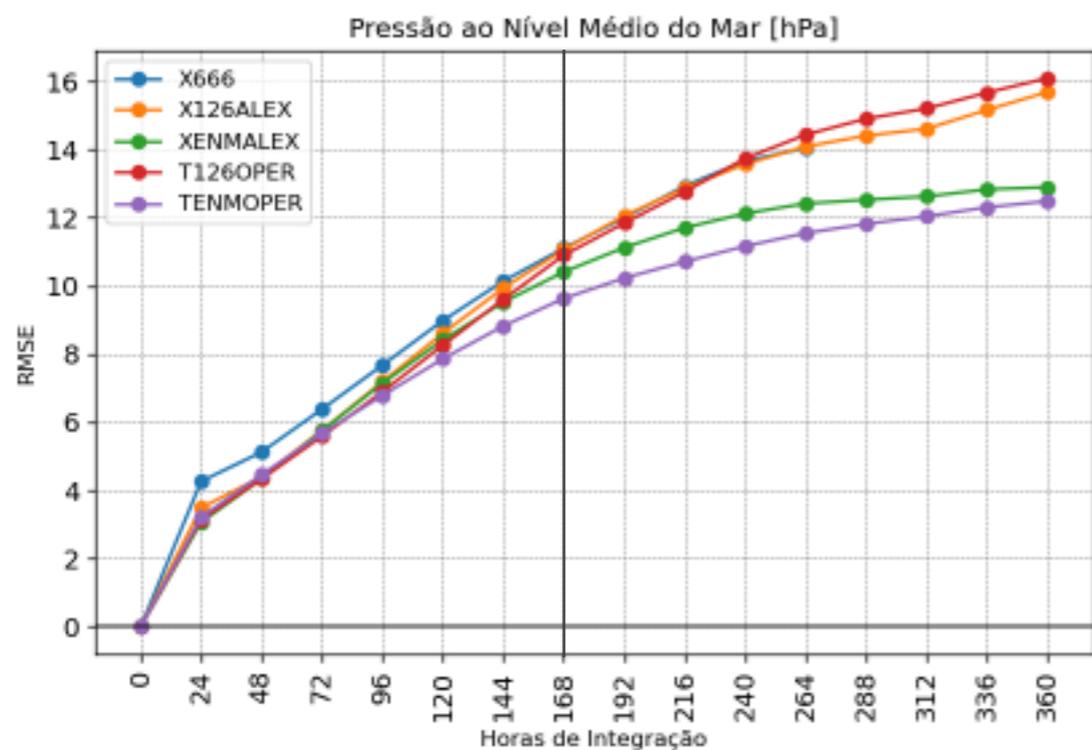
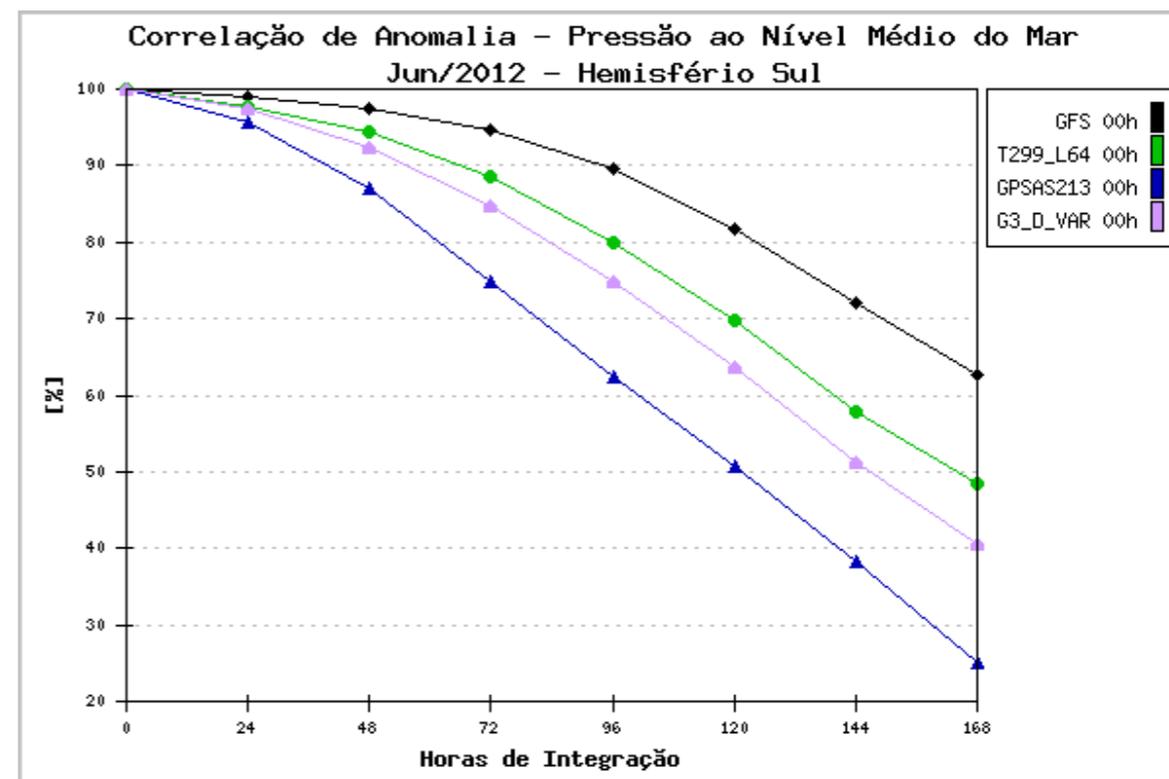
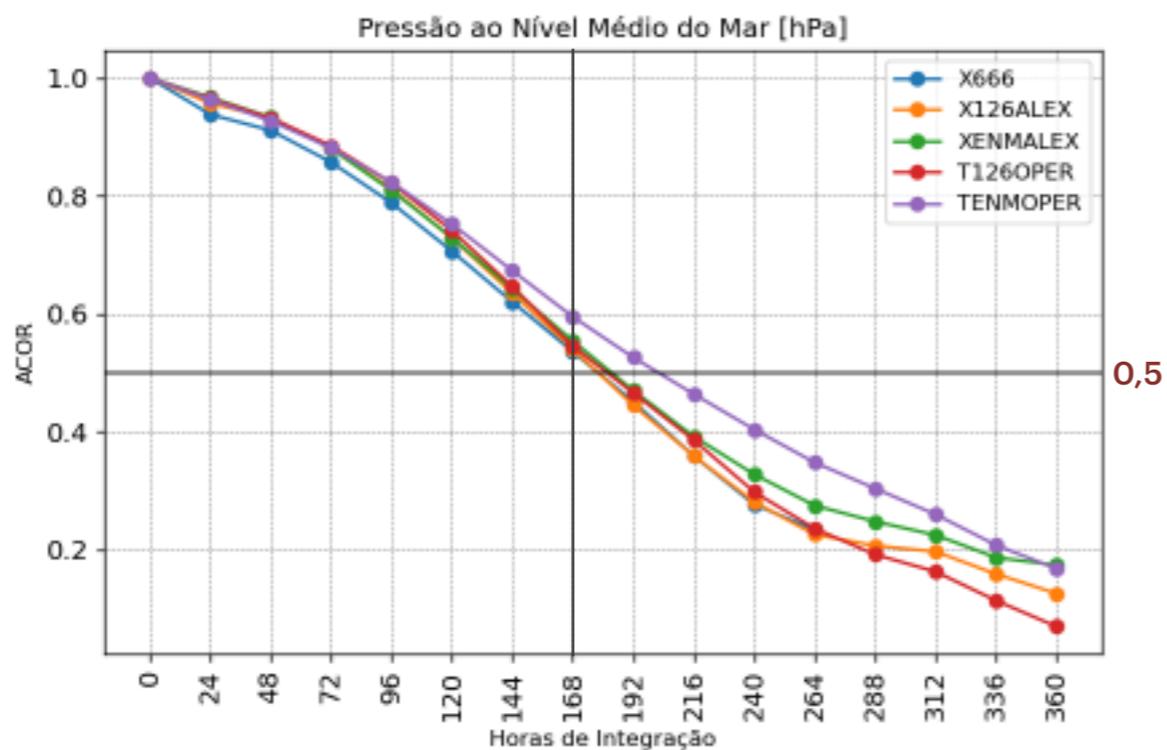
* Média do Conjunto de Previsões

AValiação SKILL (JJA/2020)

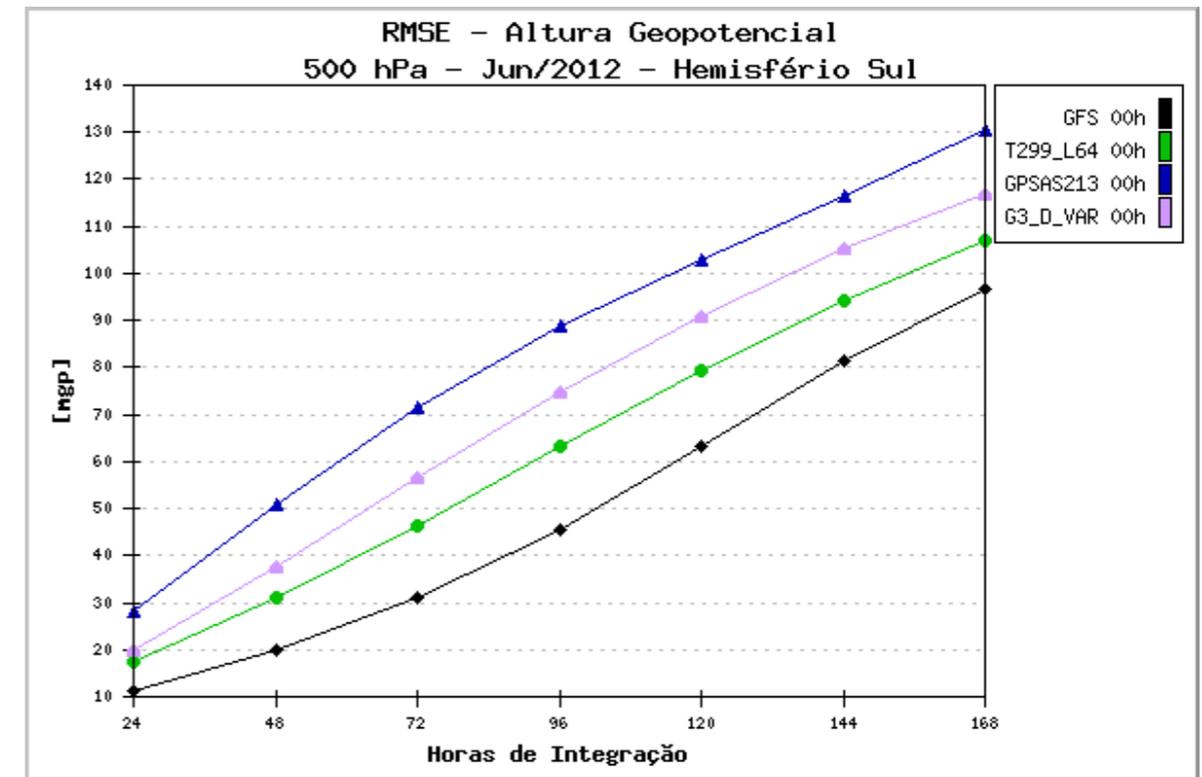
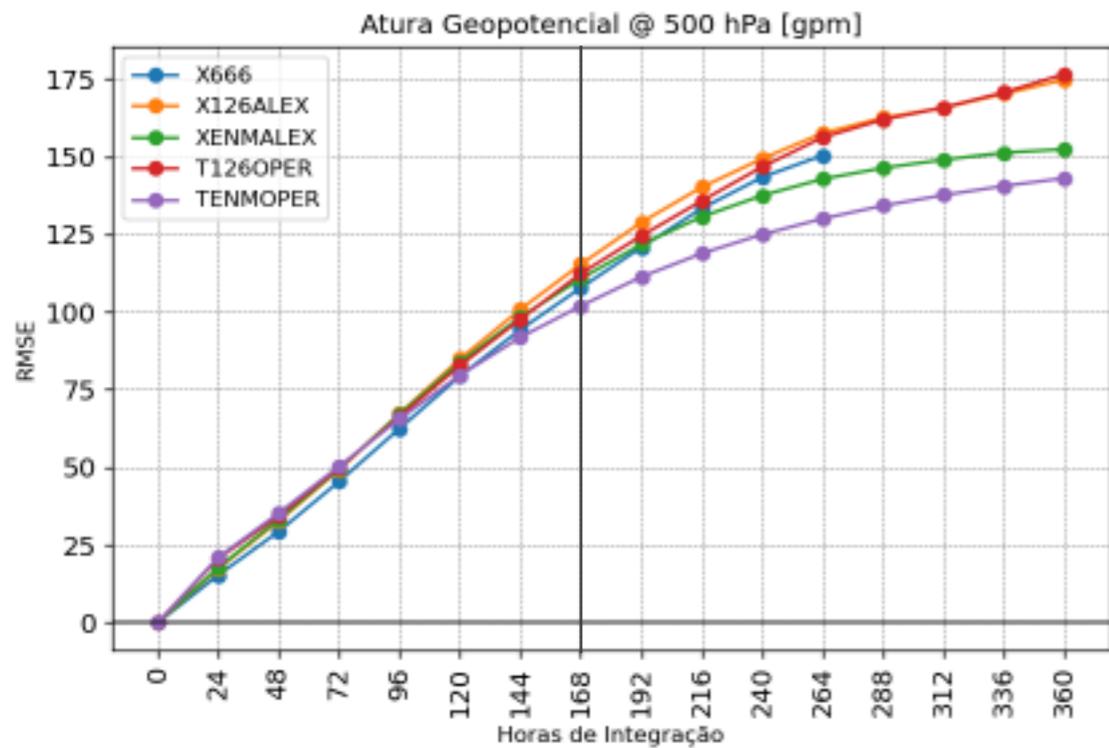
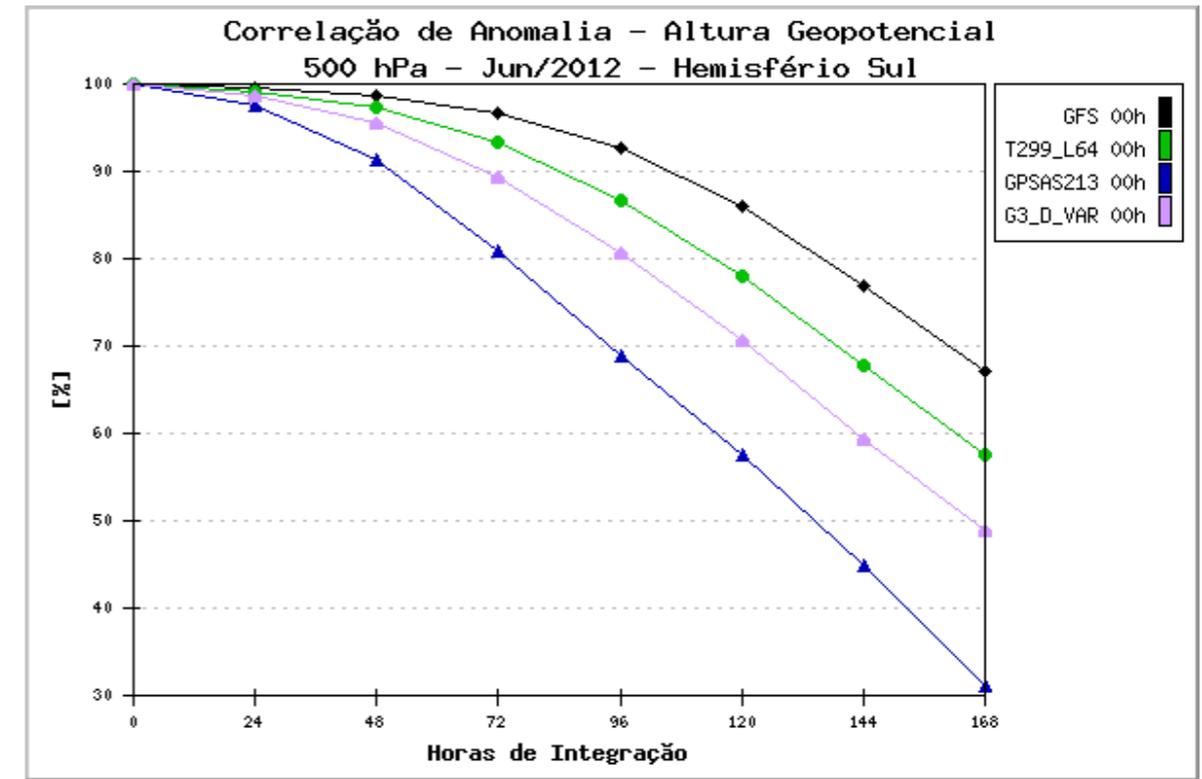
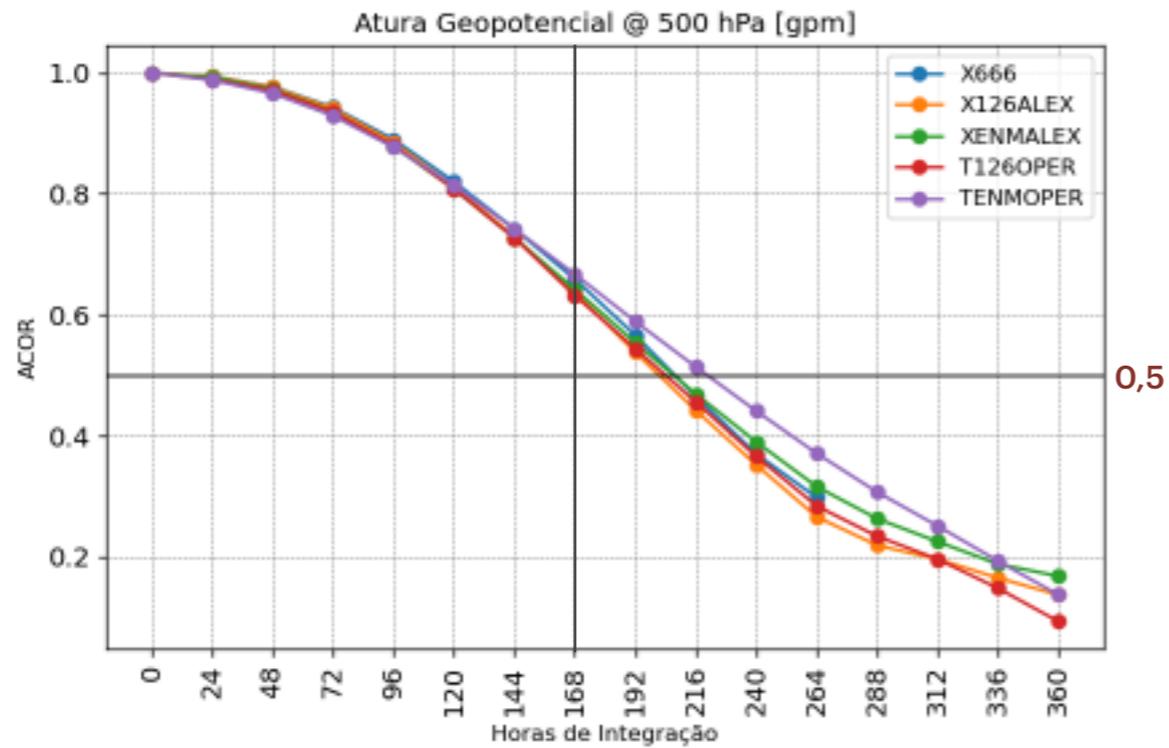
VERIFICAÇÃO OBJETIVA DA PARTE DETERMINÍSTICA (BAM VS. MCGA)

- Métricas básicas: raiz do erro quadrático médio e correlação de anomalias;
- Séries temporais sobre o Hemisfério Sul;
- Comparação entre controle, média dos membros e modelo determinístico de alta resolução;
- Resumo das estatísticas baseadas no score da raiz do erro quadrático médio;
- Comparação com resultados de 2012 (para referência);

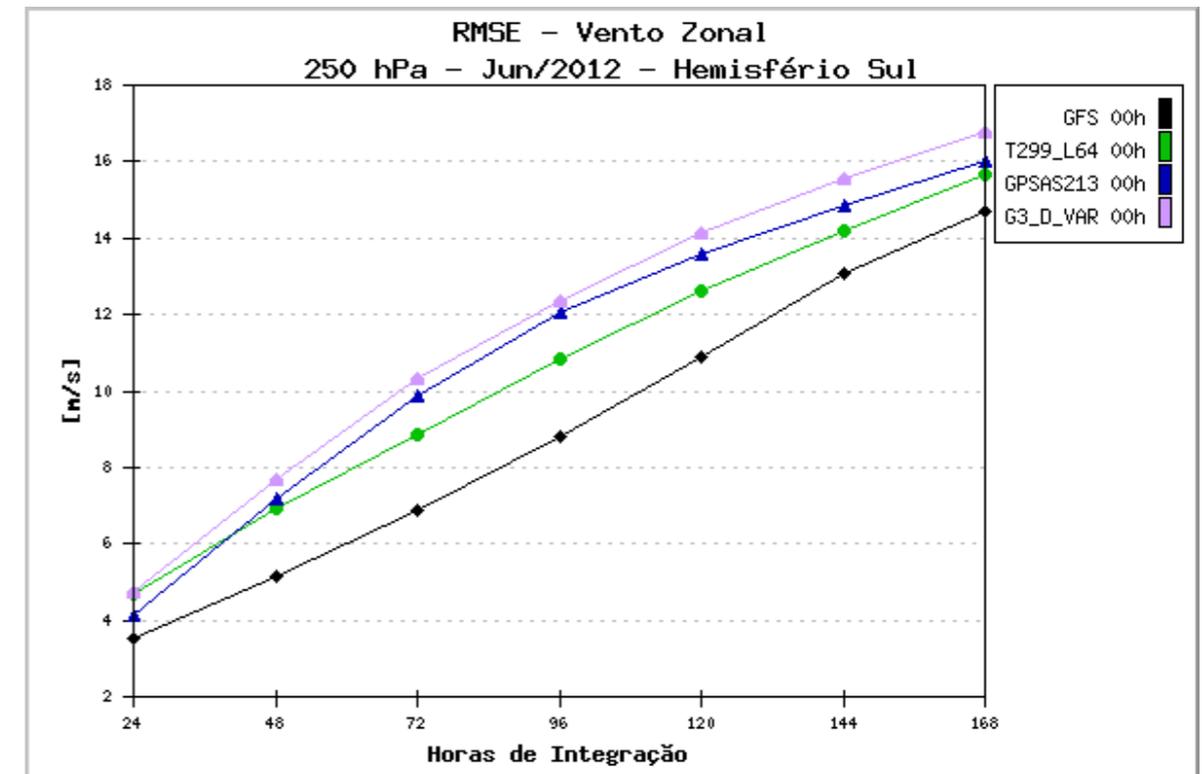
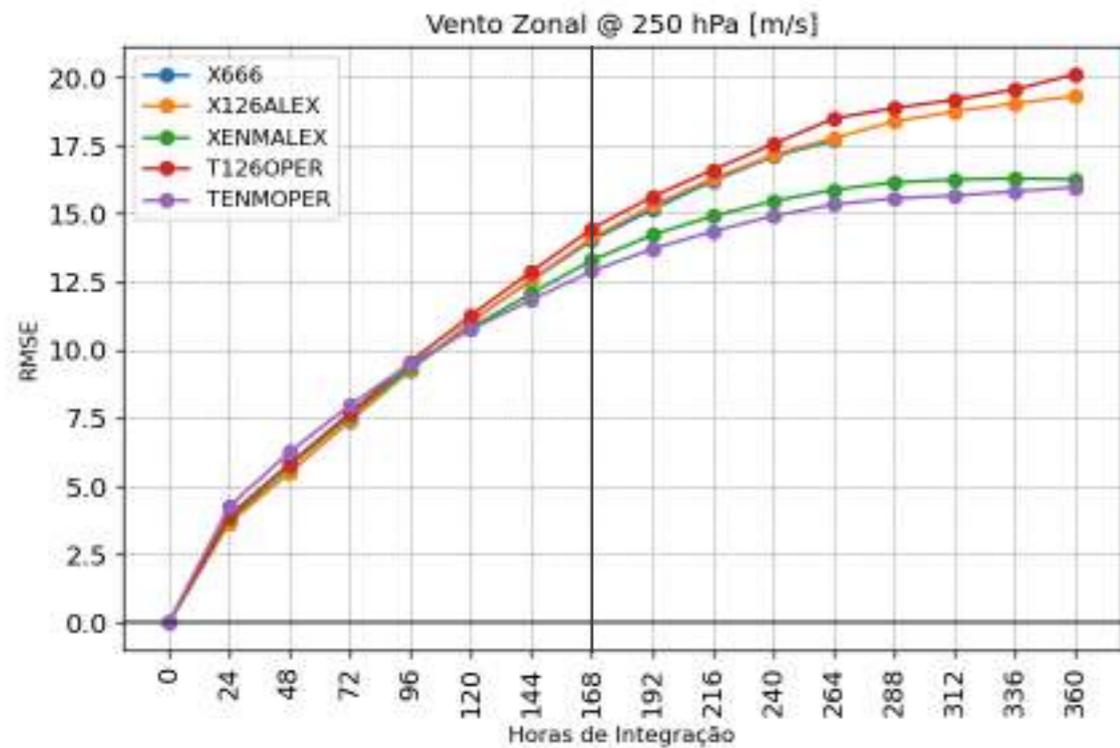
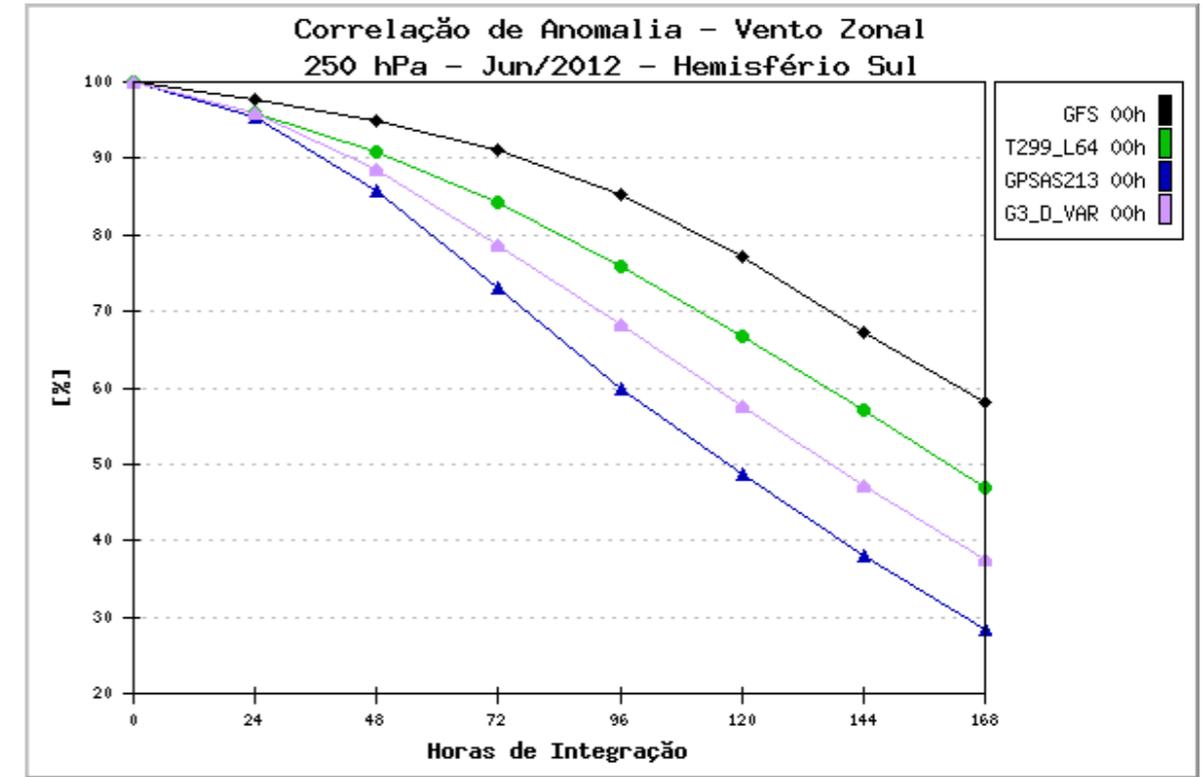
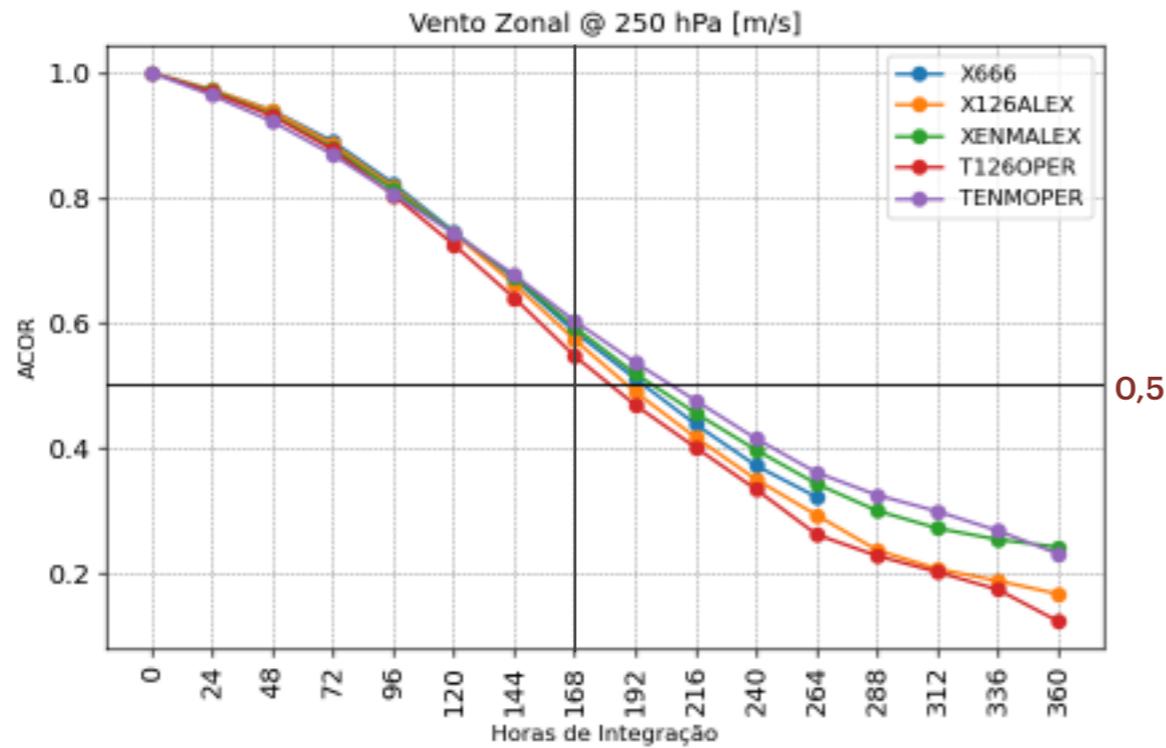
VERIFICAÇÃO OBJETIVA DA PARTE DETERMINÍSTICA (2020060100 - 2020081500)



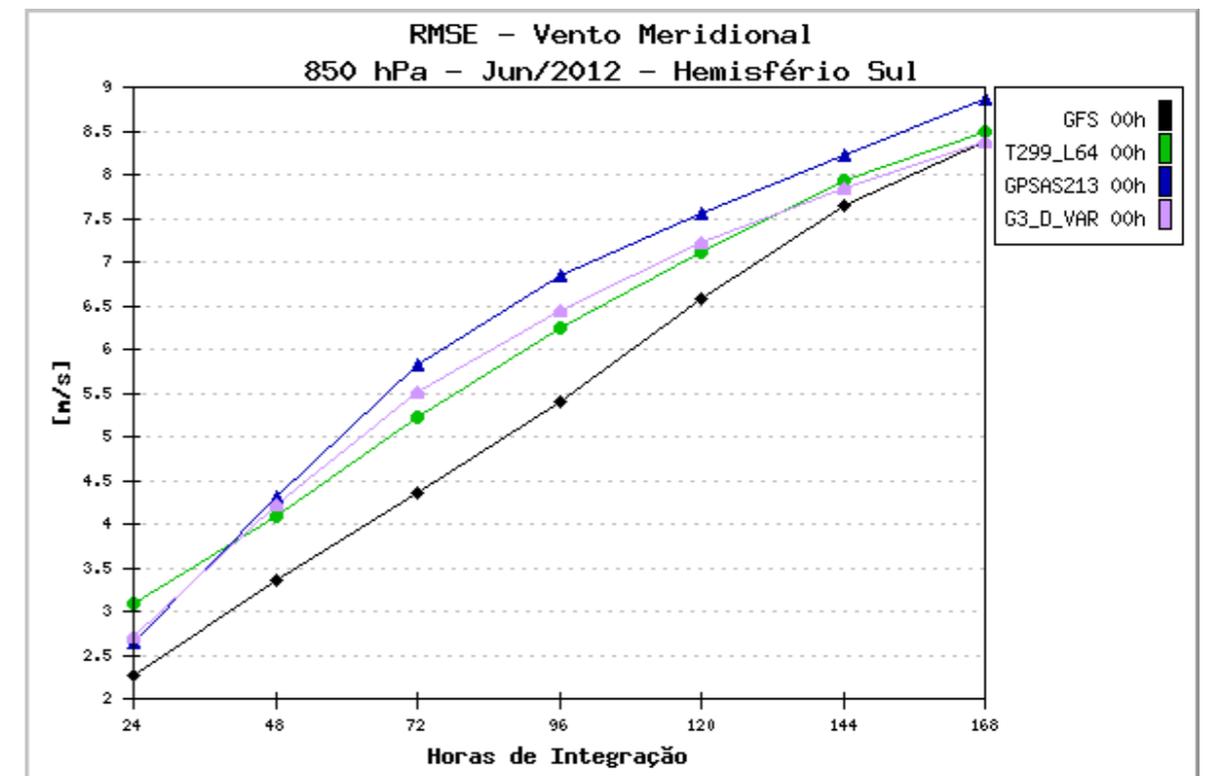
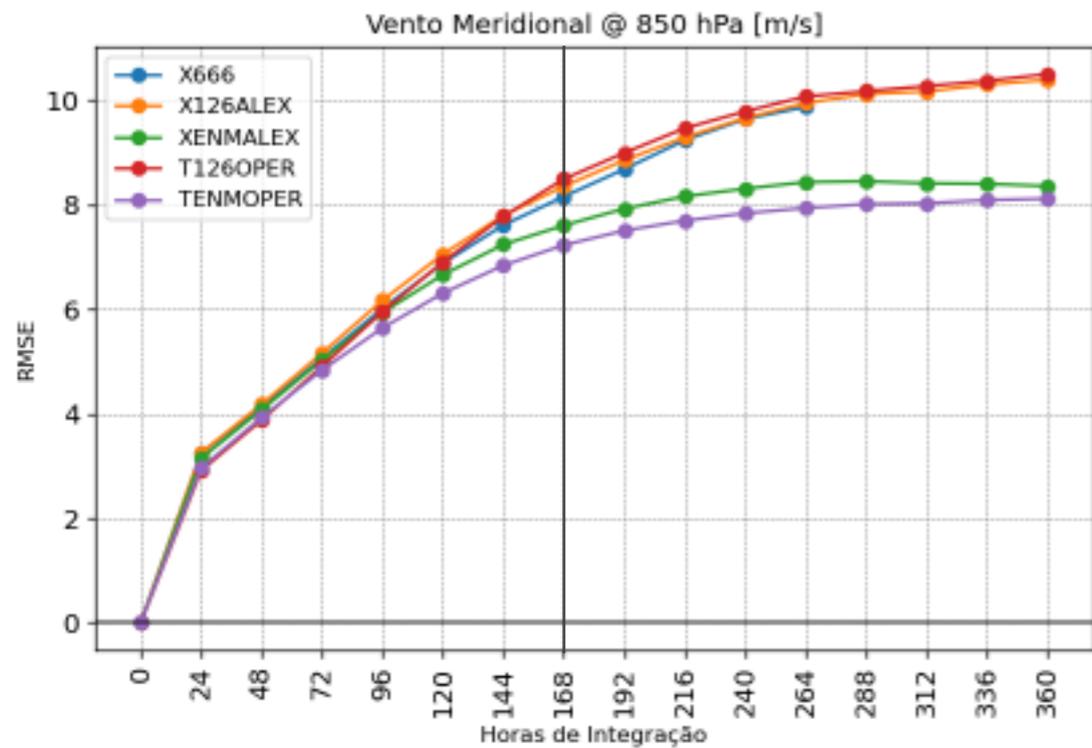
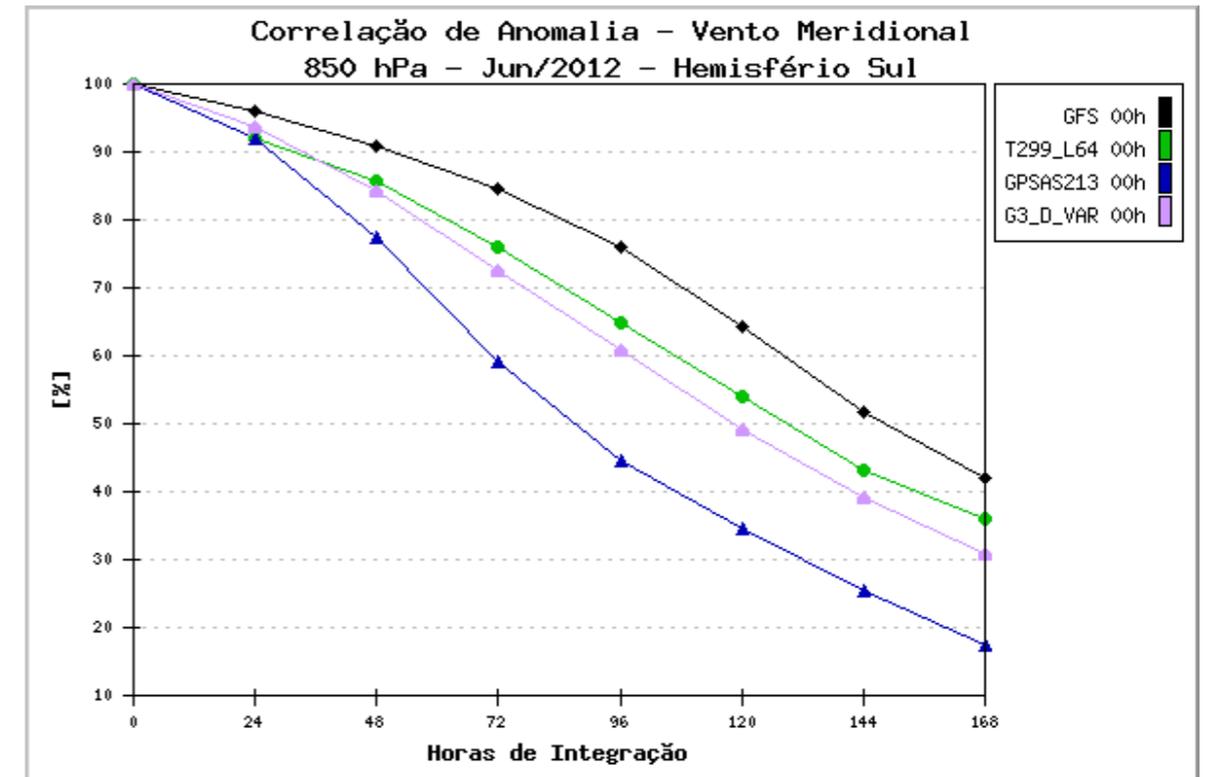
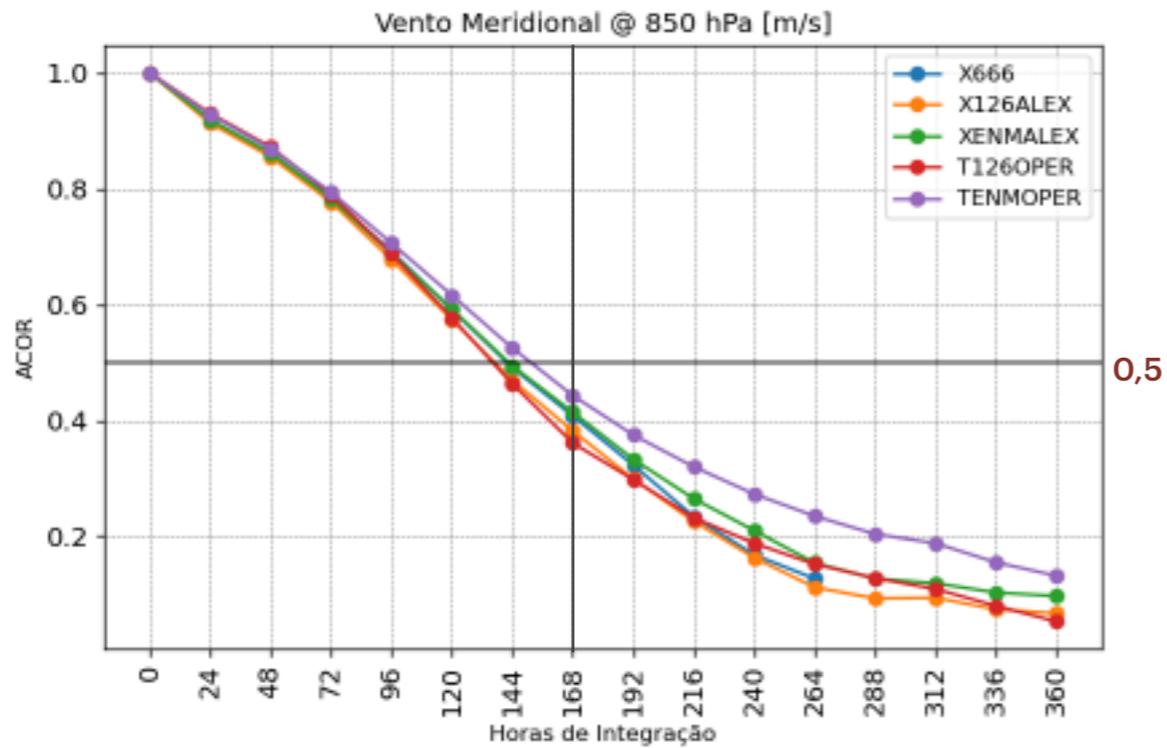
VERIFICAÇÃO OBJETIVA DA PARTE DETERMINÍSTICA (2020060100 - 2020081500)



VERIFICAÇÃO OBJETIVA DA PARTE DETERMINÍSTICA (2020060100 - 2020081500)



VERIFICAÇÃO OBJETIVA DA PARTE DETERMINÍSTICA (2020060100 - 2020081500)

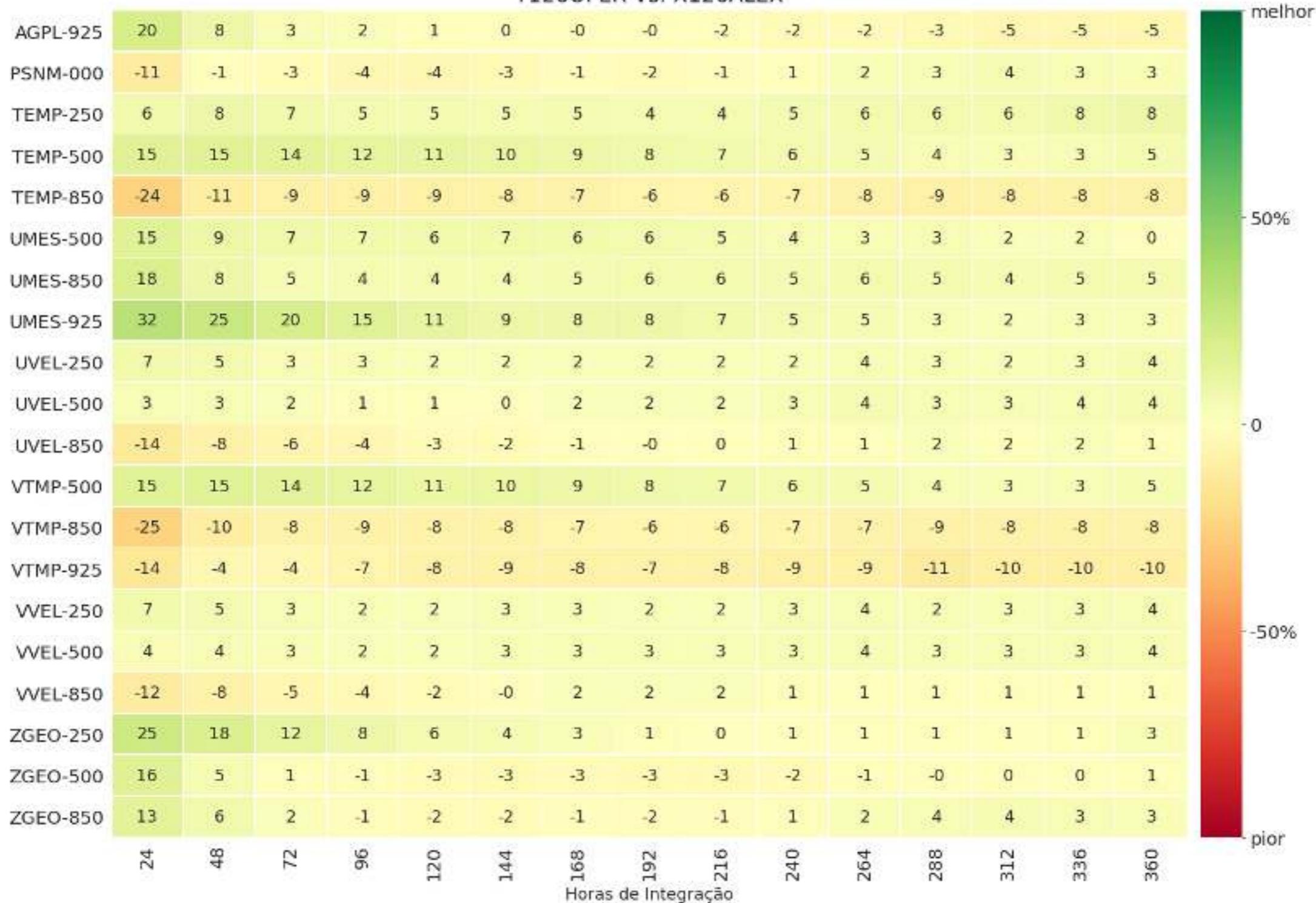


RESUMO - VERIFICAÇÃO OBJETIVA DA PARTE DETERMINÍSTICA (2020060100 - 2020081500)

$$Ganho_{RMSE} = \frac{EXP2_{RMSE} - EXP1_{RMSE}}{EXP_{perfeito} - EXP1_{RMSE}} \times 100$$

Mostra o quanto o EXP2 X126ALEX melhorou/piorou em relação ao EXP1 T126OPER

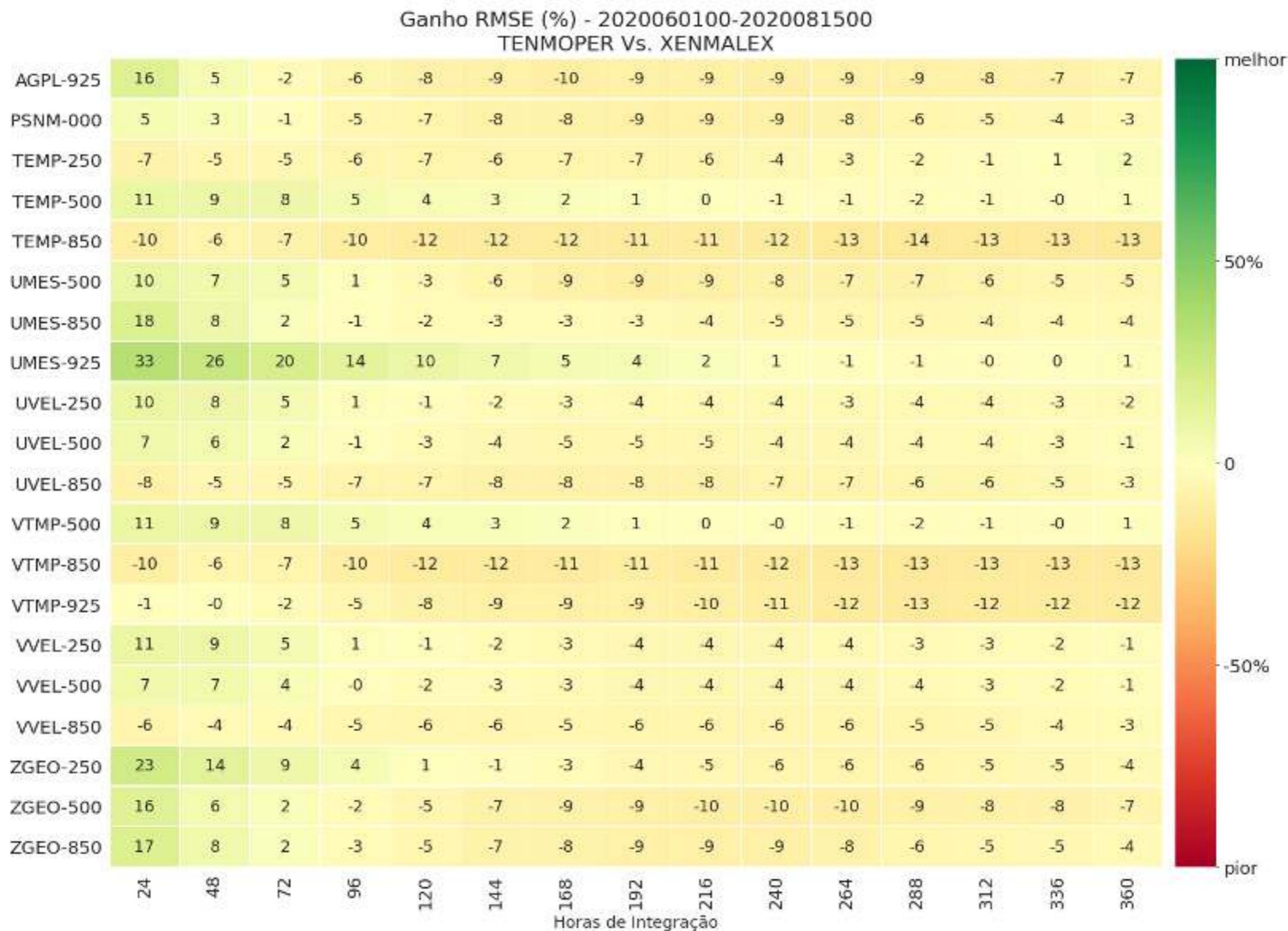
Ganho RMSE (%) - 2020060100-2020081500
T126OPER Vs. X126ALEX



RESUMO - VERIFICAÇÃO OBJETIVA DA PARTE DETERMINÍSTICA (2020060100 - 2020081500)

$$Ganho_{RMSE} = \frac{EXP2_{RMSE} - EXP1_{RMSE}}{EXP_{perfeito} - EXP1_{RMSE}} \times 100$$

Mostra o quanto o EXP2 XENMALEX melhorou/piorou em relação ao EXP1 TENMOPER

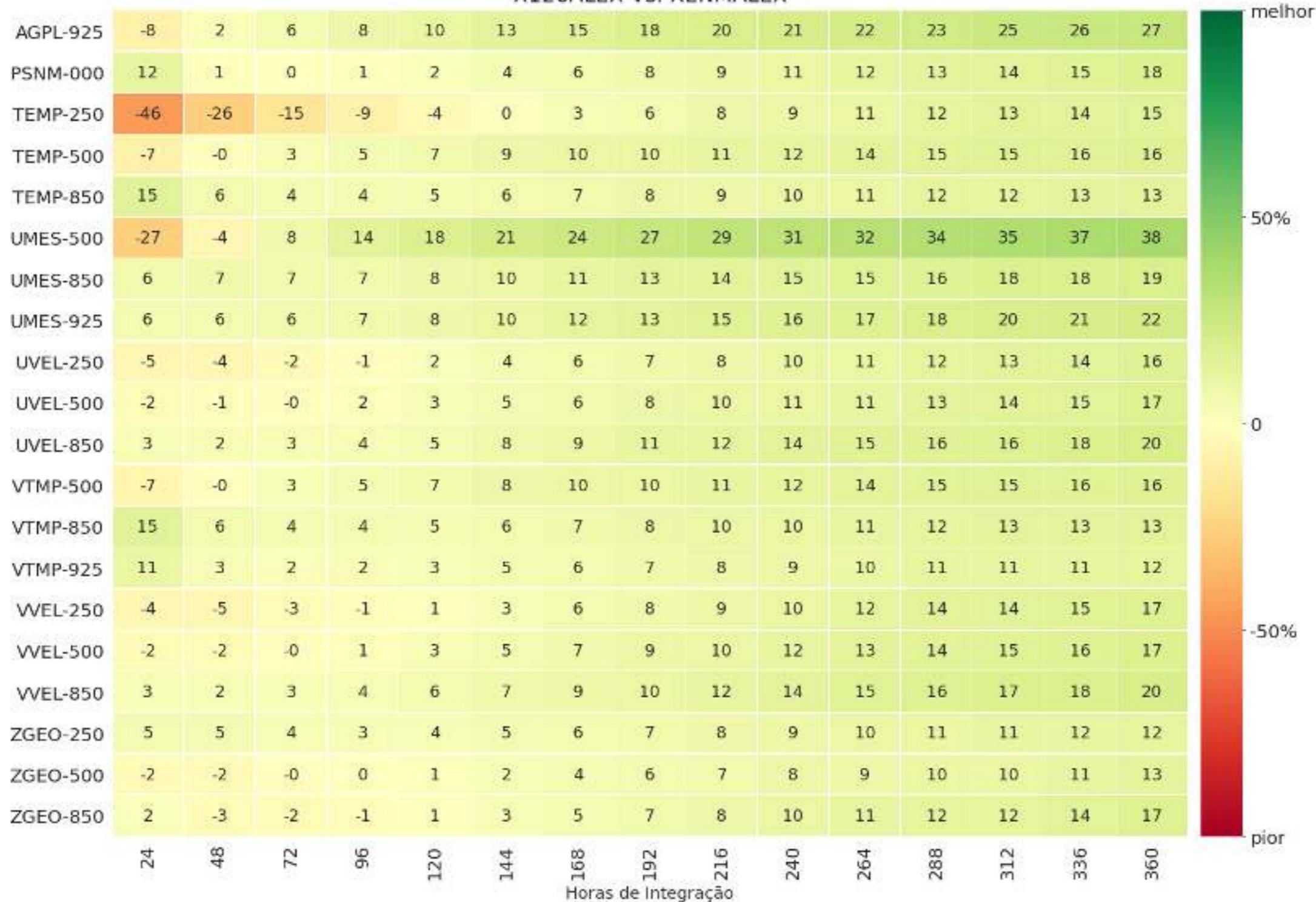


RESUMO - VERIFICAÇÃO OBJETIVA DA PARTE DETERMINÍSTICA (2020060100 - 2020081500)

$$Ganho_{RMSE} = \frac{EXP2_{RMSE} - EXP1_{RMSE}}{EXP_{perfeito} - EXP1_{RMSE}} \times 100$$

Mostra o quanto o EXP2 XENMALEX melhorou/piorou em relação ao EXP1 X126ALEX

Ganho RMSE (%) - 2020060100-2020081500
X126ALEX Vs. XENMALEX

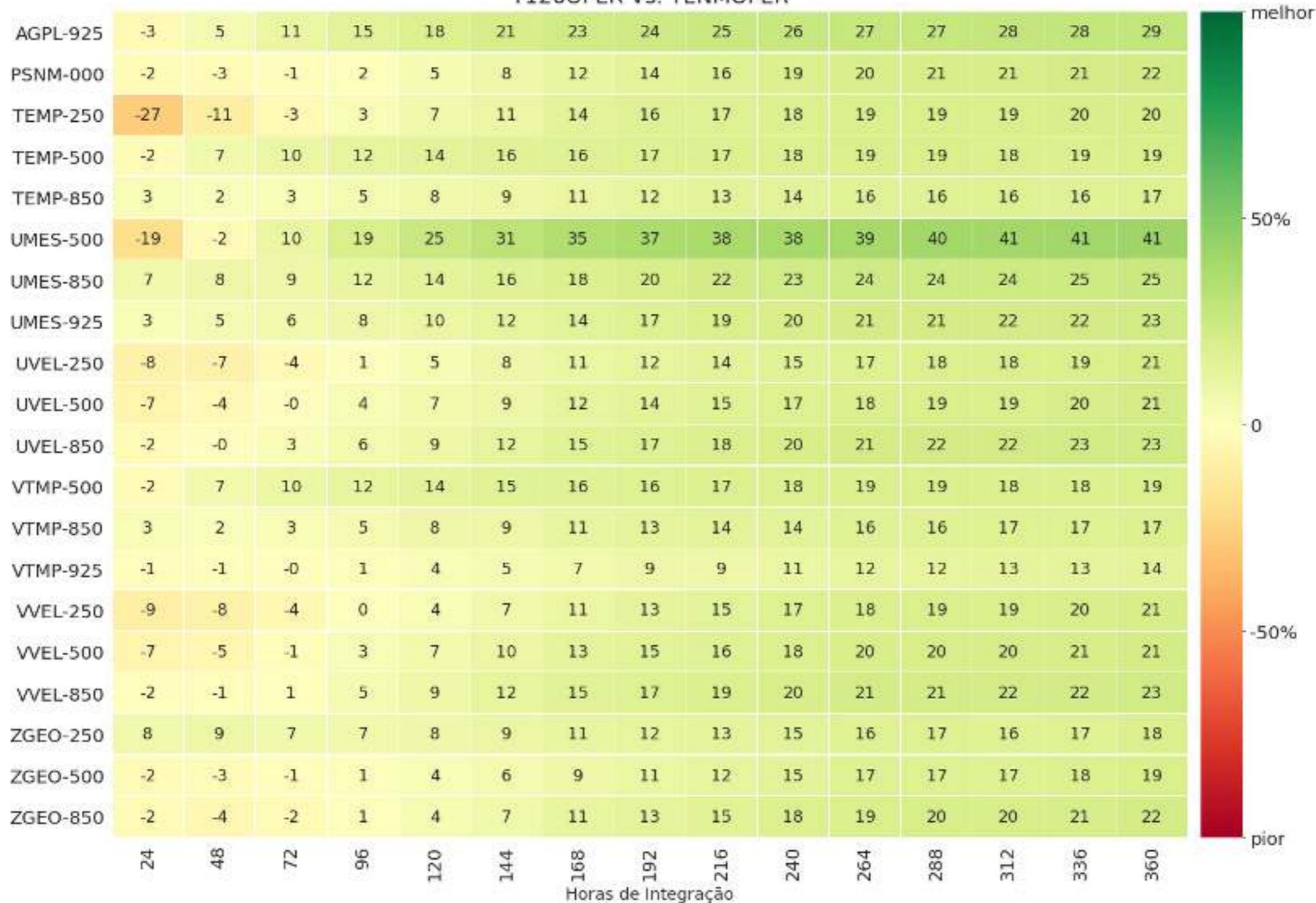


RESUMO - VERIFICAÇÃO OBJETIVA DA PARTE DETERMINÍSTICA (2020060100 - 2020081500)

$$Ganho_{RMSE} = \frac{EXP2_{RMSE} - EXP1_{RMSE}}{EXP_{perfeito} - EXP1_{RMSE}} \times 100$$

Mostra o quanto o EXP2 TENMOPER melhorou/piorou em relação ao EXP1 T126OPER

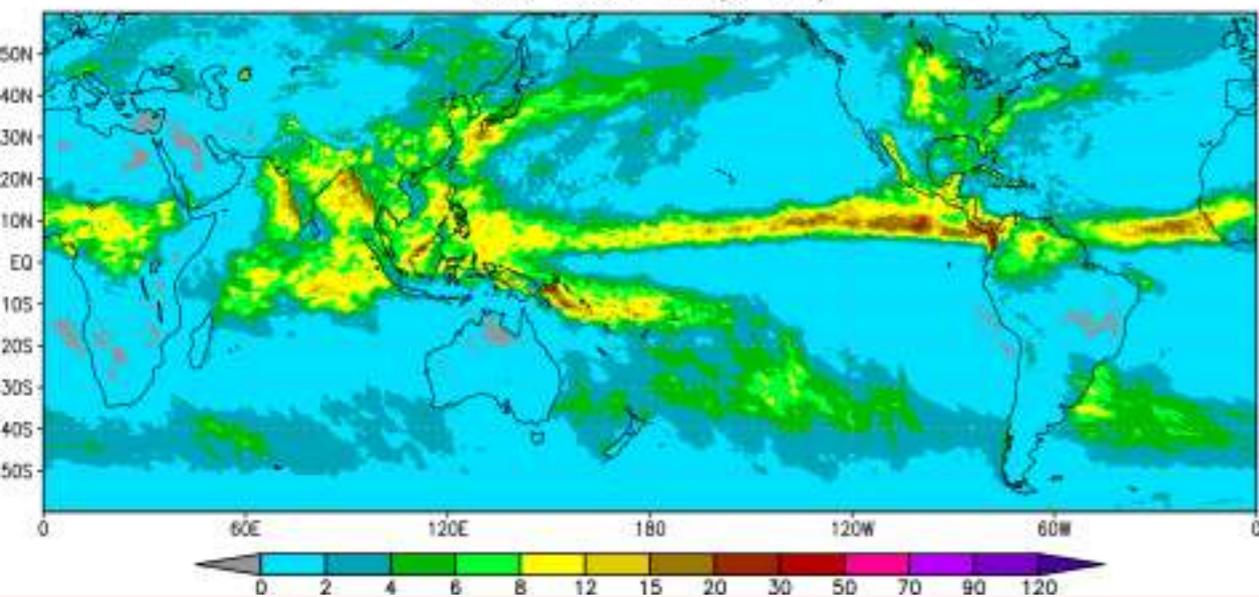
Ganho RMSE (%) - 2020060100-2020081500
T126OPER Vs. TENMOPER



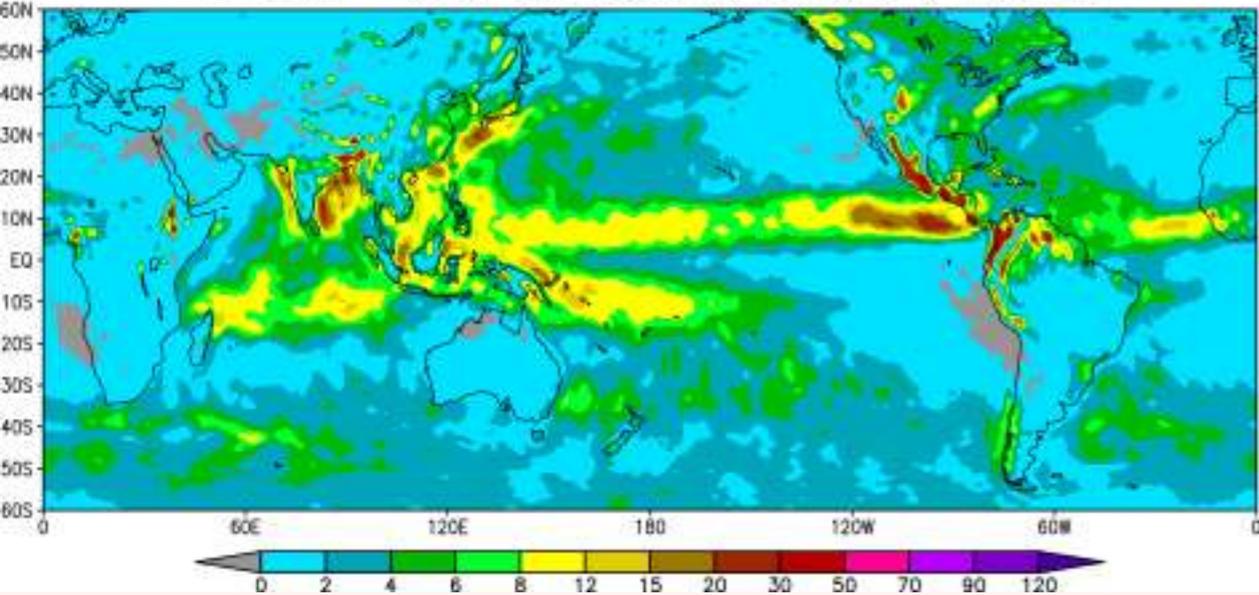
AVALIAÇÃO ESPACIAL DA PRECIPITAÇÃO

- Período considerado: 2020060100 a 2020083100 (JJA);
- Médias do período das previsões de 24, 48, 72, ..., 360 horas;
- Comparações com a observação (CMORPH);

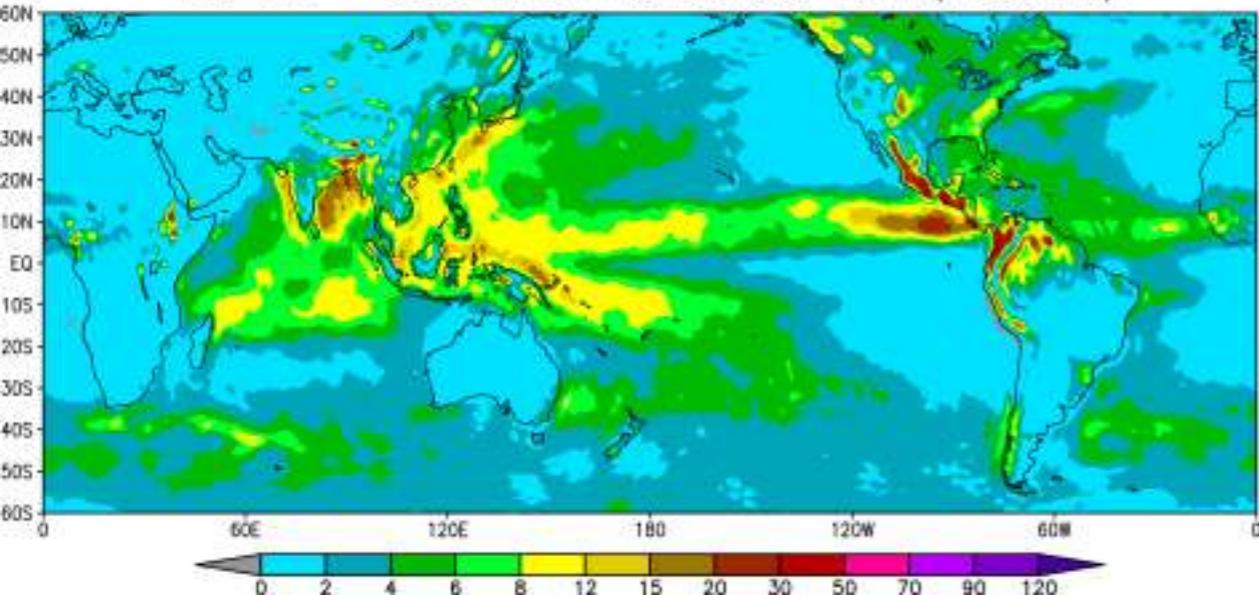
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
OBS CMORPH (8 km)



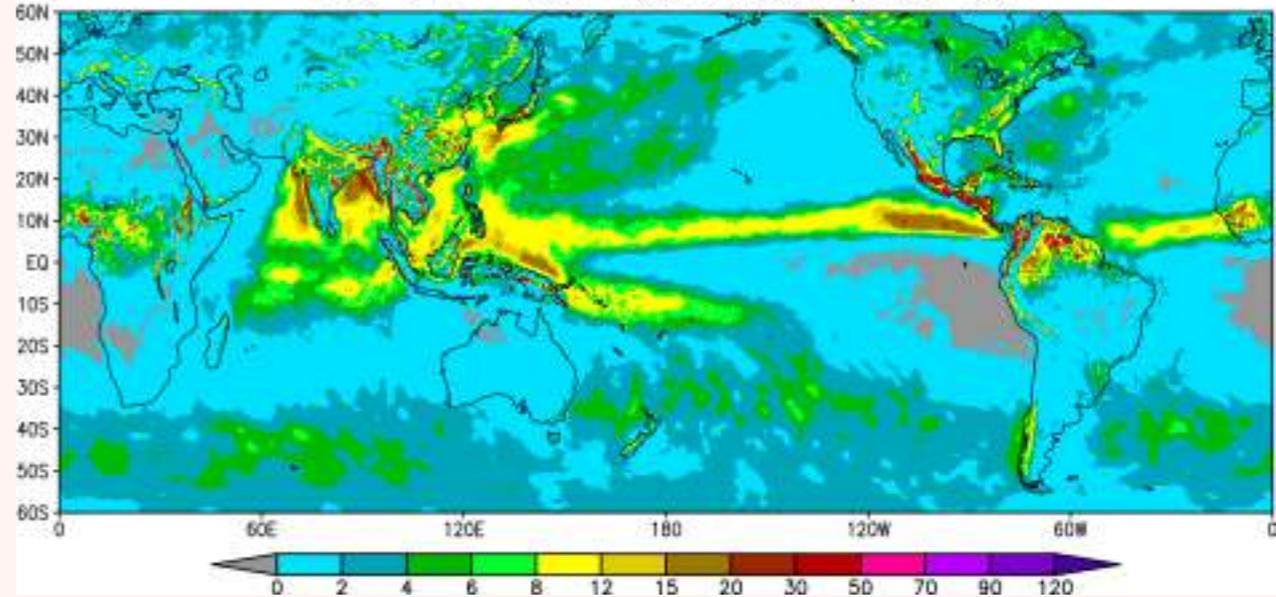
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 24h - OENS CTR TQ0126L028 TUPA (~100 km)



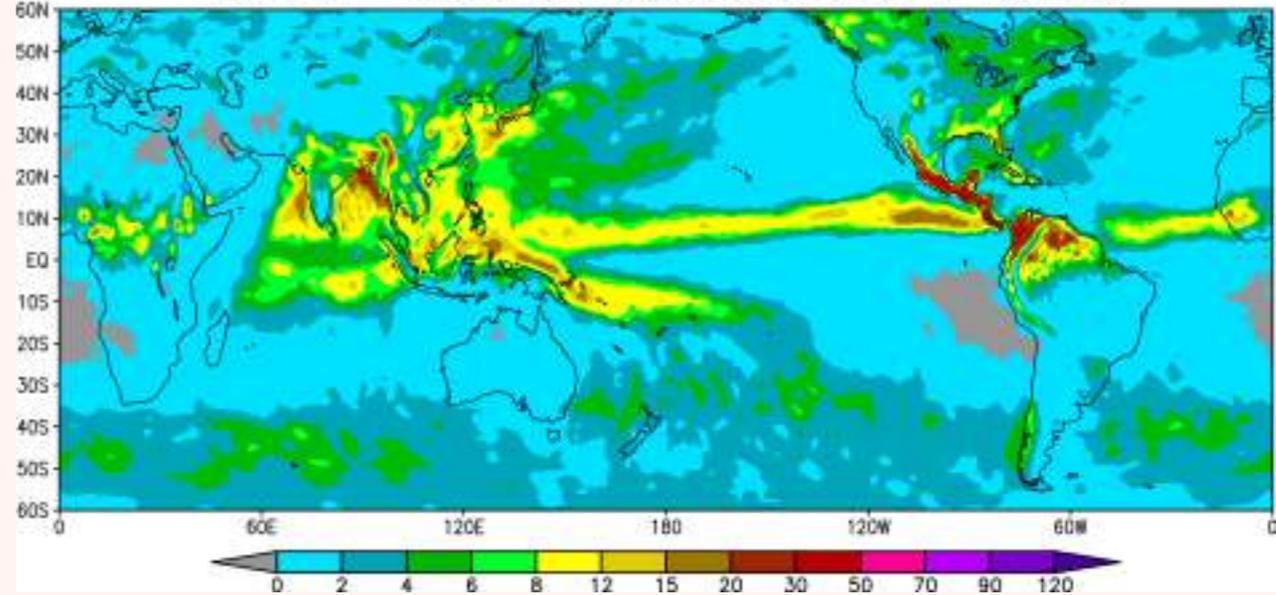
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 24h - OENS MEAN TQ0126L028 TUPA (~100 km)



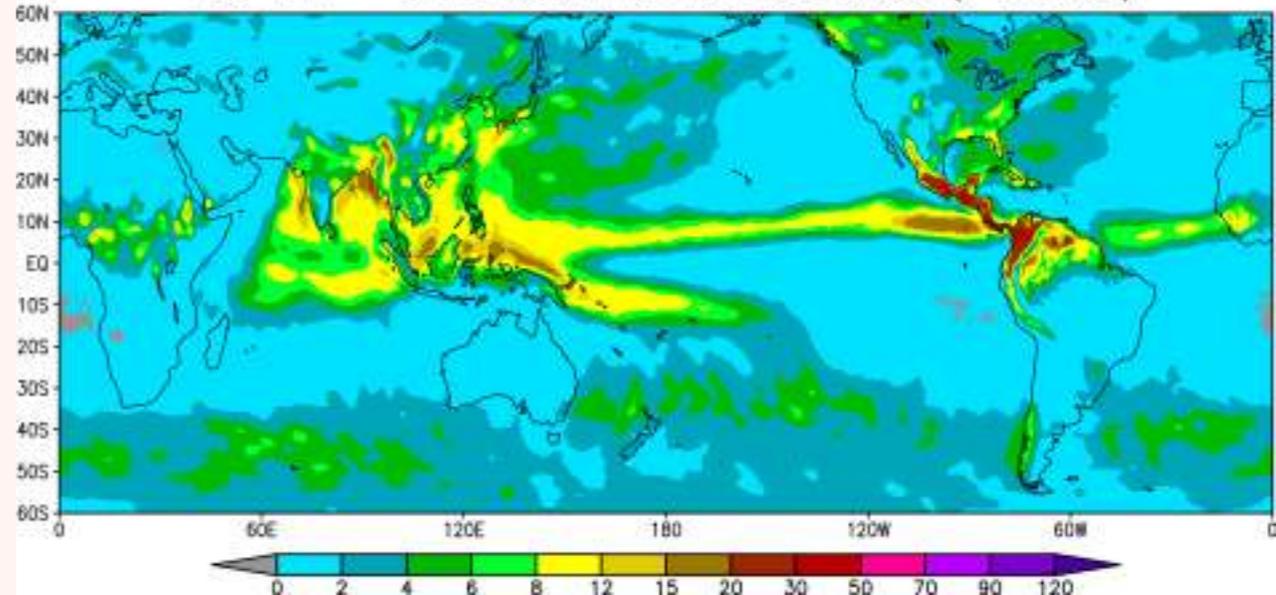
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 24h - BAM TQ0666L054 (~20 km)



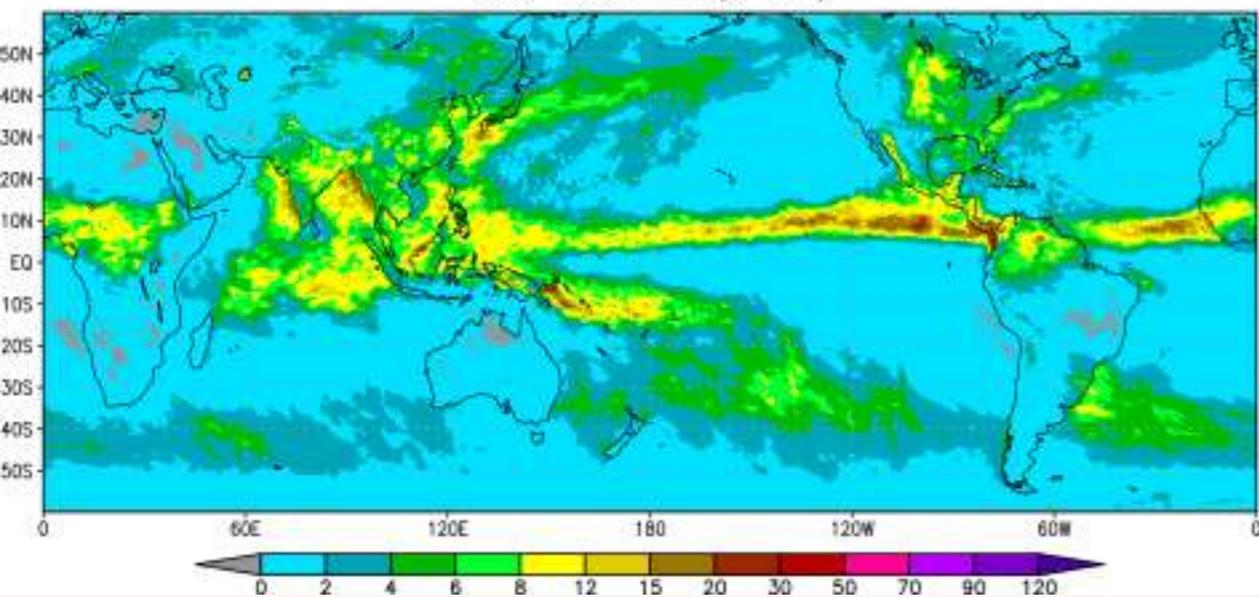
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 24h - OENS CTR TQ0126L028 XC50 (~100 km)



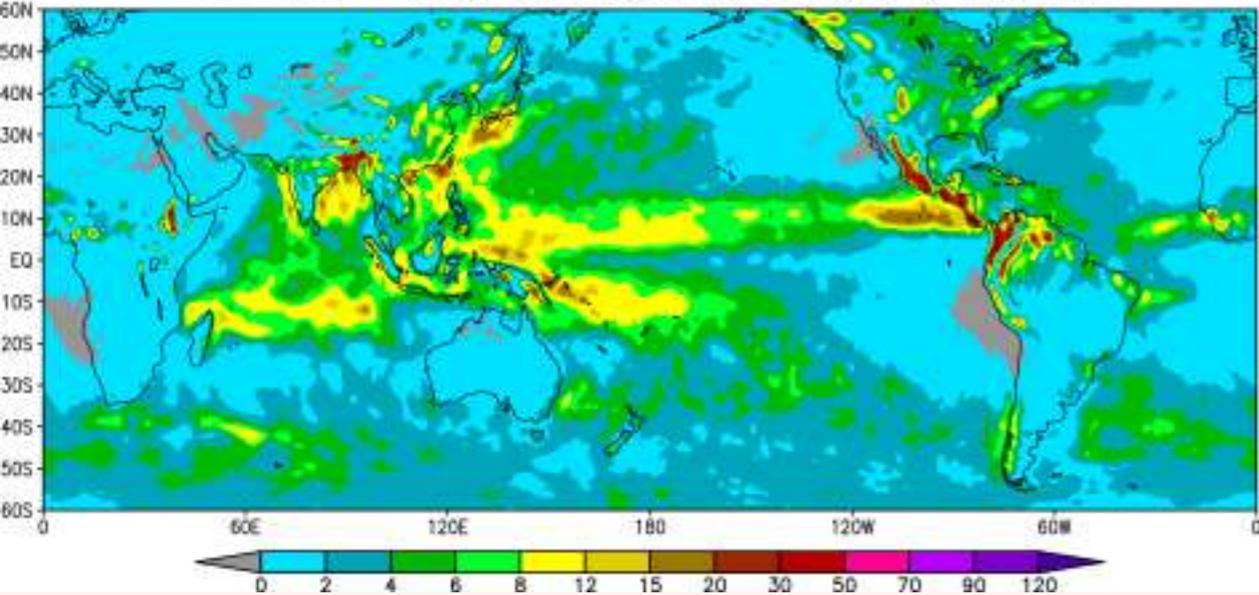
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 24h - OENS MEAN TQ0126L028 XC50 (~100 km)



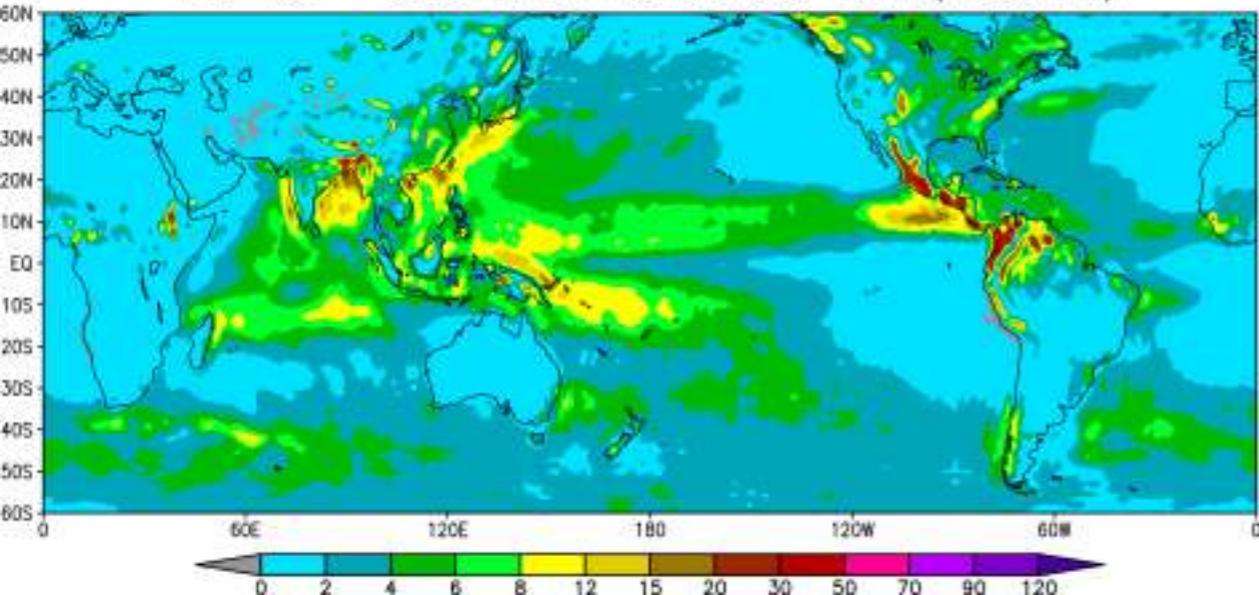
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
OBS CMORPH (8 km)



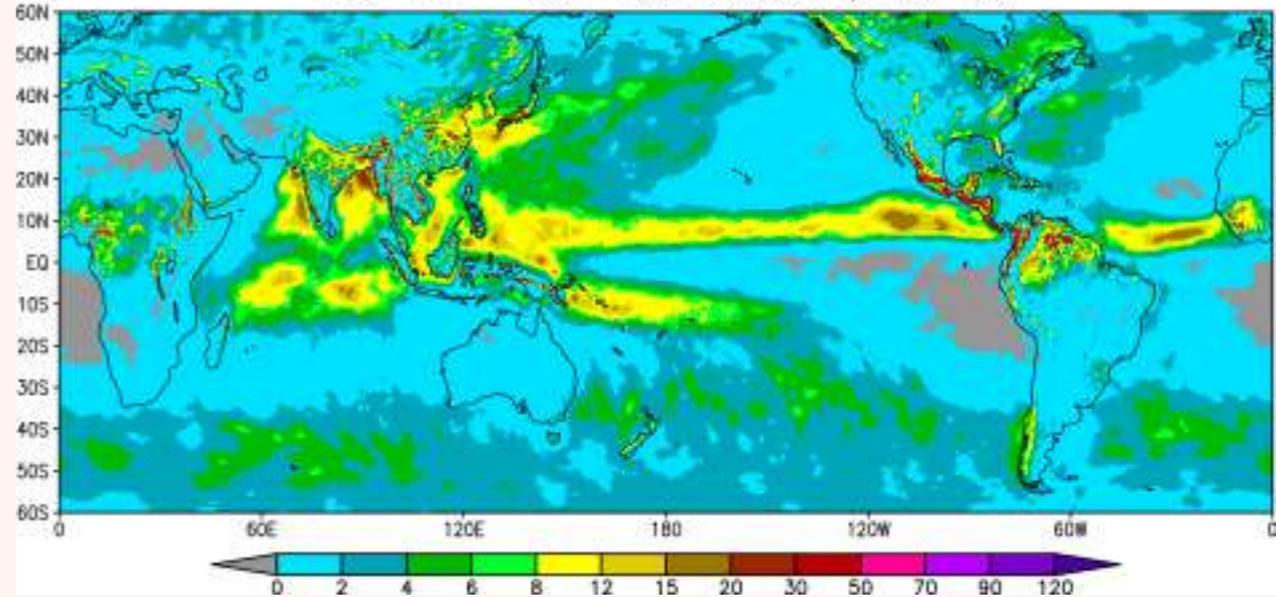
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 48h - OENS CTR TQ0126L028 TUPA (~100 km)



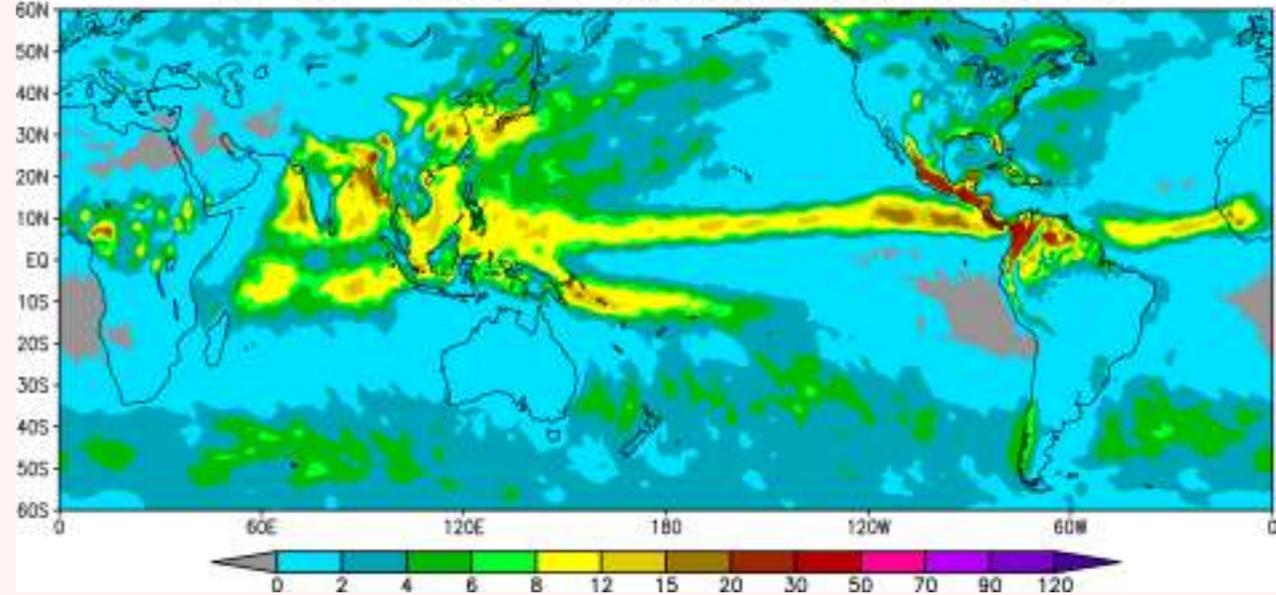
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 48h - OENS MEAN TQ0126L028 TUPA (~100 km)



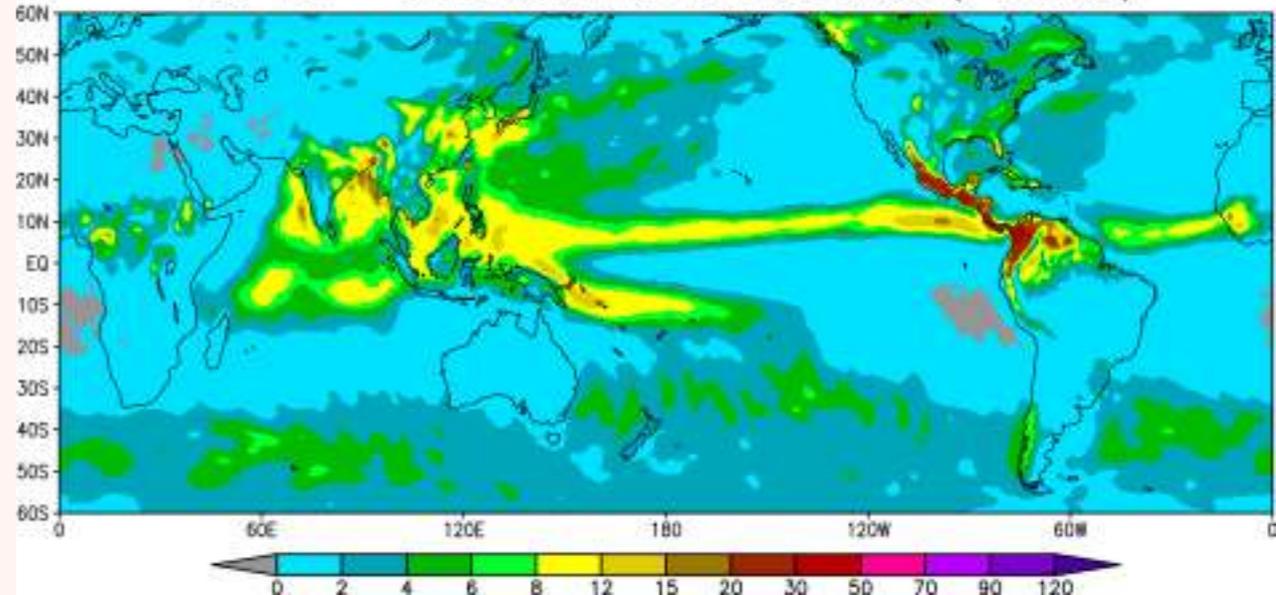
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 48h - BAM TQ0666L054 (~20 km)



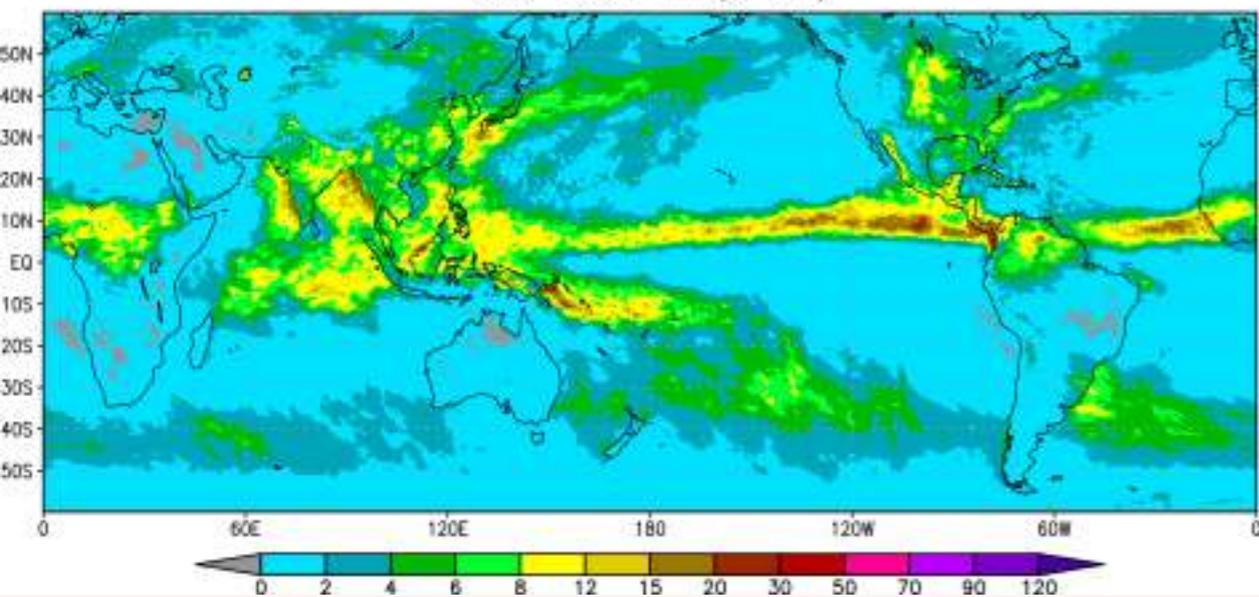
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 48h - OENS CTR TQ0126L028 XC50 (~100 km)



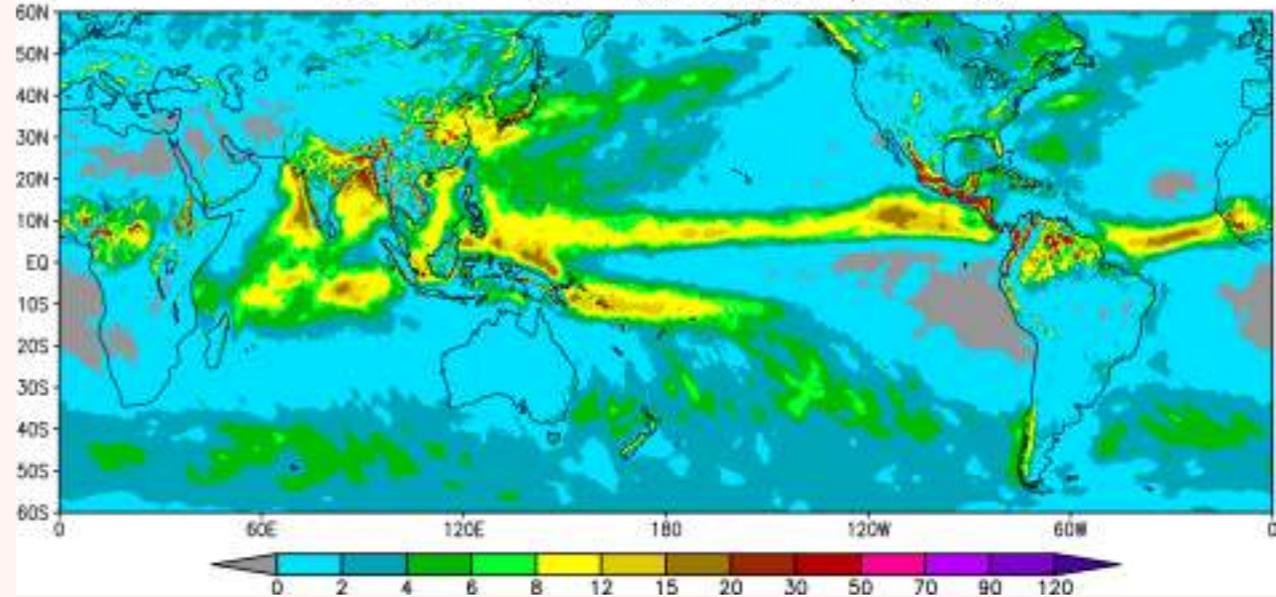
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 48h - OENS MEAN TQ0126L028 XC50 (~100 km)



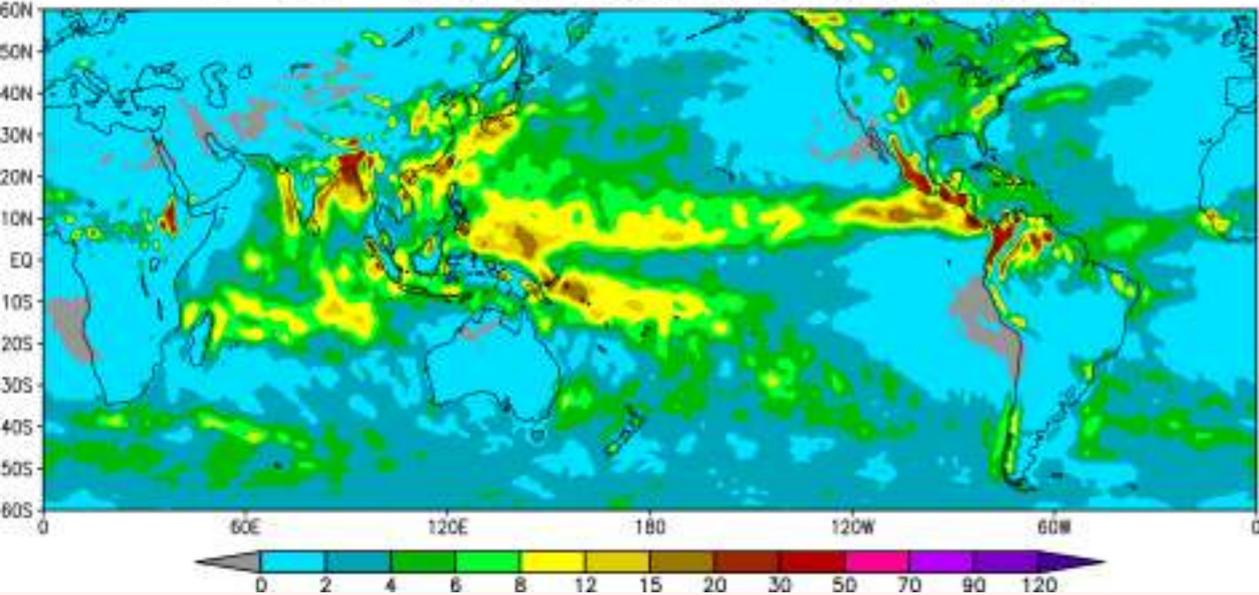
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
OBS CMORPH (8 km)



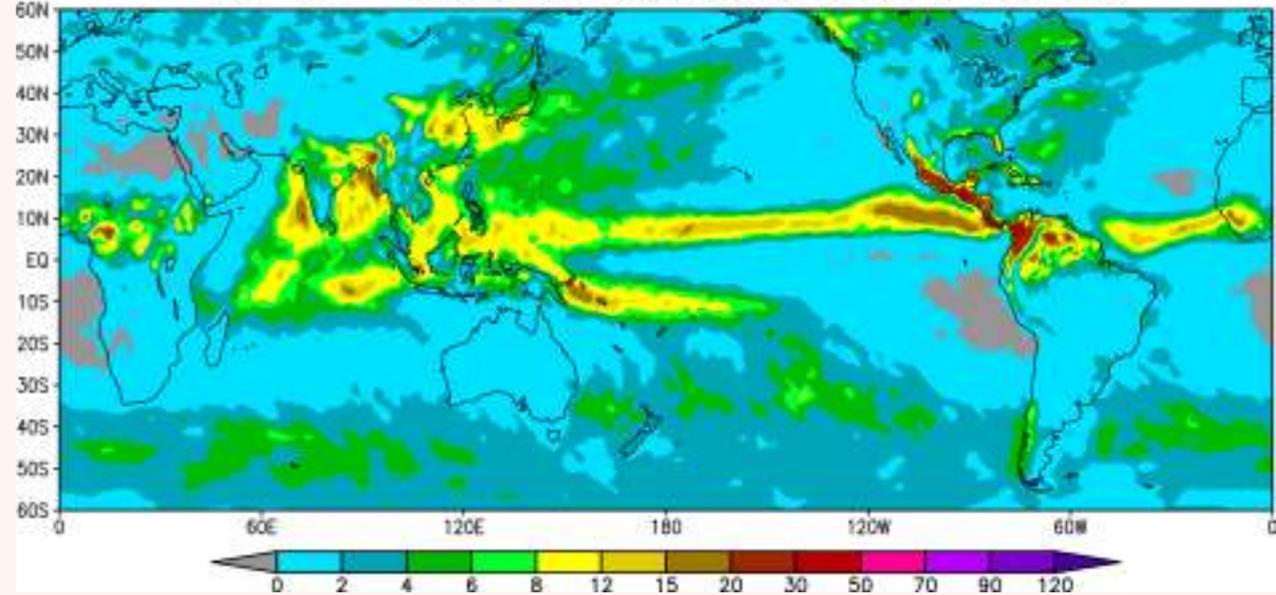
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 72h - BAM TQ0666L054 (~20 km)



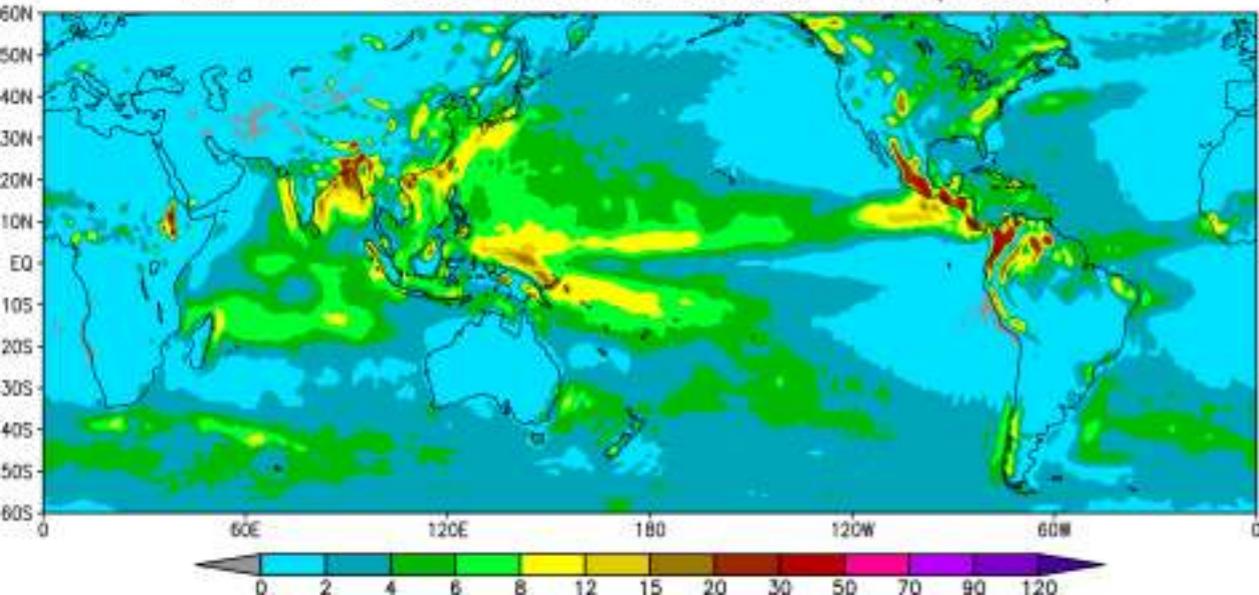
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 72h - OENS CTR TQ0126L028 TUPA (~100 km)



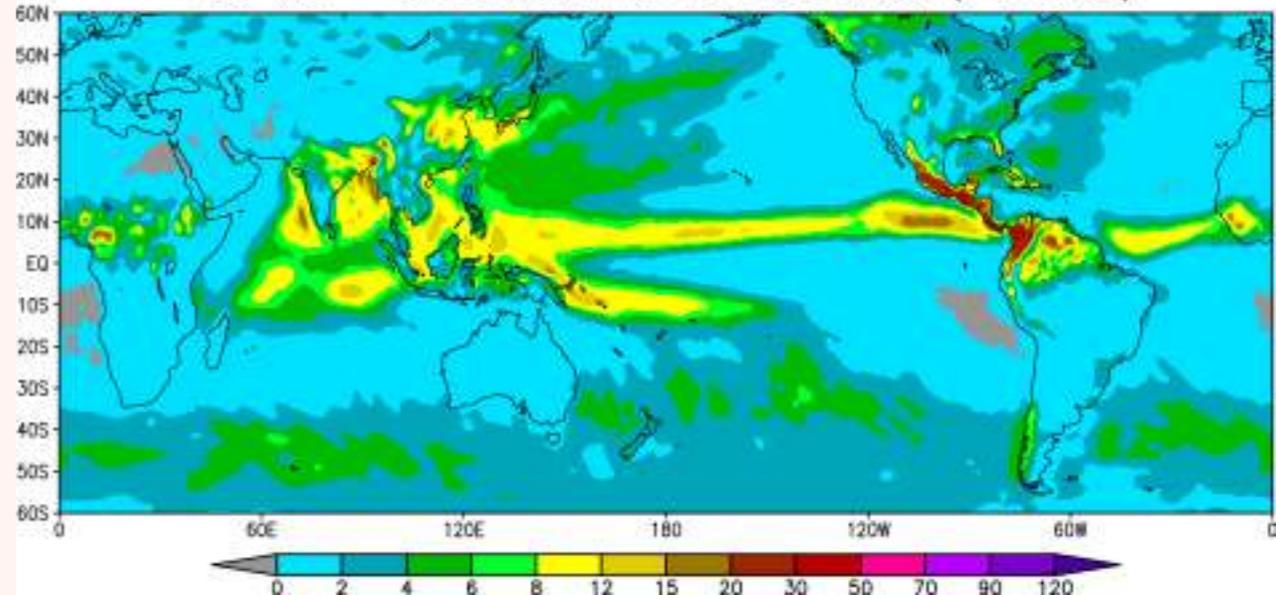
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 72h - OENS CTR TQ0126L028 XC50 (~100 km)



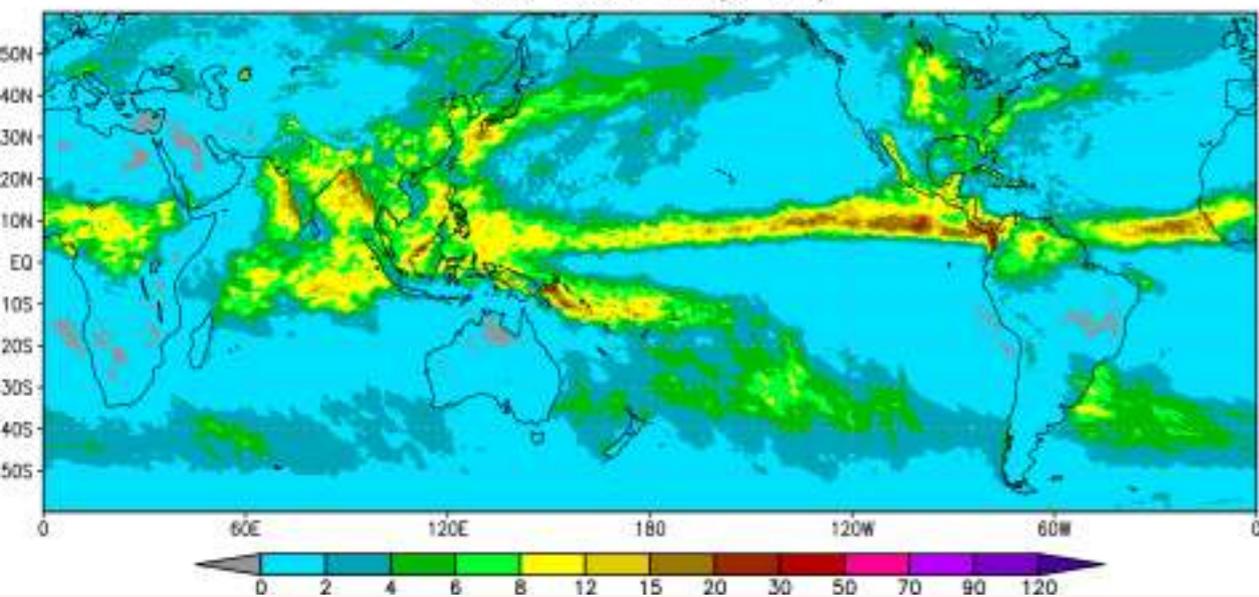
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 72h - OENS MEAN TQ0126L028 TUPA (~100 km)



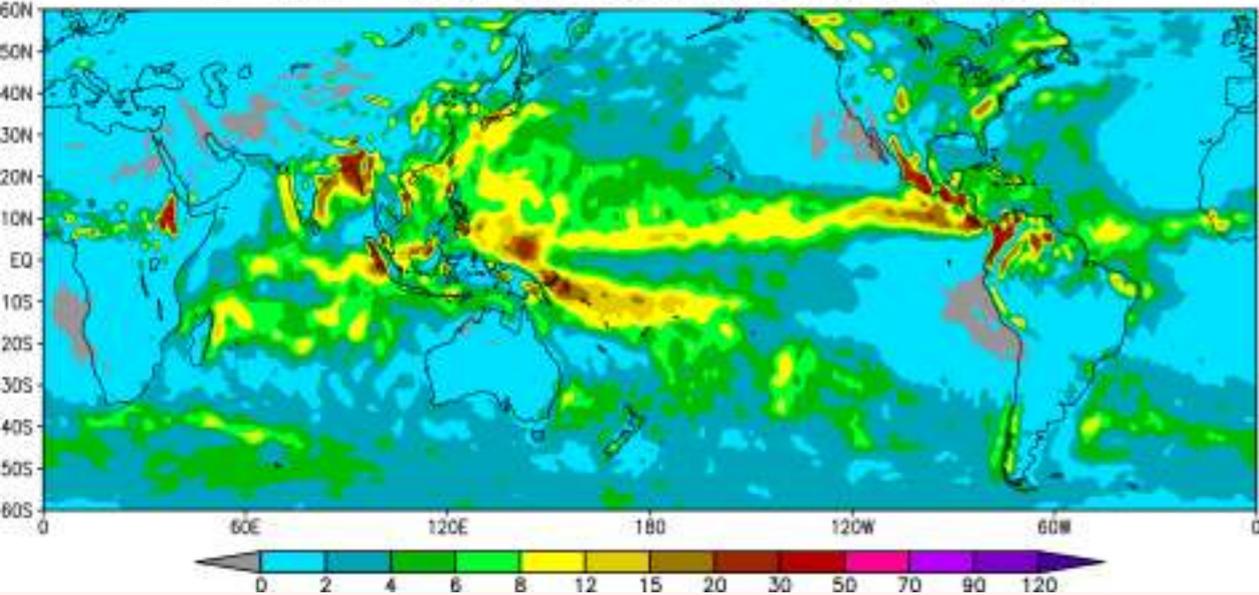
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 72h - OENS MEAN TQ0126L028 XC50 (~100 km)



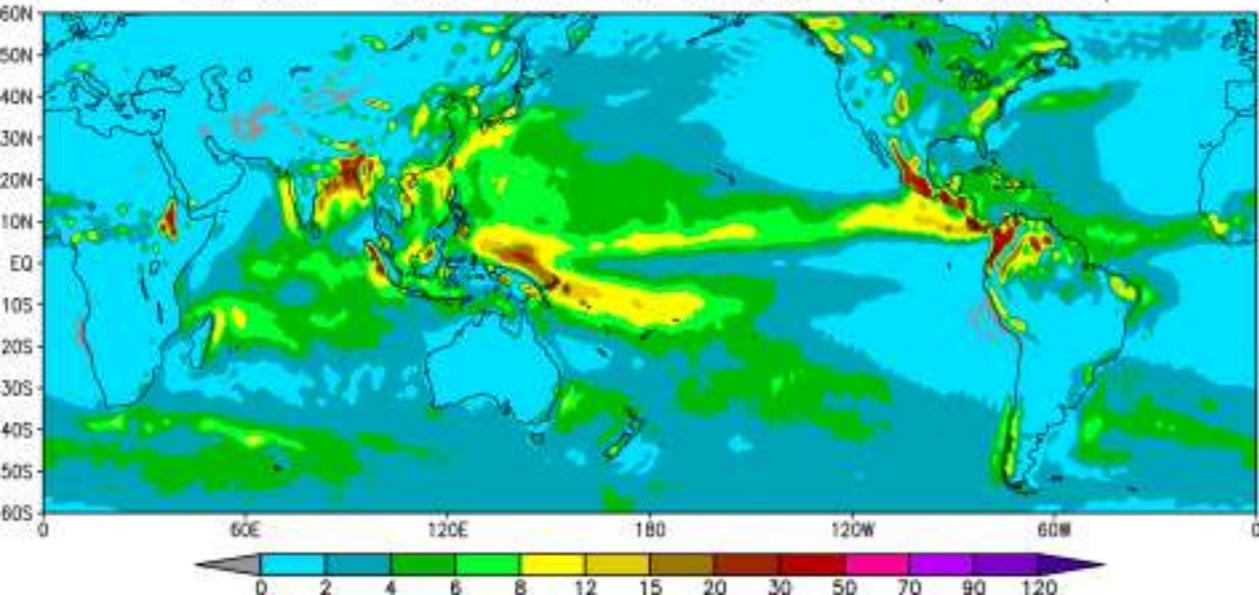
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
OBS CMORPH (8 km)



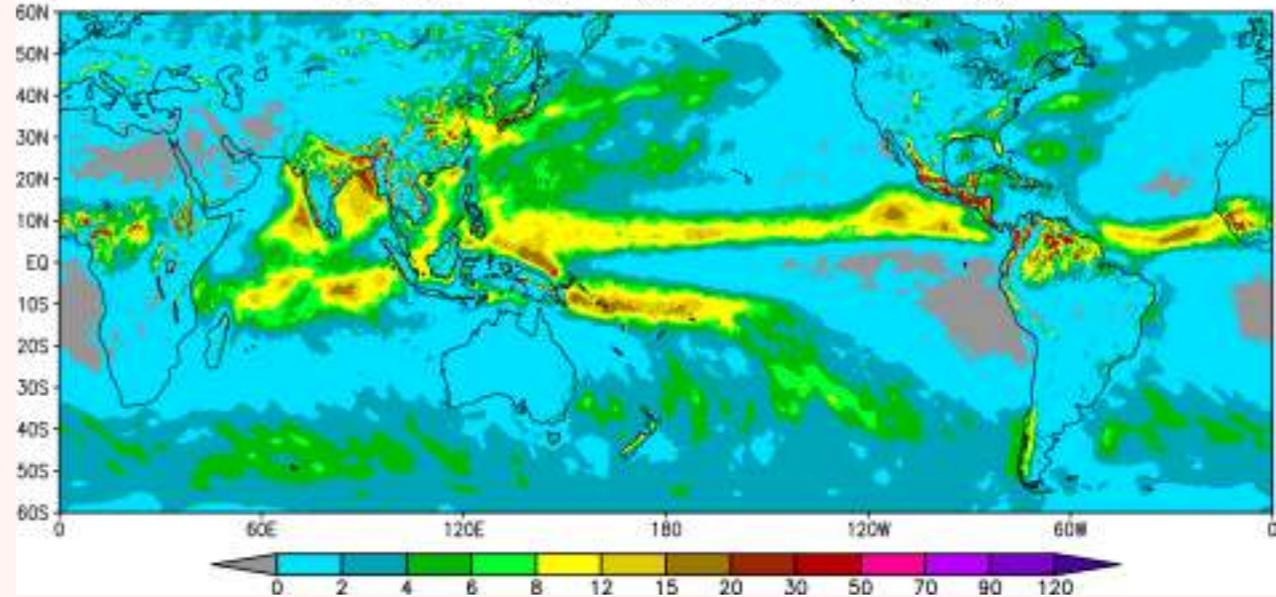
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 96h - OENS CTR TQ0126L028 TUPA (~100 km)



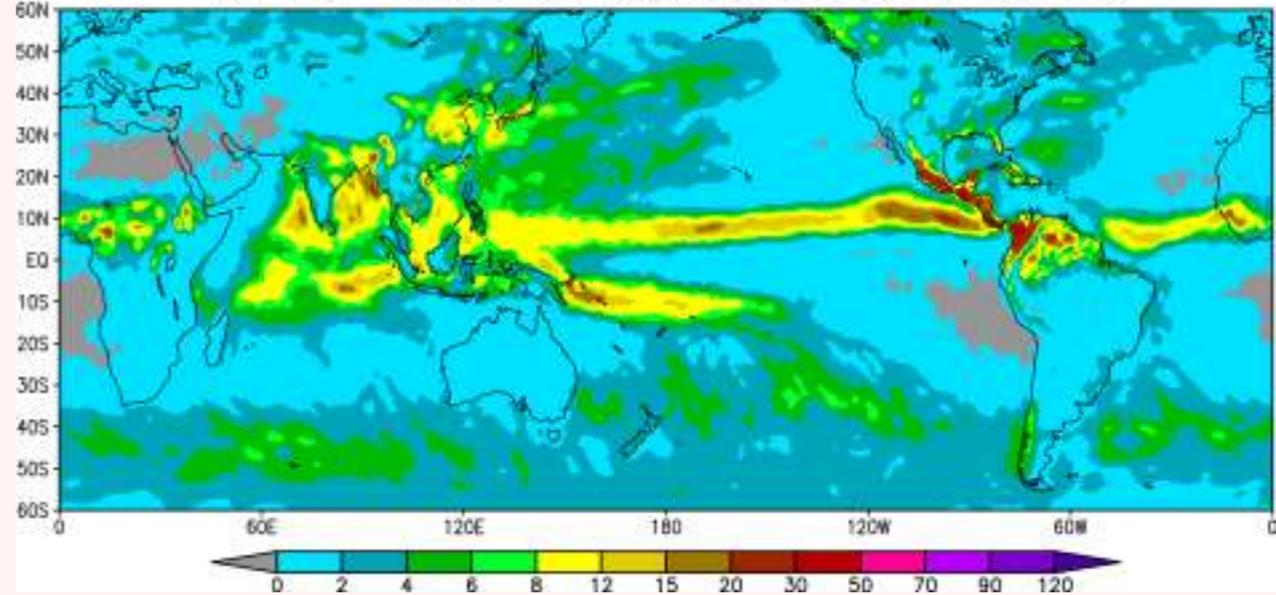
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 96h - OENS MEAN TQ0126L028 TUPA (~100 km)



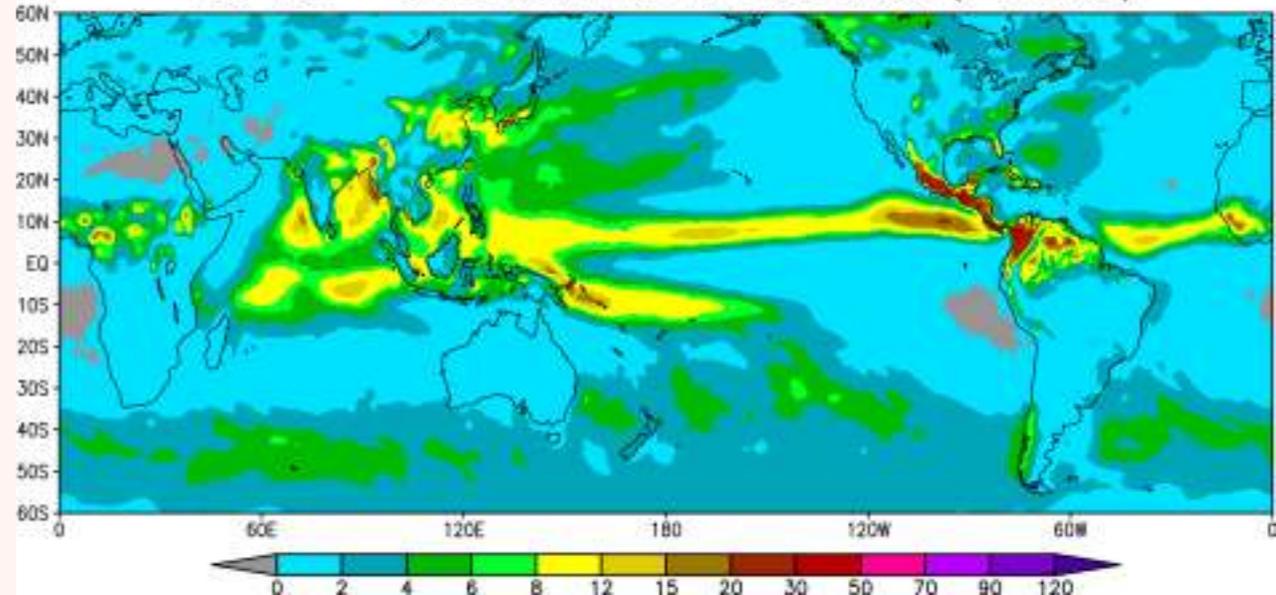
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 96h - BAM TQ0666L054 (~20 km)



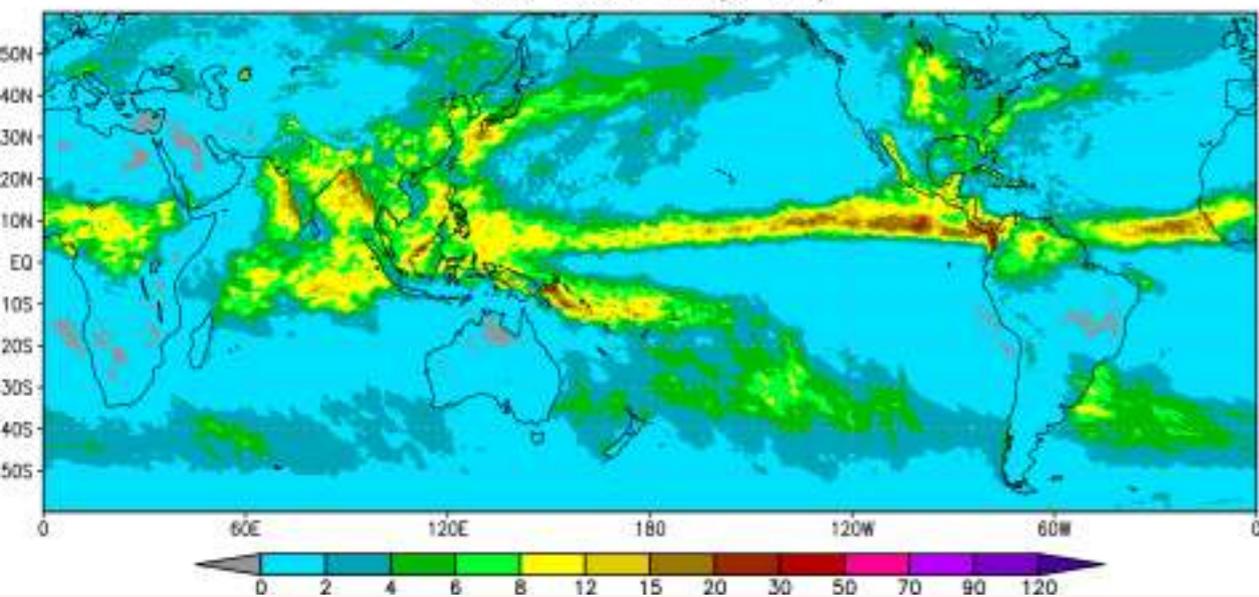
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 96h - OENS CTR TQ0126L028 XC50 (~100 km)



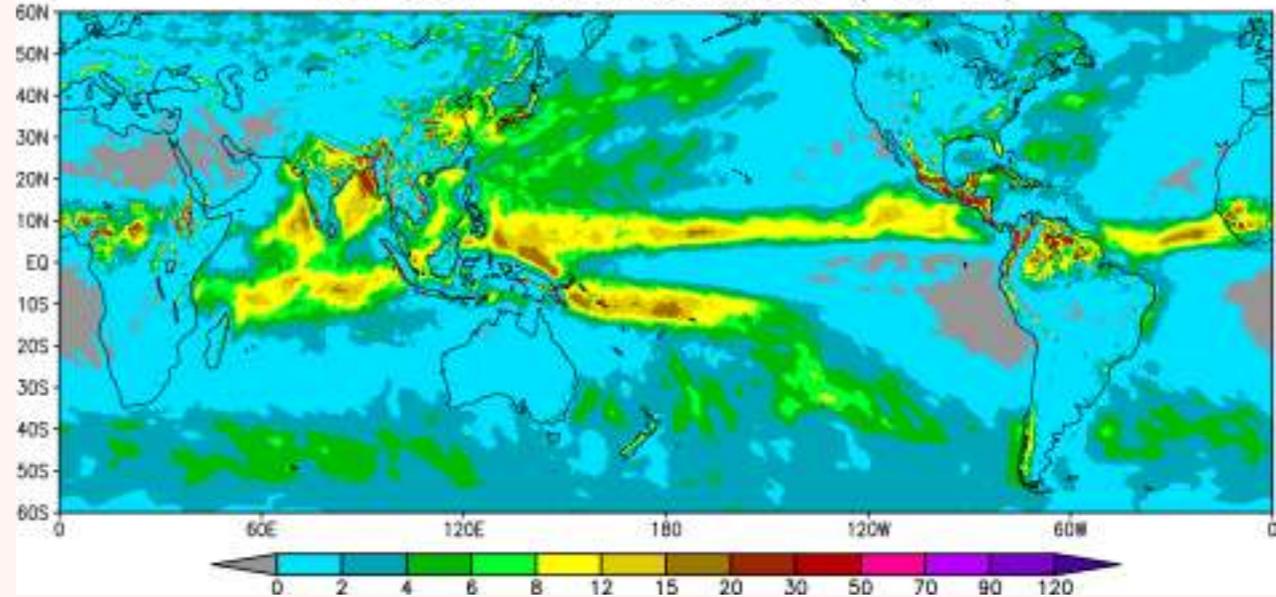
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 96h - OENS MEAN TQ0126L028 XC50 (~100 km)



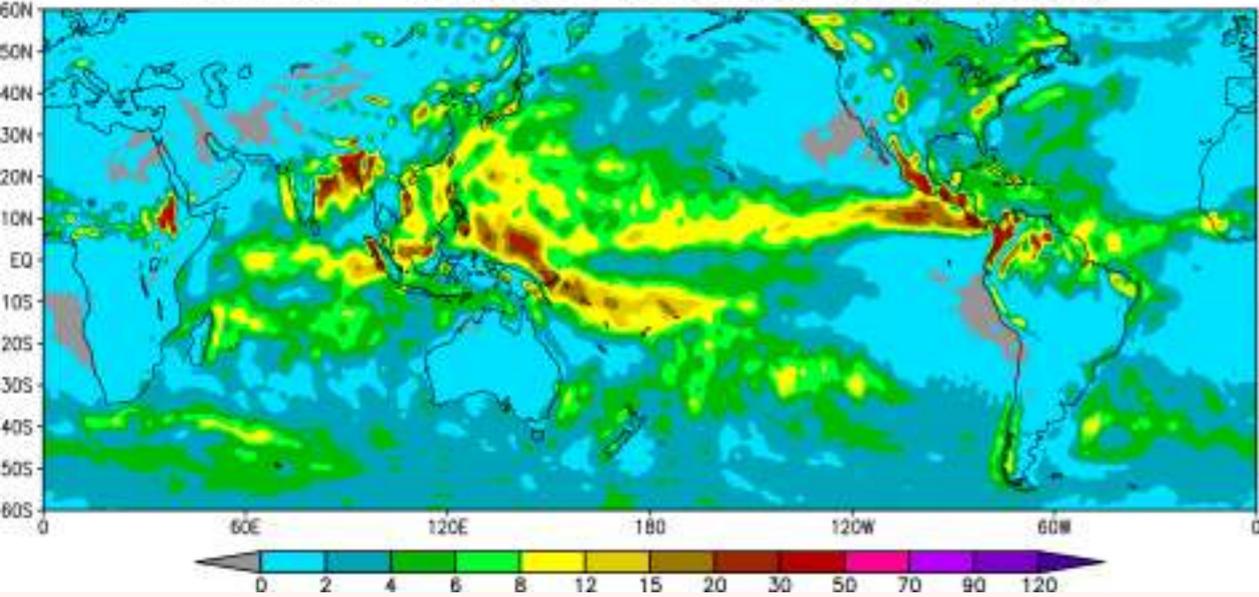
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
OBS CMORPH (8 km)



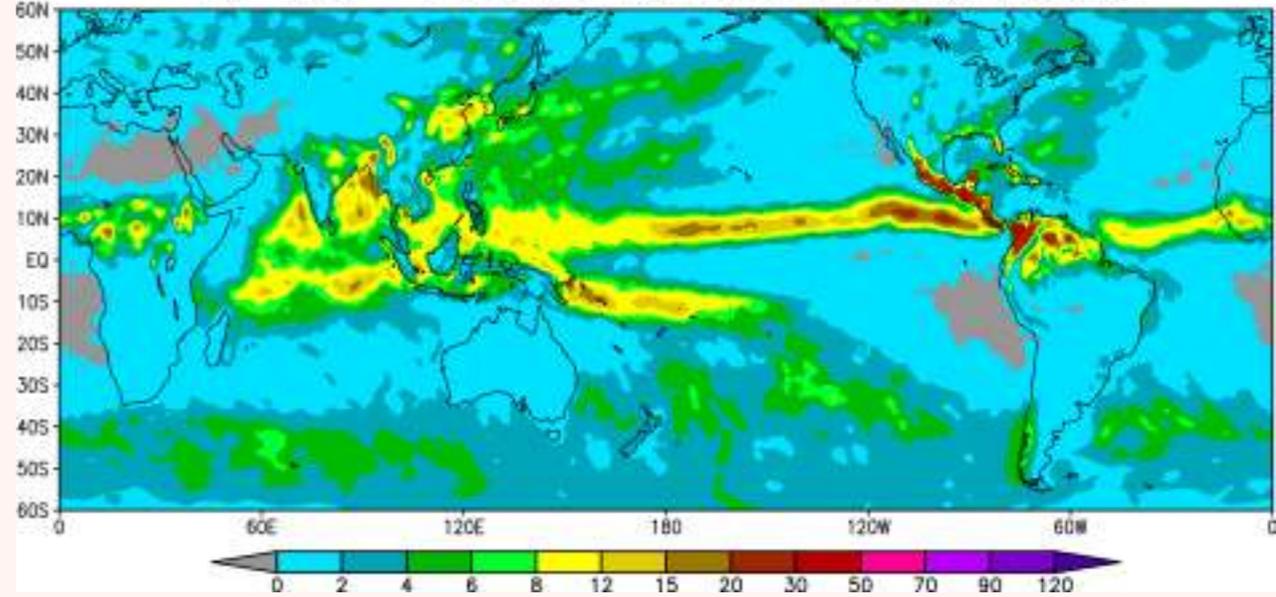
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 120h - BAM TQ0666L054 (~20 km)



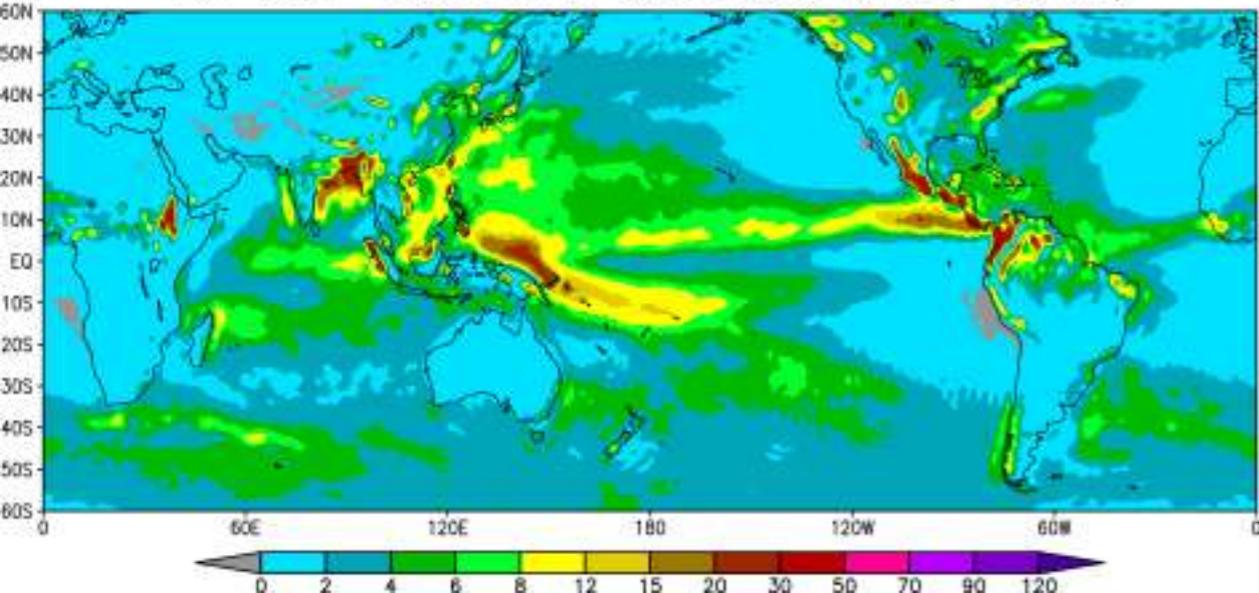
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 120h - OENS CTR TQ0126L028 TUPA (~100 km)



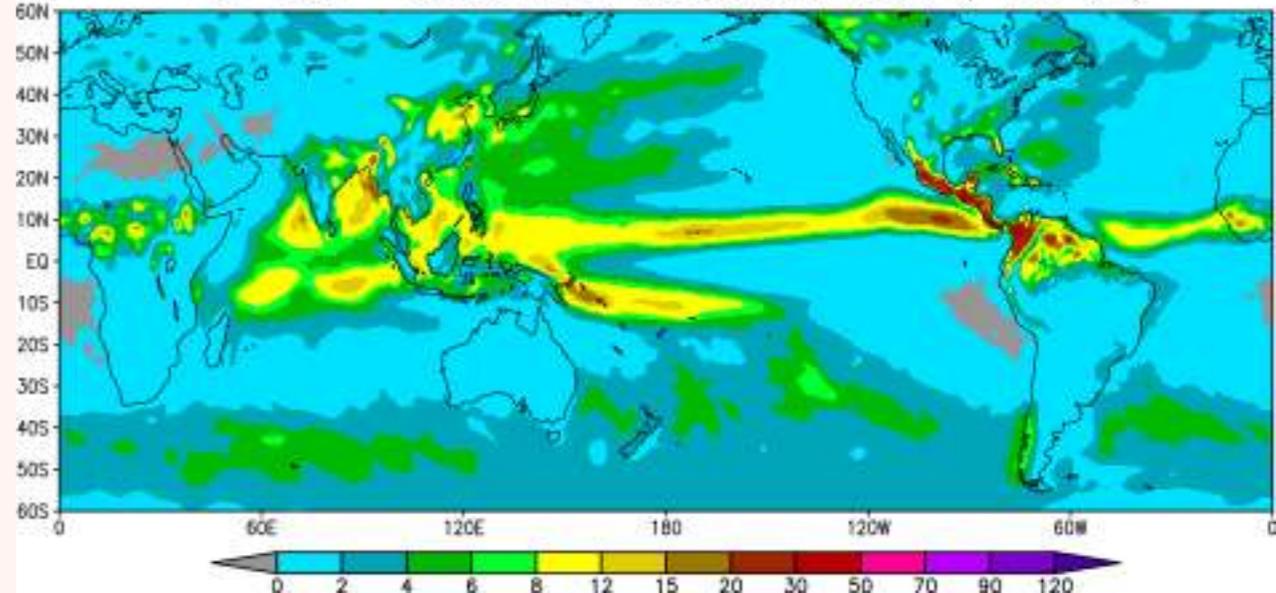
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 120h - OENS CTR TQ0126L028 XC50 (~100 km)



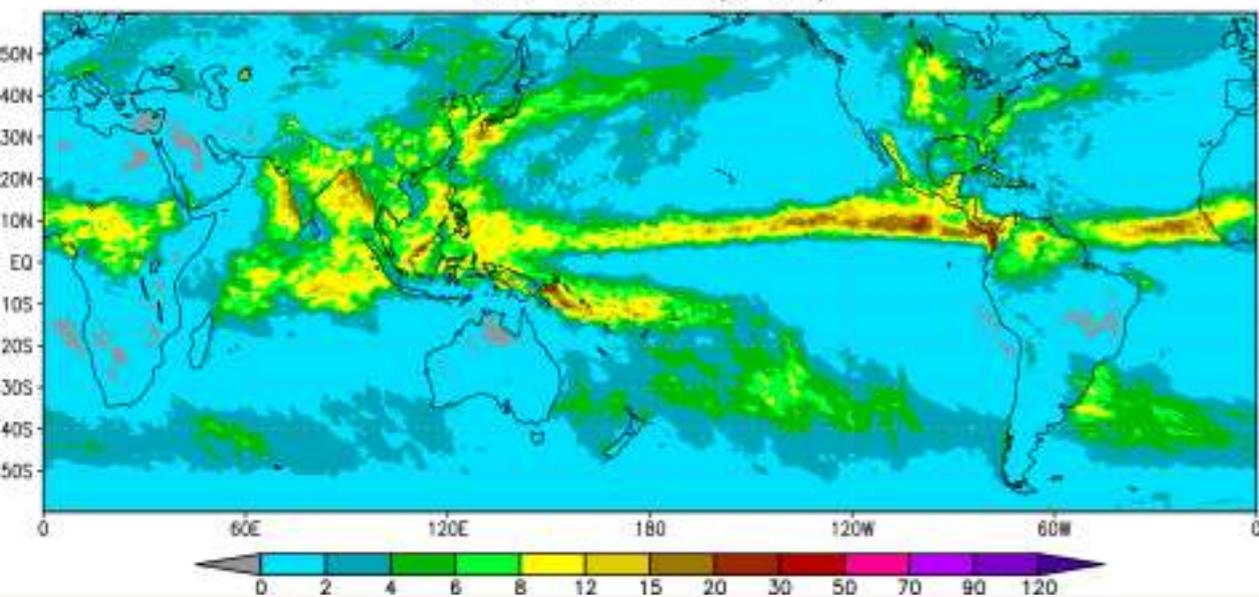
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 120h - OENS MEAN TQ0126L028 TUPA (~100 km)



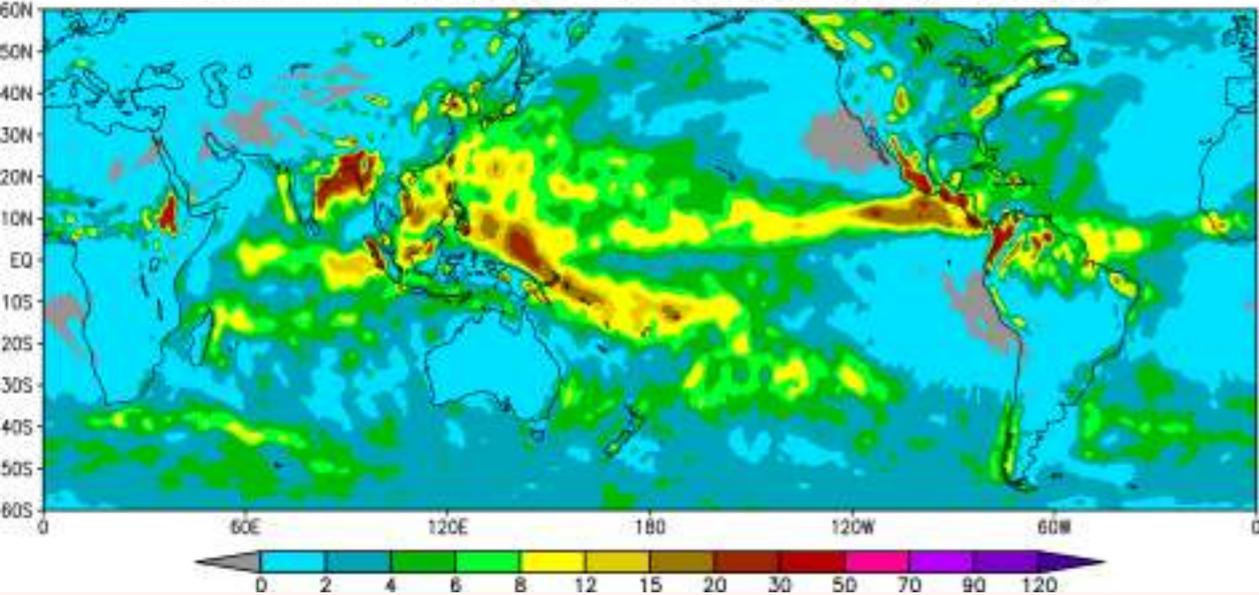
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 120h - OENS MEAN TQ0126L028 XC50 (~100 km)



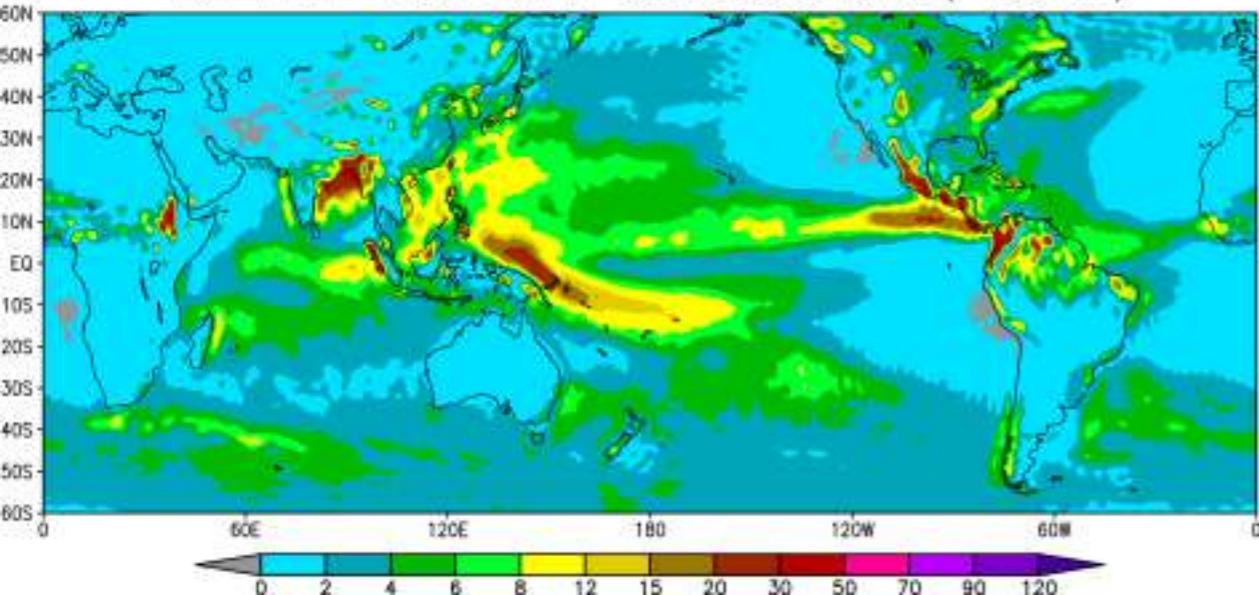
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
OBS CMORPH (8 km)



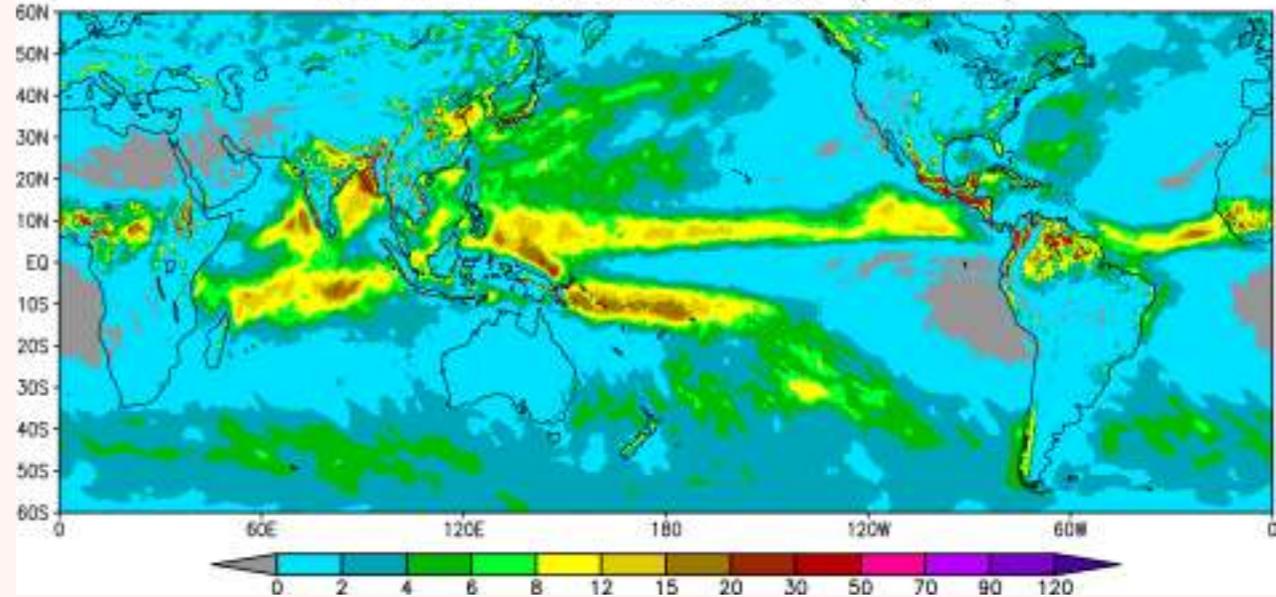
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 144h - OENS CTR TQ0126L028 TUPA (~100 km)



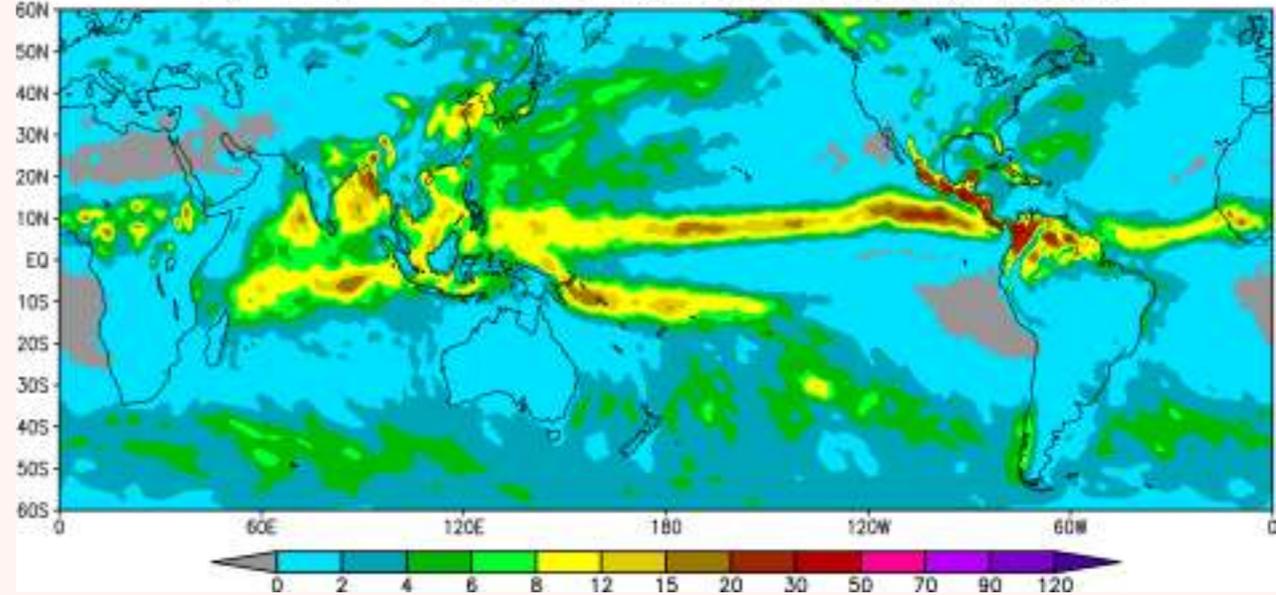
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 144h - OENS MEAN TQ0126L028 TUPA (~100 km)



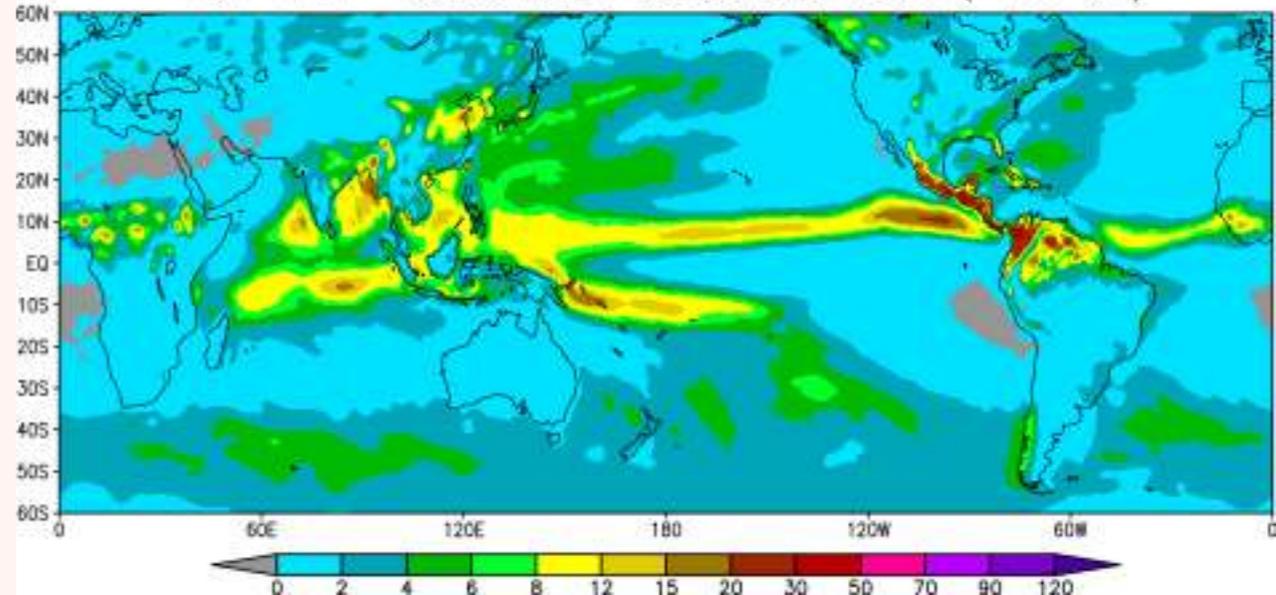
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 144h - BAM TQ0666L054 (~20 km)



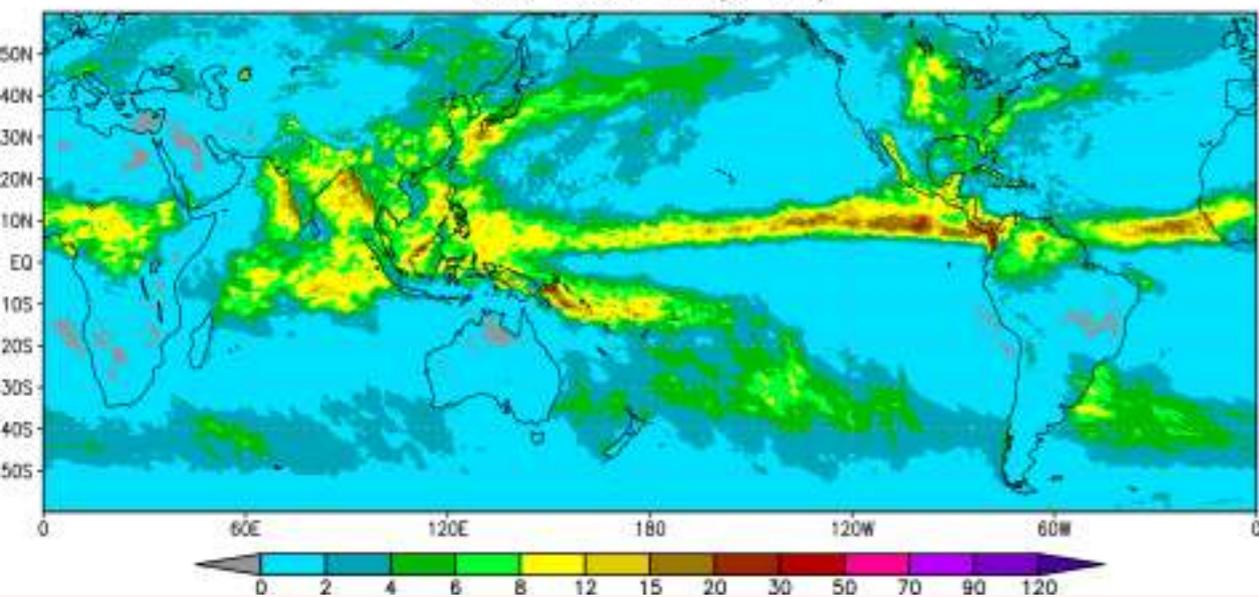
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 144h - OENS CTR TQ0126L028 XC50 (~100 km)



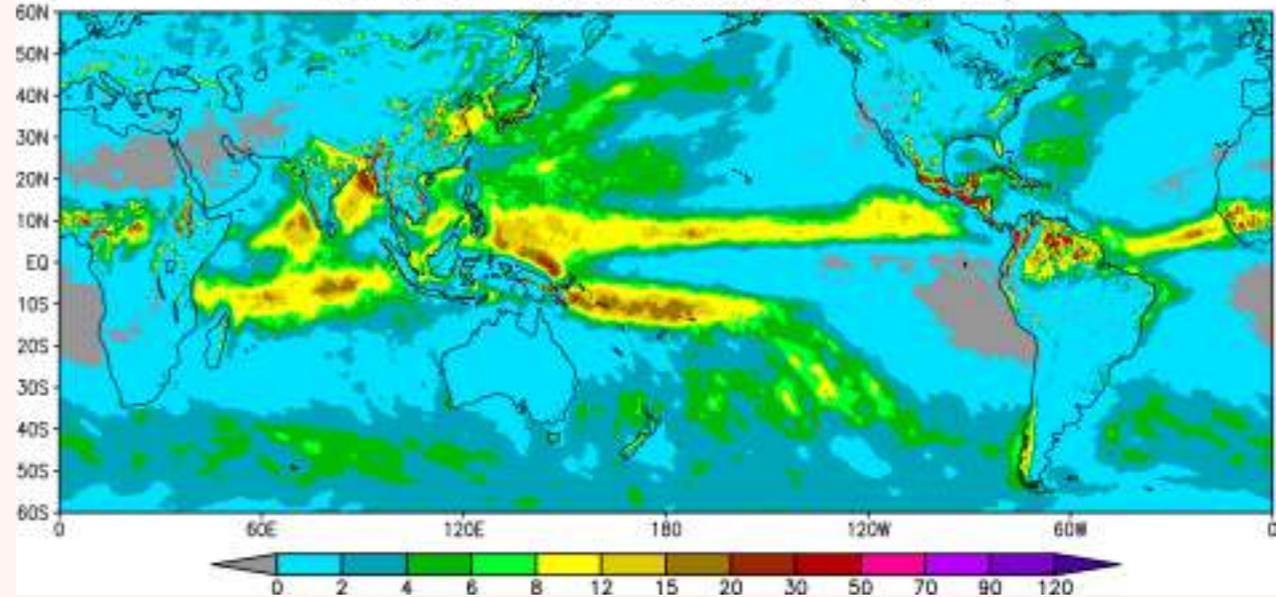
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 144h - OENS MEAN TQ0126L028 XC50 (~100 km)



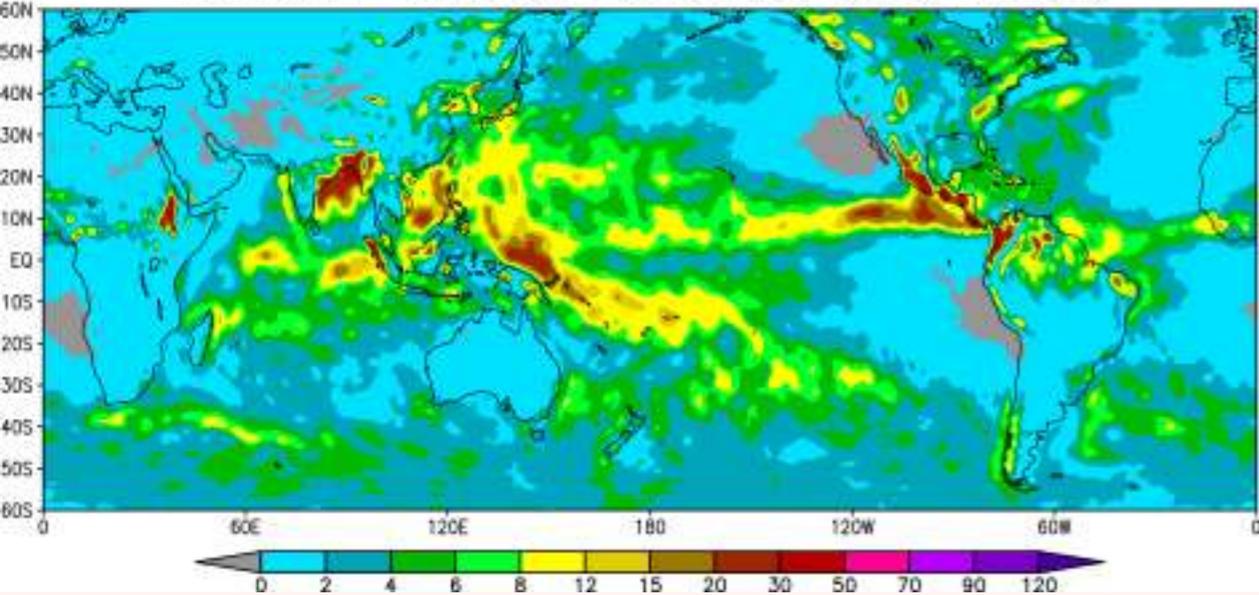
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
OBS CMORPH (8 km)



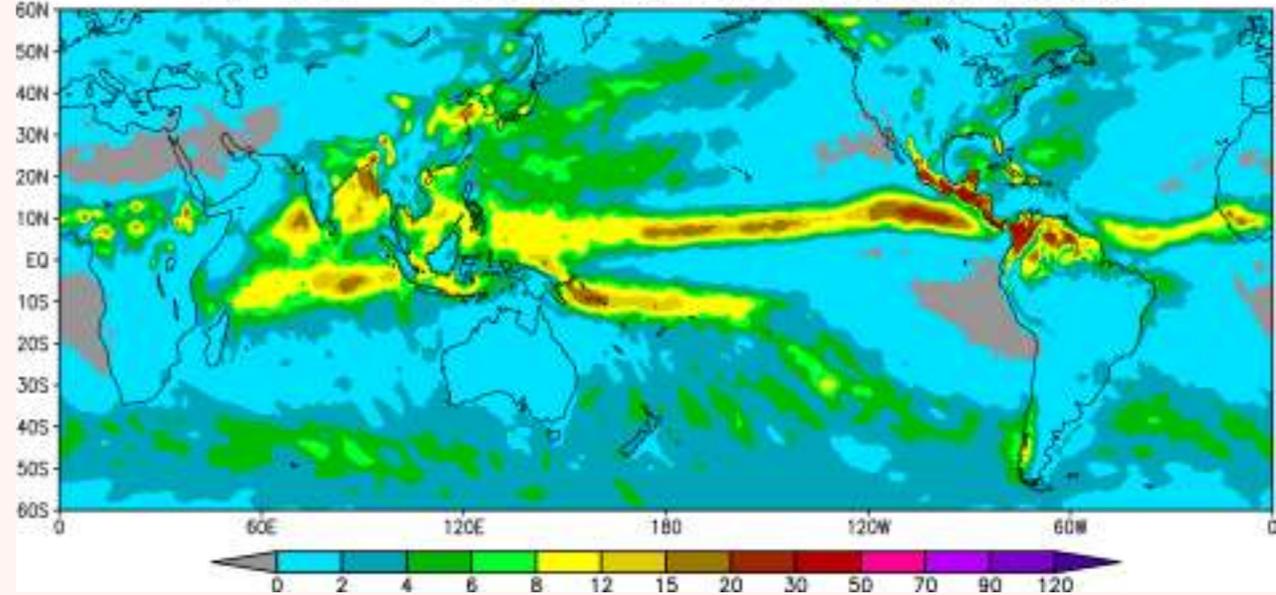
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 168h - BAM TQ0666L054 (~20 km)



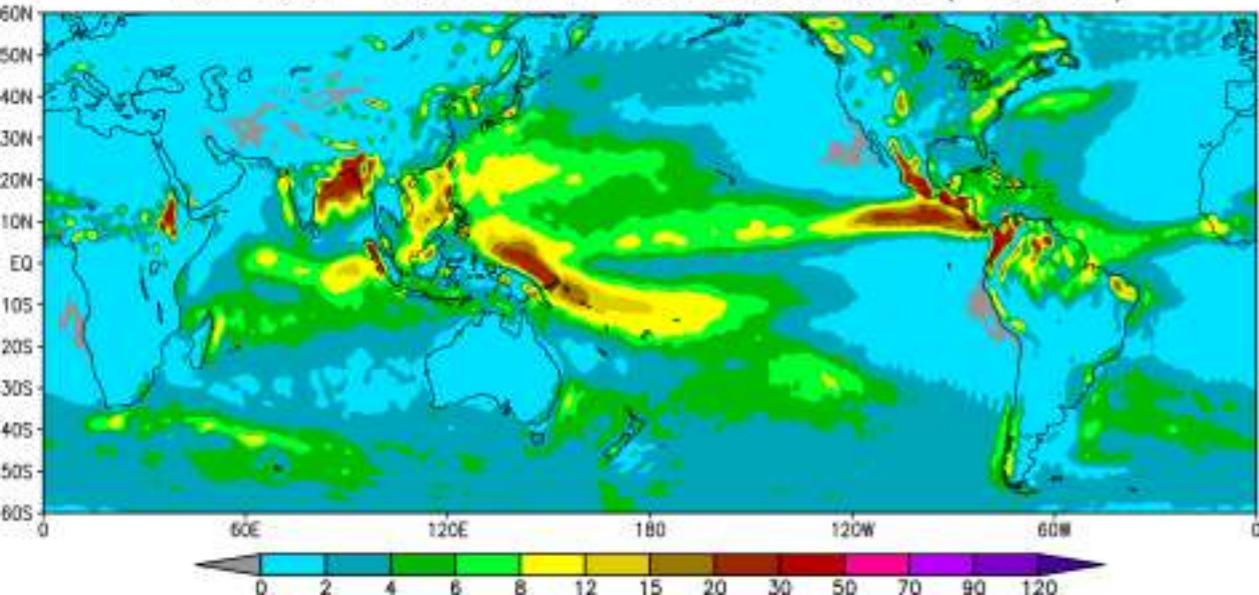
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 168h - OENS CTR TQ0126L028 TUPA (~100 km)



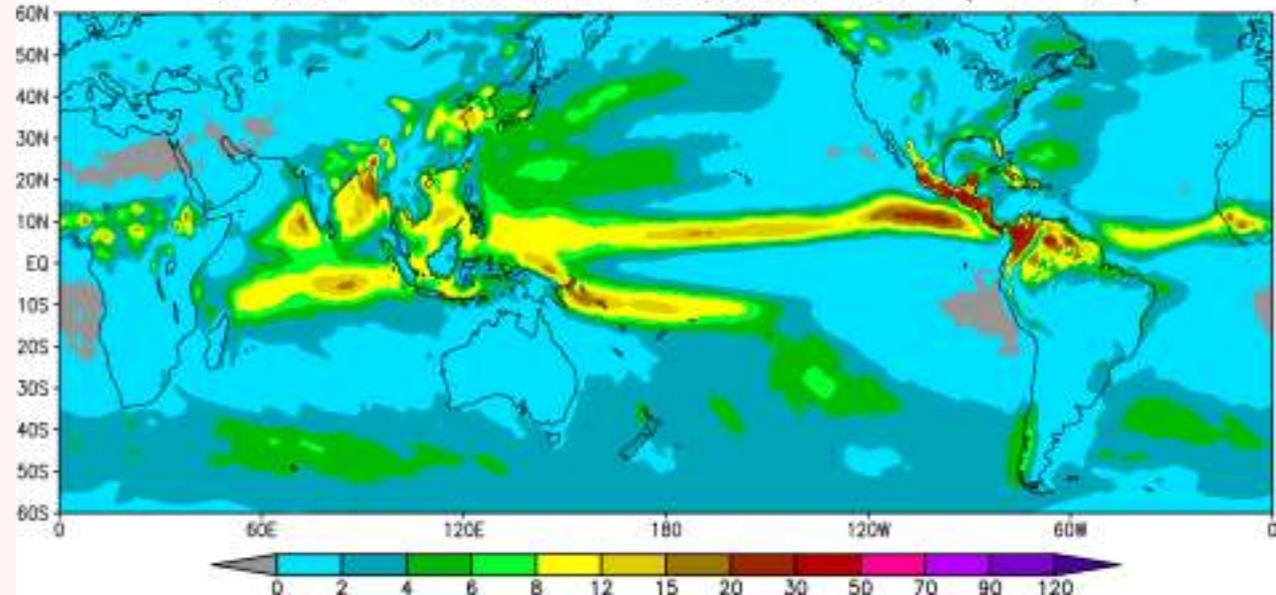
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 168h - OENS CTR TQ0126L028 XC50 (~100 km)



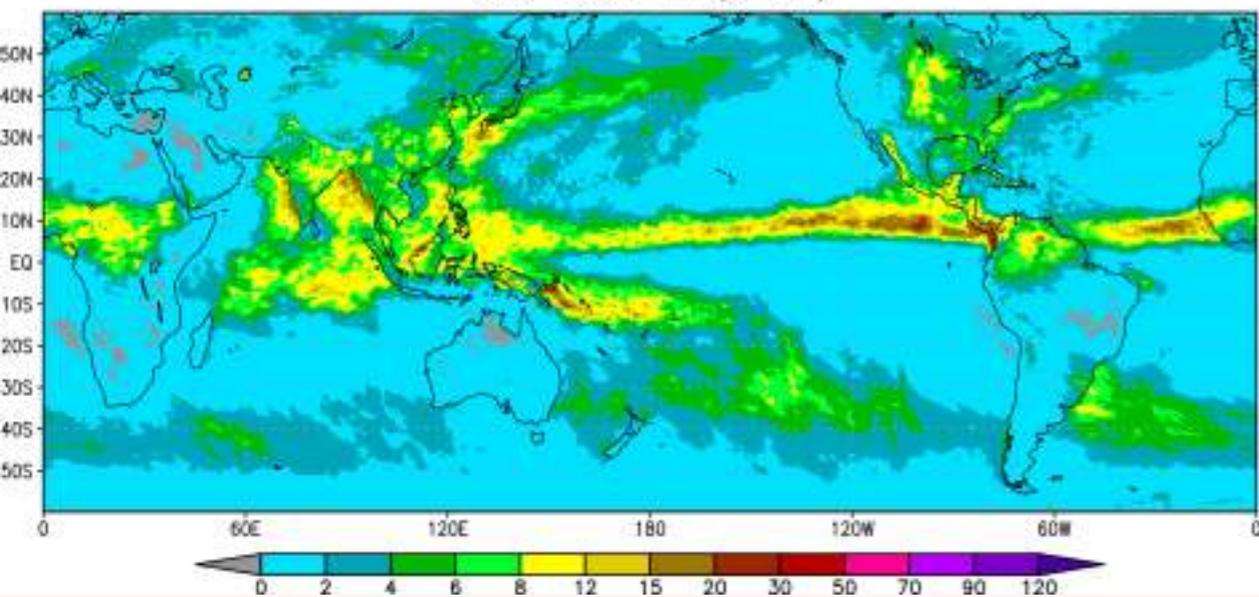
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 168h - OENS MEAN TQ0126L028 TUPA (~100 km)



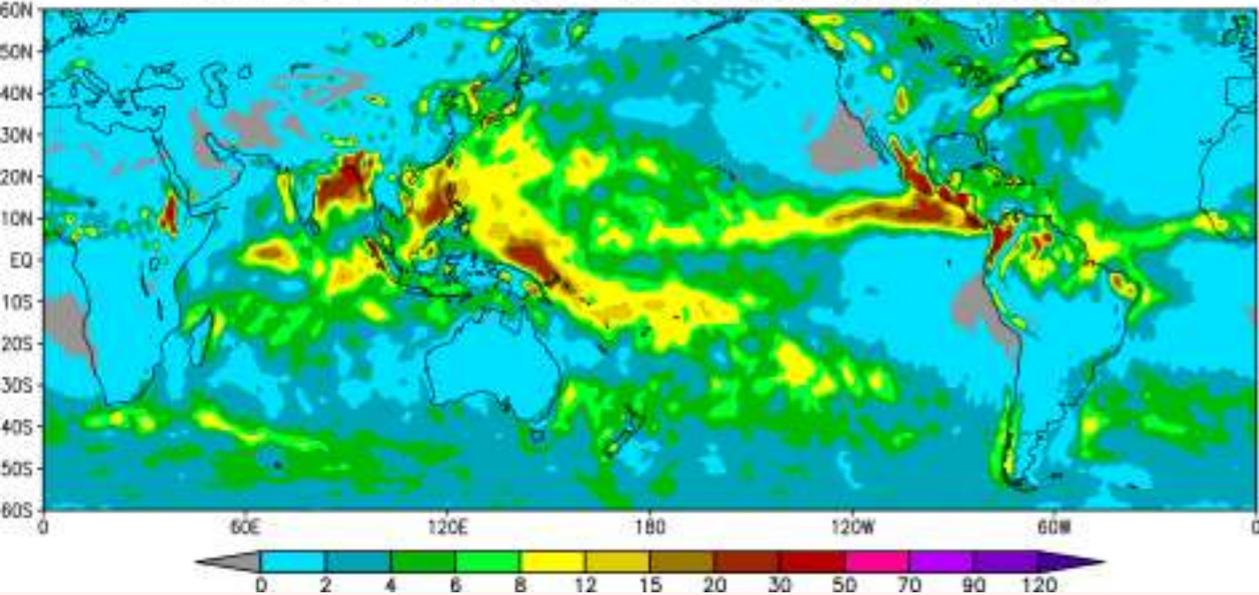
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 168h - OENS MEAN TQ0126L028 XC50 (~100 km)



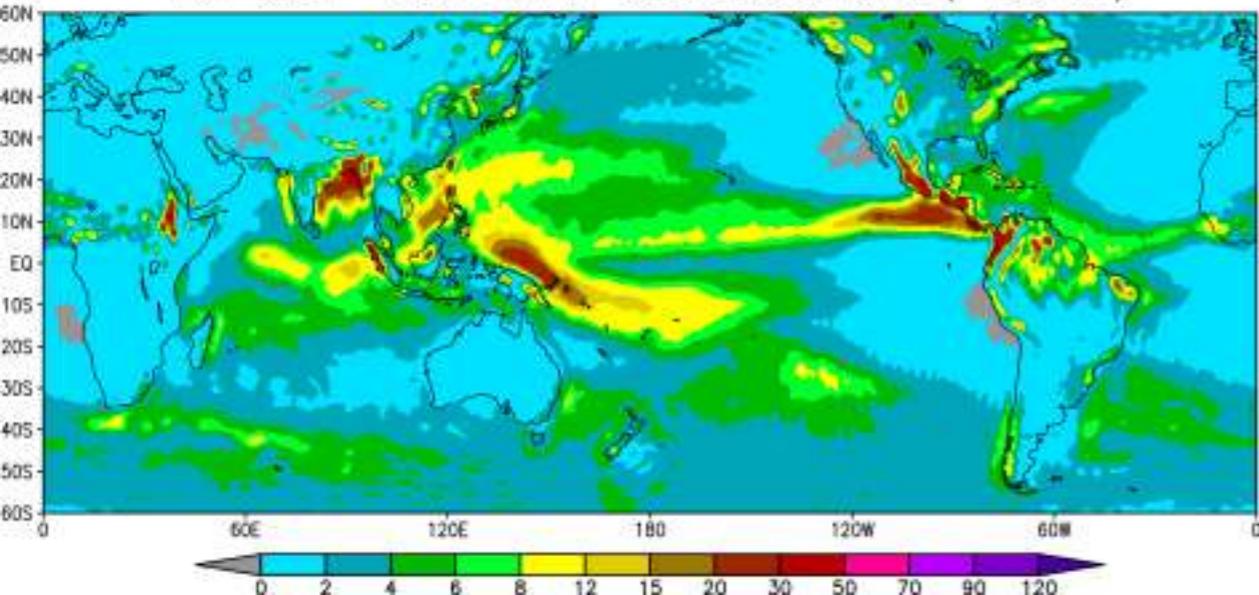
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
OBS CMORPH (8 km)



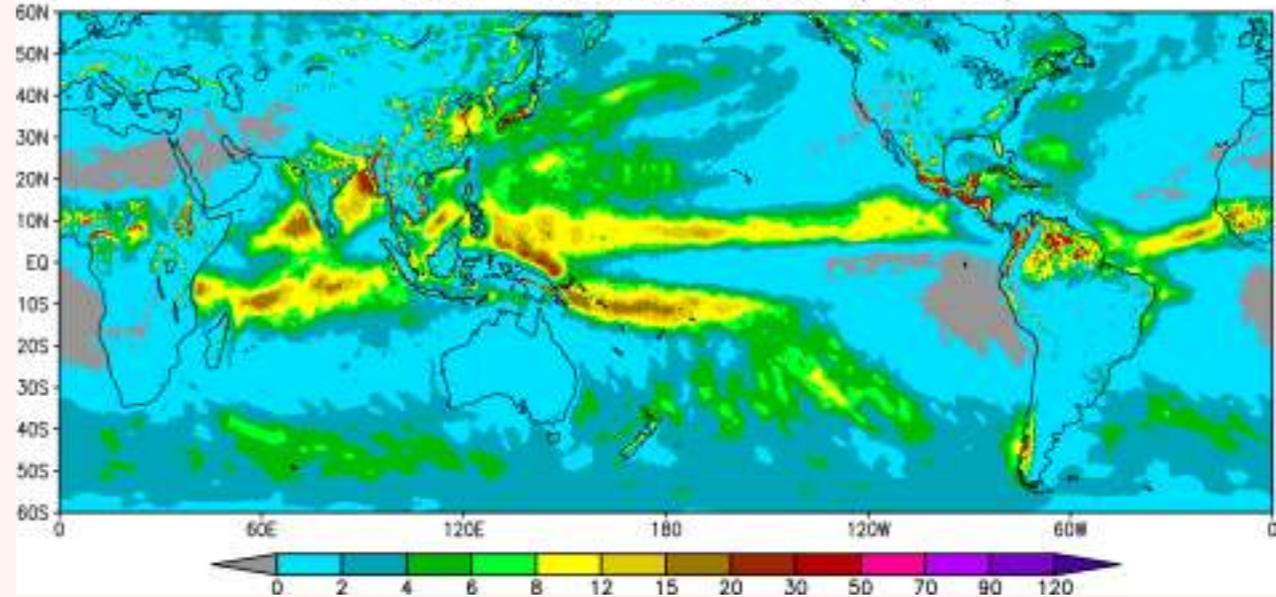
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 192h - OENS CTR TQ0126L028 TUPA (~100 km)



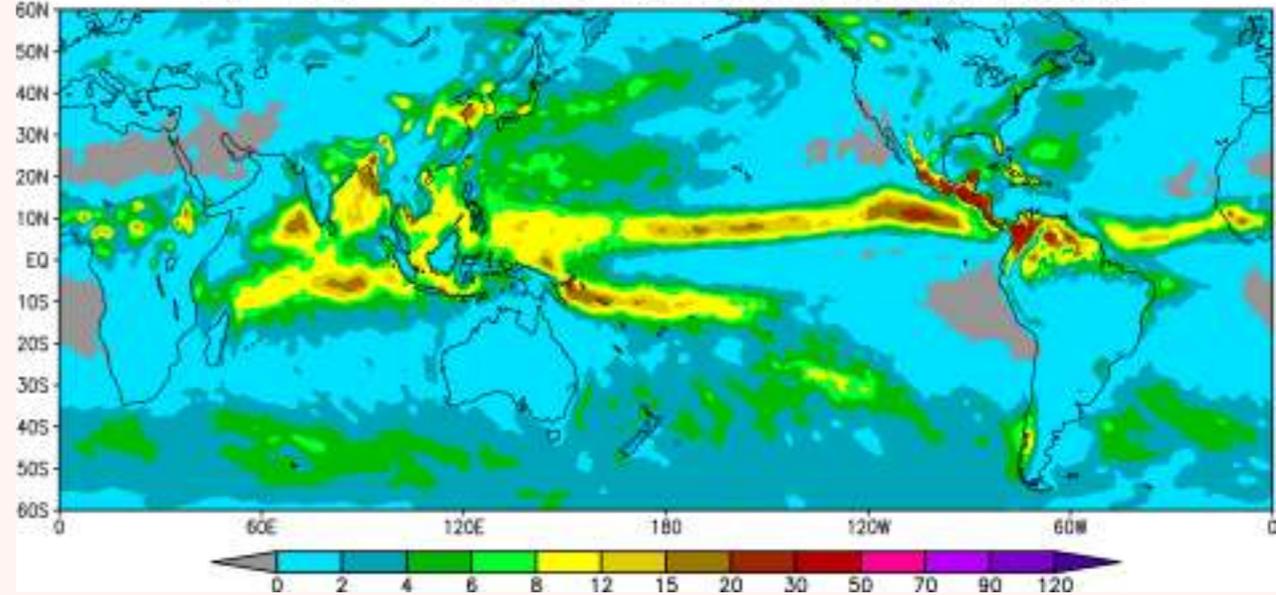
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 192h - OENS MEAN TQ0126L028 TUPA (~100 km)



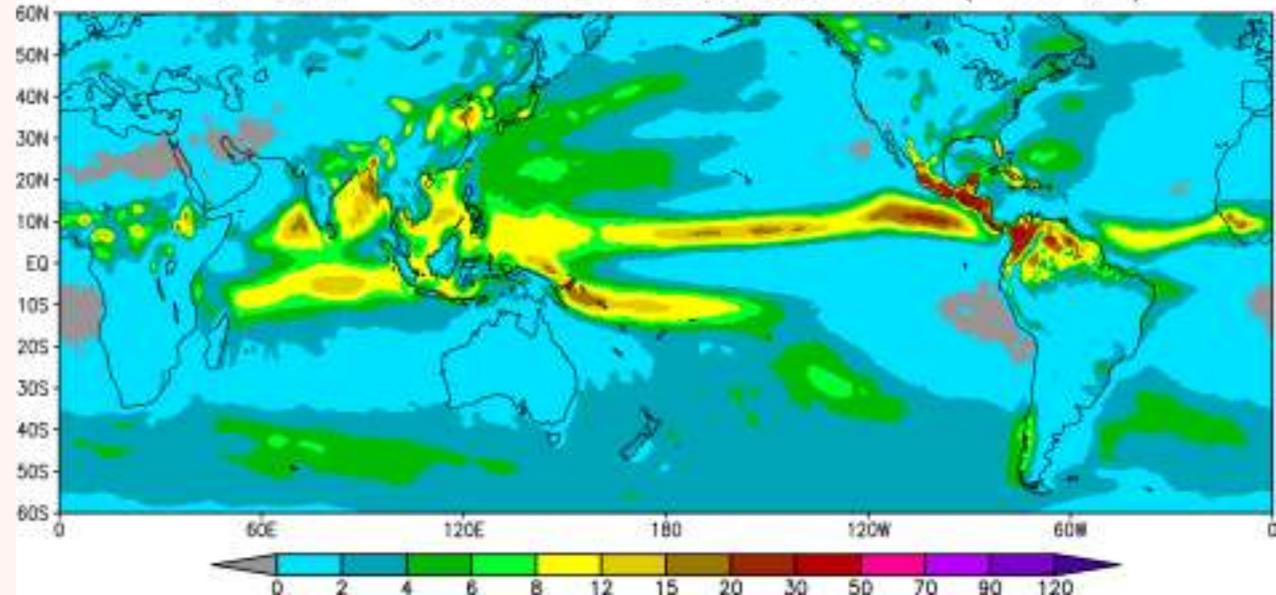
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 192h - BAM TQ0666L054 (~20 km)



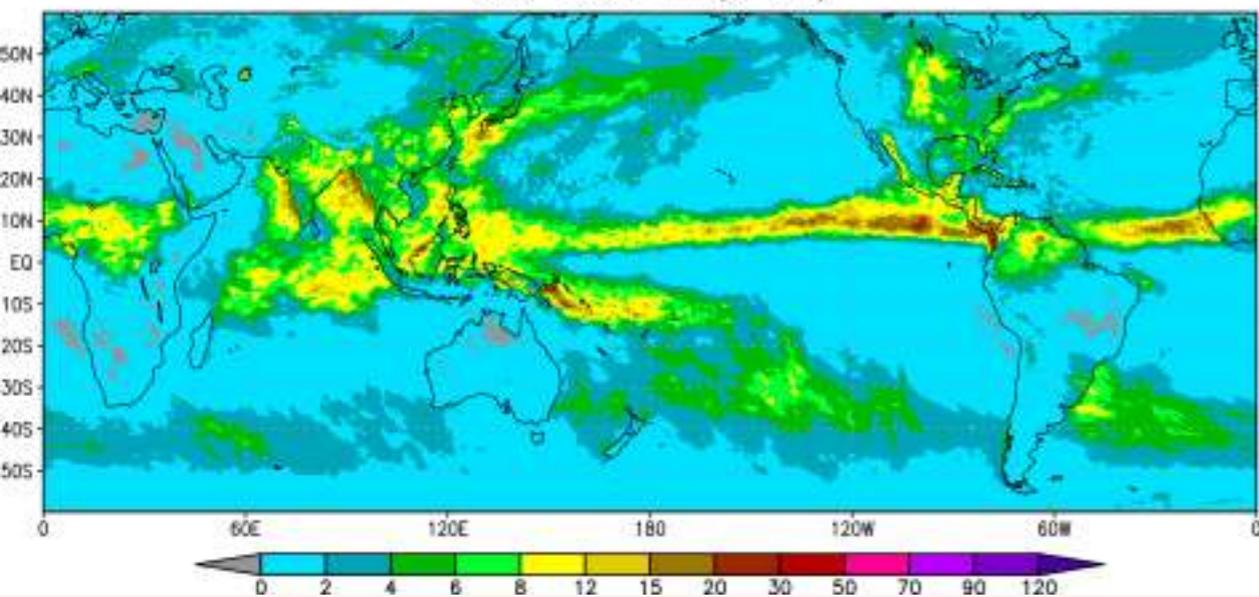
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 192h - OENS CTR TQ0126L028 XC50 (~100 km)



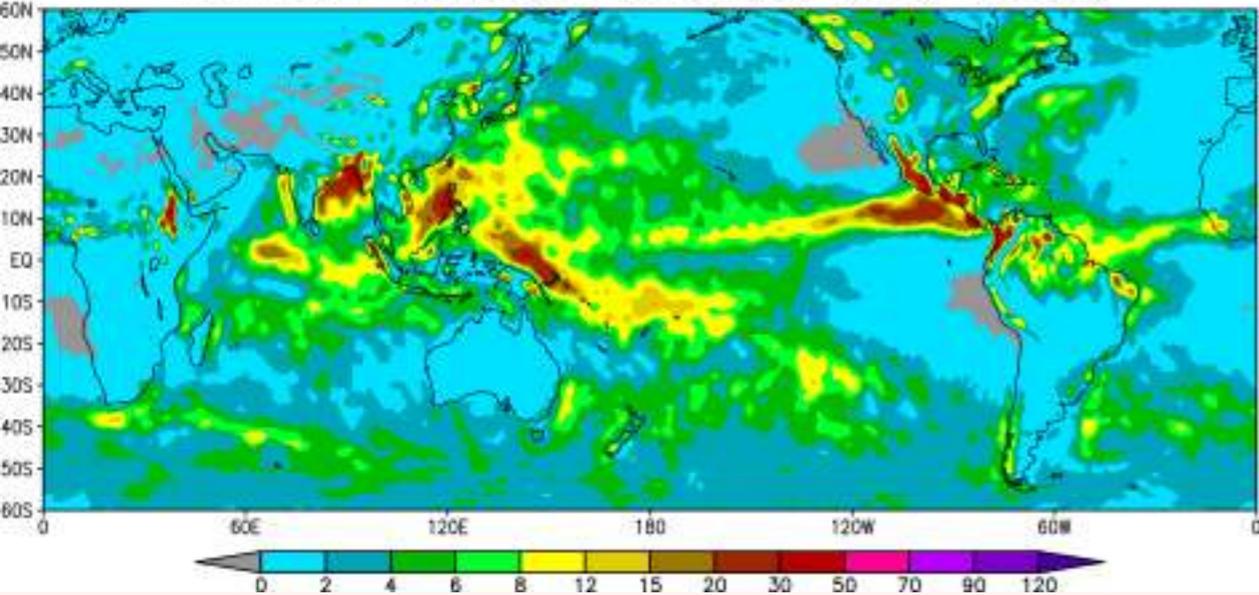
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 192h - OENS MEAN TQ0126L028 XC50 (~100 km)



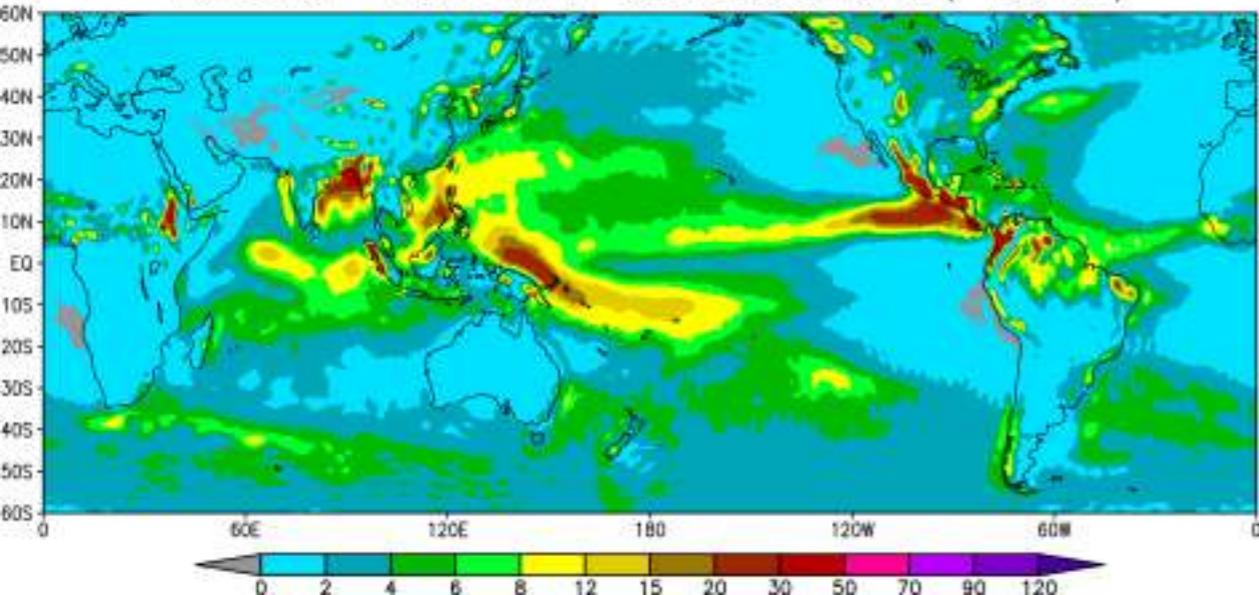
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
OBS CMORPH (8 km)



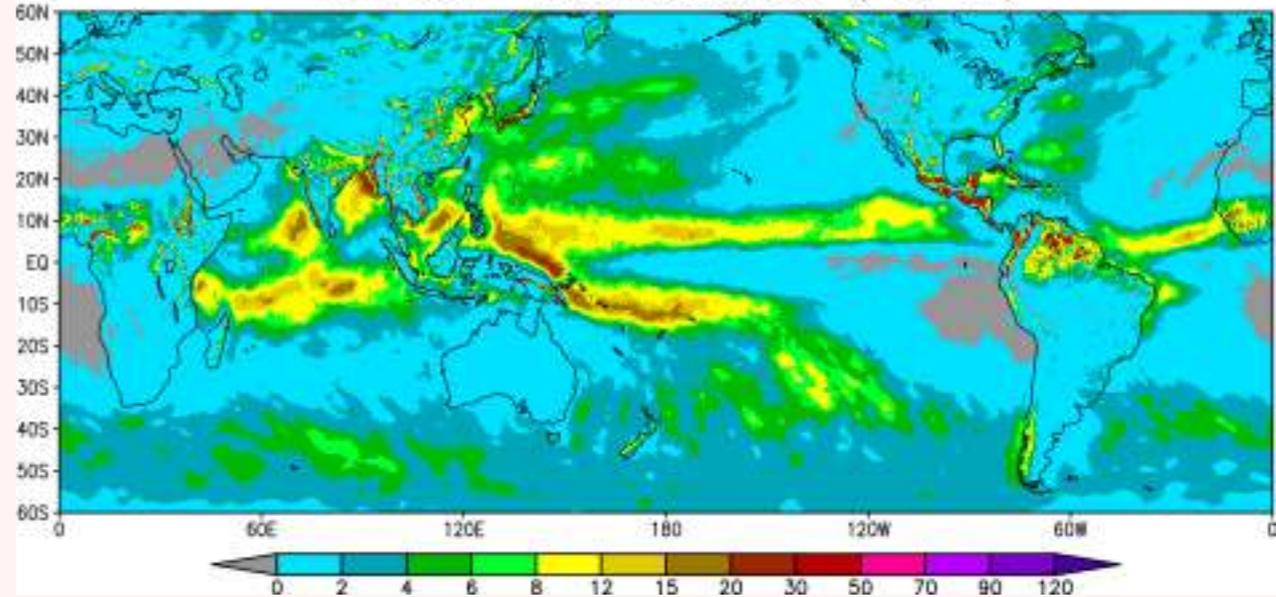
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 216h - OENS CTR TQ0126L028 TUPA (~100 km)



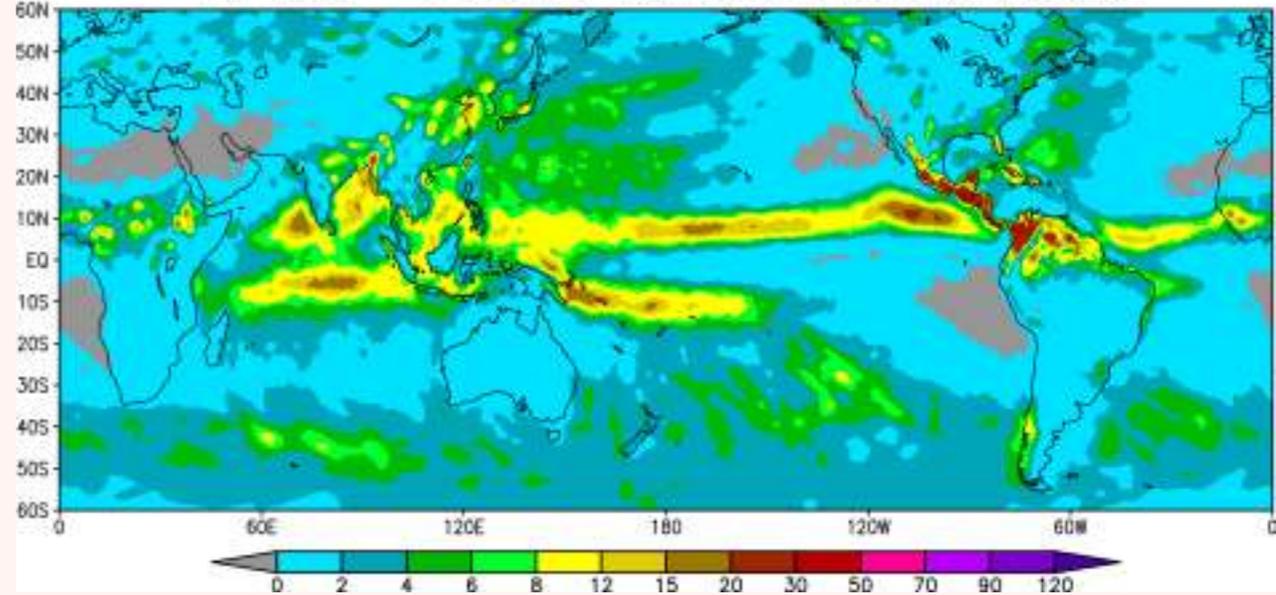
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 216h - OENS MEAN TQ0126L028 TUPA (~100 km)



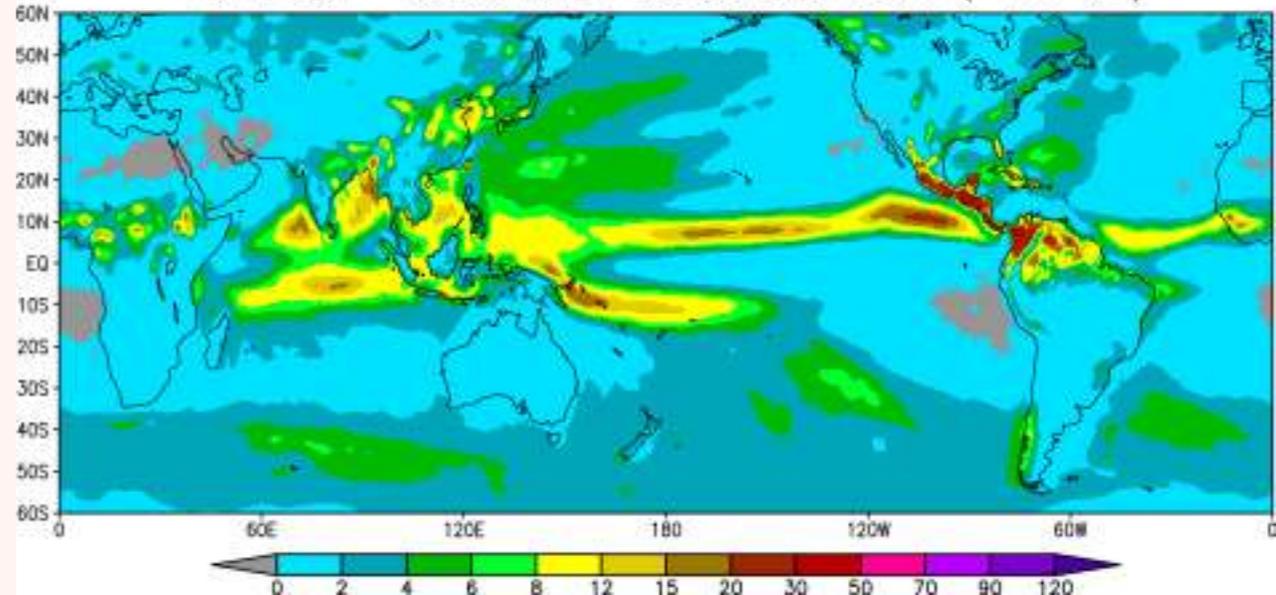
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 216h - BAM TQ0666L054 (~20 km)



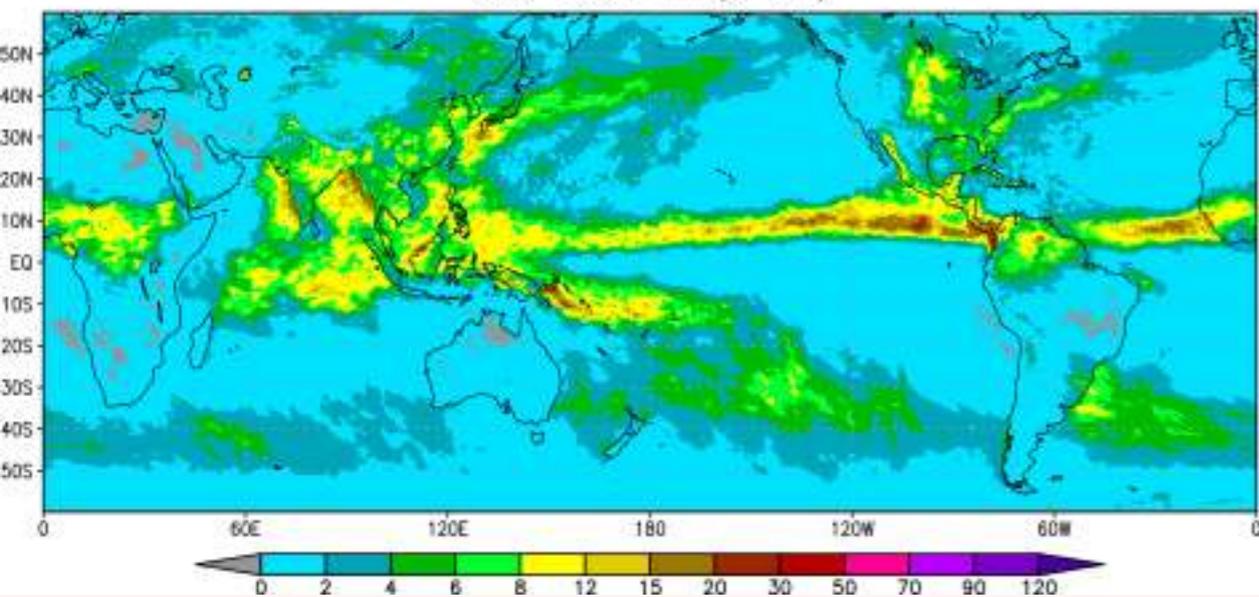
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 216h - OENS CTR TQ0126L028 XC50 (~100 km)



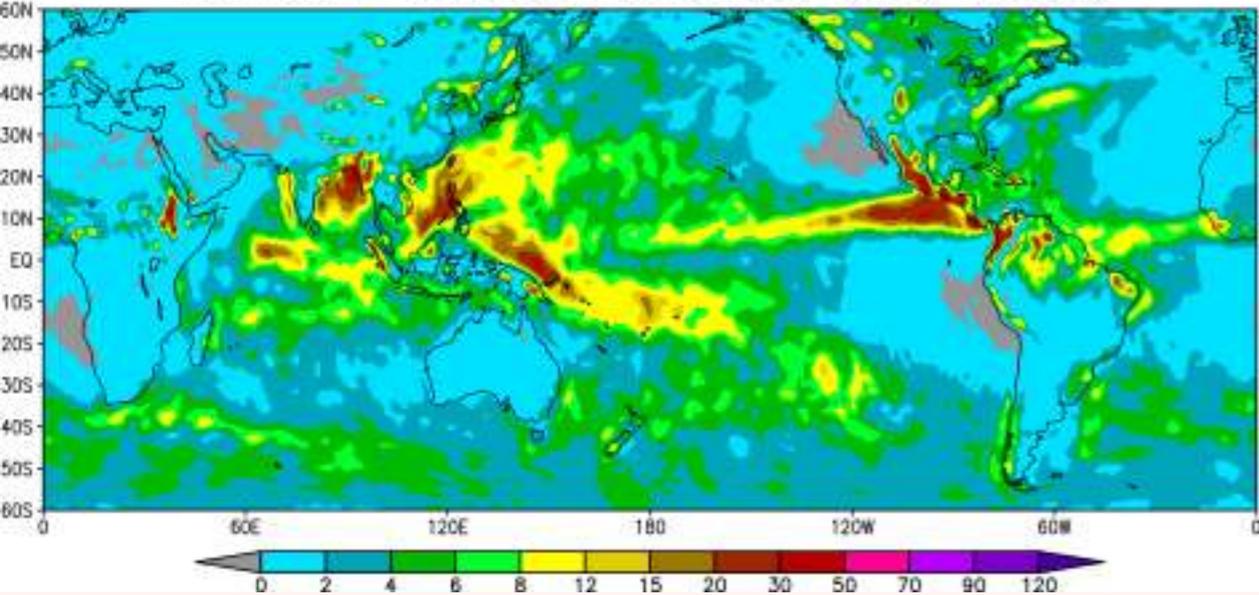
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 216h - OENS MEAN TQ0126L028 XC50 (~100 km)



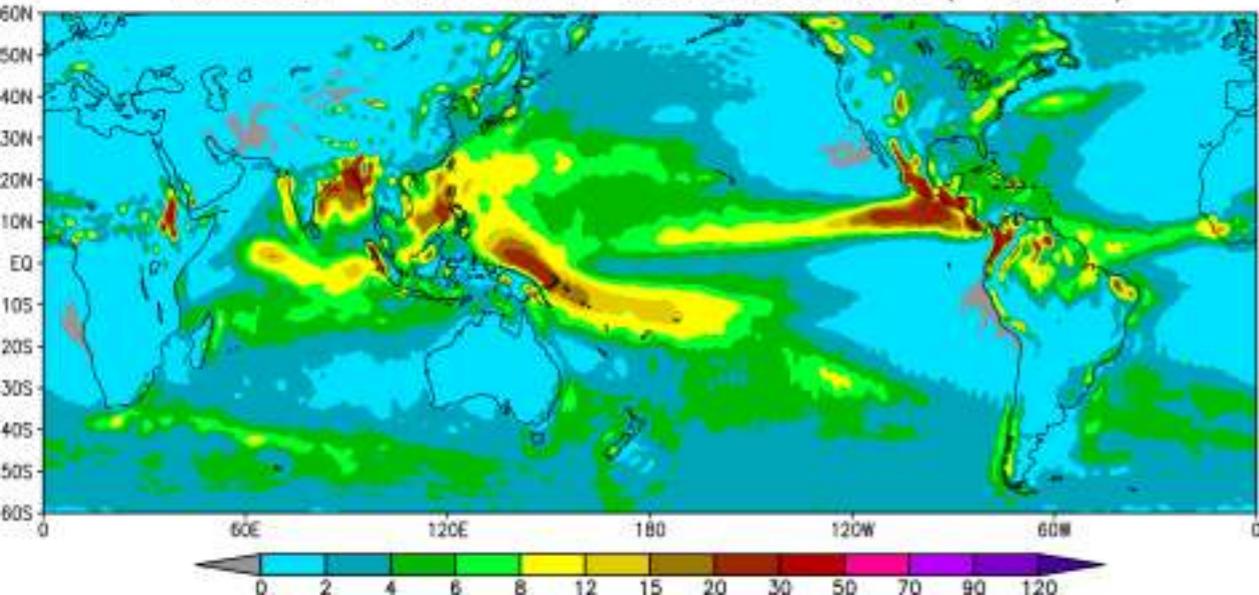
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
OBS CMORPH (8 km)



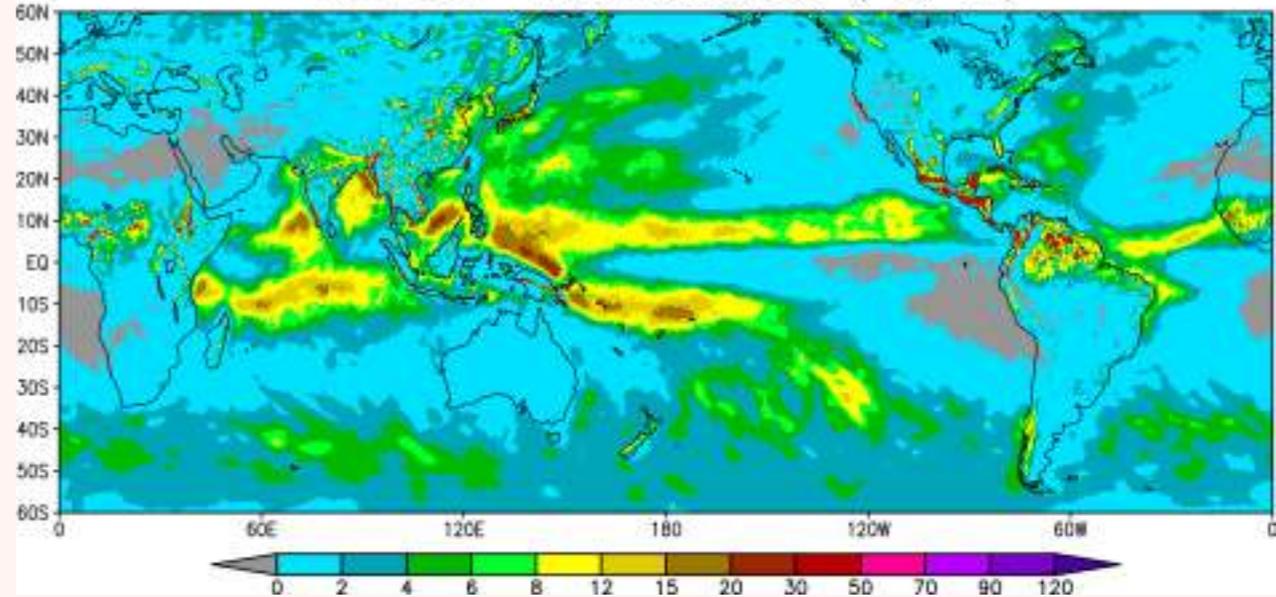
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 240h - OENS CTR TQ0126L028 TUPA (~100 km)



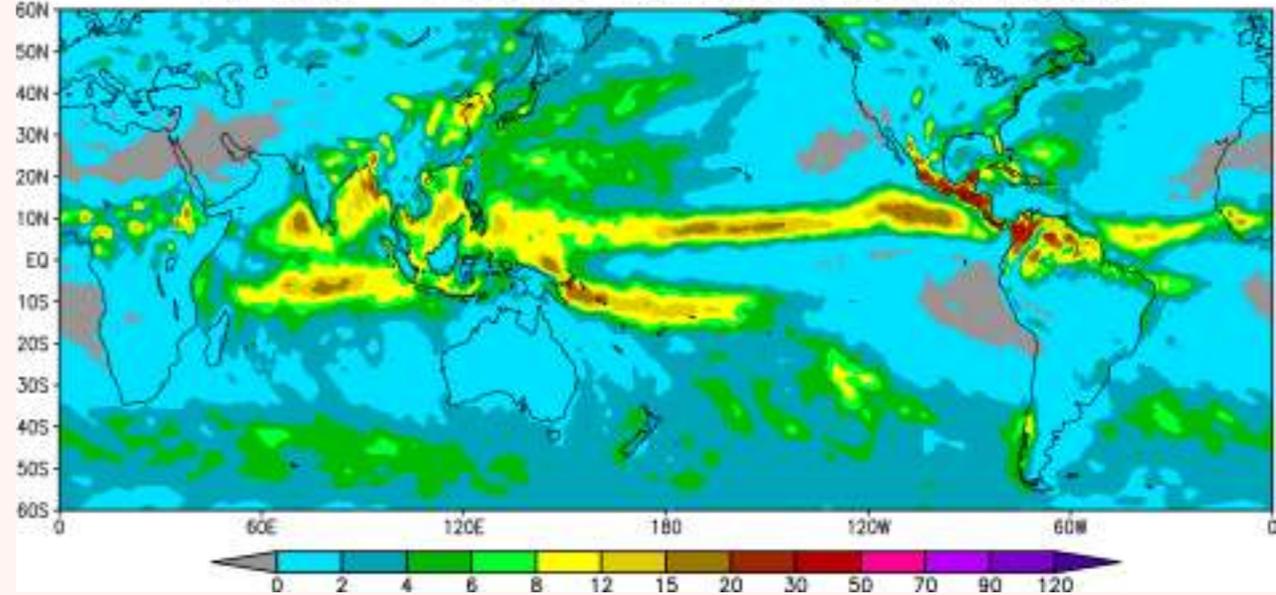
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 240h - OENS MEAN TQ0126L028 TUPA (~100 km)



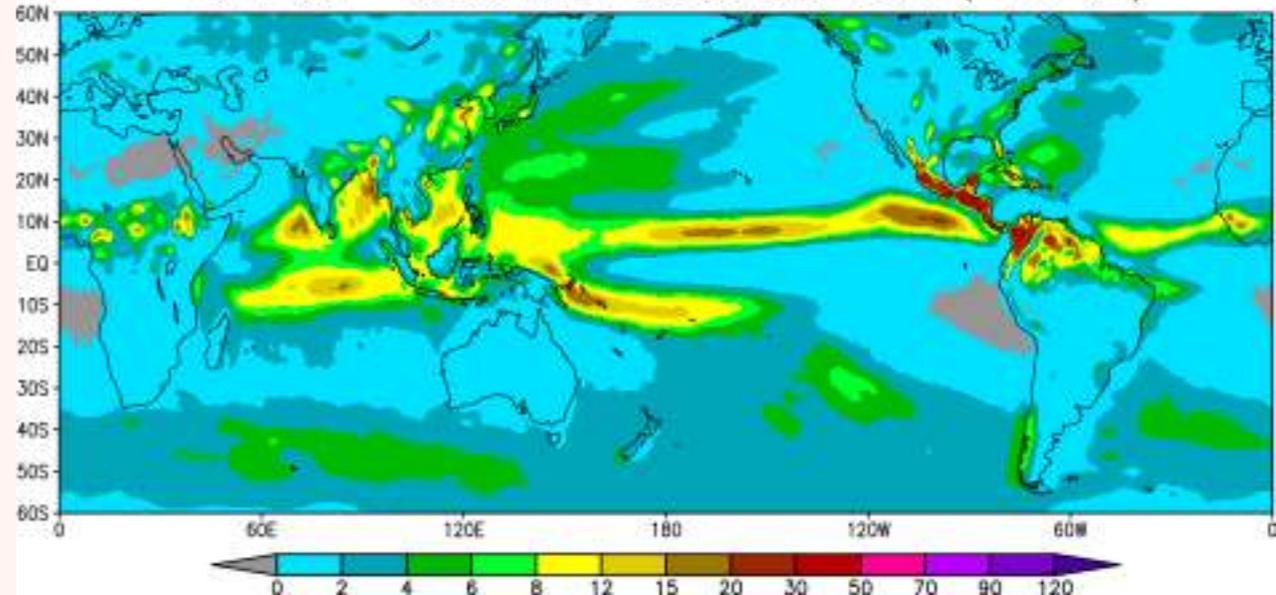
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 240h - BAM TQ0666L054 (~20 km)



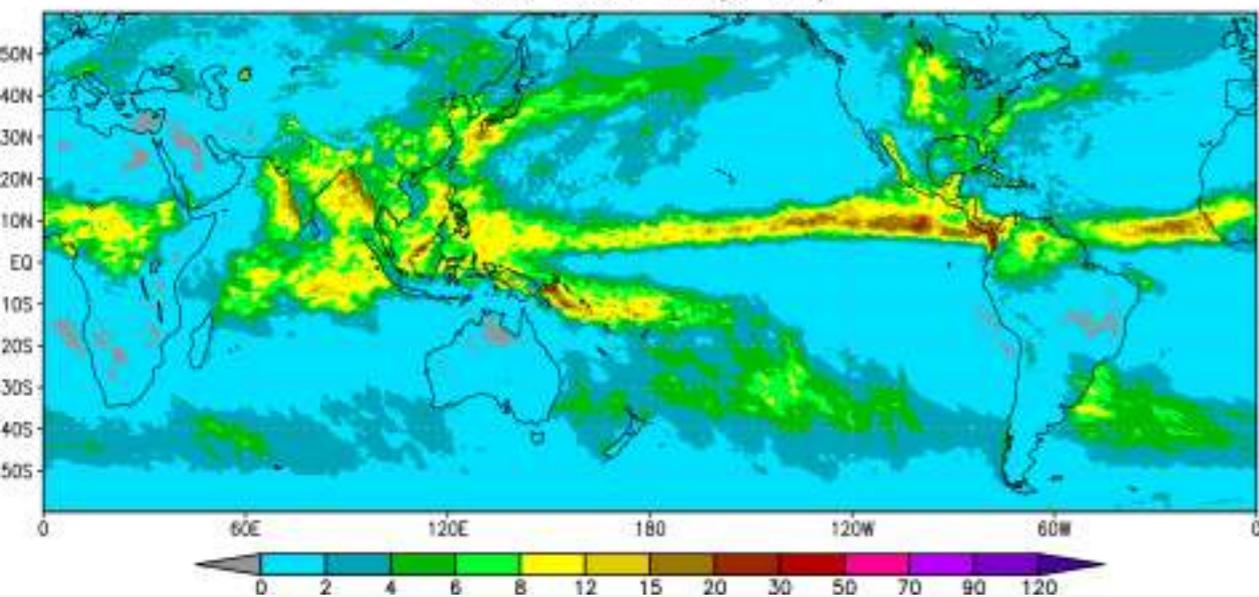
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 240h - OENS CTR TQ0126L028 XC50 (~100 km)



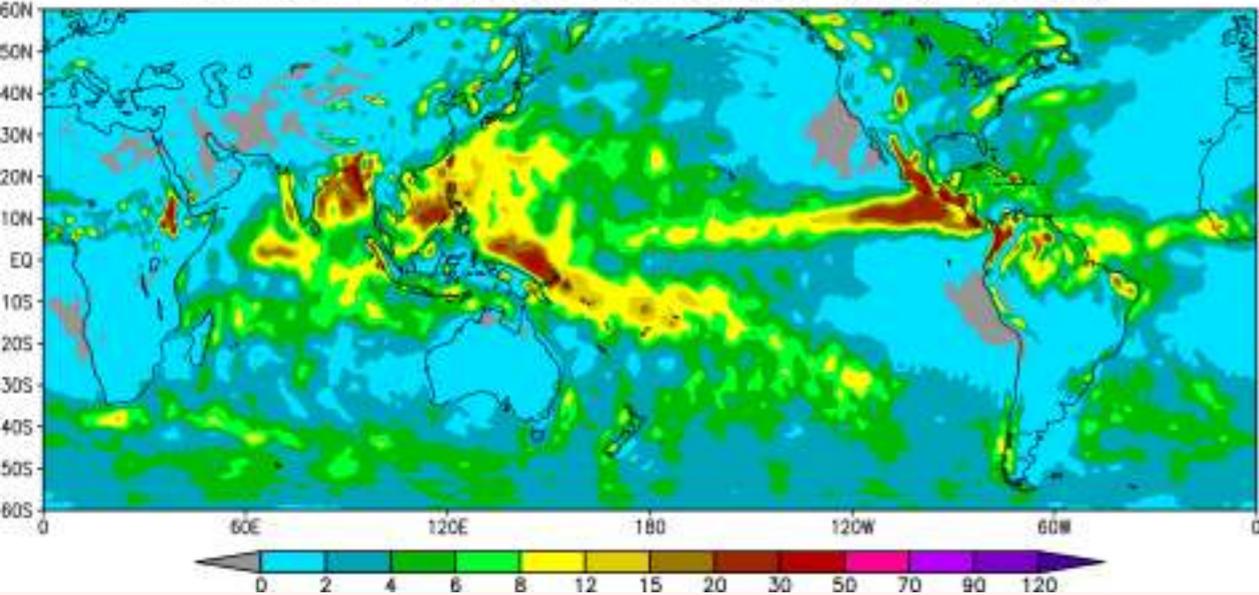
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 240h - OENS MEAN TQ0126L028 XC50 (~100 km)



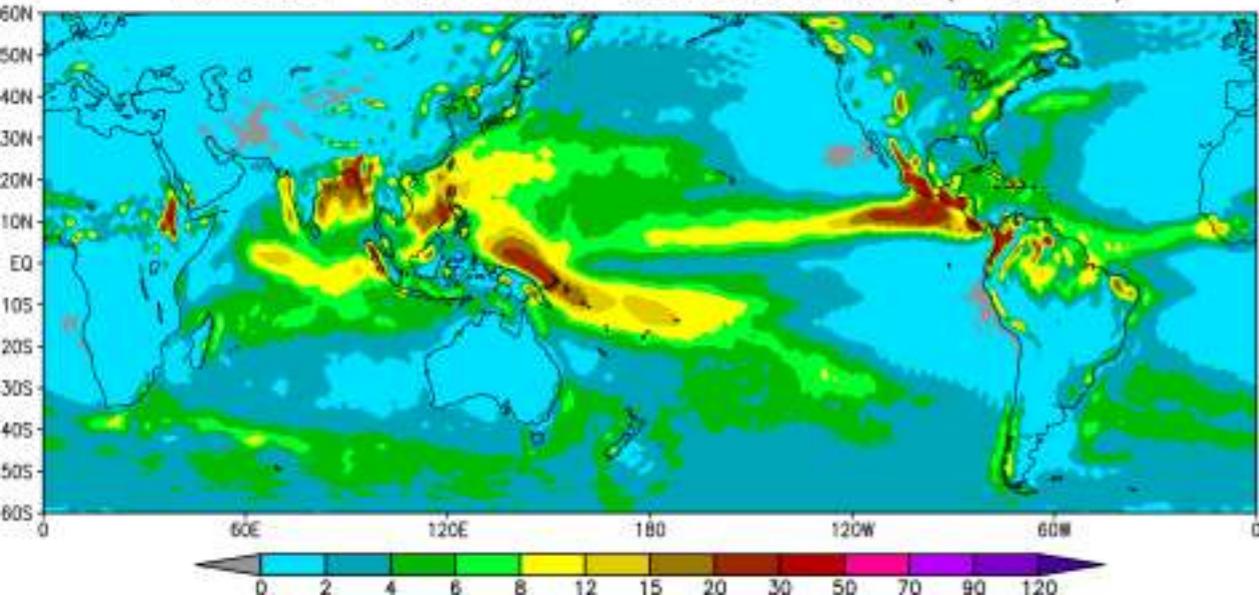
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
OBS CMORPH (8 km)



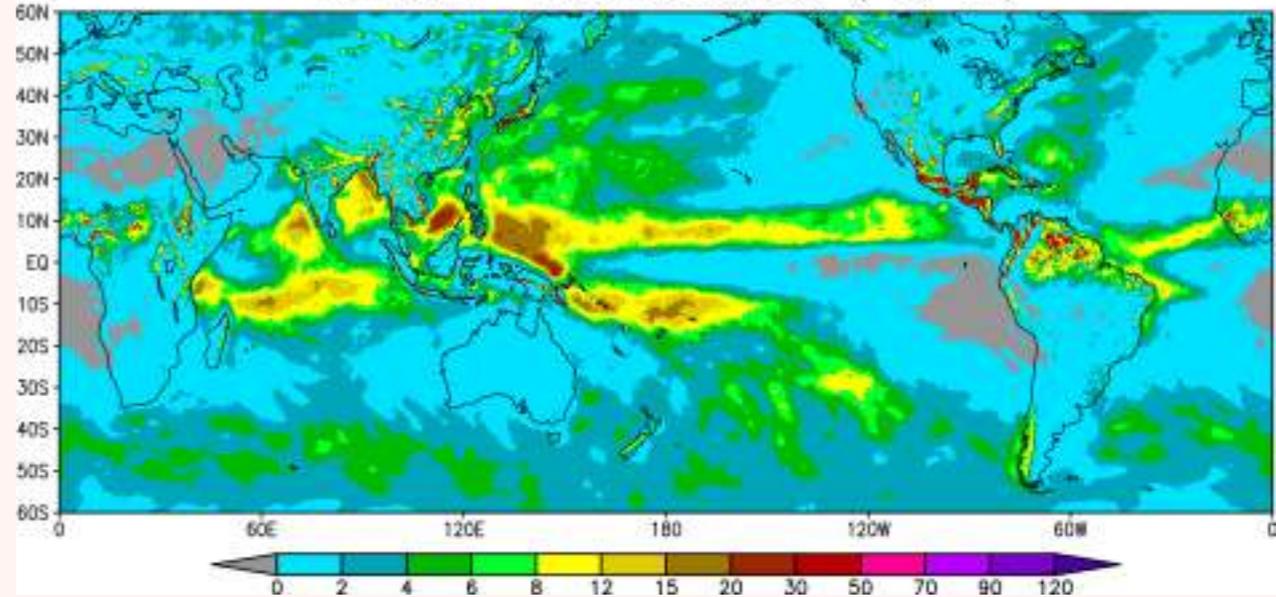
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 264h - OENS CTR TQ0126L028 TUPA (~100 km)



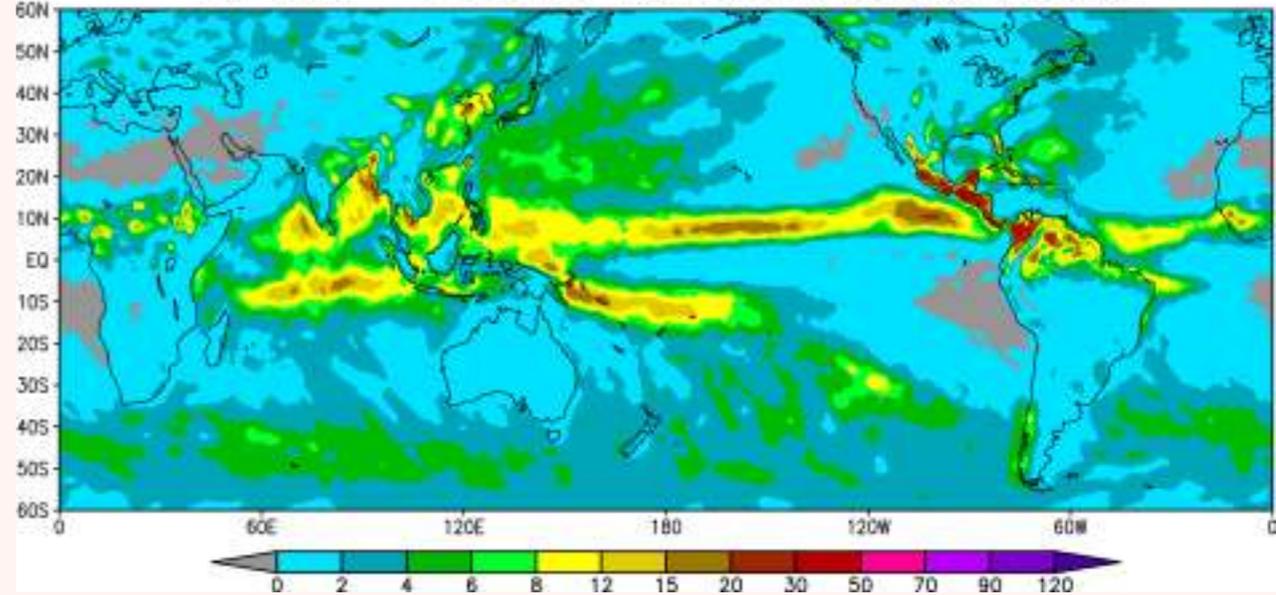
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 264h - OENS MEAN TQ0126L028 TUPA (~100 km)



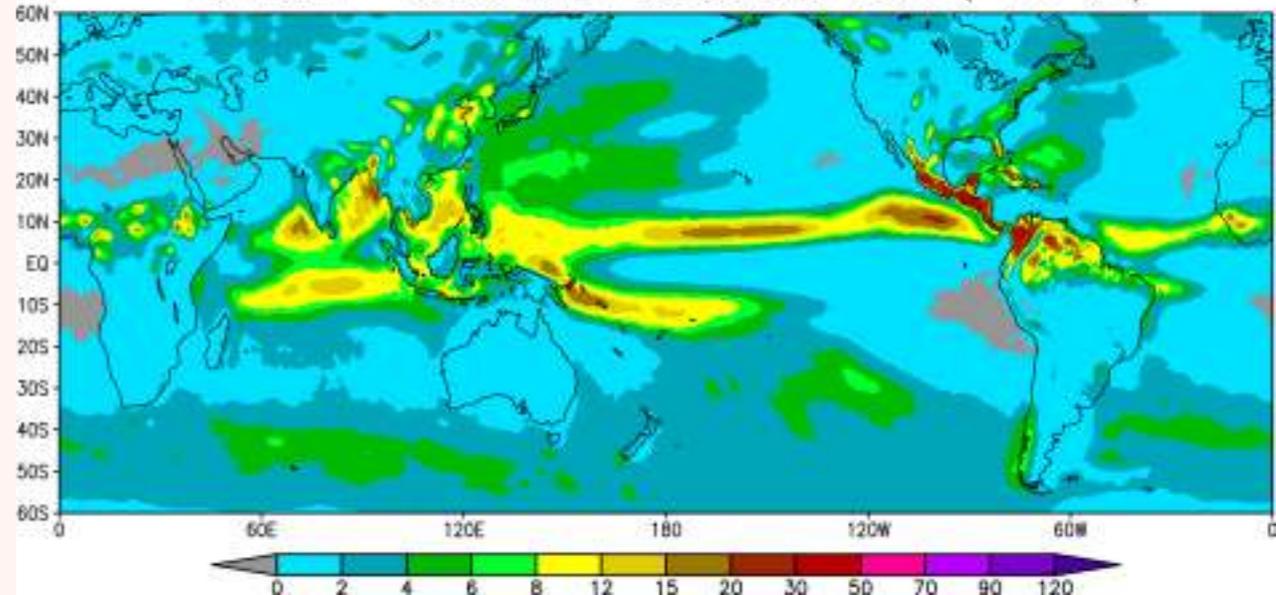
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 264h - BAM TQ0666L054 (~20 km)



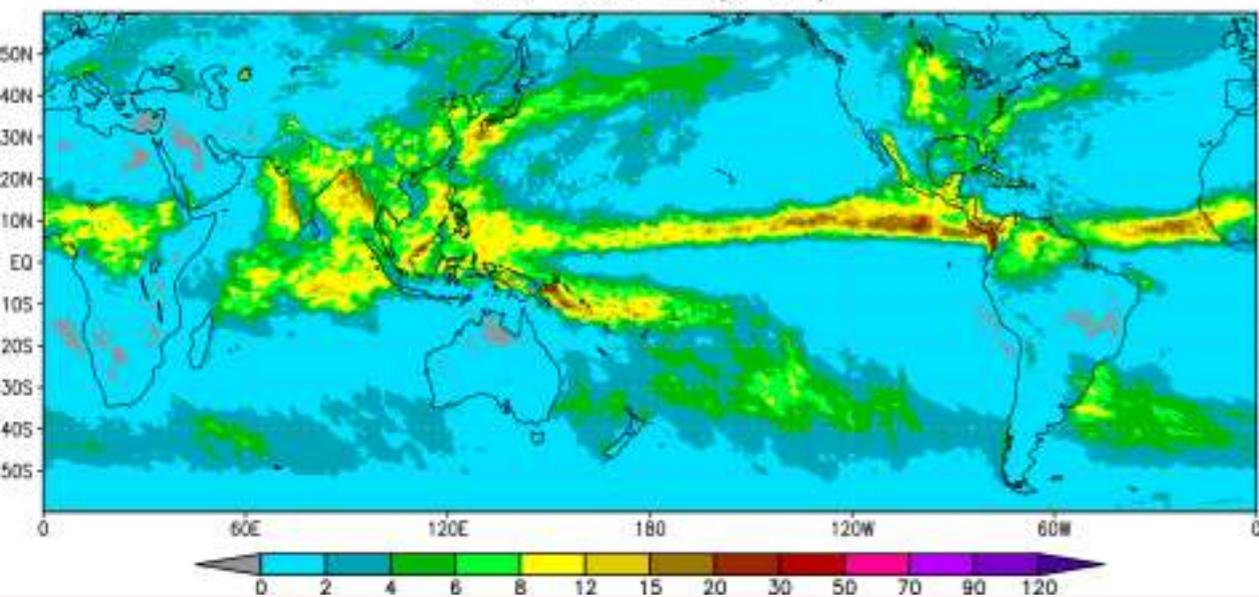
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 264h - OENS CTR TQ0126L028 XC50 (~100 km)



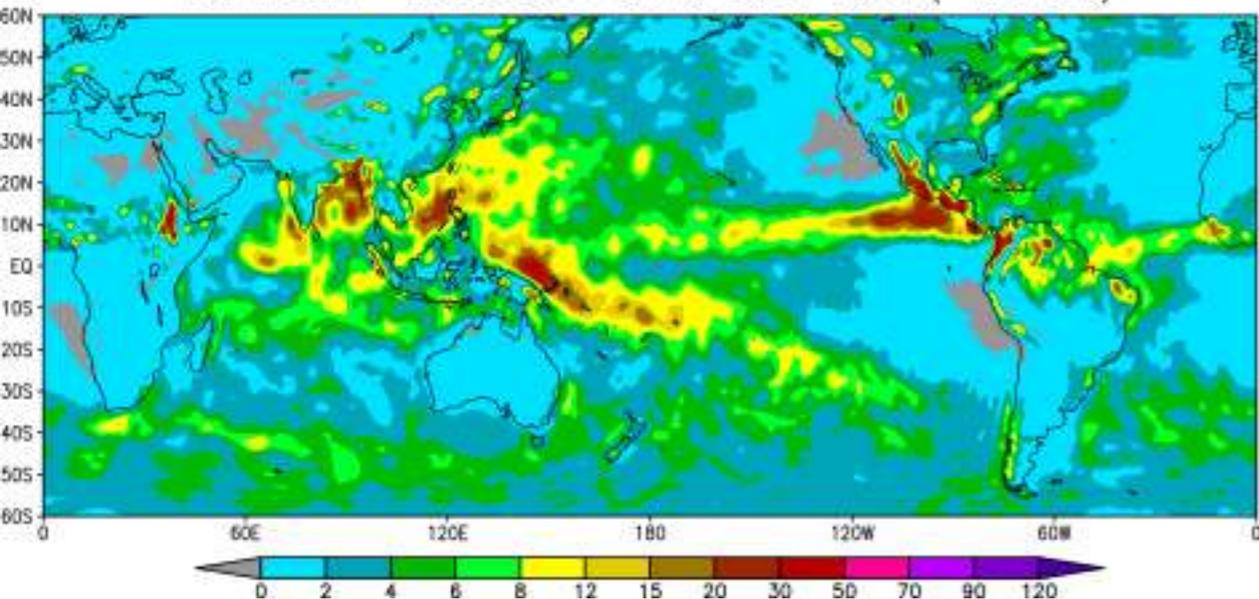
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 264h - OENS MEAN TQ0126L028 XC50 (~100 km)



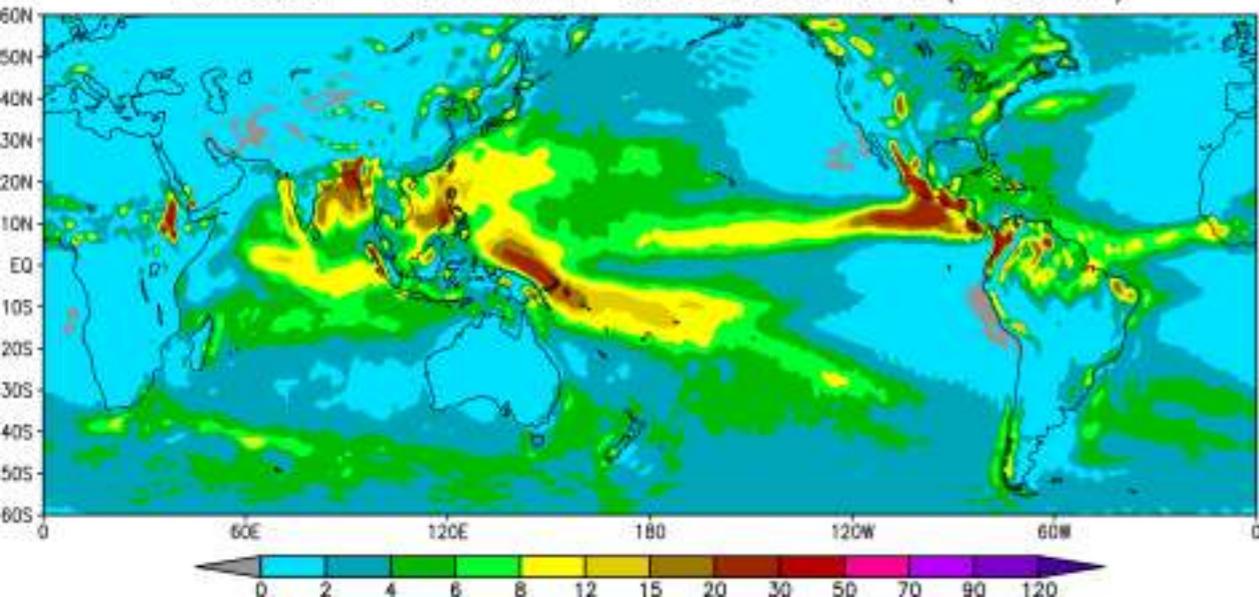
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
OBS CMORPH (8 km)



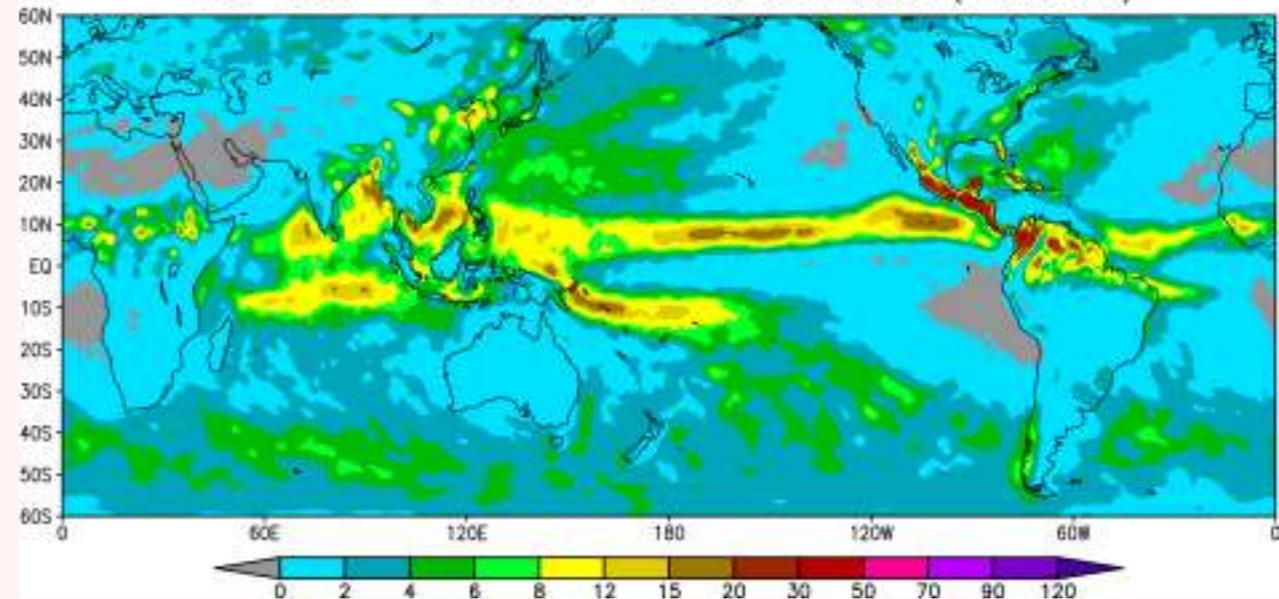
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 288h - OENS CTR TQ0126L028 TUPA (~100 km)



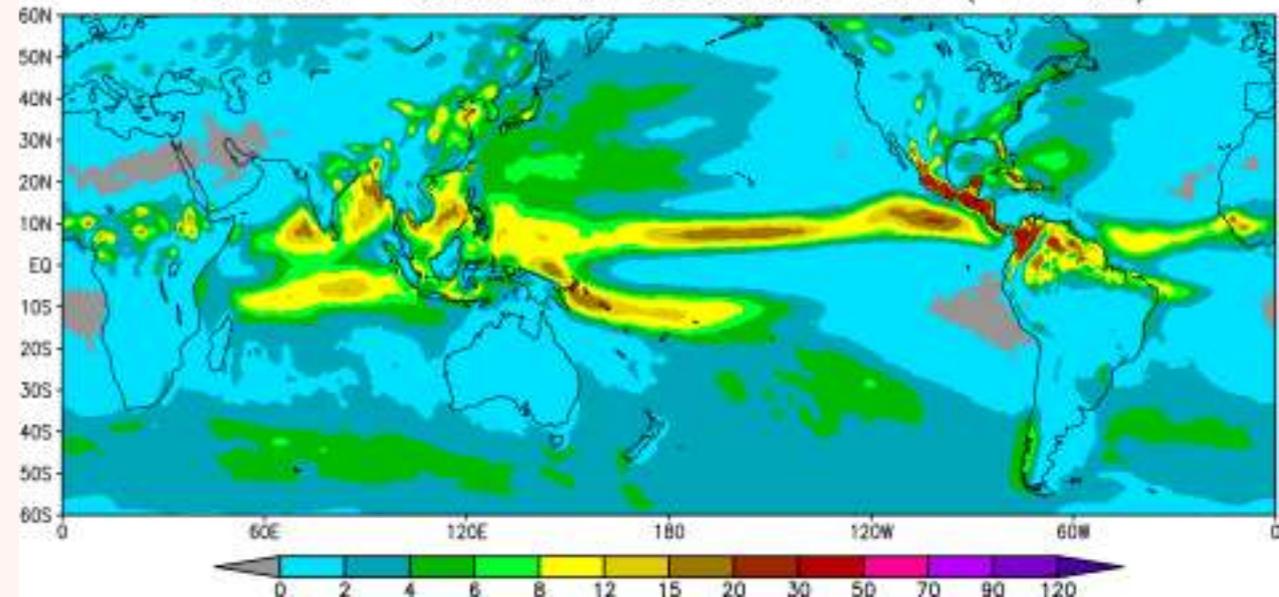
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 288h - OENS MEAN TQ0126L028 TUPA (~100 km)



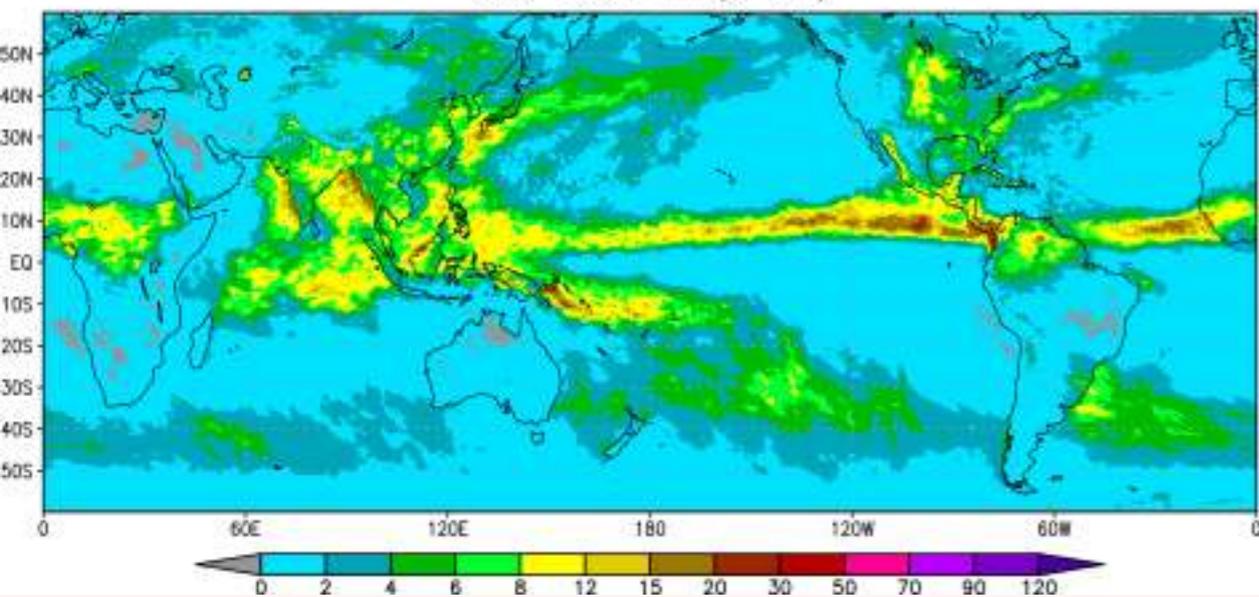
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 288h - OENS CTR TQ0126L028 XC50 (~100 km)



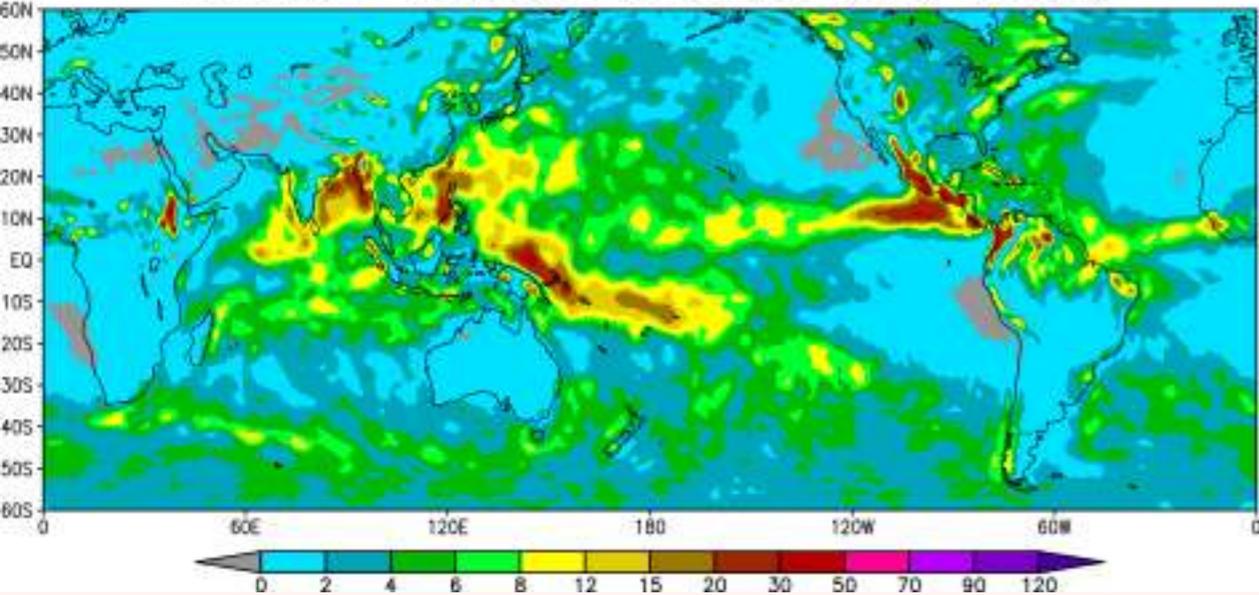
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 288h - OENS MEAN TQ0126L028 XC50 (~100 km)



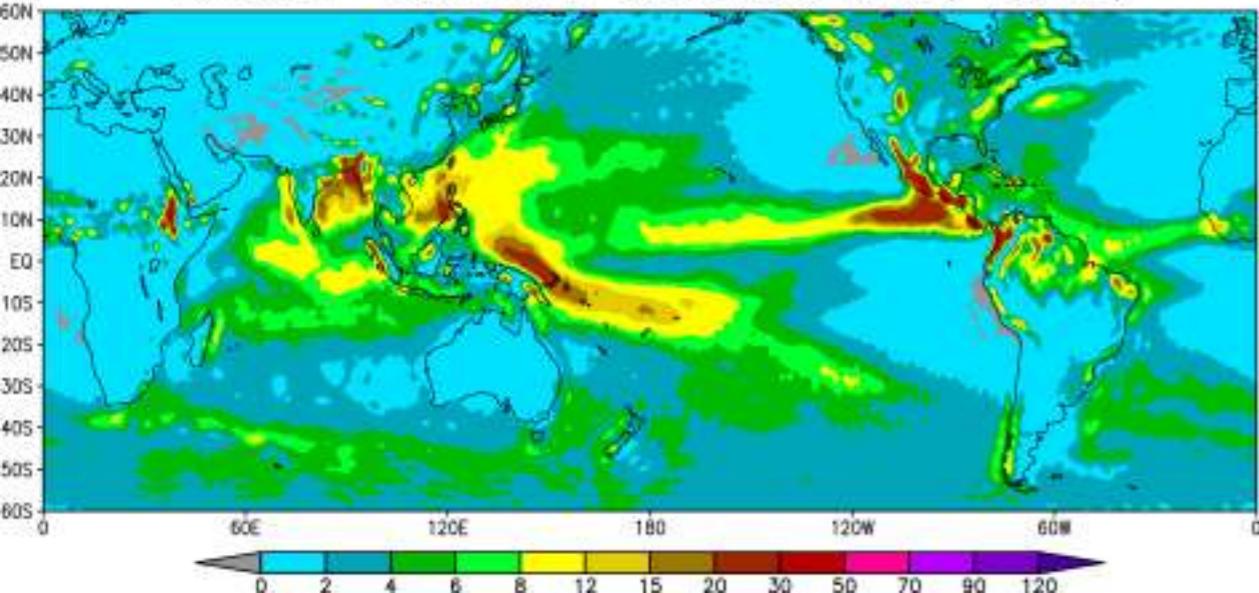
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
OBS CMORPH (8 km)



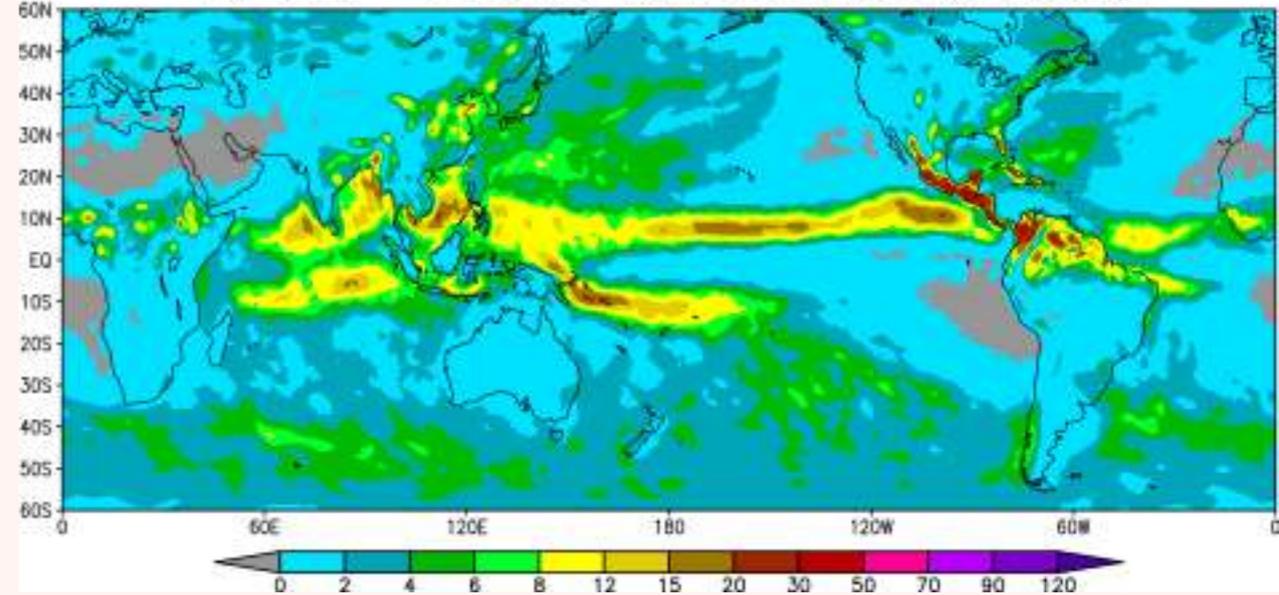
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 312h - OENS CTR TQ0126L028 TUPA (~100 km)



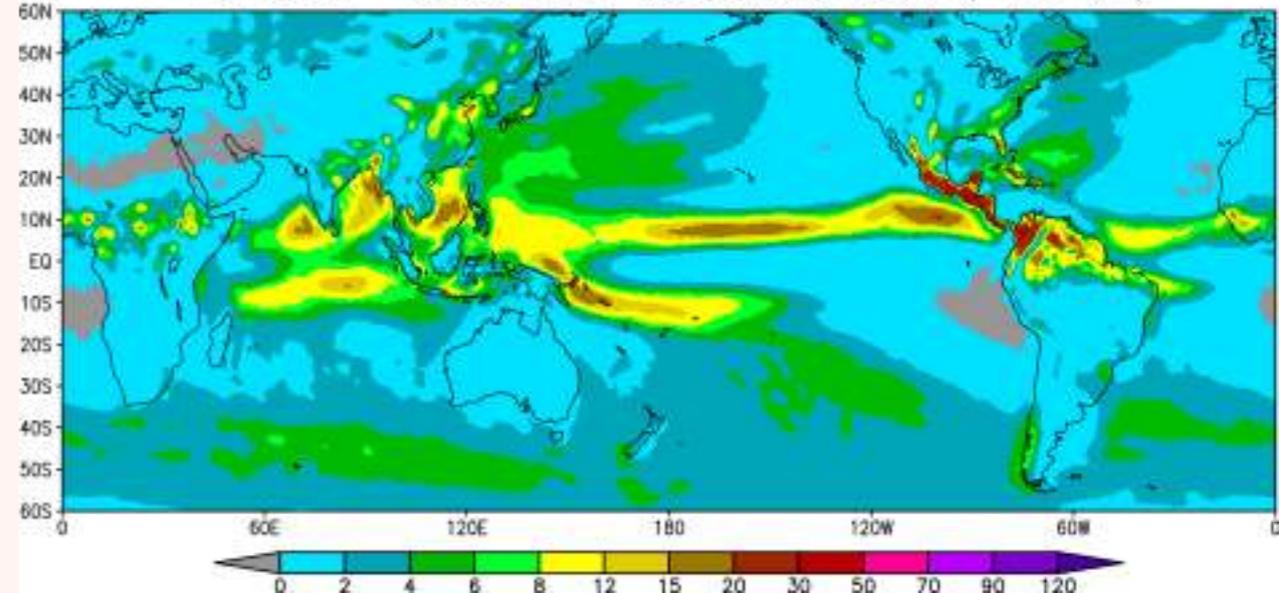
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 312h - OENS MEAN TQ0126L028 TUPA (~100 km)



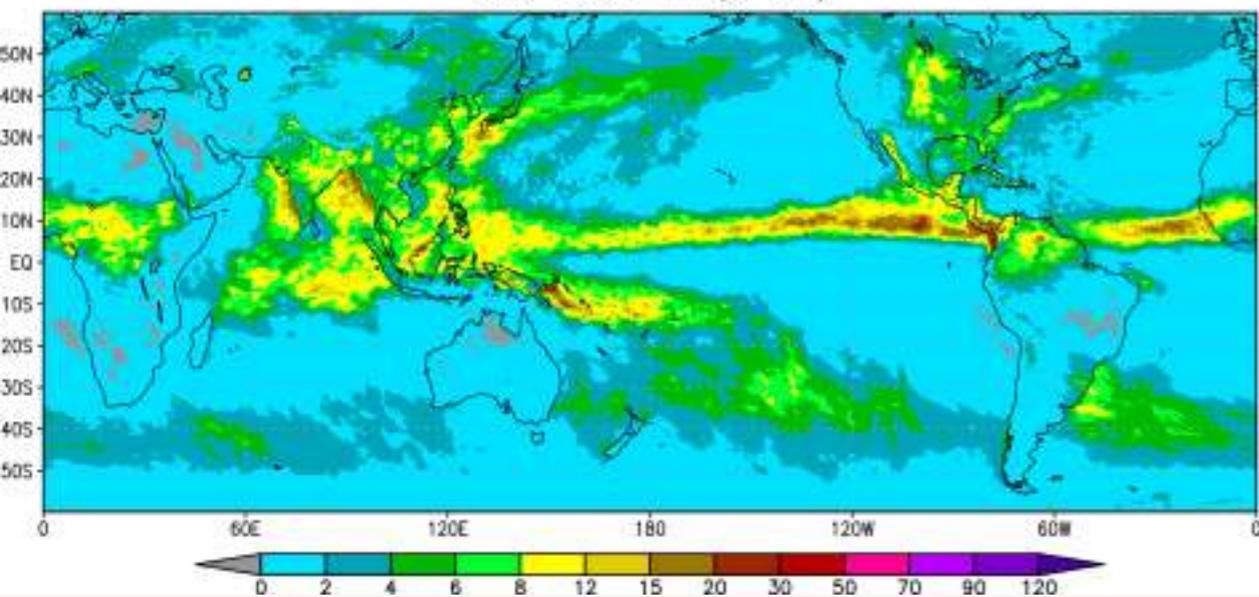
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 312h - OENS CTR TQ0126L028 XC50 (~100 km)



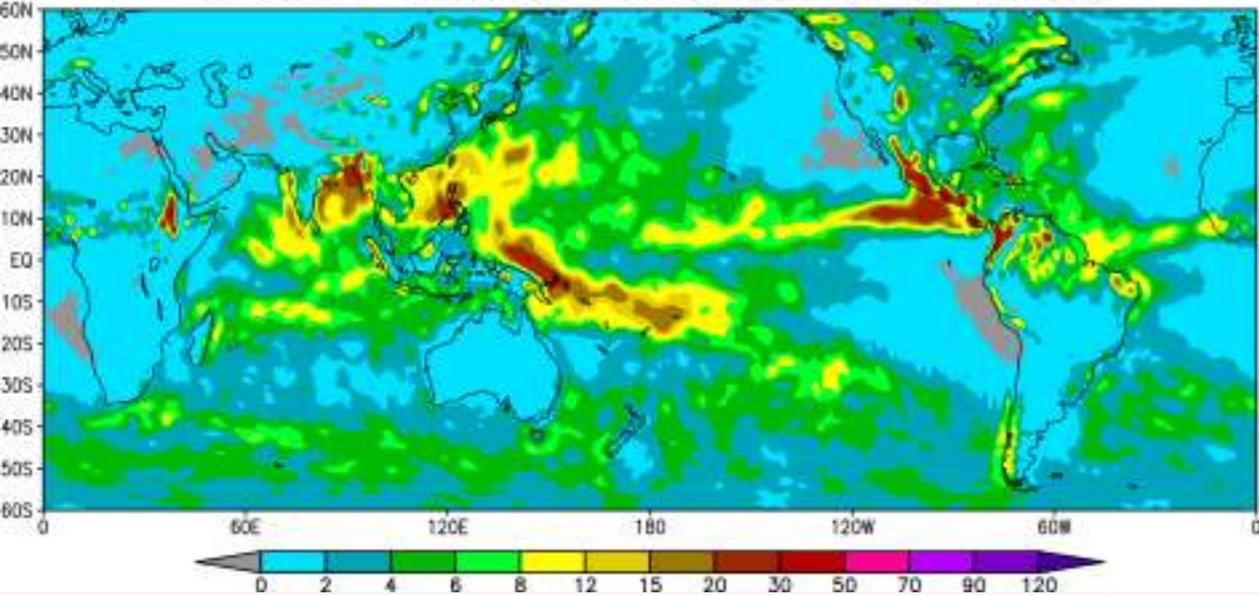
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 312h - OENS MEAN TQ0126L028 XC50 (~100 km)



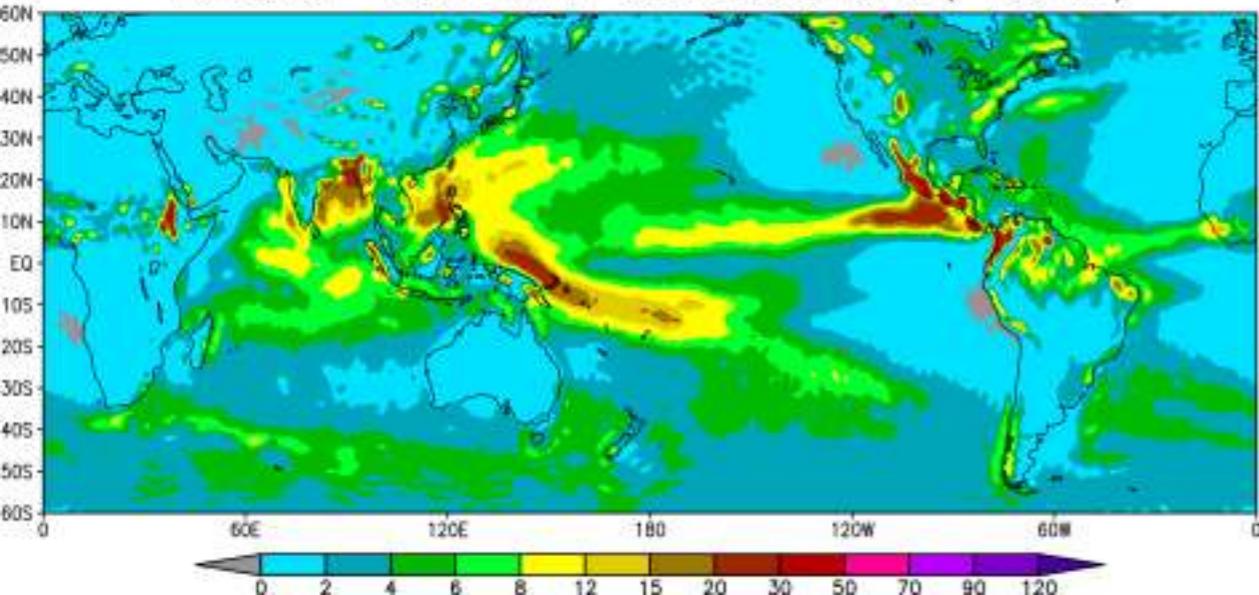
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
OBS CMORPH (8 km)



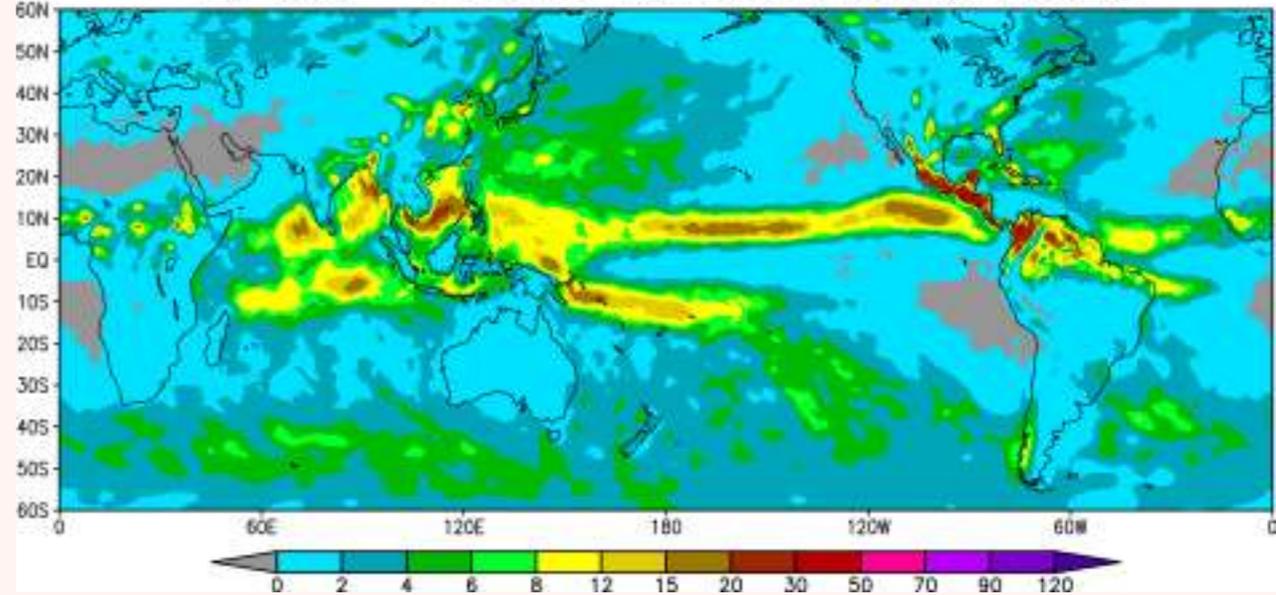
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 336h - OENS CTR TQ0126L028 TUPA (~100 km)



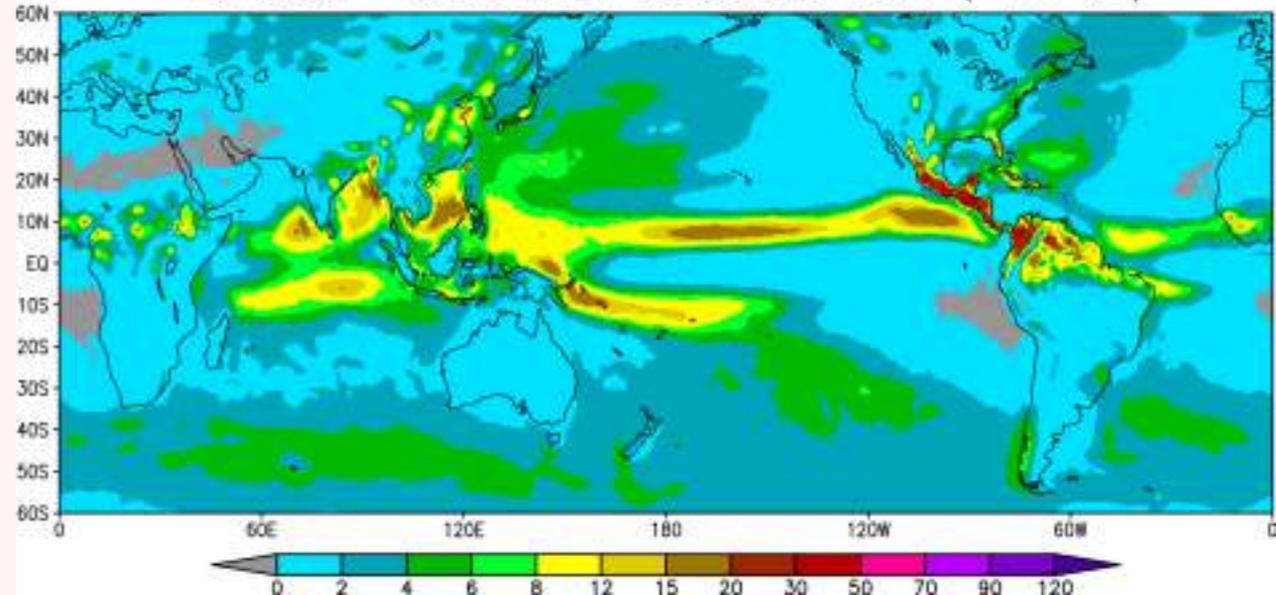
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 336h - OENS MEAN TQ0126L028 TUPA (~100 km)



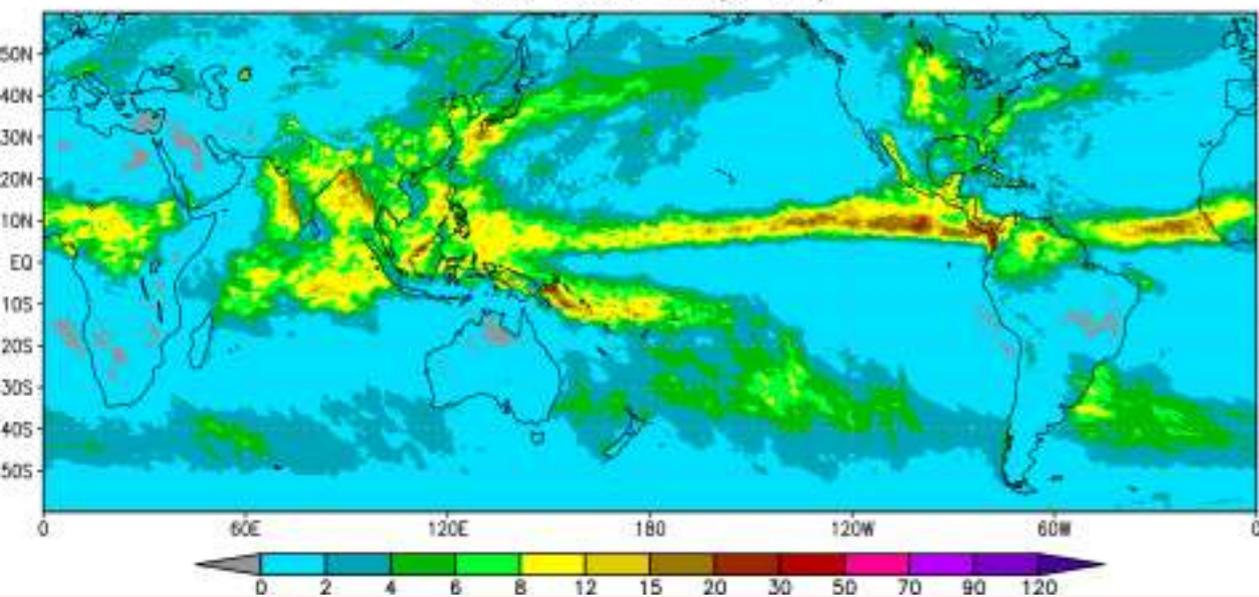
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 336h - OENS CTR TQ0126L028 XC50 (~100 km)



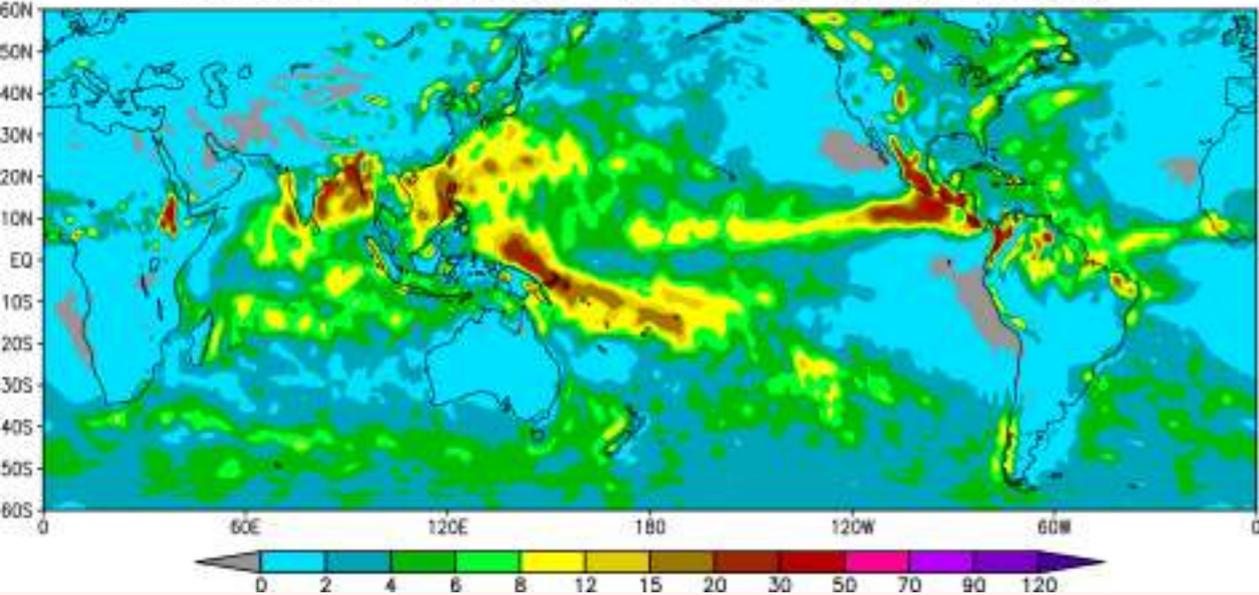
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 336h - OENS MEAN TQ0126L028 XC50 (~100 km)



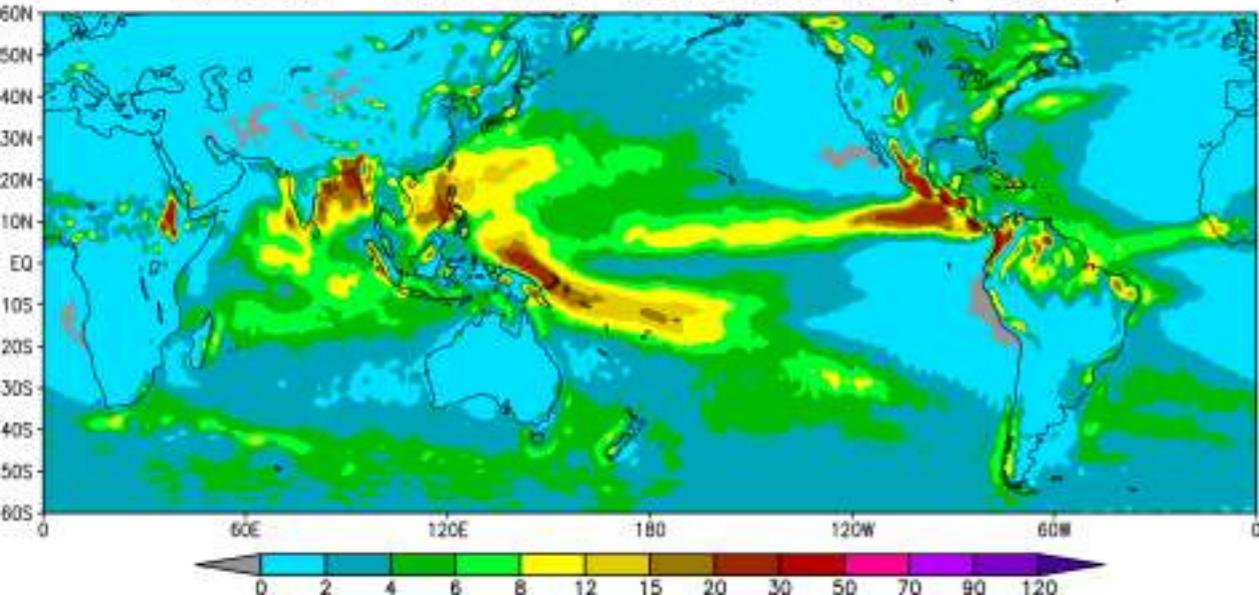
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
OBS CMORPH (8 km)



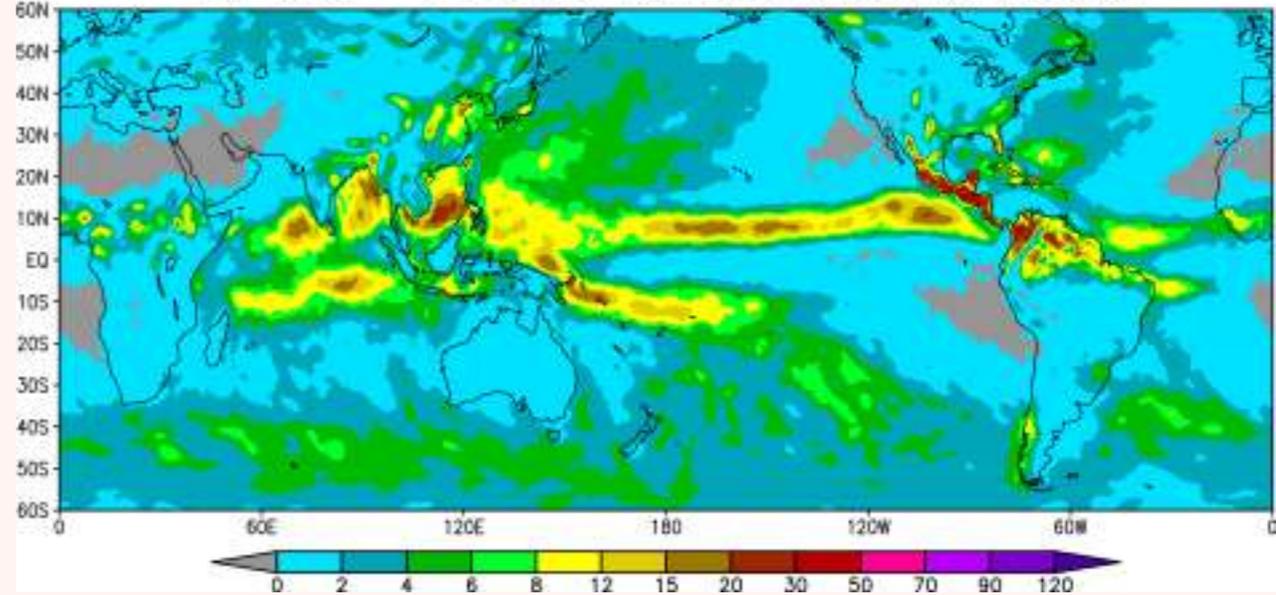
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 360h - OENS CTR TQ0126L028 TUPA (~100 km)



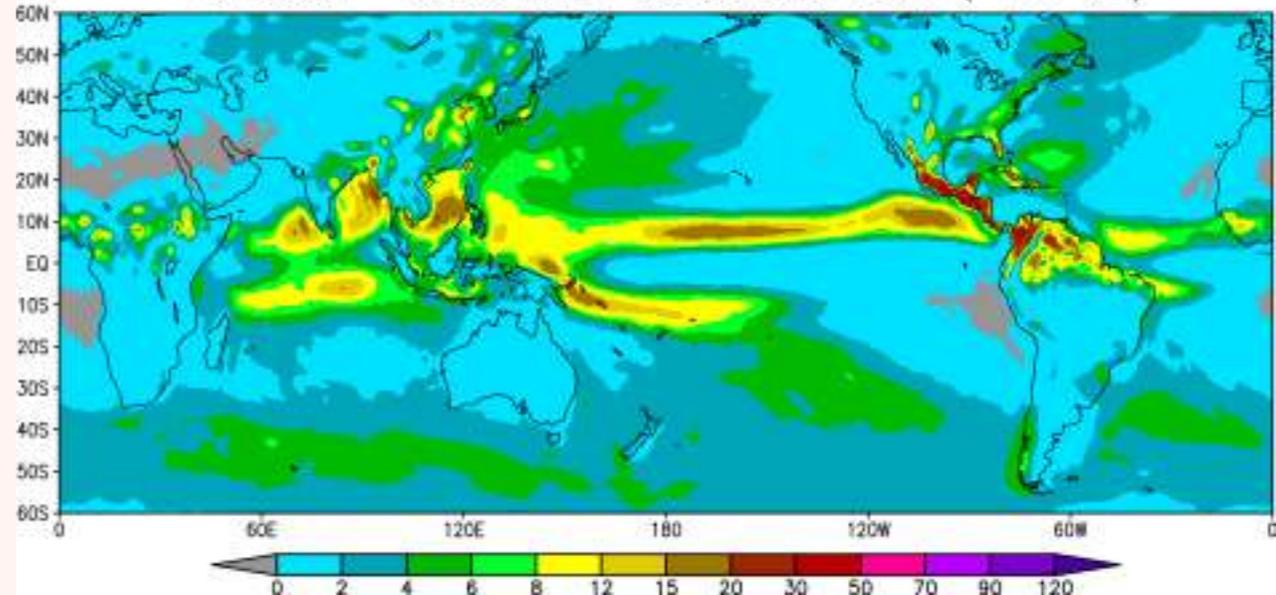
PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 360h - OENS MEAN TQ0126L028 TUPA (~100 km)



PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 360h - OENS CTR TQ0126L028 XC50 (~100 km)



PRECIPITATION (mm/day) for 00Z30MAY2020 - 00Z01SEP2020
FCT 360h - OENS MEAN TQ0126L028 XC50 (~100 km)



VERIFICAÇÃO DO ESPALHAMENTO DO CONJUNTO

VERIFICAÇÃO DO ESPALHAMENTO DO CONJUNTO

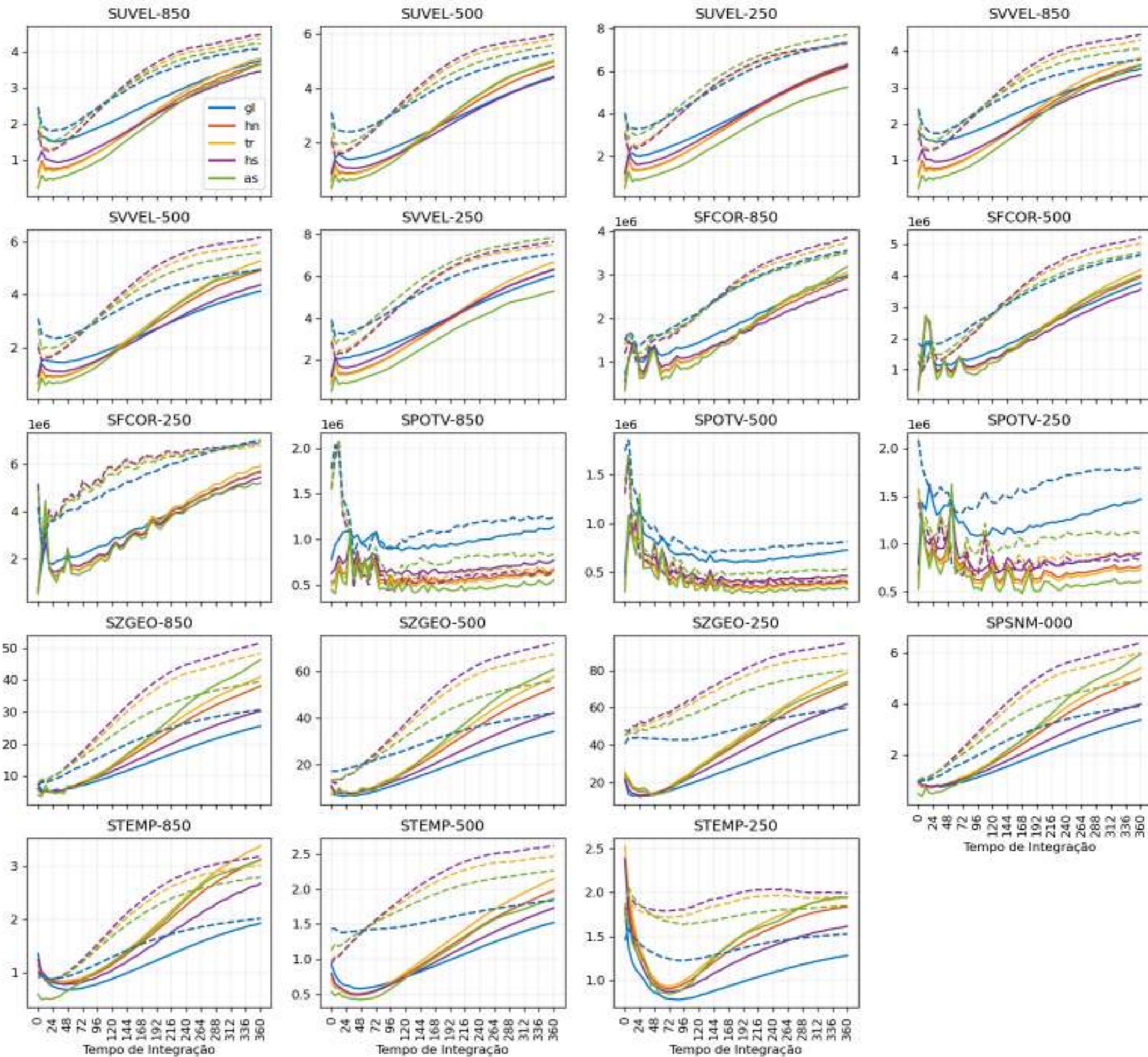
- Séries temporais do espalhamento do conjunto:
 - Médias dos espalhamentos das análises e previsões subsequentes (24, 48, 72, ..., 360 horas);
 - Séries temporais do espalhamento das análises e previsões subsequentes (5, 10 e 15 dias);
 - Regiões: global, hemisférios norte e sul e região equatorial;

**Médias Espaciais do
Espalhamento**
Análises e Previsões

1 a 15 dias

**2020051500 a
2020083100**

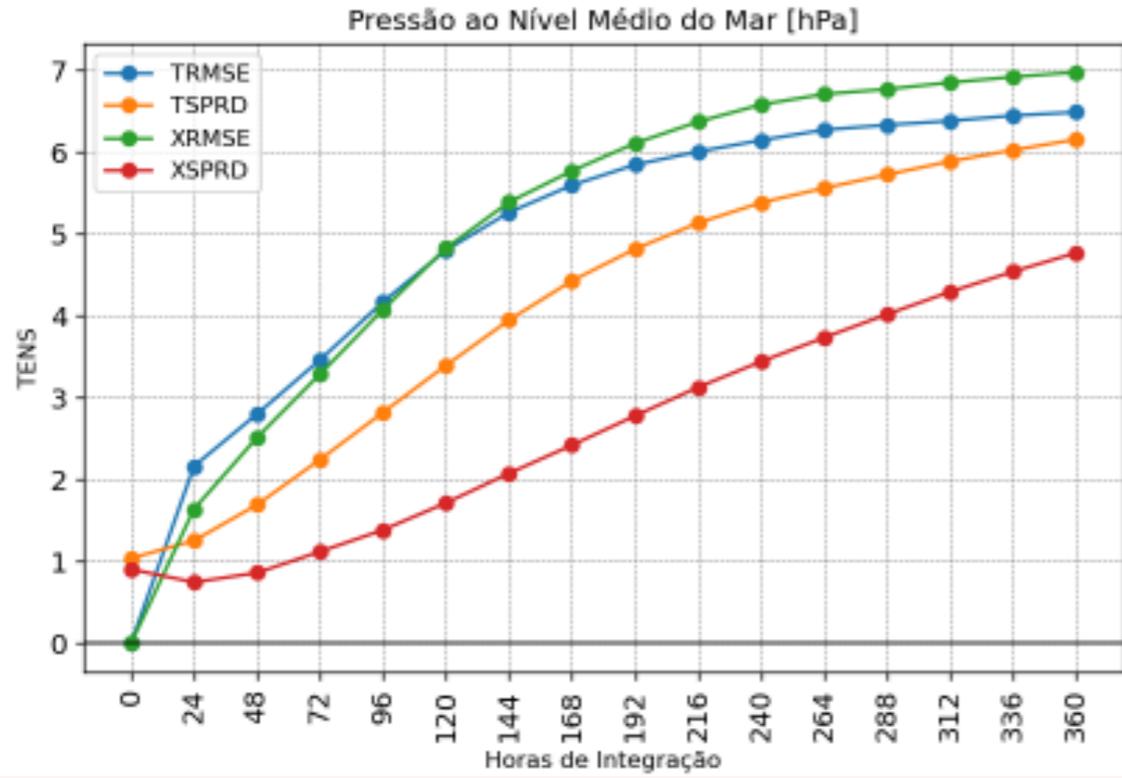
- Linha sólida:
SPRD BAM XC50
- Linha pontilhada:
SPRD MCGA
Tupã



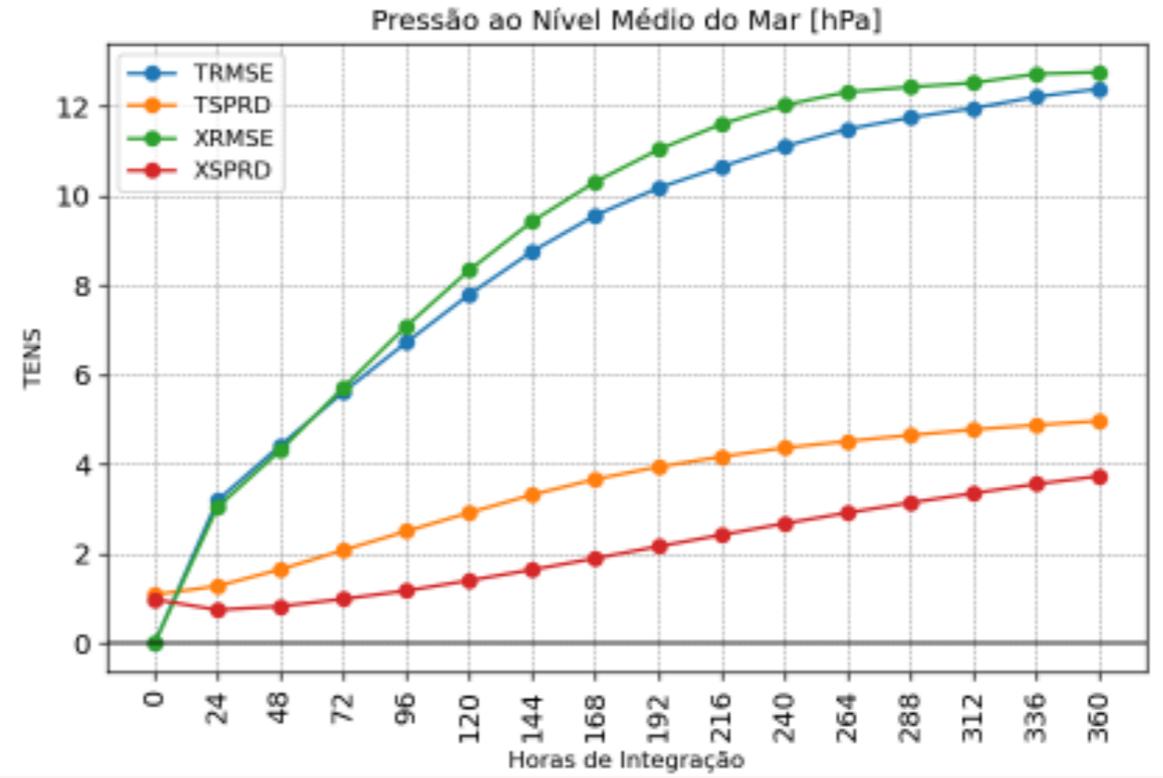
COMPARAÇÃO RMSE MÉDIA DOS MEMBROS COM O ESPALHAMENTO

- Gráficos plotados sobre as regiões HN, TR, HS e AS (mesmas regiões da verificação do Skill):
 - Pressão ao Nível Médio do Mar;
 - Altura Geopotencial em 500 hPa;
 - Temperatura do Ar em 850, 500 e 250 hPa;
 - Componente zonal do vento em 250 hPa;
 - Componente meridional do vento em 850 hPa;

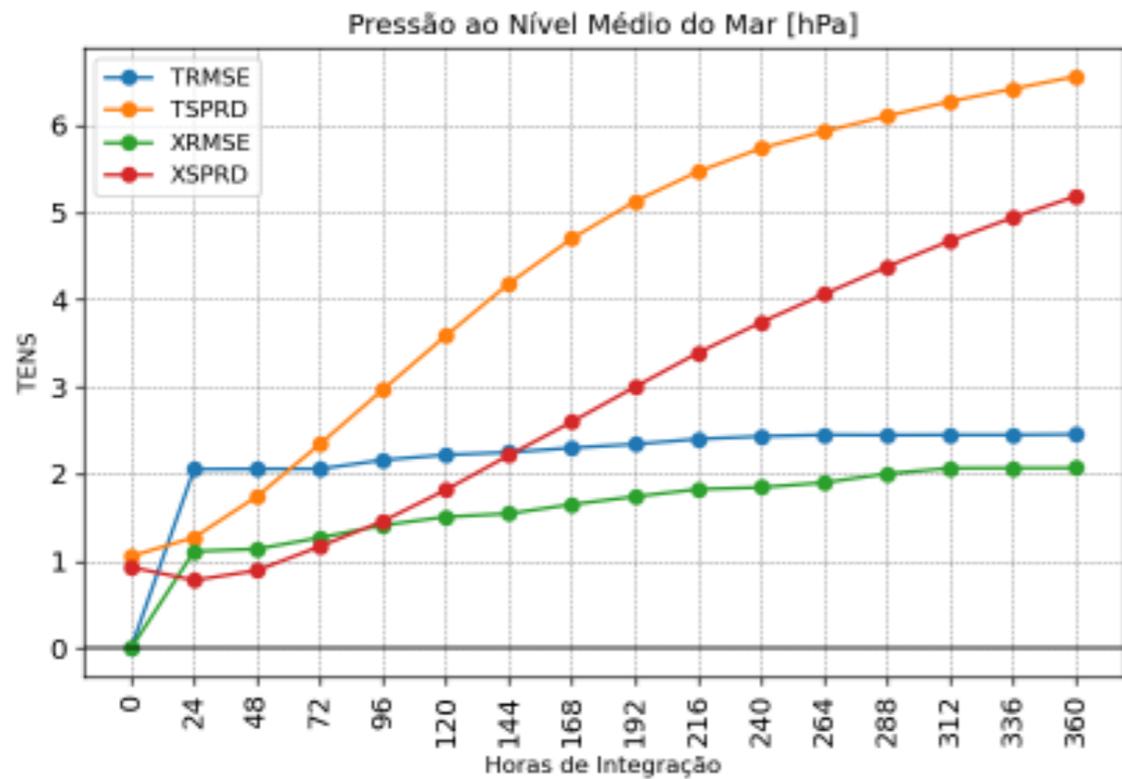
HN



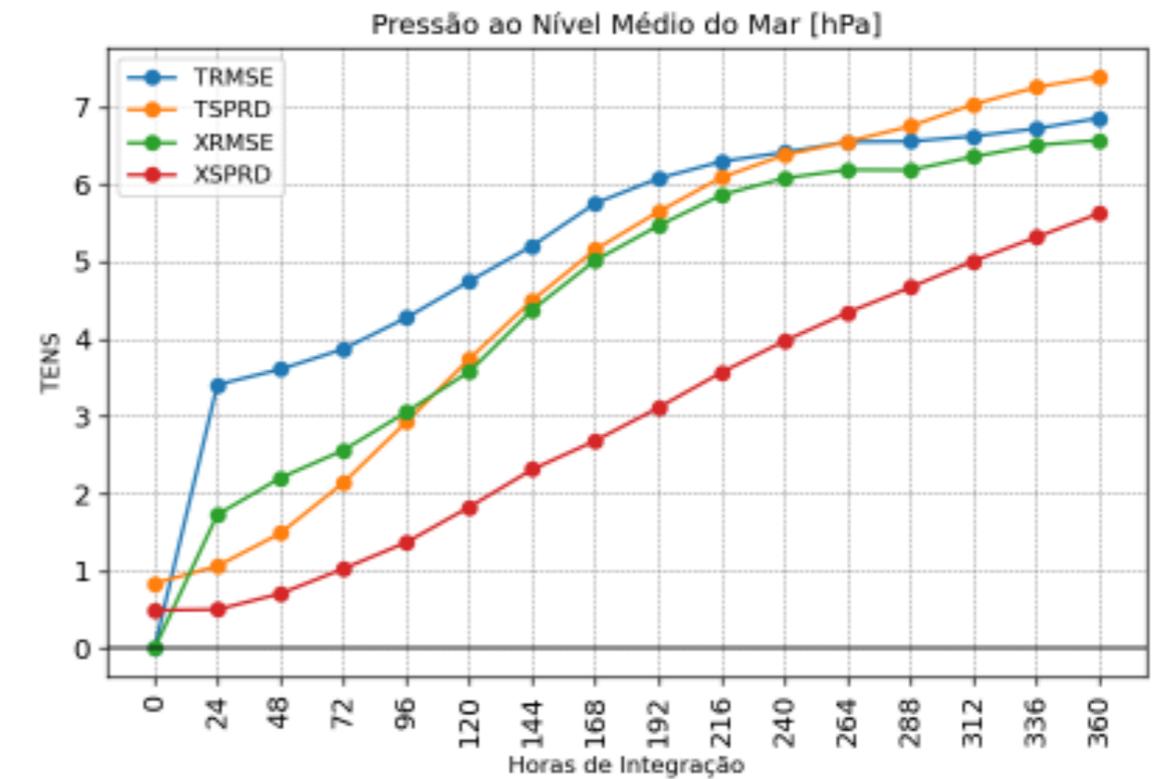
TR



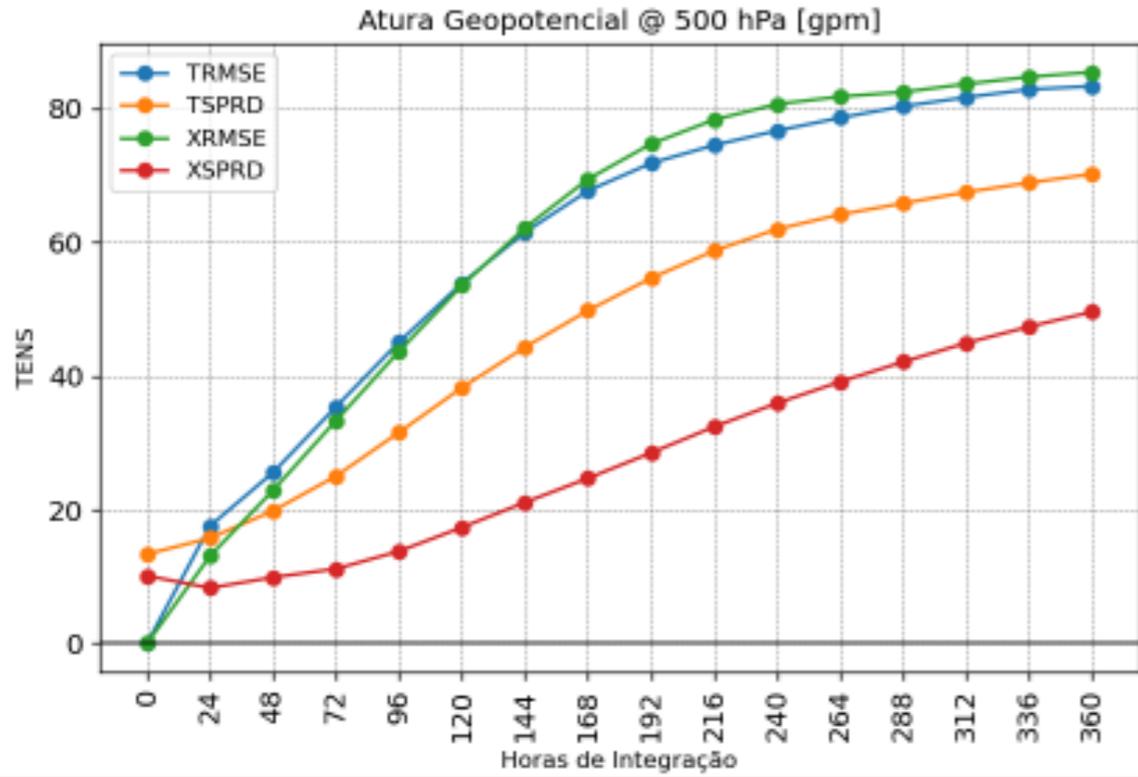
HS



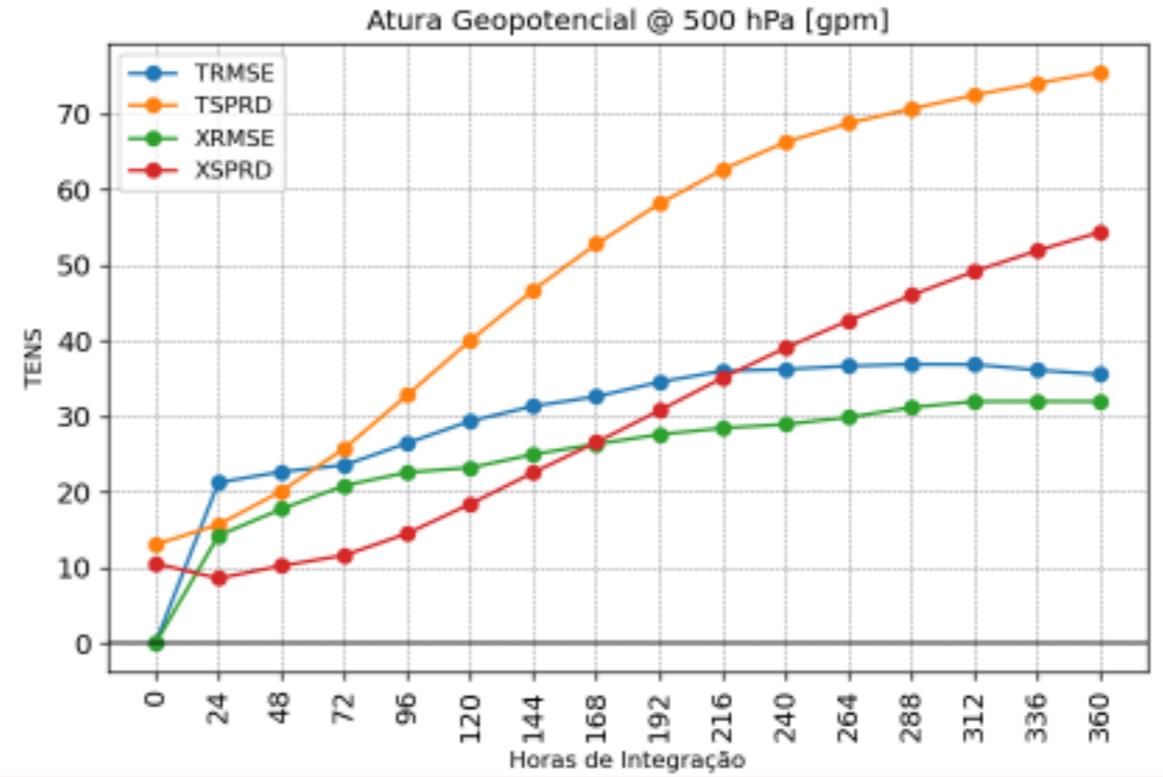
AS



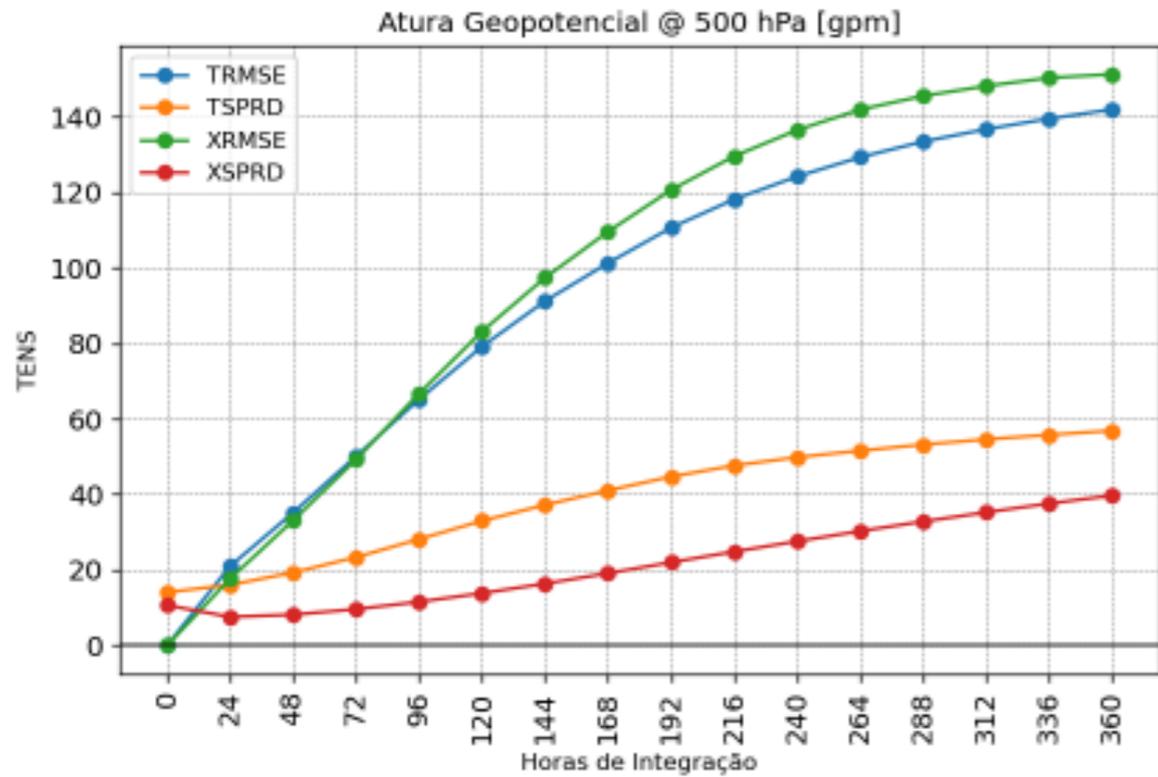
HN



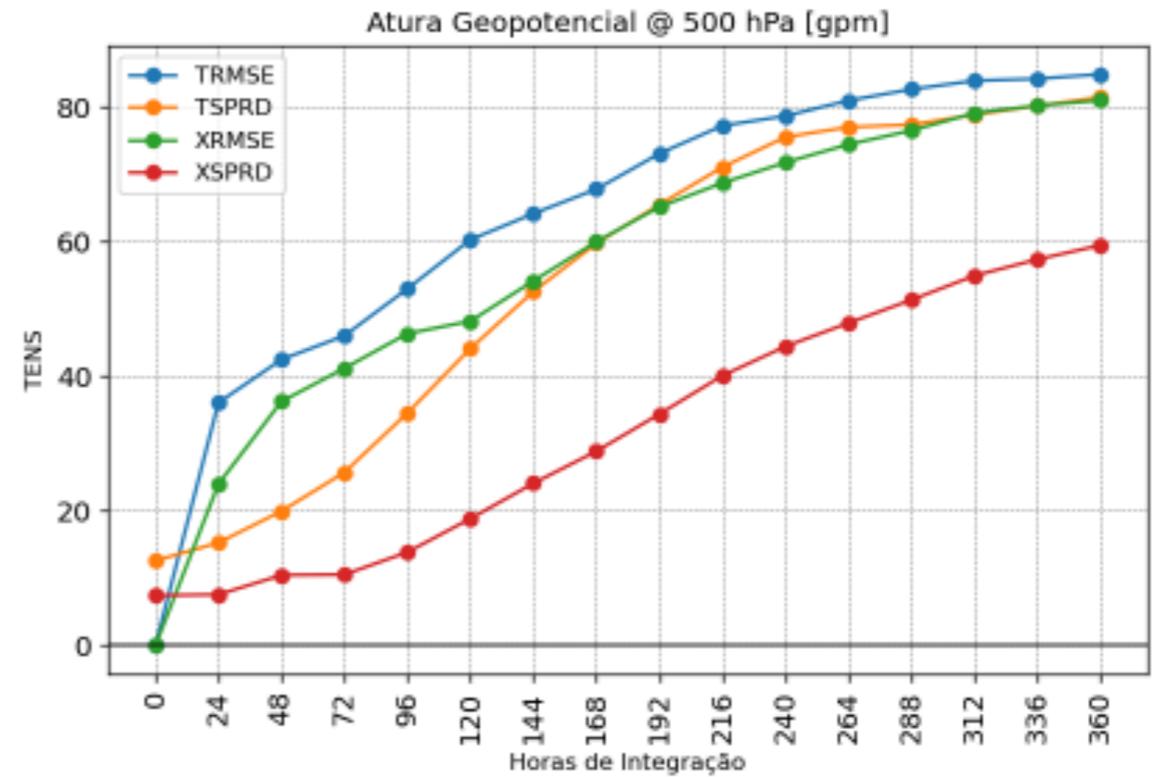
TR



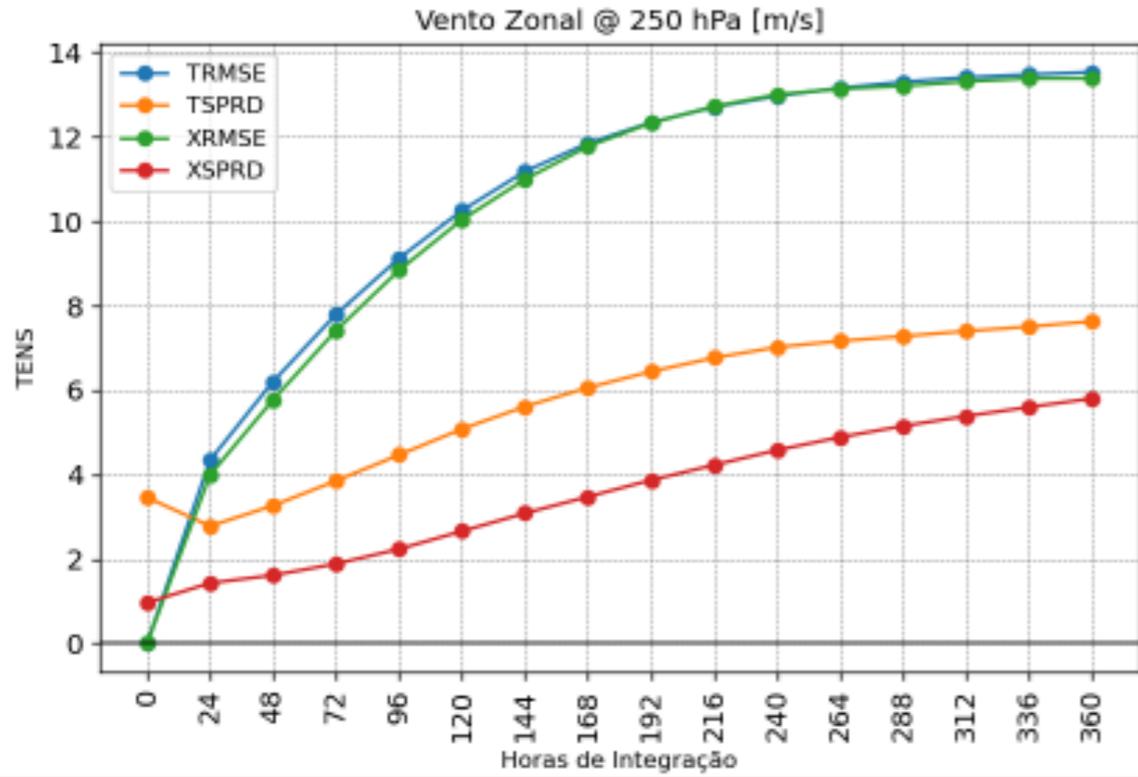
HS



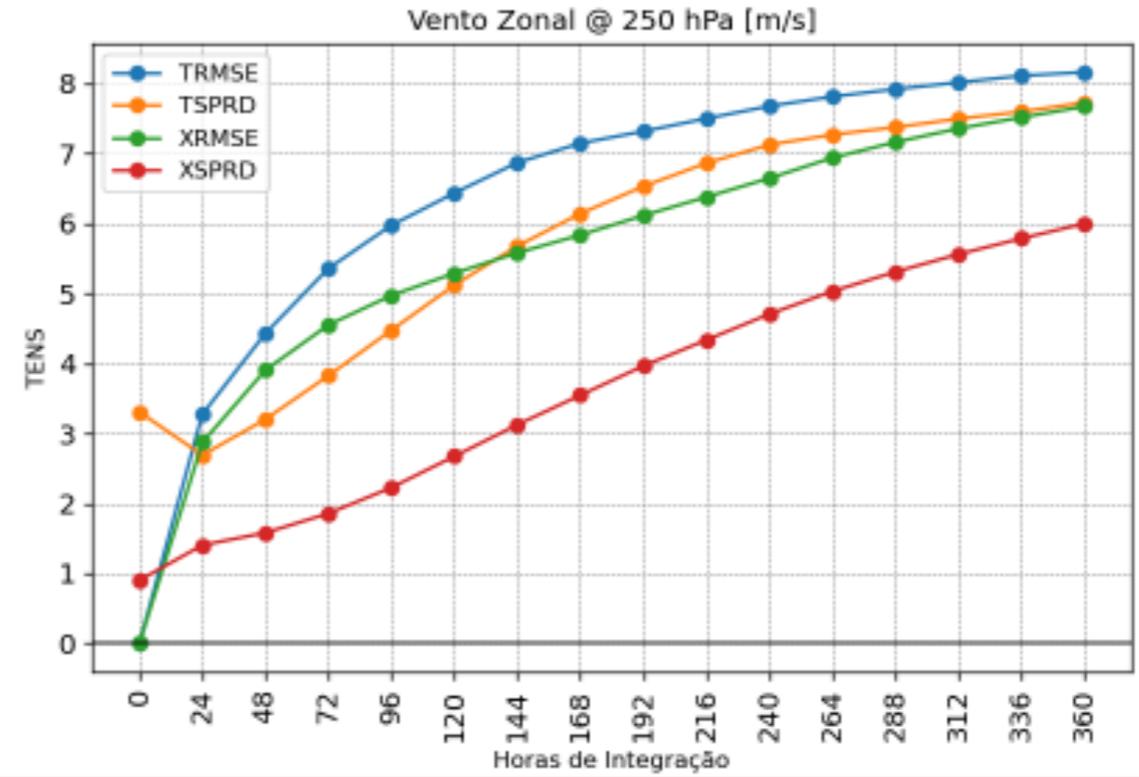
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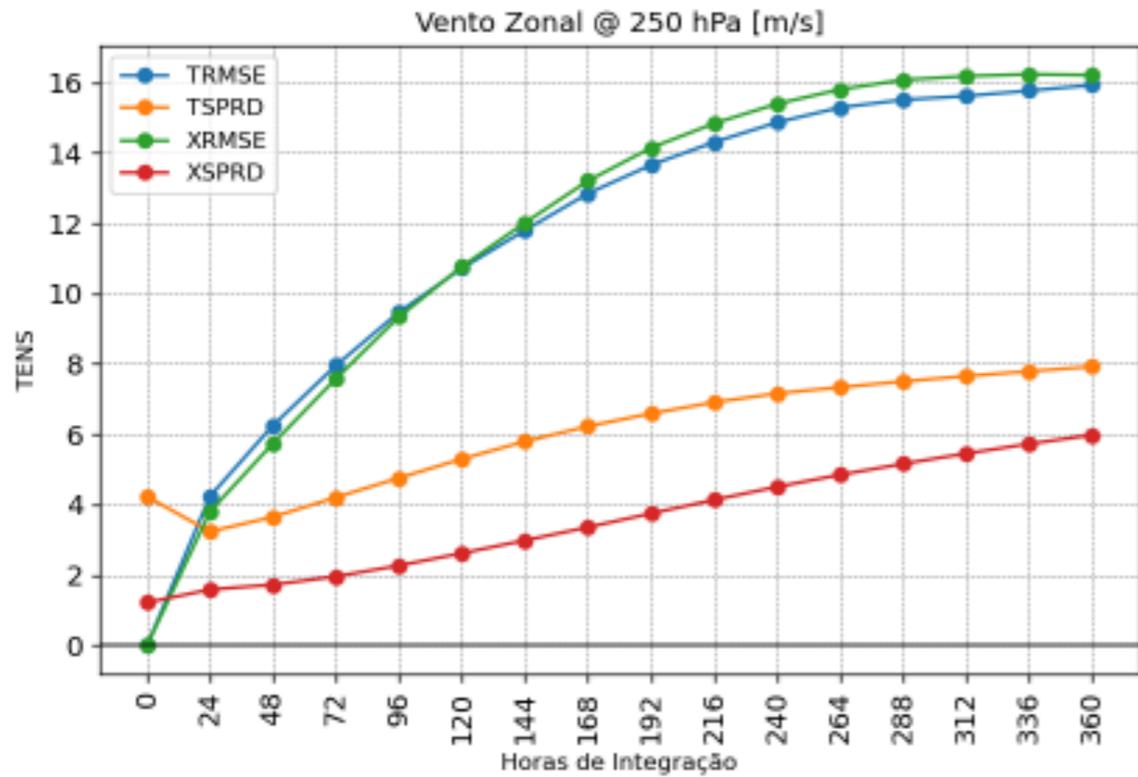
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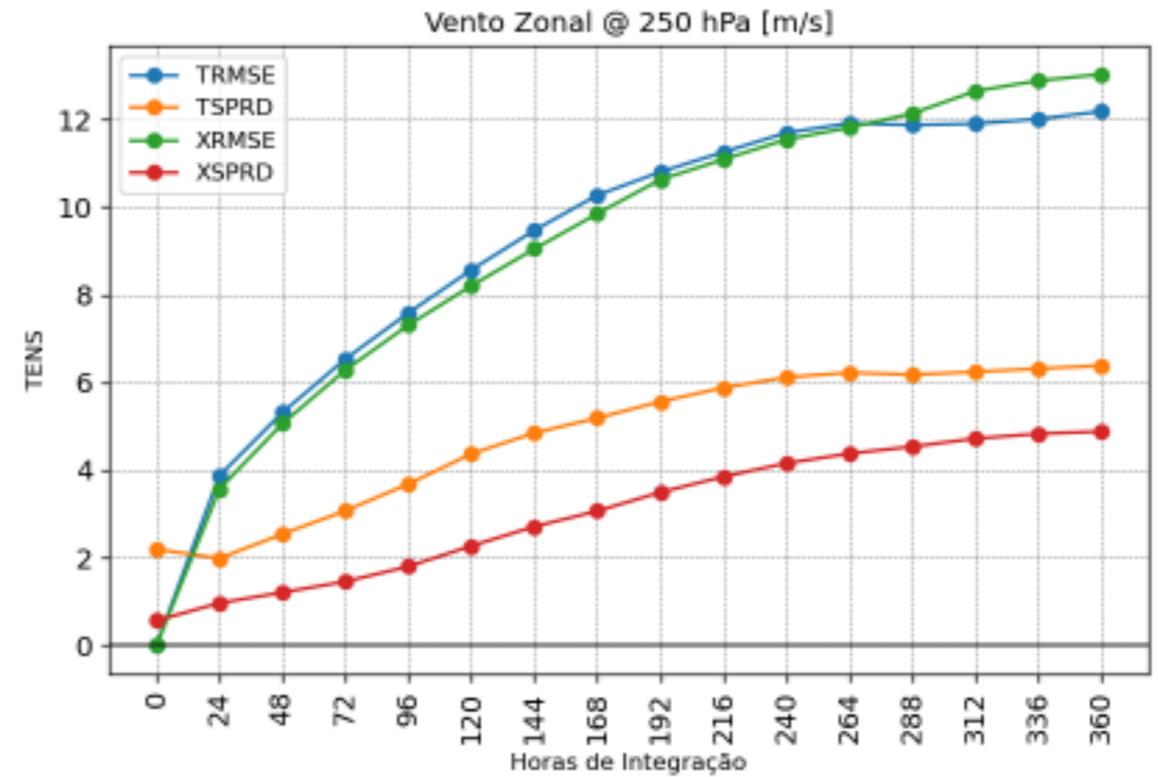
TR



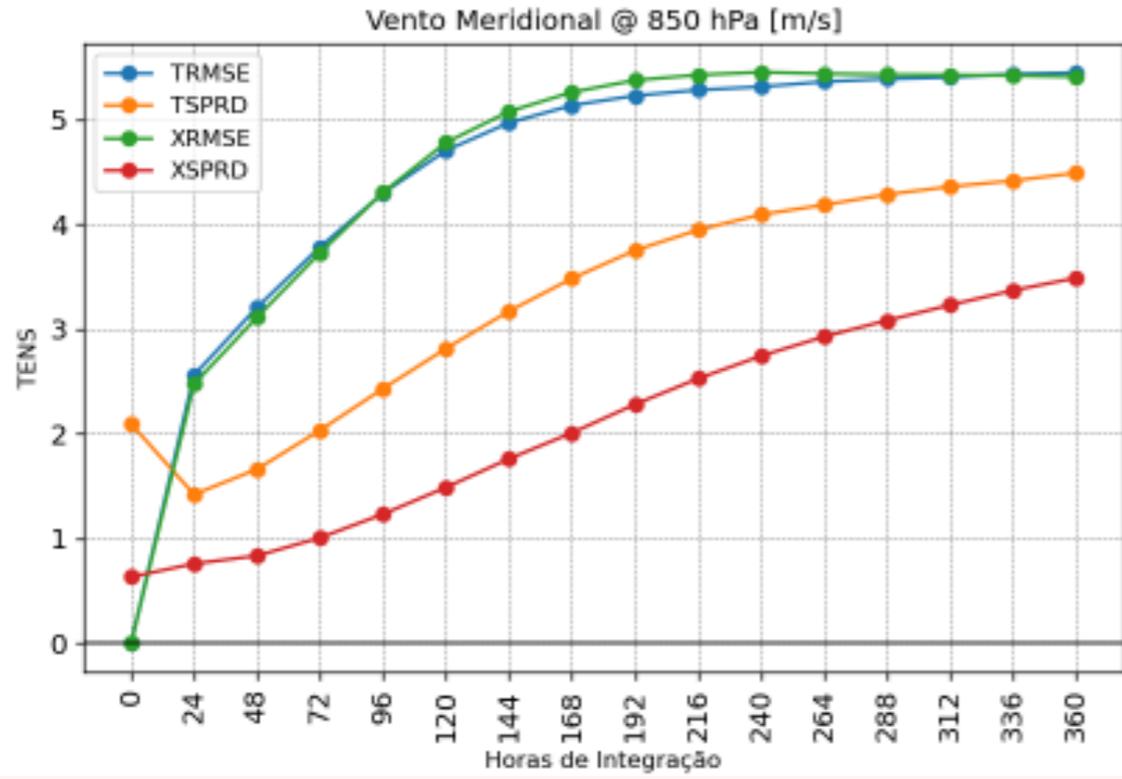
HS



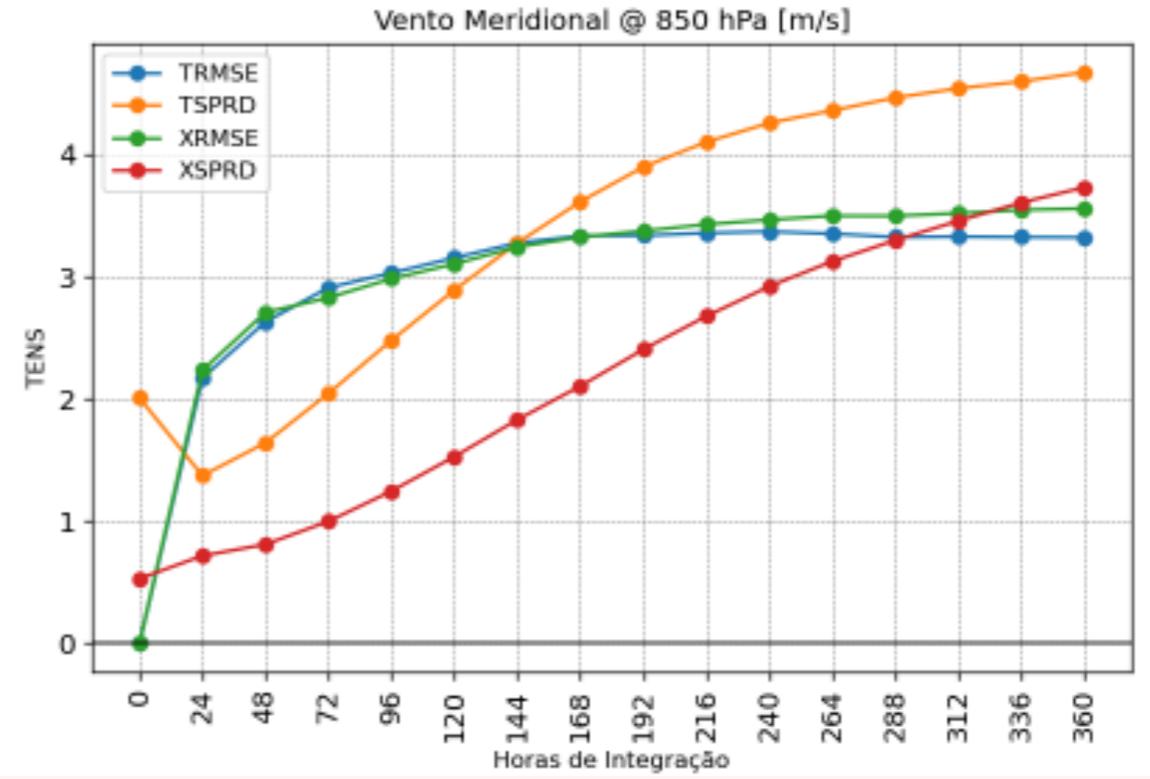
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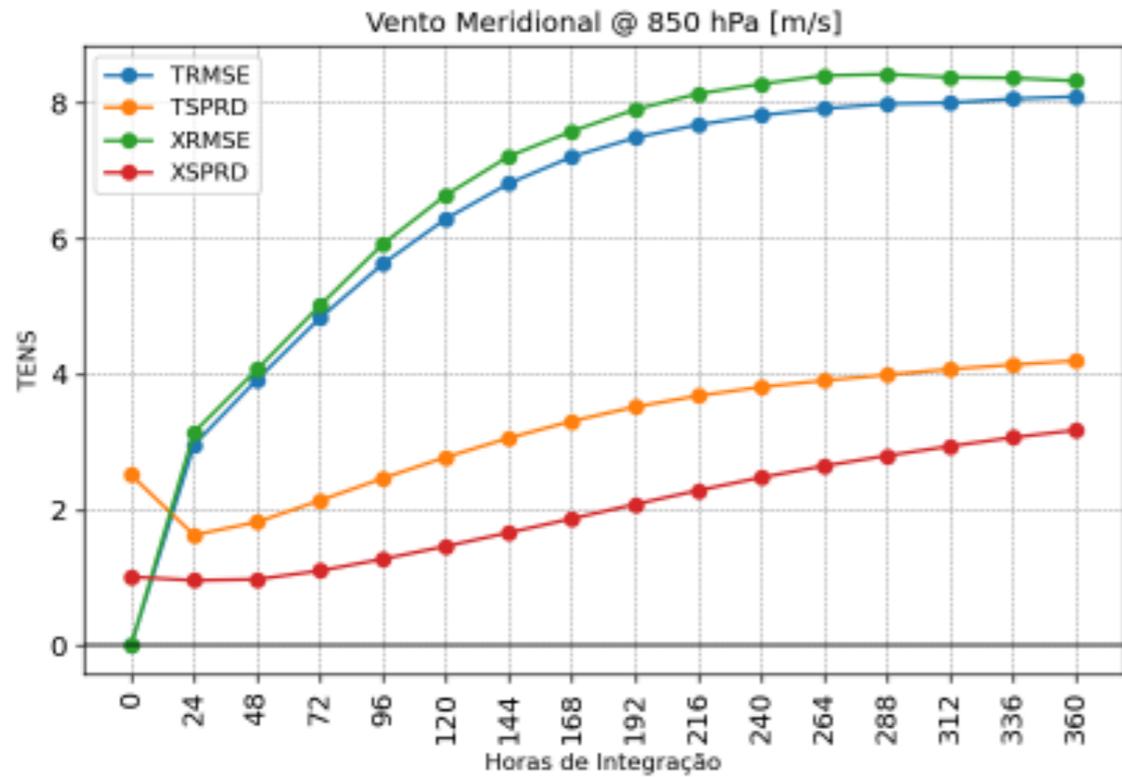
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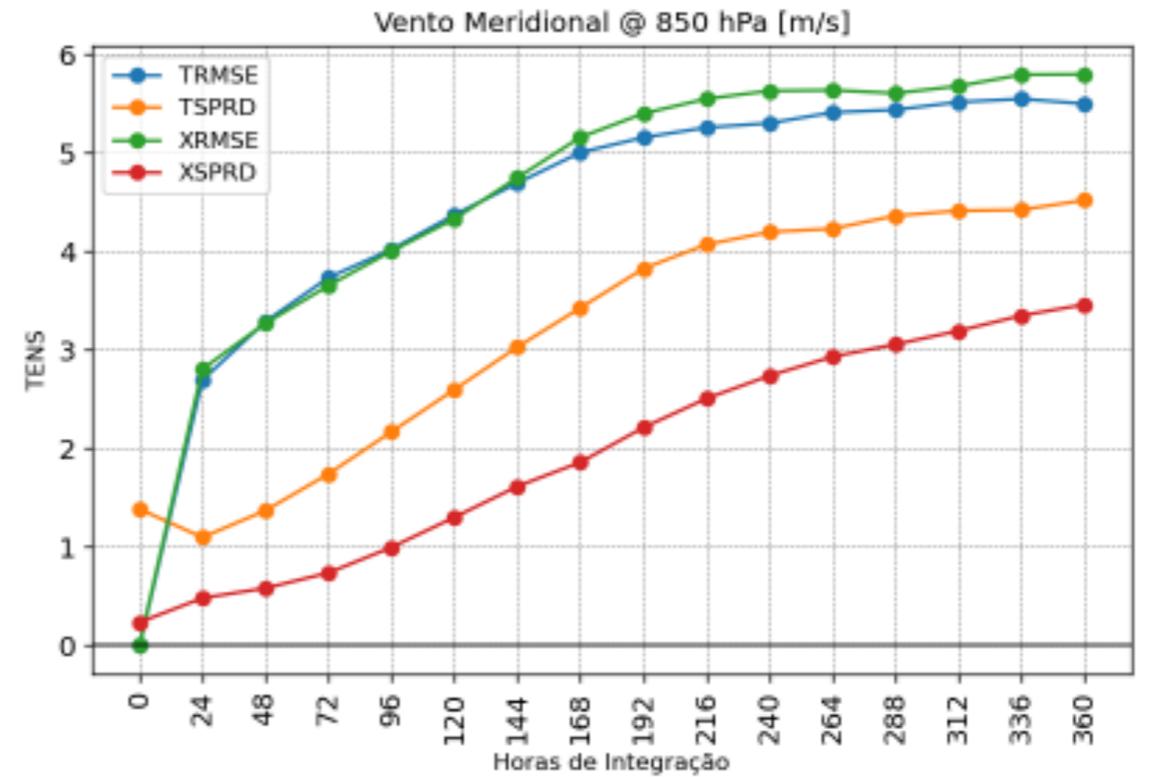
TR



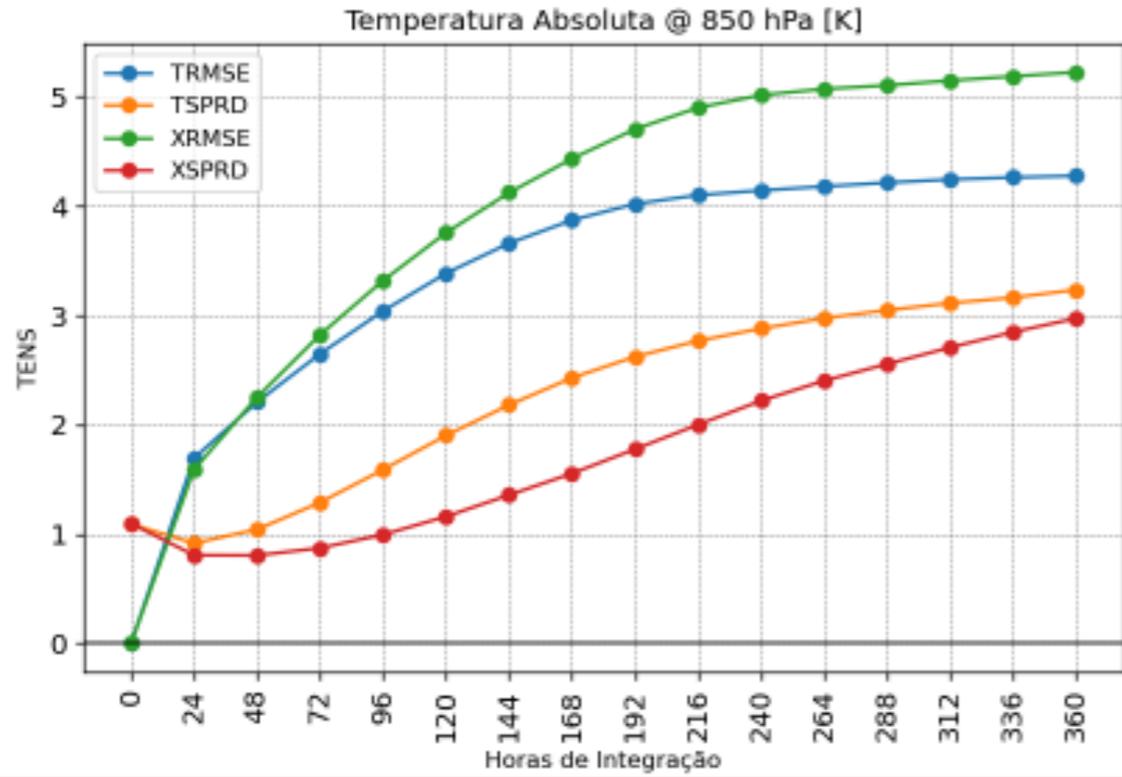
HS



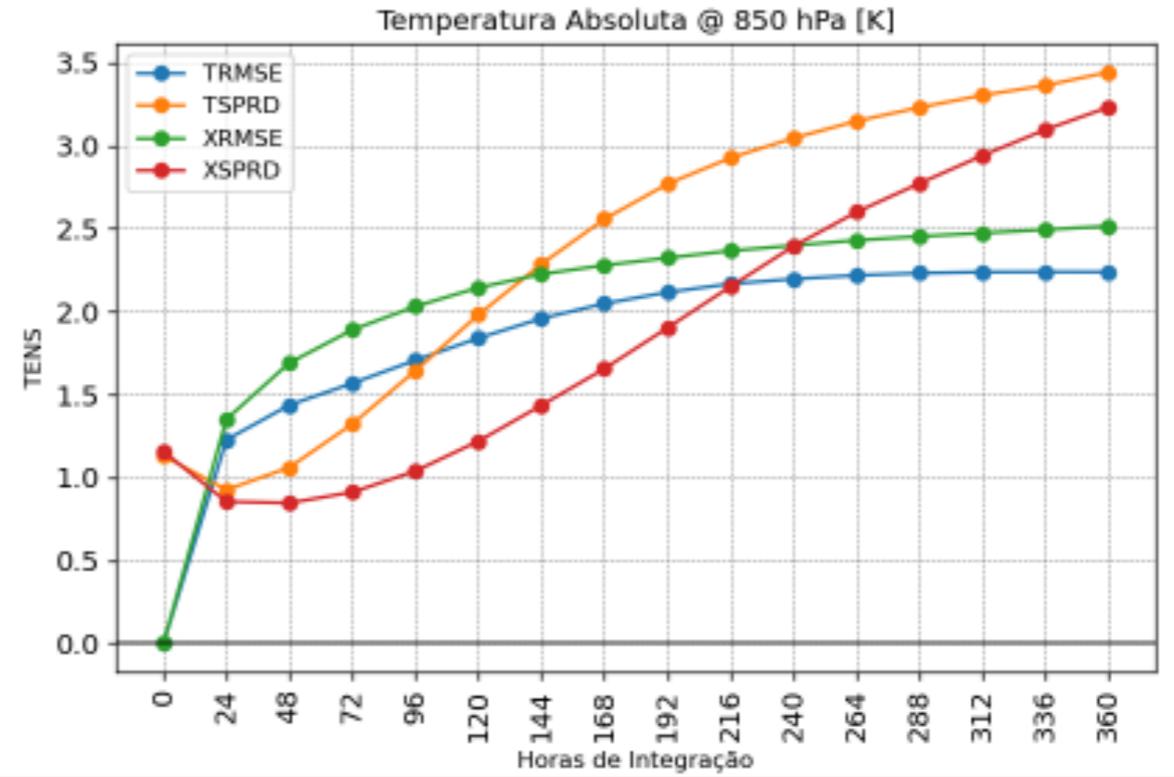
AS



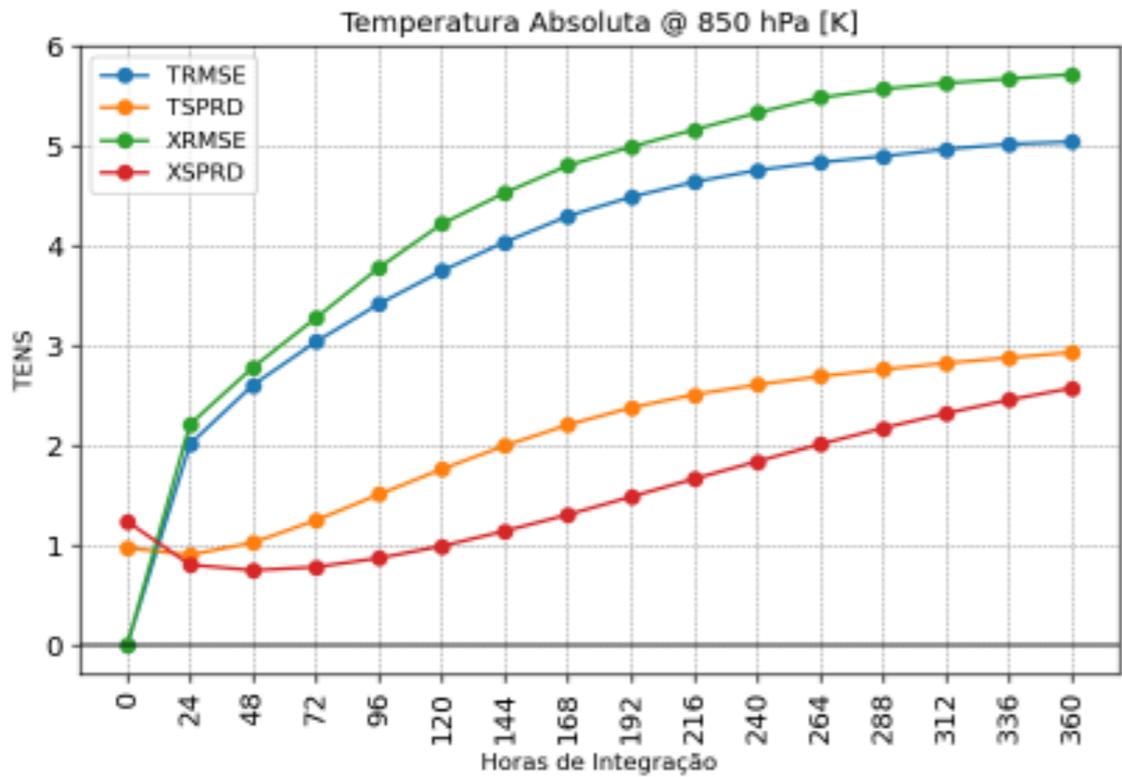
HN



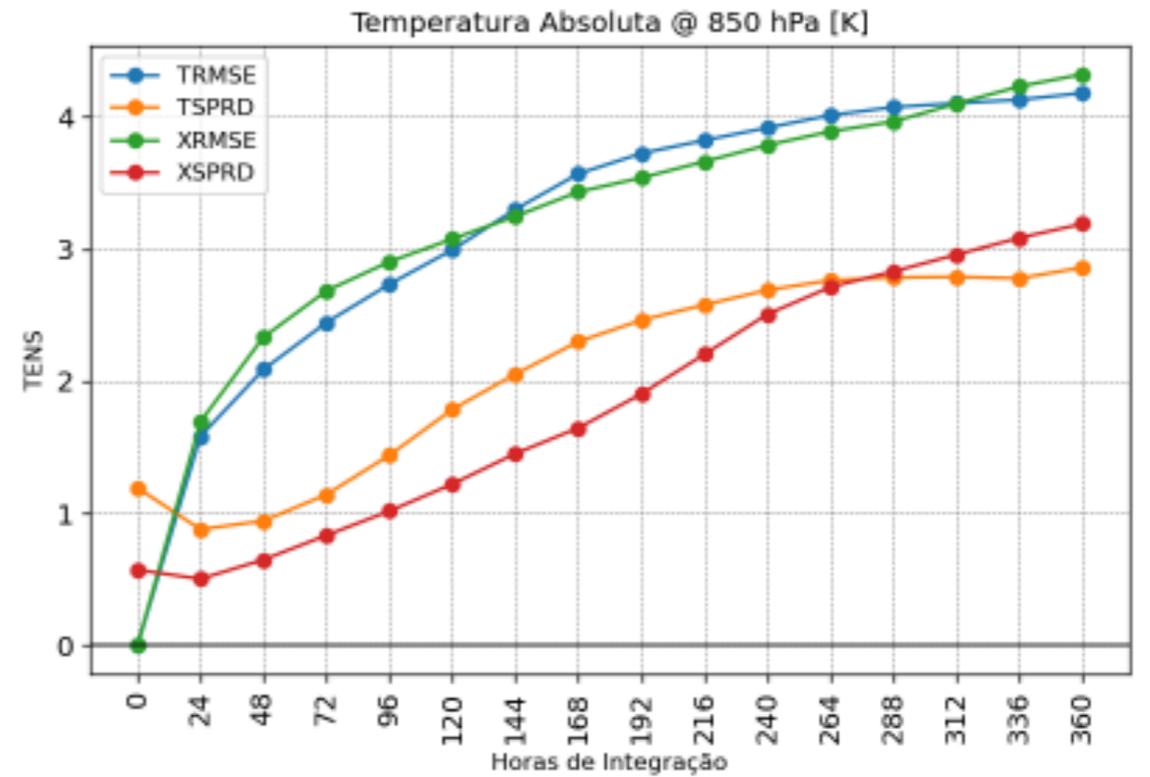
TR



HS



AS



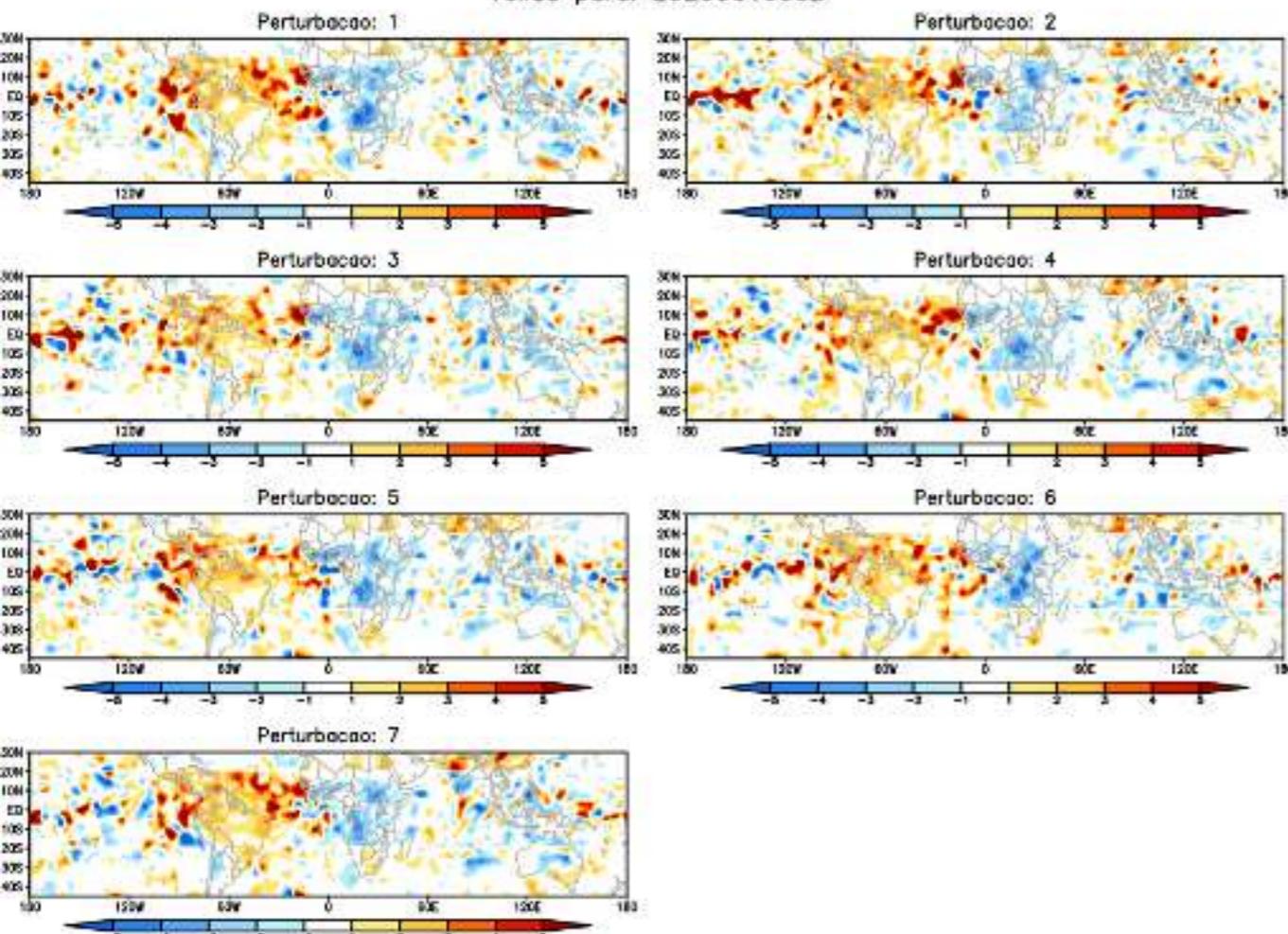
DISTRIBUIÇÃO ESPACIAL DAS PERTURBAÇÕES INICIAIS

- Gráficos plotados sobre o domínio do modelo para as seguintes variáveis;
 - Temperatura do Ar em 850, 500 e 250 hPa;
 - Componente zonal do vento em 850, 500 e 250 hPa;
 - Componente meridional do vento em 850, 500 e 250 hPa;

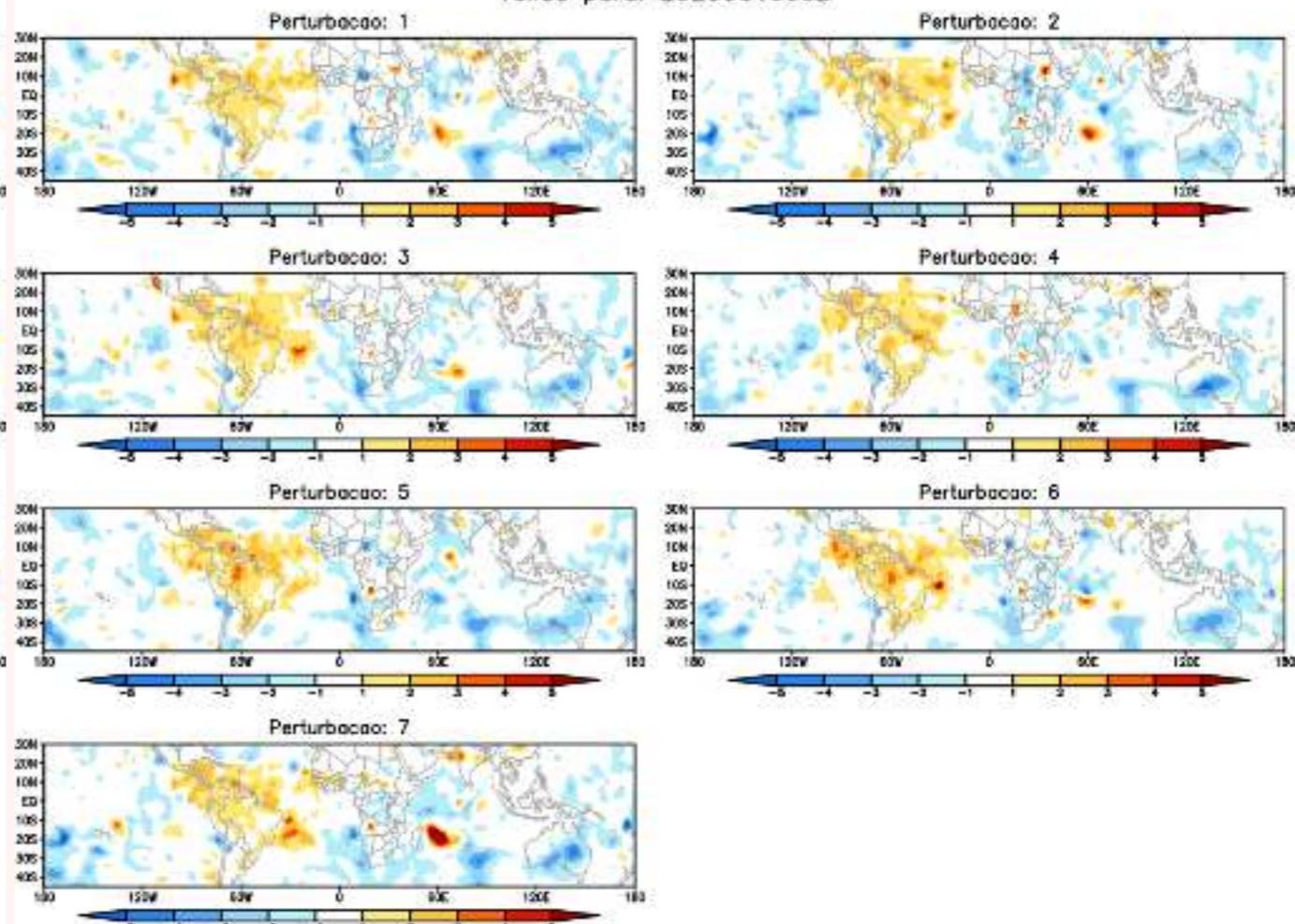
BAM XC50

MCGA XE6

CPTEC/INPE/MCT – PREVISÃO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Perturbações Iniciais da Temperatura (C) (850 hPa)
Valido para: 2020061600Z



CPTEC/INPE/MCT – PREVISÃO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Perturbações Iniciais da Temperatura (C) (850 hPa)
Valido para: 2020061600Z

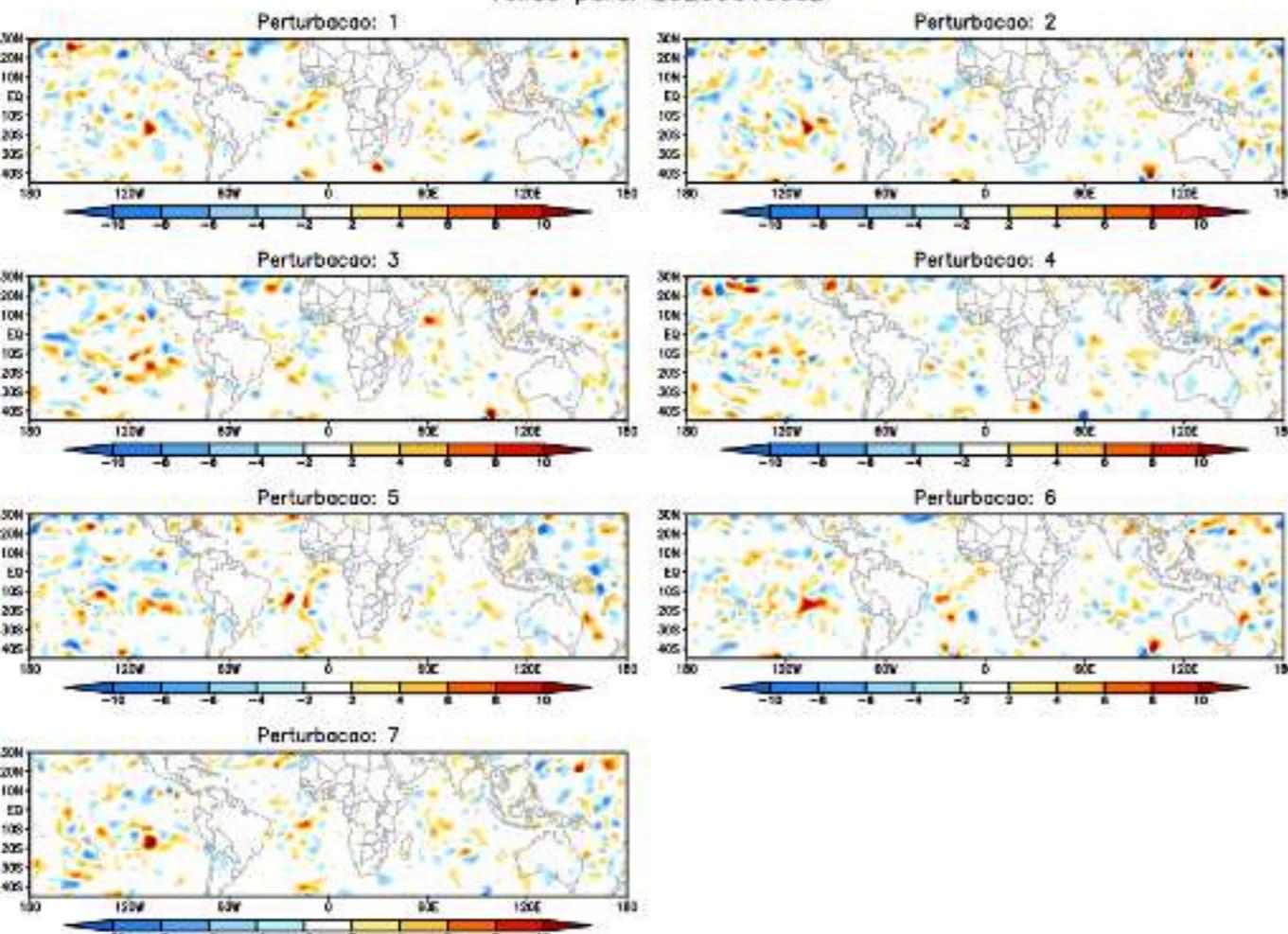


Análise 2020061600

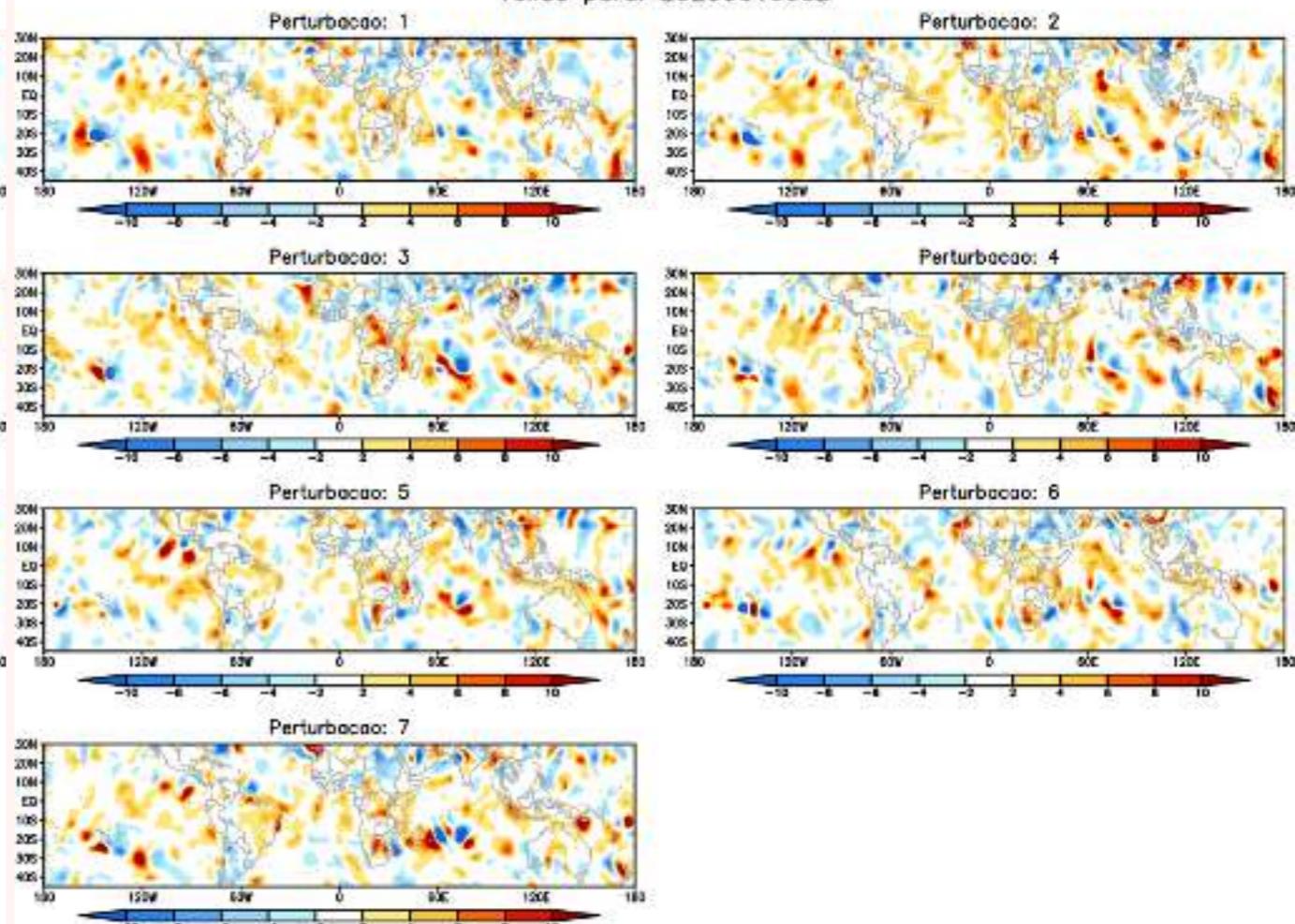
BAM XC50

MCGA XE6

CPTEC/INPE/MCT – PREVISÃO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Perturbações Iniciais da Componente Meridional do Vento (m/s) (850 hPa)
Valido para: 2020061600Z



CPTEC/INPE/MCT – PREVISÃO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Perturbações Iniciais da Componente Meridional do Vento (m/s) (850 hPa)
Valido para: 2020061600Z

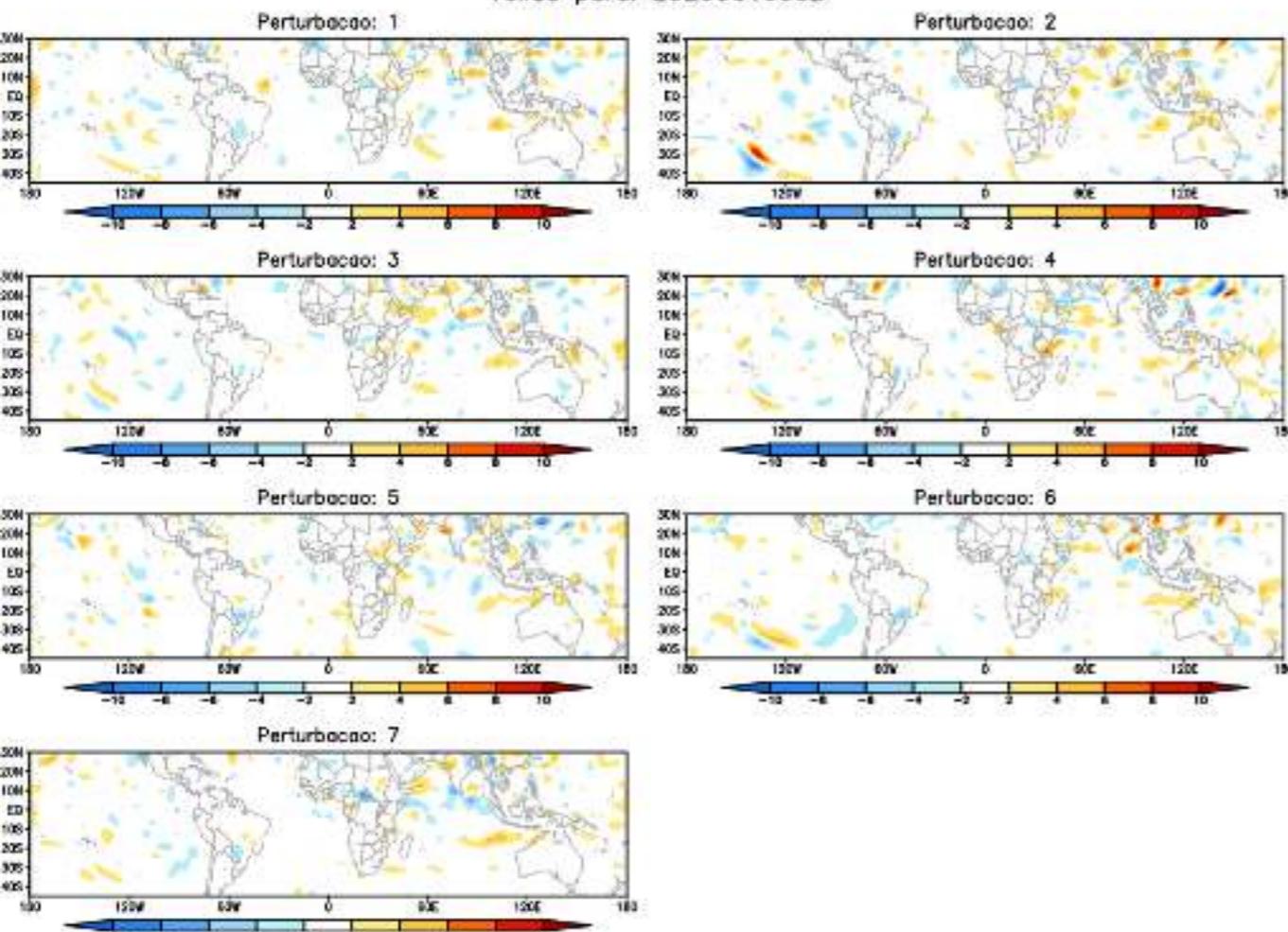


Análise 2020061600

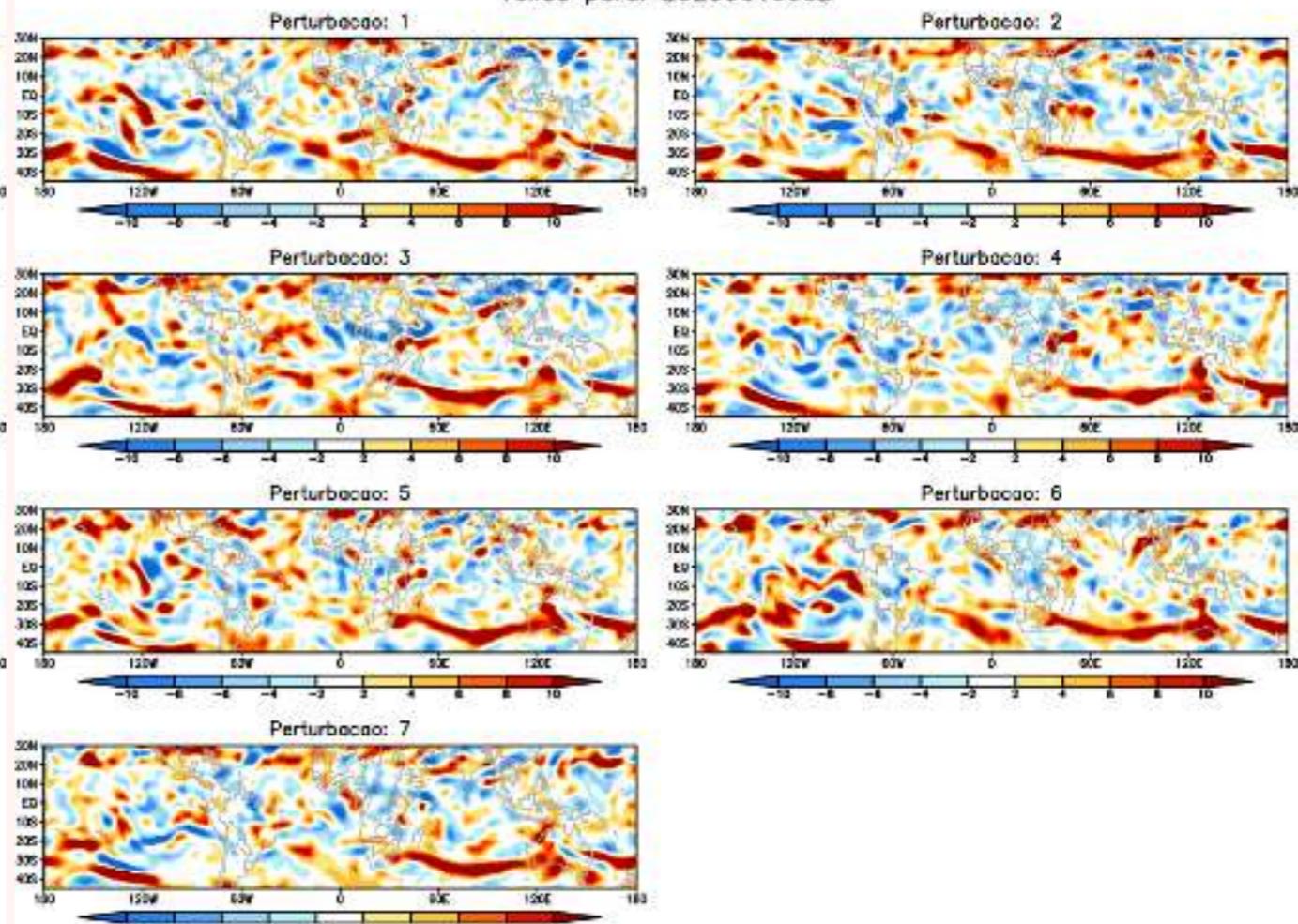
BAM XC50

MCGA XE6

CPTEC/INPE/MCT – PREVISÃO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Perturbações Iniciais da Componente Zonal do Vento (m/s) (250 hPa)
Valido para: 2020061600Z



CPTEC/INPE/MCT – PREVISÃO DE TEMPO GLOBAL POR ENSEMBLE – TQ0126L028
Perturbações Iniciais da Componente Zonal do Vento (m/s) (250 hPa)
Valido para: 2020061600Z

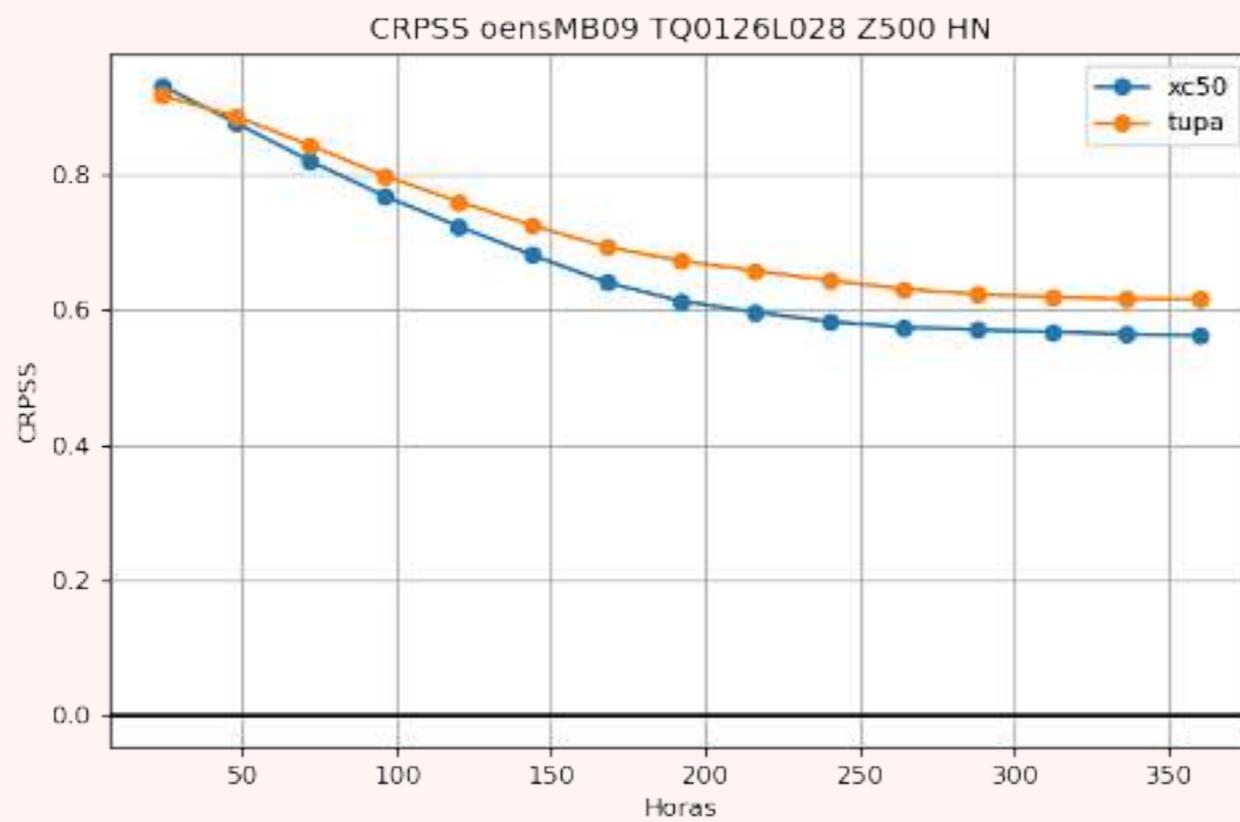
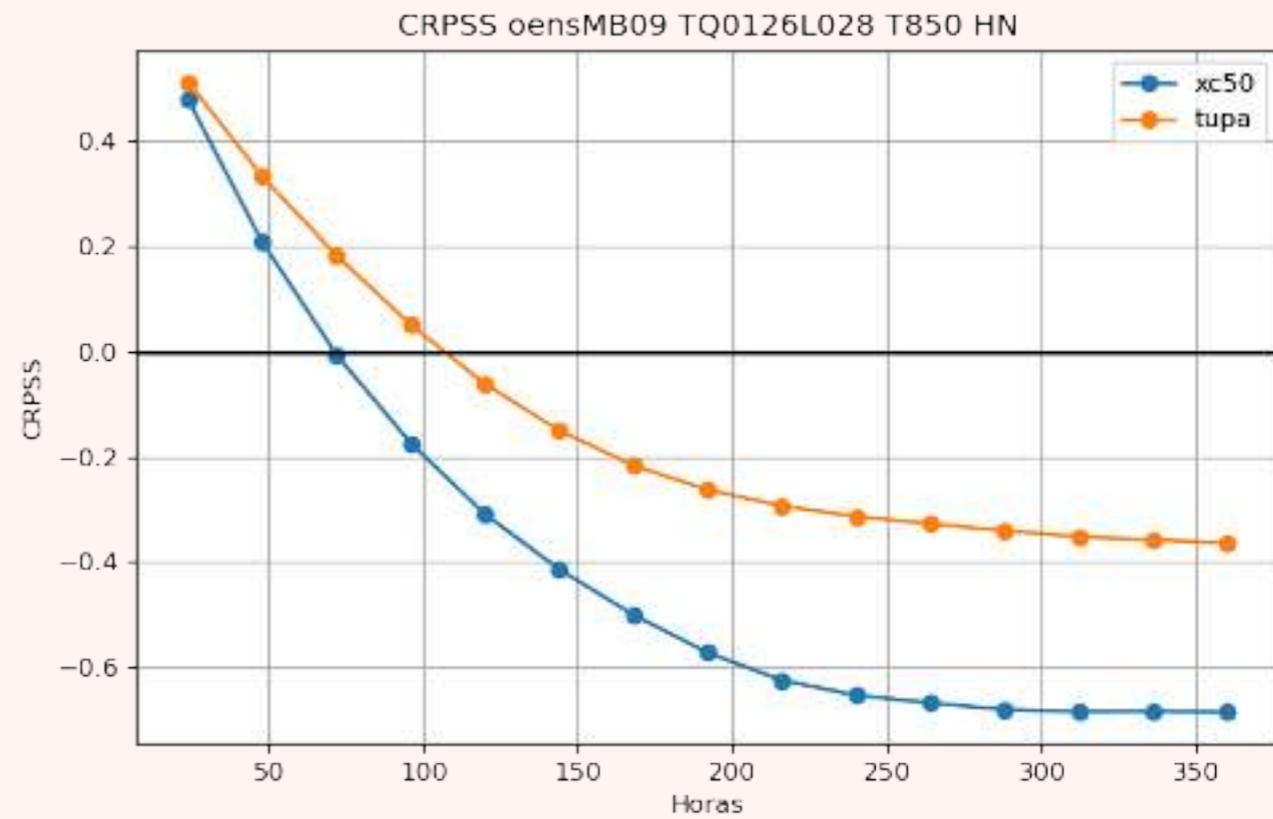
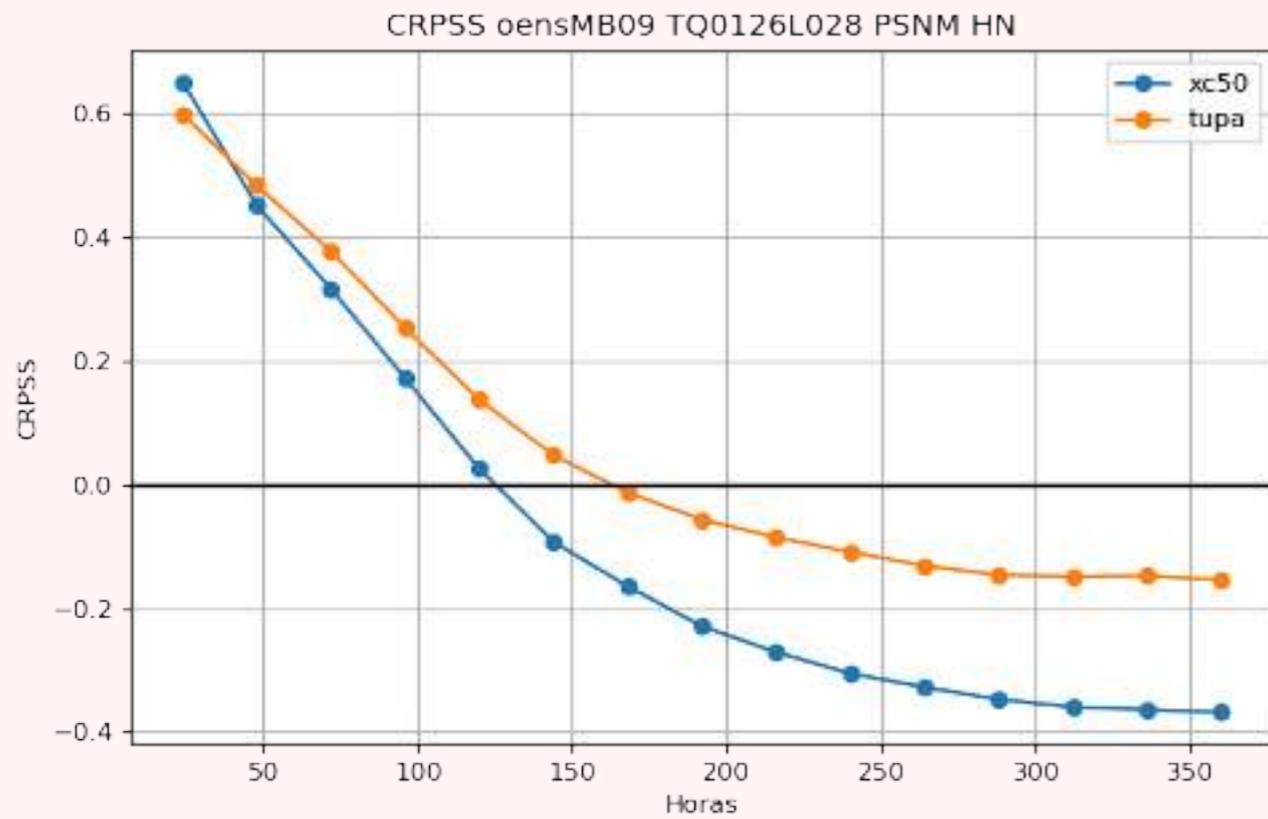


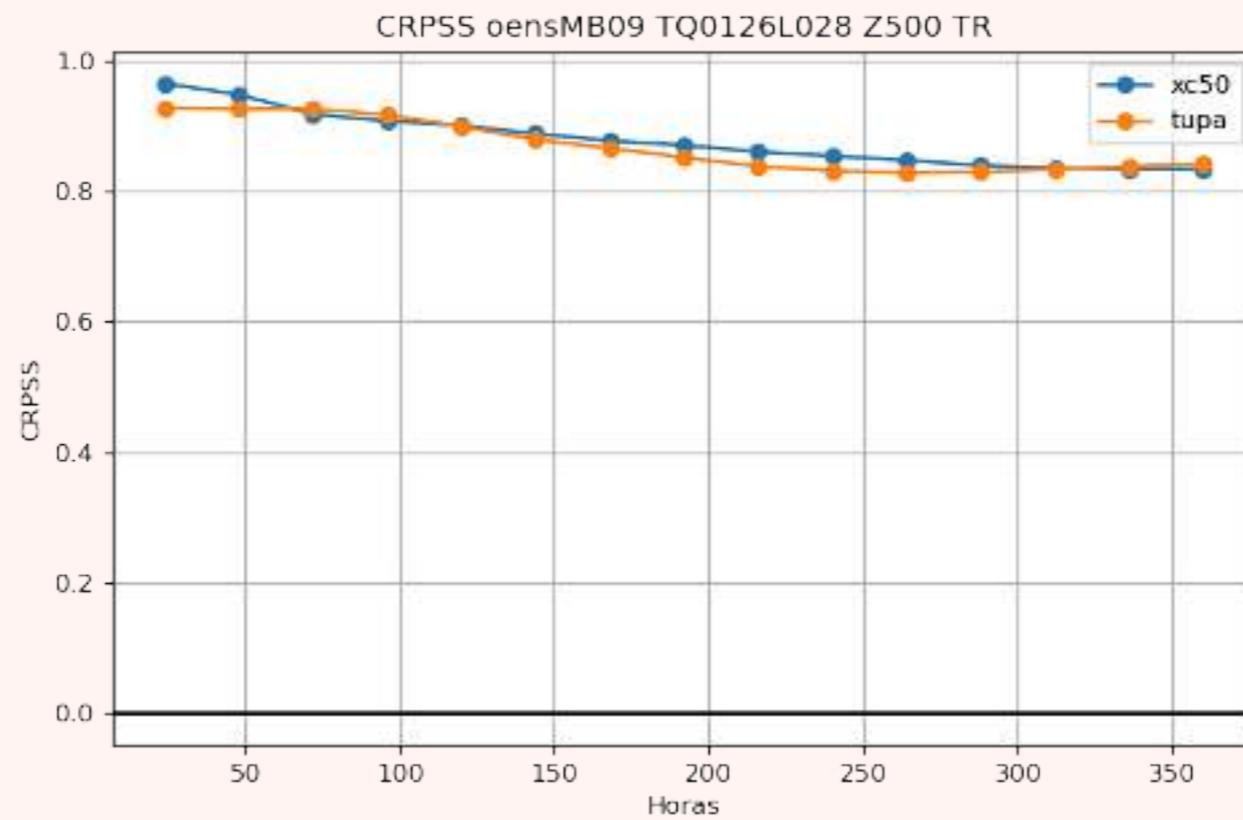
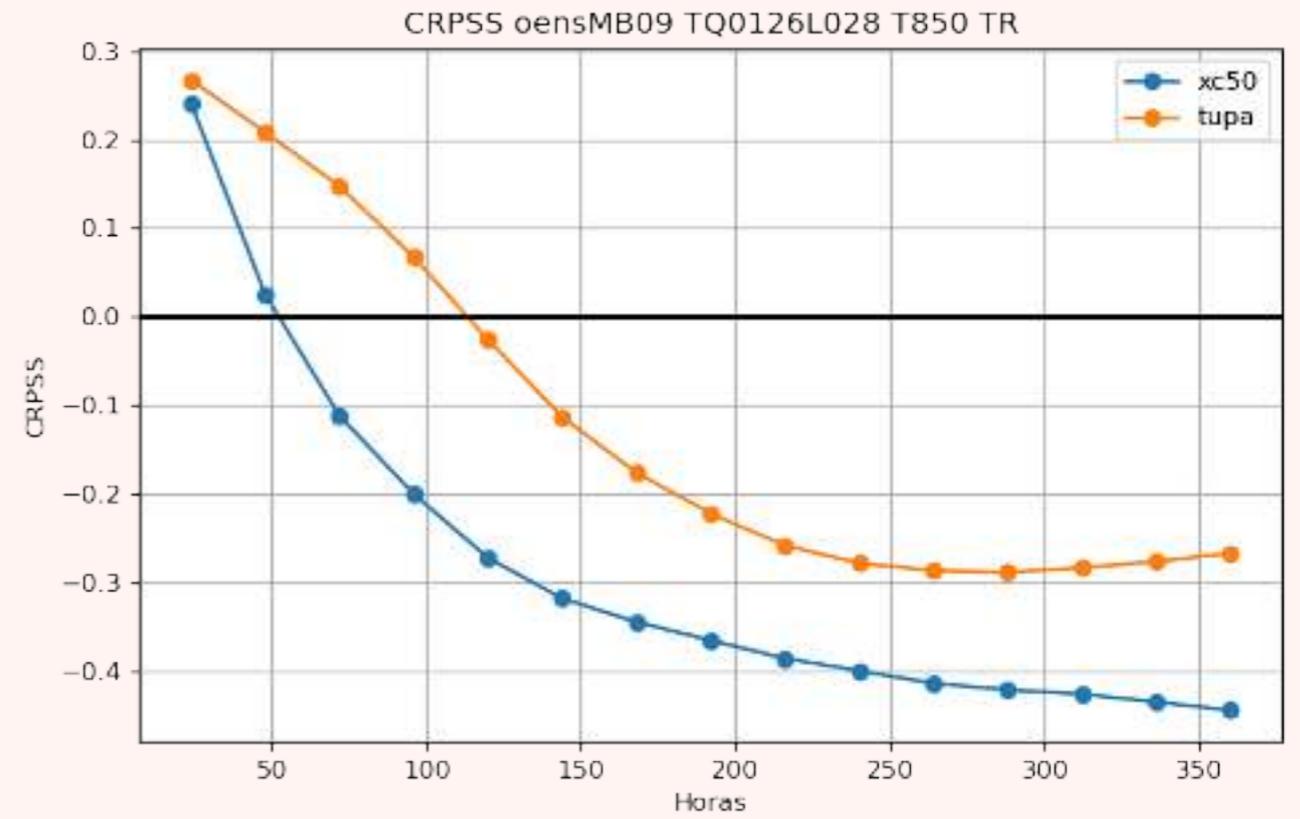
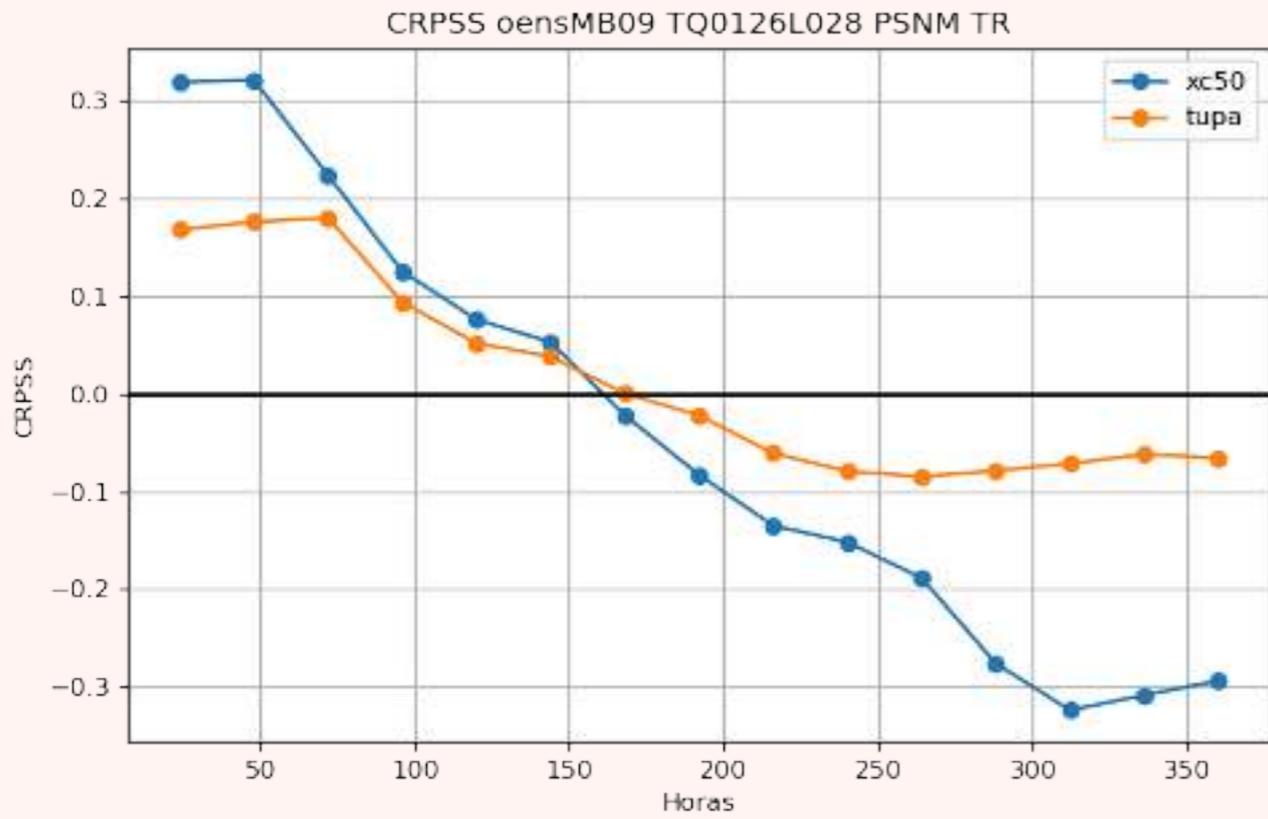
Análise 2020061600

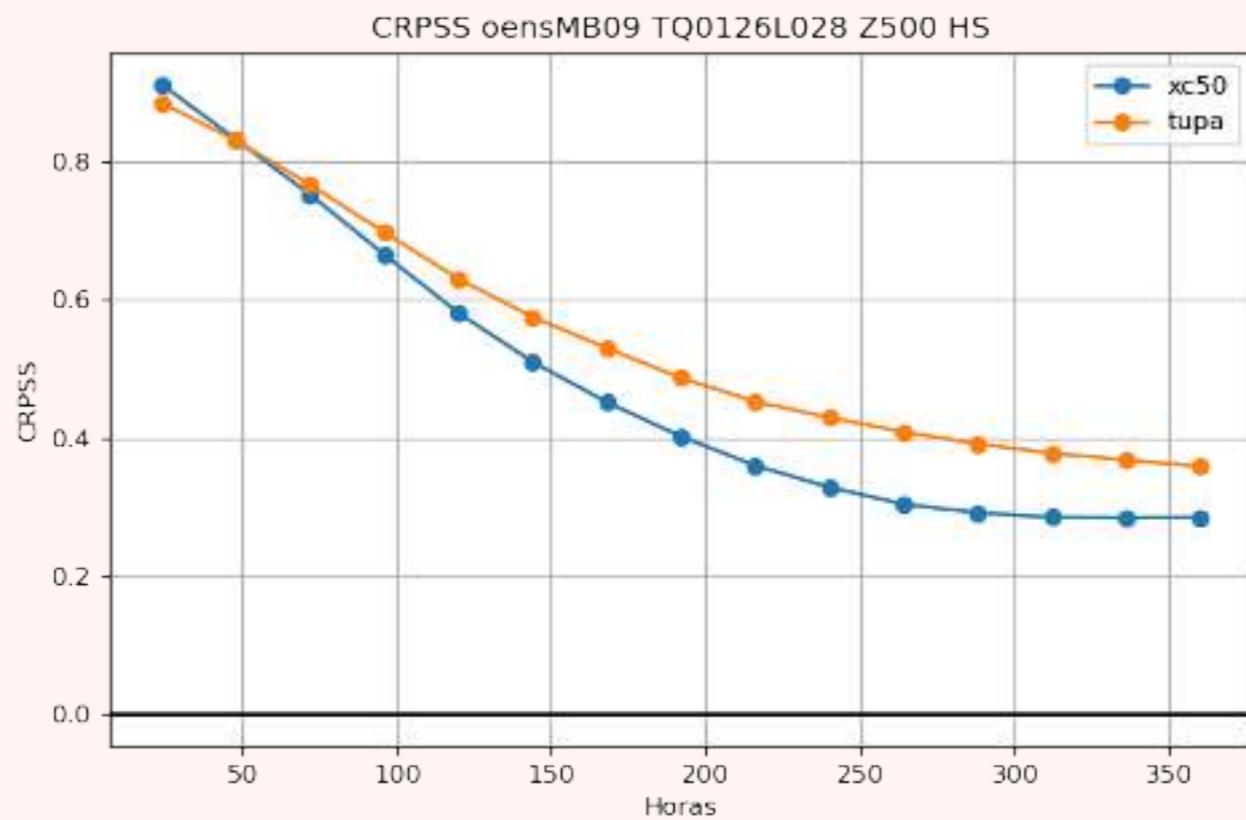
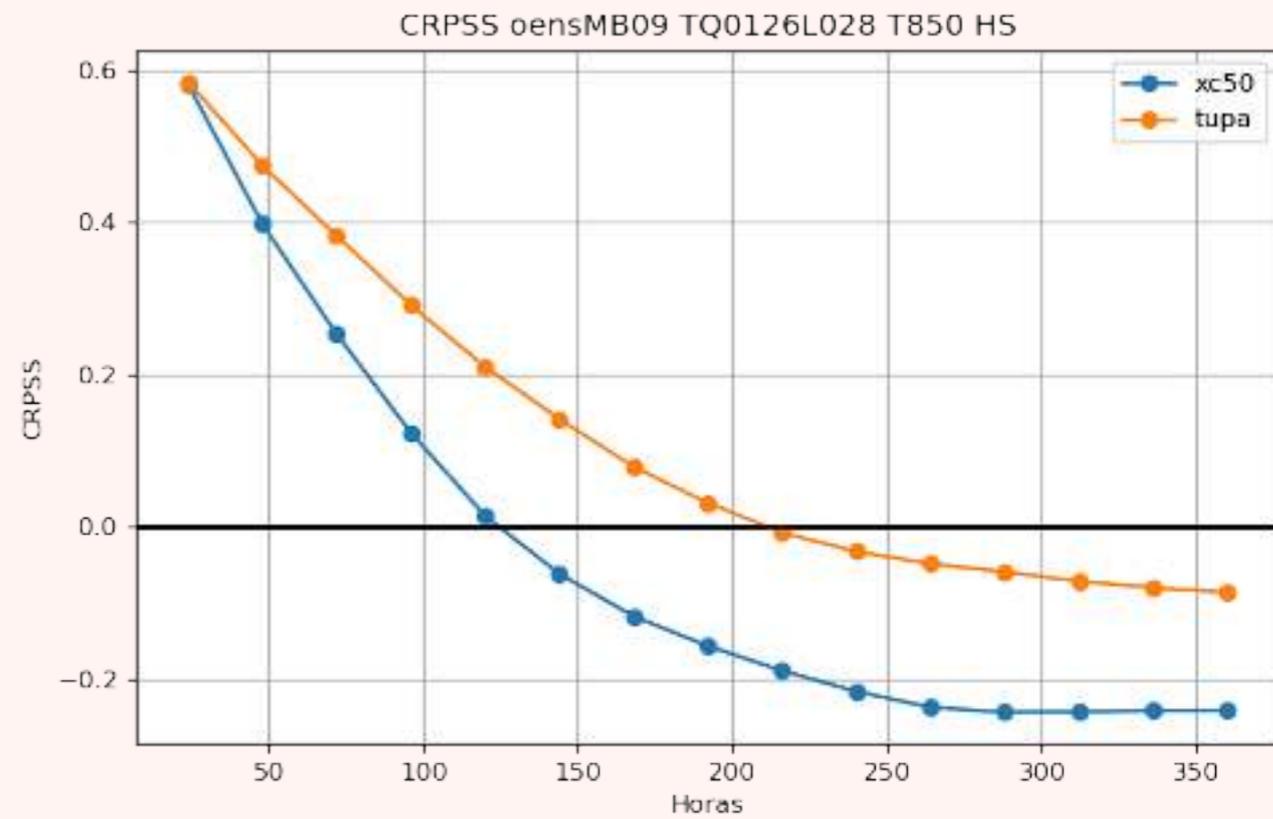
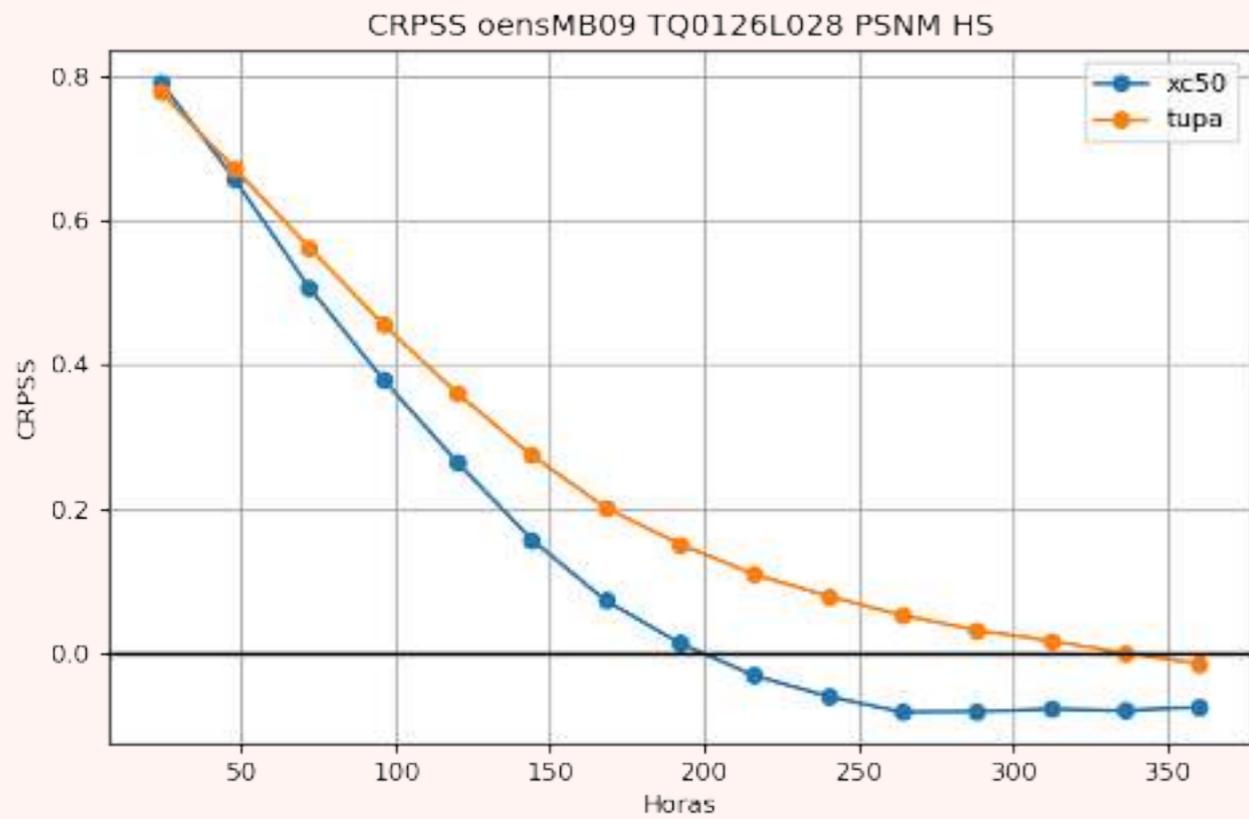
VERIFICAÇÃO DO CRPS

VERIFICAÇÃO DO CRPSS

- Verificação do CRPSS para as seguintes variáveis (sobre as regiões HN, TR e HS) para o período 2020060100 a 2020083100:
 - Temperatura absoluta em 850 hPa;
 - Pressão reduzida ao nível médio do mar;
 - Altura geopotencial em 500 hPa;
- CRPS - *Continuou Ranked Probability Skill*: representa o erro quadrático médio da distribuição cumulativa do conjunto de previsões (para previsão determinística, representa o erro médio absoluto);
- CRPSS - *Skill Score*: as curvas indicam o limite de previsibilidade do conjunto de previsões, em relação à climatologia (Era Interim).







CONSIDERAÇÕES

CONSIDERAÇÕES

- Método de perturbação é serial, compilado com GNU sem otimizações:
 - Aumento da resolução ou do número de membros, demandará melhorias nas rotinas que empregas as transformadas (espectral -> grade, vice-versa);
- Alguns produtos e meios de pós-processamento (eg, TIGGE) necessitam ser migrados e/ou verificados (ajuda DIDOP com o TIGGE);
- Necessário fazer ajustes no método de perturbação MB09, considerando a nova versão/configuração do modelo e a nova máquina - **previsão para término até março/2021**;
- Necessário colocar em prática o procedimento de remoção de viés implementado pelo Christopher (ou algum outro método);