

SERVICIO METEOROLÓGICO NACIONAL



GOBIERNO
FEDERAL

SEMARNAT

NAEFS Application at Mexico



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SMN



6th NAEFS Workshop
FNMOOC, Monterey, CA, USA.

May 1, 2012



Vivir Mejor

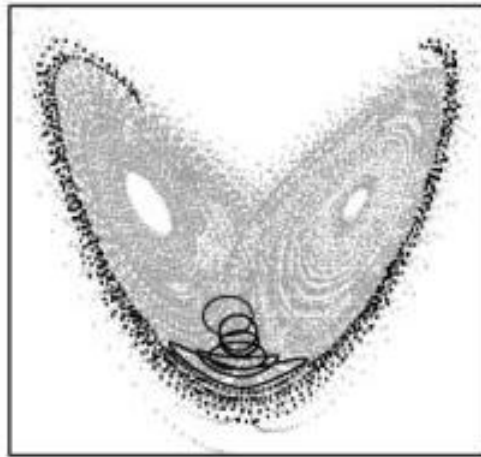
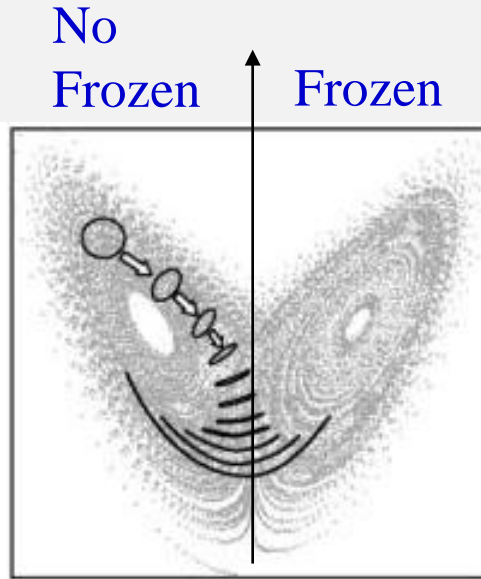
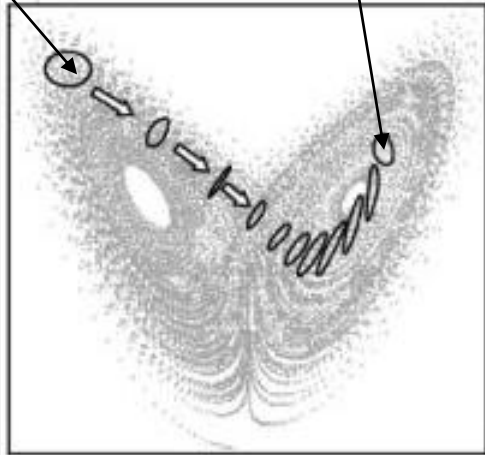
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- On the use of NAEFS data
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- DMD (Daily Meteorological Discussion) at SMN
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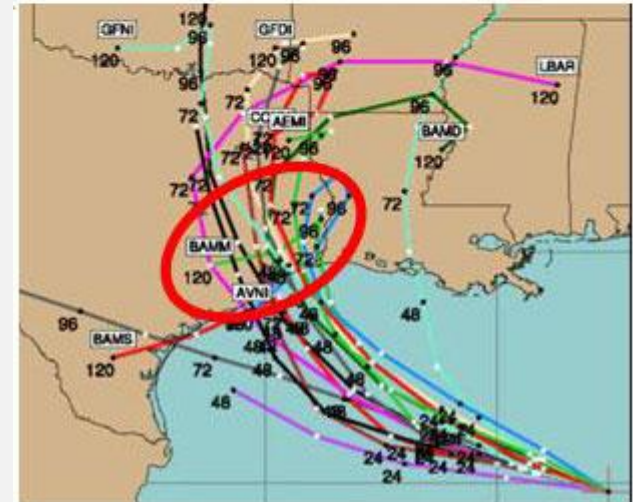
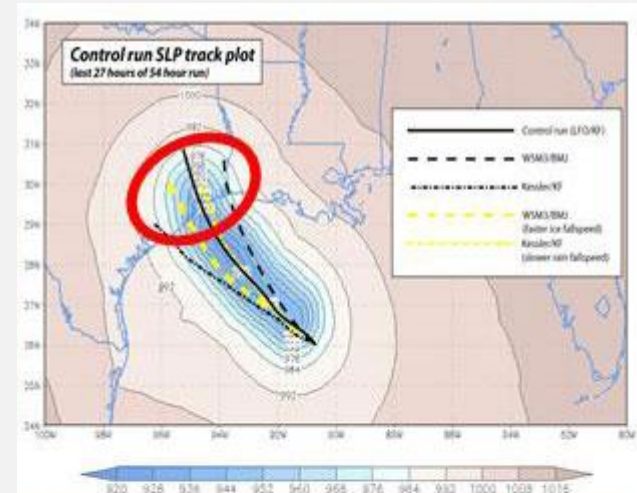
Butterfly Effect (Lorenz, 1963):

Initial state

Final state



Palmer (2006)



Main Goal

Ensemble Forecasting intends to cope with the two sources of uncertainty in Weather Forecast Models:

- Errors due to the uncertainty on the initial conditions
- Errors due to the uncertainty on the knowledge of the model physics

NAEFS Data from Canada



Environment
Canada

Environnement
Canada

Canada

Weatheroffice
www.weatheroffice.gc.ca

Français

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Products from the North American Ensemble Forecast System (NAEFS)



The North American Ensemble Forecast System (NAEFS) is a joint project involving the Meteorological Service of Canada (MSC), the United States National Weather Service (NWS) and the National Meteorological Service of Mexico (NMSM). NAEFS was officially launched in November 2004 in presence of representatives of the three countries.

NAEFS combines state of the art ensemble forecasts, developed at the MSC and the NWS. When combined, the grand ensemble can provide weather forecast guidance for the 1-14 day period that is of higher quality than the currently available operational guidance based on either set of ensembles alone. It allows the generation of a set of forecast products that are seamless across the national boundaries between Canada, the United States and Mexico. The research/development and operational costs of the NAEFS system are shared by the three organizations (MSC, NWS, and NMSM), which make it more cost effective and result in higher quality and more extensive weather forecast products.

Comments concerning the NAEFS products are welcome. Please send your comments by visiting [Contact Us](#). Your suggestions will be considered in future updates.

- **Temperature Anomaly: Day 8 to 14 Outlooks**
- **EPSgrams for cities in Canada, Mexico and United States of America**
- **Ensemble means and standard deviation charts**
- **Maps of probabilities of occurrence of several weather events**



Coordinación de Hidrología
Subcoordinación de Hidrometeorología



- Boletines
- Imágenes de Satélite
- Monitoreo de Lluvia
- Pronóstico numérico
- THORPEX México
- Proyectos

Inicio No. de visitante: 48826 Lunes 30 de Abril de 2012

Pronóstico meteorológico con el modelo NAEFS



North American Ensemble Forecast System

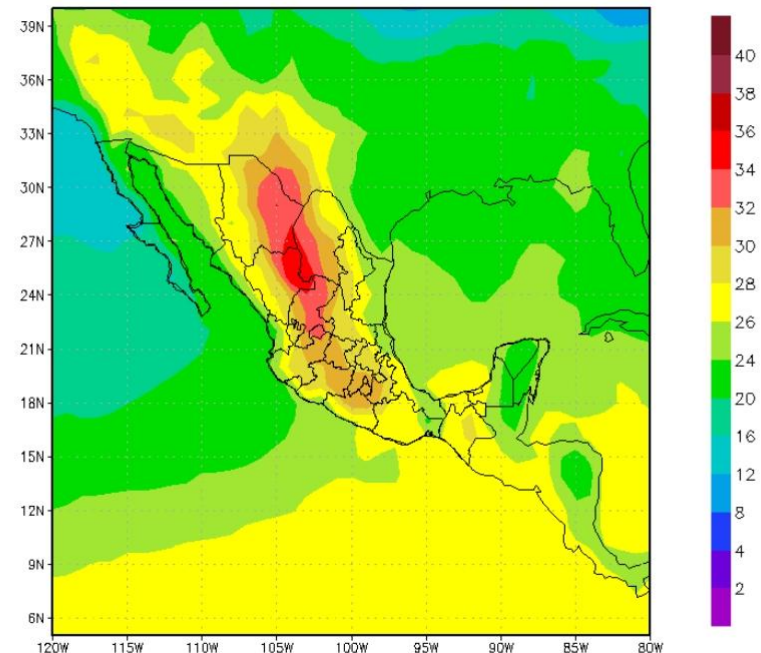
El North American Ensemble Forecast System (NAEFS) es un proyecto conjunto con el Servicio Meteorológico de Canada (MSC), el Servicio Meteorológico Nacional de los Estados Unidos (NWS) y el Servicio Meteorológico Nacional de México (NMSM). NAEFS fue lanzado oficialmente en noviembre de 2004 en presencia de los representantes de los tres países.

NAEFS combina la técnica del ensamble de pronósticos, desarrollado en el MSC y el NWS. Cuando se combinan, el ensamble puede proporcionar orientación del pronóstico del tiempo para el período de 1-14 días que es de mayor calidad que los disponibles en la actualidad considerando las directrices operacionales sobre la base de alguno de los sistemas por si solo. Permite la generación de un conjunto de previsiones de los productos a los que están sin fisuras a través de las fronteras nacionales entre Canada, Estados Unidos y México. La investigación desarrollo y gastos de funcionamiento del sistema NAEFS son compartidas por las tres organizaciones (MSC, NWS y NMSM), por lo que es más rentable y en consecuencia de mayor calidad y mejor prevision de productos meteorológicos, para mayor información consulte la pagina principal del proyecto NAEFS:

<http://www.emc.ncep.noaa.gov/gmb/ens/NAEFS.html>

Variable	Fecha	Hora	
Temperatura	20120430	06	<input type="button" value="Consultar"/>

Temperatura promedio 20120430_06



GrADS: COLA/IGES

INSTITUTO MEXICANO DE TECNOLOGÍA DEL AGUA


2012-04-30-06:21

NAEFS Data from IMTA's website




WRF Ensemble from IMTA

[Inicio](#) | [Historia](#) | [Mapa de sitio](#) | [Comentarios](#) | [English](#)



http://galileo.imta.mx/

Coordinación de Hidrología
Subcoordinación de Hidrometeorología



SEMARNAT
SECRETARÍA DE MEDIO AMBIENTE Y RECURSOS NATURALES

Boletines
Imágenes de Satélite
Monitoreo de Lluvia
Pronóstico numérico
THORPEX México
Proyectos

Inicio
No. de visitante: 48843
Martes 01 de Mayo de 2012

Ensamble con el modelo WRF

Ensamble del modelo WRF, utilizando como parametrizaciones de esquemas de nubes cúmulus: Kain-Fritsch, Betts-Miller-Janic, Grell-Devenyi, Grell 3d, Arakawa y Old Kain-Fritsch. Estas simulaciones se ejecutan en el clúster denominado Gaiia1, utilizando para cada opción de parametrización 2 equipos esclavos (nodos) con doble procesador Quad Core.

Se realizan tres opciones de parametrización a la vez, y al terminar se ejecutan las siguientes tres. El tiempo de procesamiento es de alrededor de 25 minutos.

Año	Mes	Día	Variable	Pronóstico			Consultar
2012	Abril	30	Precipitación	<input checked="" type="radio"/> a 24 hrs.	<input type="radio"/> a 48 hrs.	<input type="radio"/> a 72 hrs.	

Descargar datos en formato CSV (separado por comas):

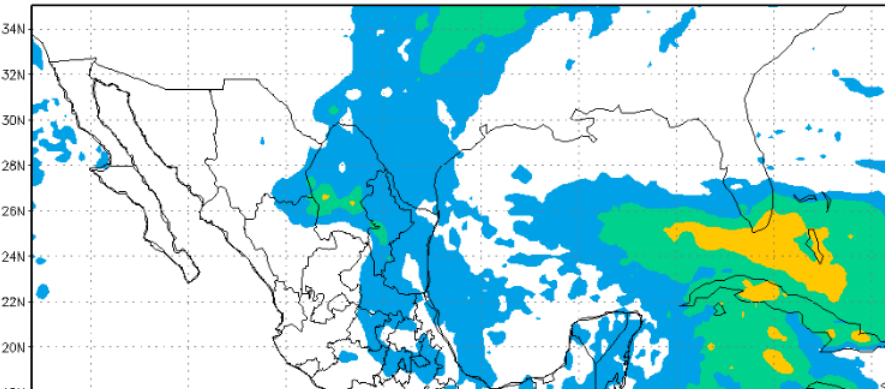
[24horas](#)

[48horas](#)

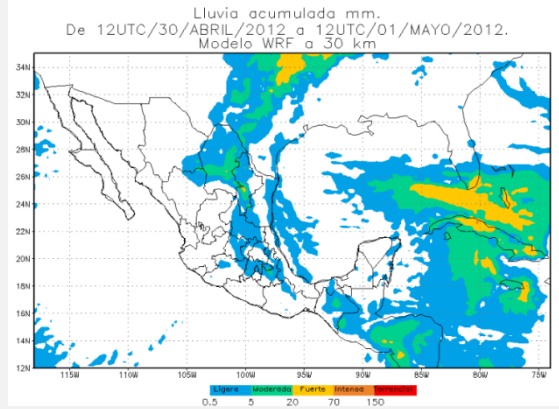
[72horas](#)

Promedio

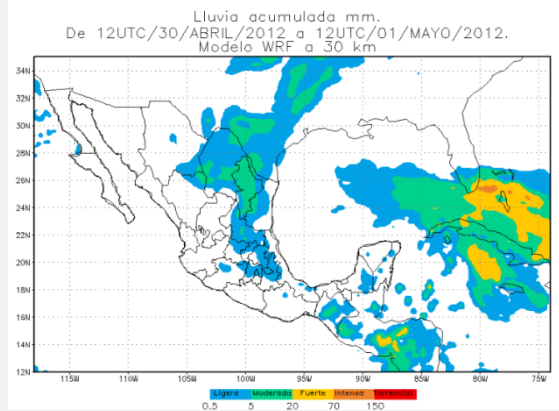
Promedio de Lluvia acumulada mm.
De 12UTC/30/ABRIL/2012 a 12UTC/01/MAYO/2012.
Modelo WRF a 30 km



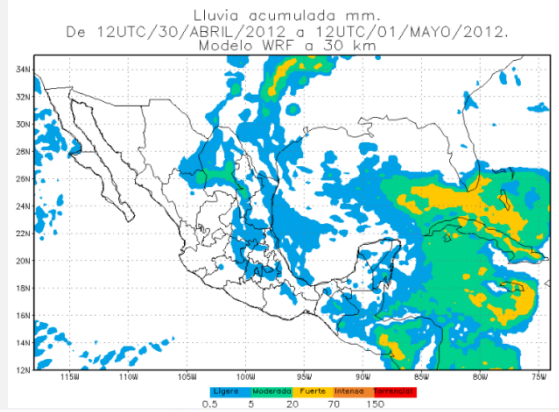
Esquema de Parametrización Kain-Fritsch (new ETA)



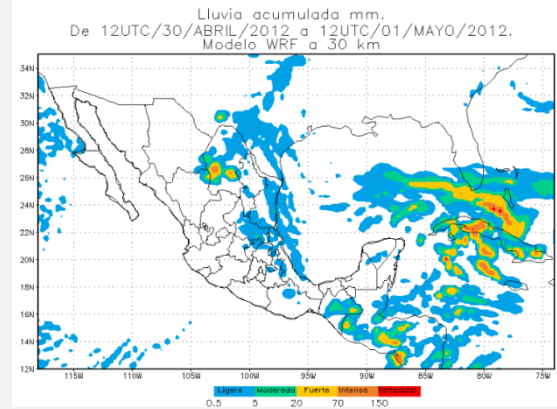
Esquema de Parametrización Betts-Miller-Janjic



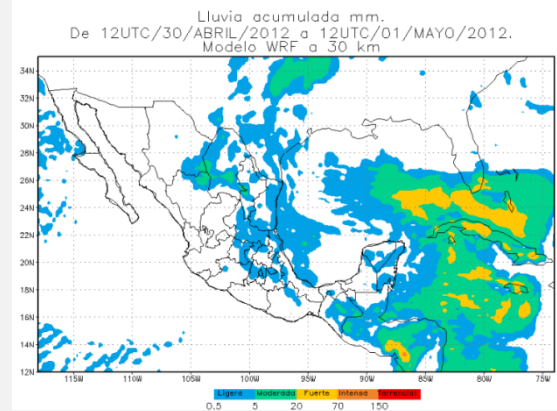
Esquema de Parametrización Grell-Devenyi



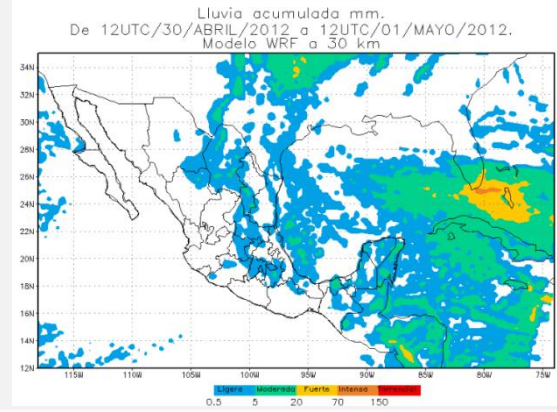
Esquema de Parametrización Arakawa-Schubert Simplificado



Esquema de parametrización Grell 3D

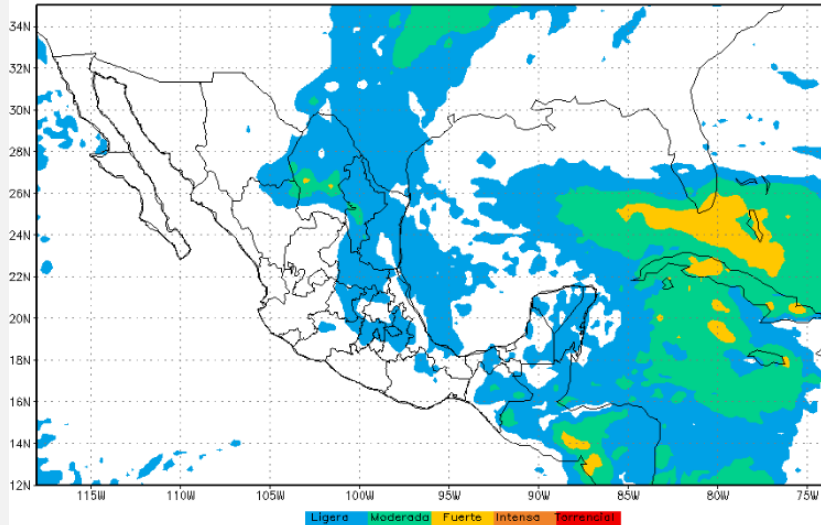


Esquema de Parametrización Kain-Fritsch (anterior)

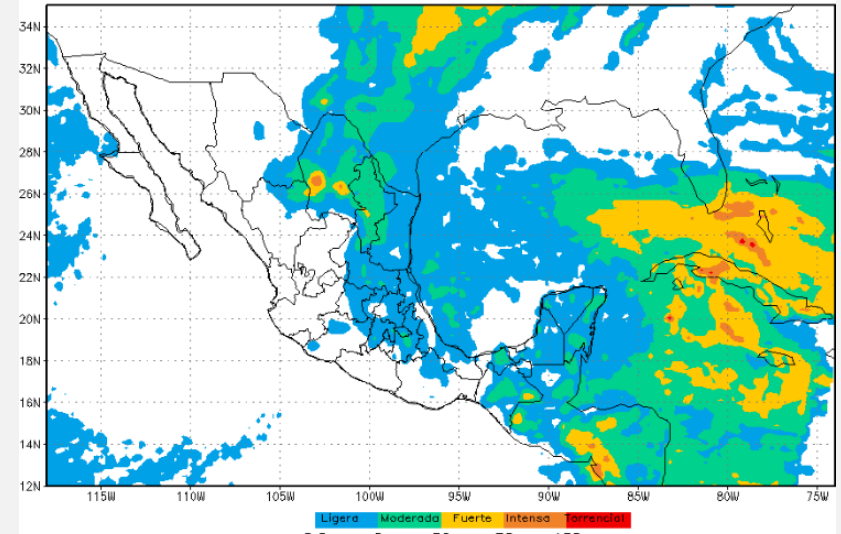


WRF Ensemble from IMTA

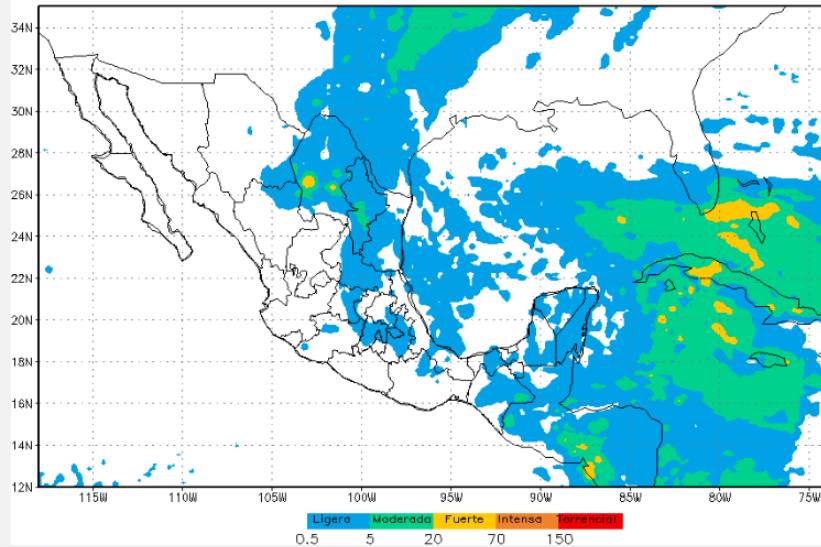
Promedio de Lluvia acumulada mm.
De 12UTC/30/ABRIL/2012 a 12UTC/01/MAYO/2012.
Modelo WRF a 30 km



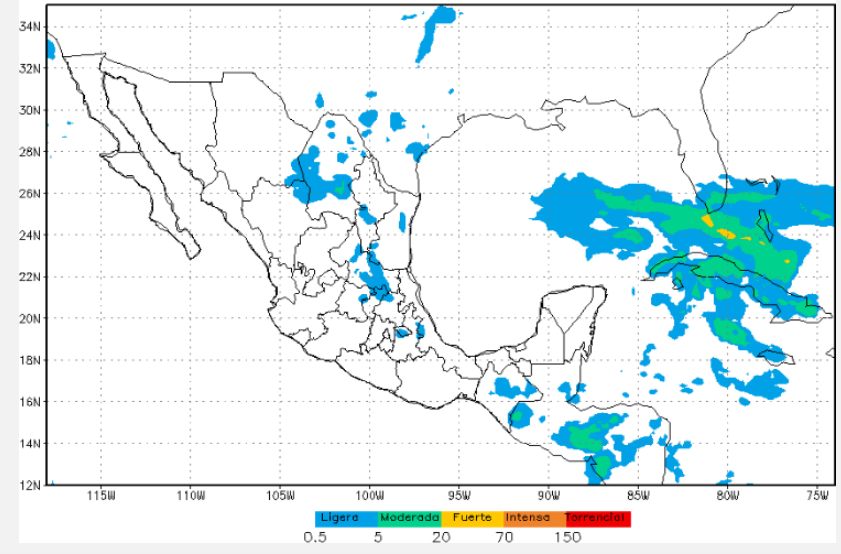
Lluvia Maxima acumulada mm.
De 30/ABRIL/2012 a 01/MAYO/2012
Modelo WRF a 30 km



Desviacion Standar de Lluvia acumulada mm.
De 12UTC/30/ABRIL/2012 a 12UTC/01/MAYO/2012.
Modelo WRF a 30 km



Lluvia Minima acumulada mm.
De 30/ABRIL/2012 a 01/MAYO/2012
Modelo WRF a 30 km



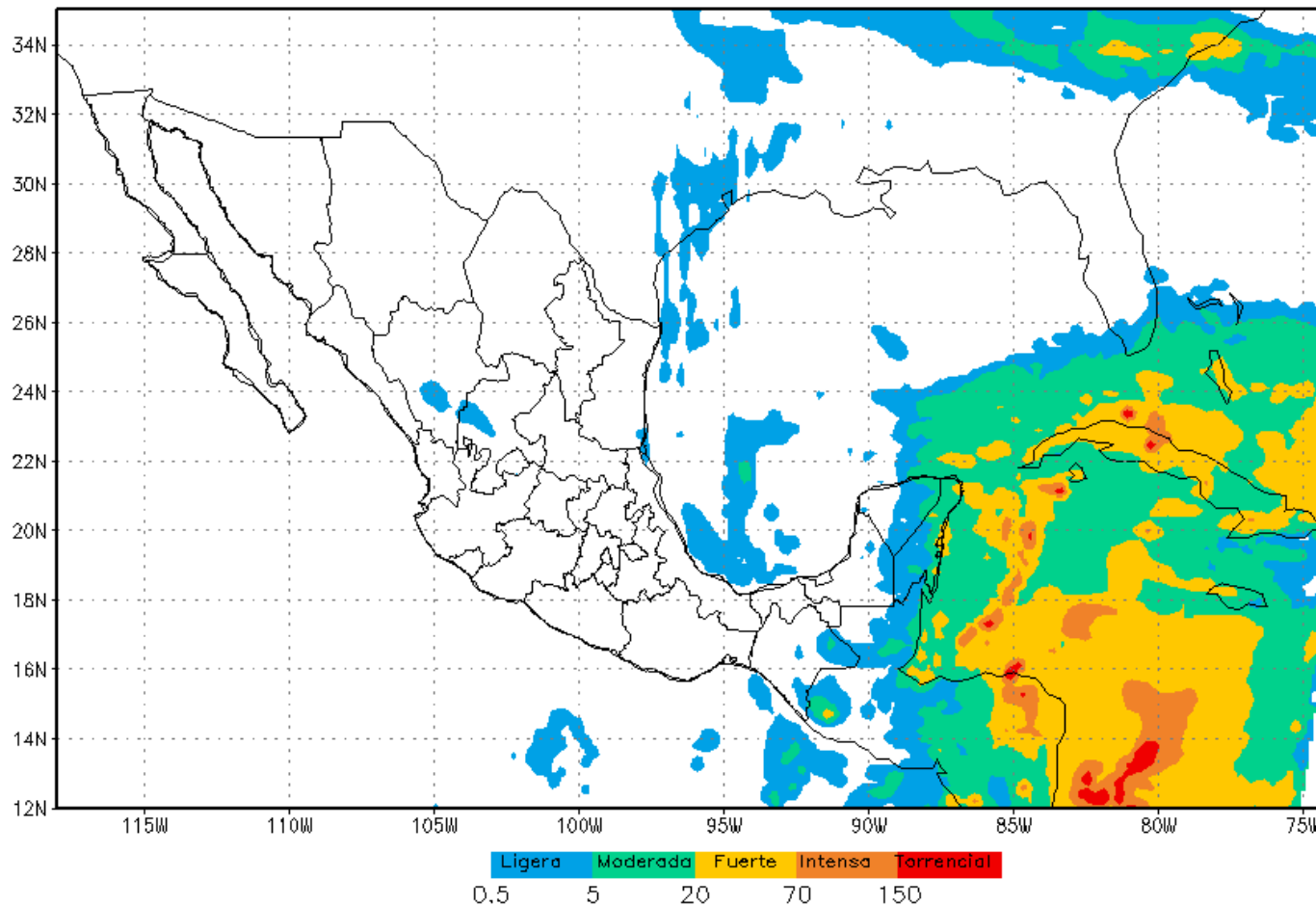


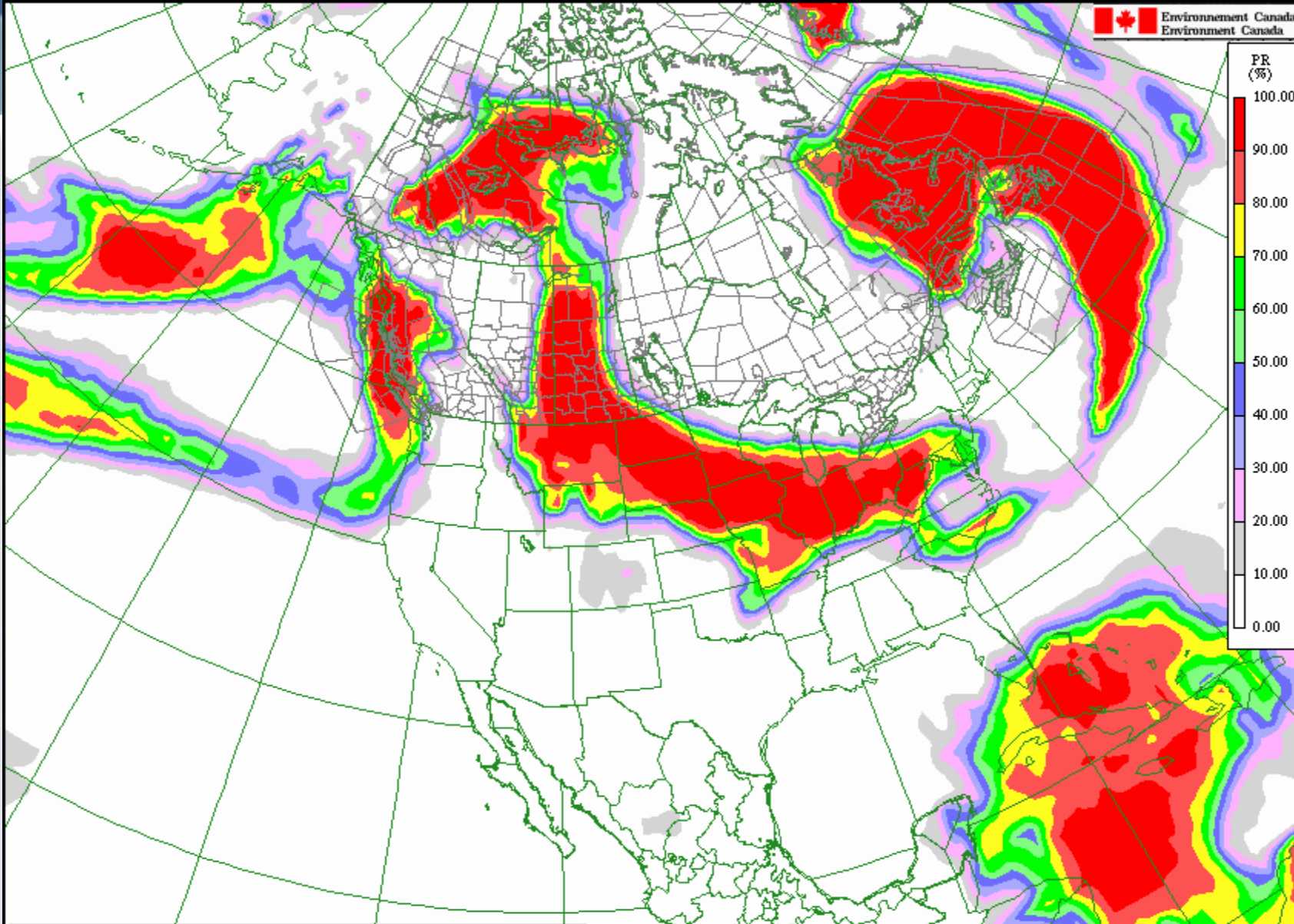
DAILY METEOROLOGICAL DISCUSSION

April 27, 2012

• Pronóstico de lluvia a 24 horas...

Lluvia Maxima acumulada mm.
De 27/ABRIL/2012 a 28/ABRIL/2012
Modelo WRF a 30 km

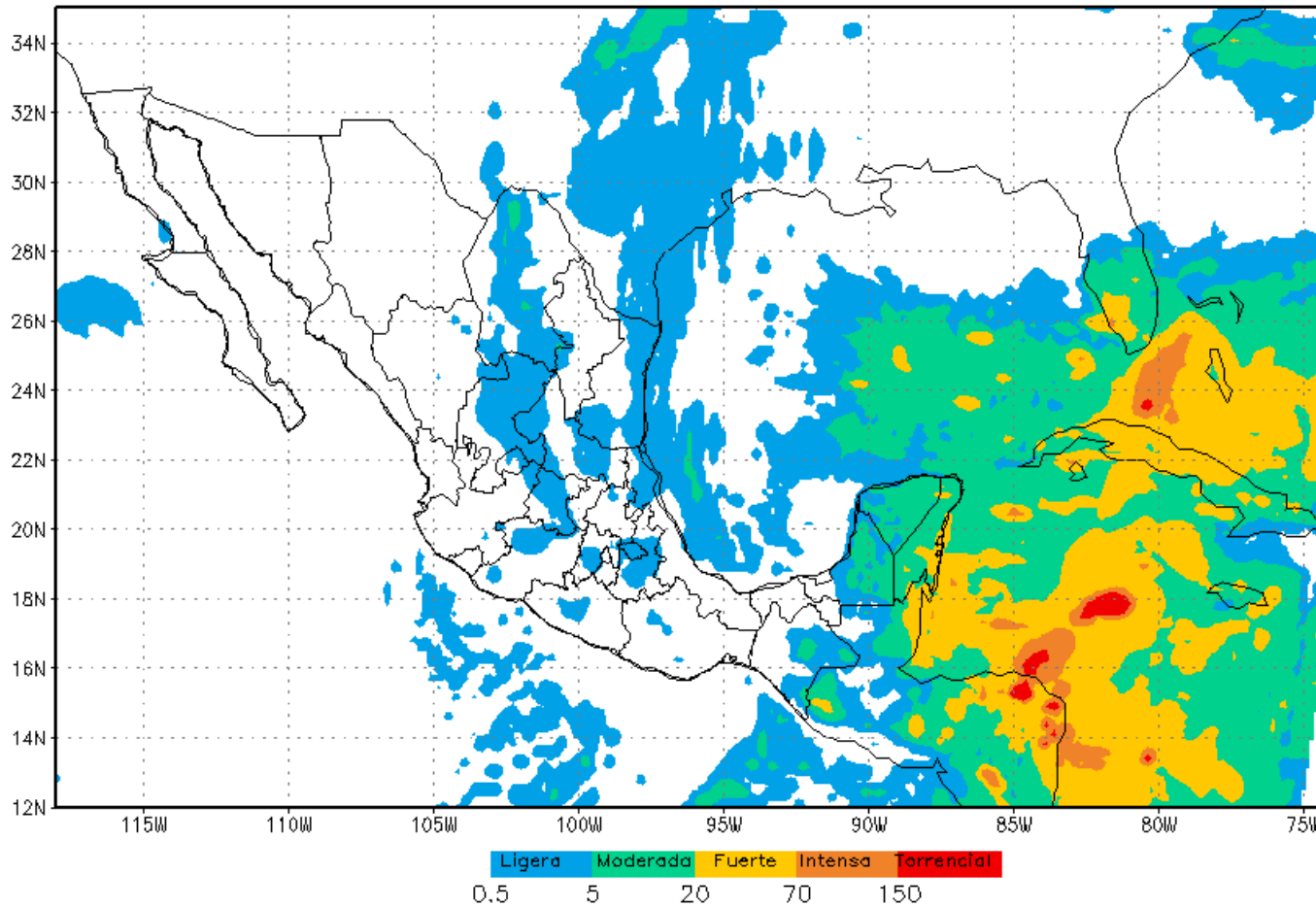


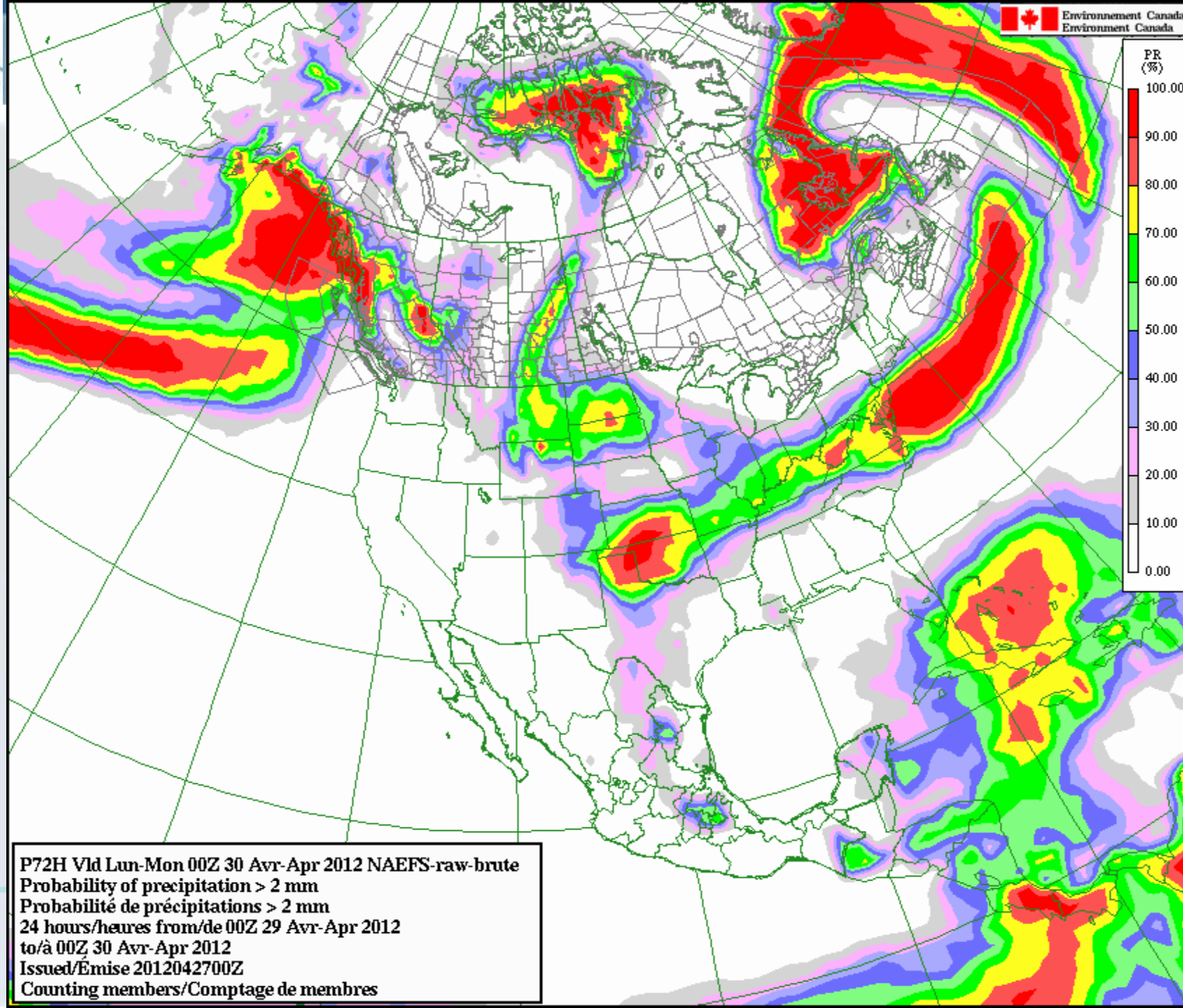


P48H Vld Dim-Sun 00Z 29 Avr-Apr 2012 NAEFS-raw-brute
Probability of precipitation > 2 mm
Probabilité de précipitations > 2 mm
24 hours/heures from/de 00Z 28 Avr-Apr 2012
to/à 00Z 29 Avr-Apr 2012
Issued/Émise 2012042700Z
Counting members/Comptage de membres

• Pronóstico para mañana ..

Lluvia Máxima acumulada mm.
De 28/ABRIL/2012 a 29/ABRIL/2012
Modelo WRF a 30 km

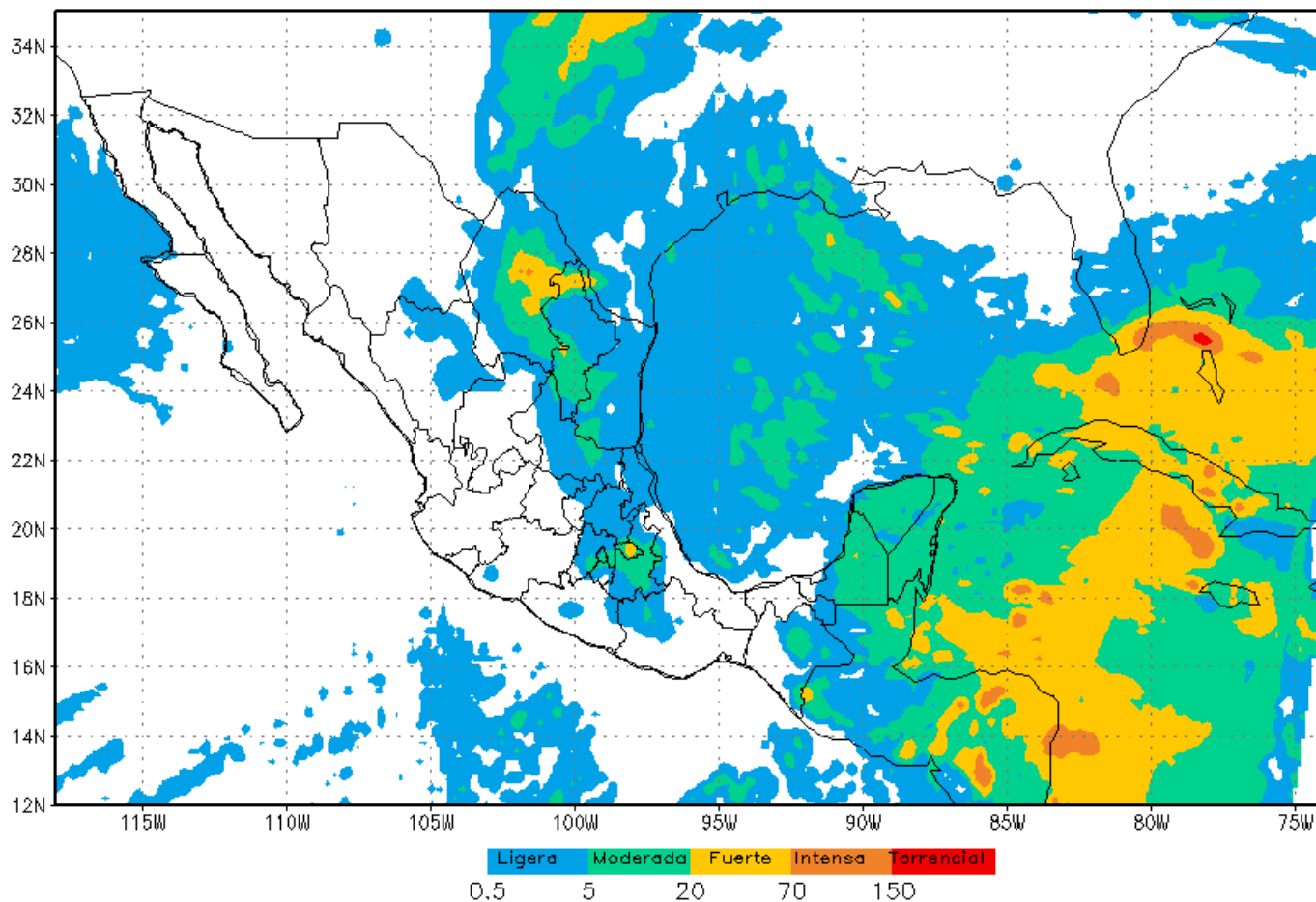


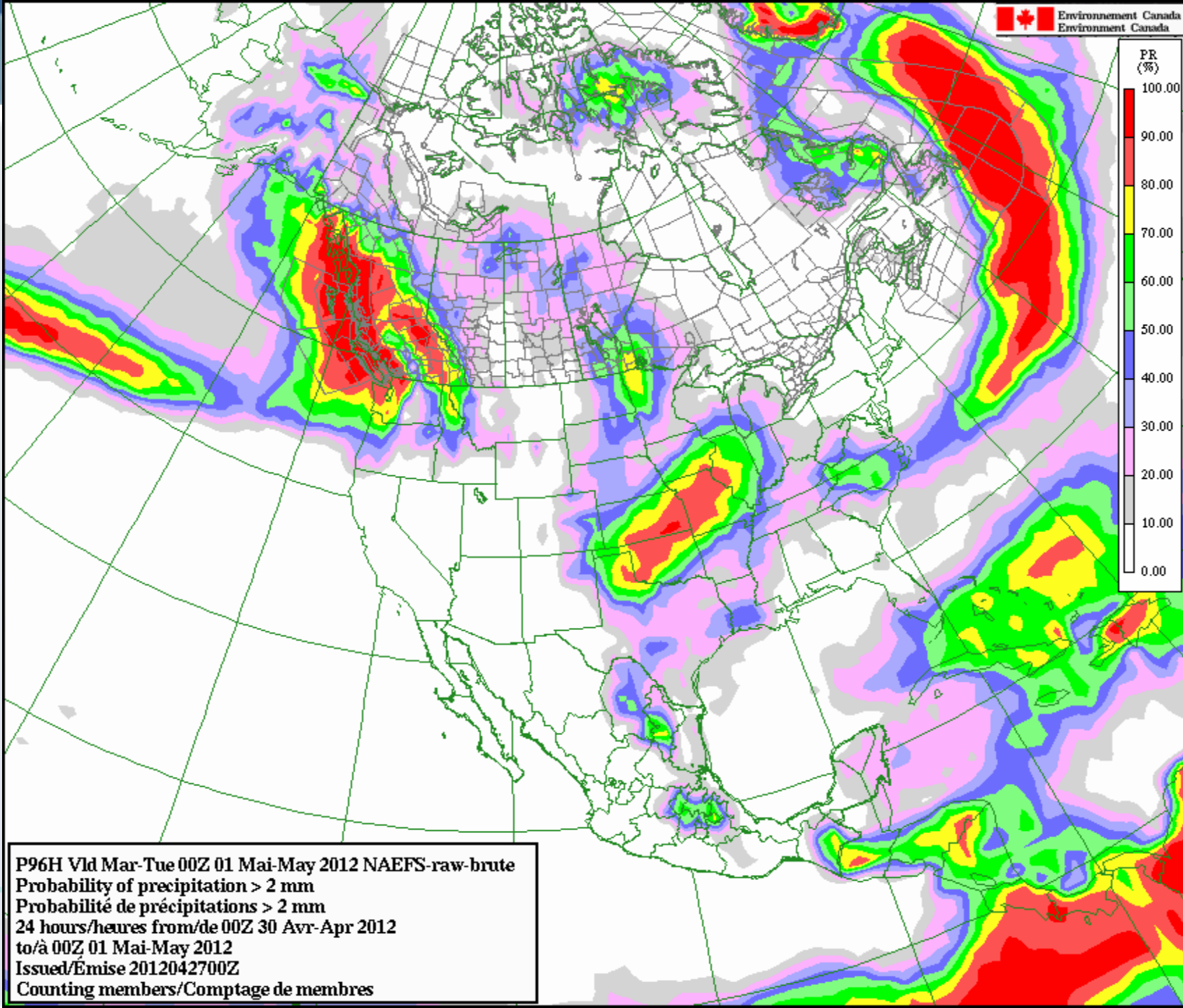


P72H Vld Lun-Mon 00Z 30 Avr-Apr 2012 NAEFS-raw-brute
Probability of precipitation > 2 mm
Probabilité de précipitations > 2 mm
24 hours/heures from/de 00Z 29 Avr-Apr 2012
to/à 00Z 30 Avr-Apr 2012
Issued/Émise 2012042700Z
Counting members/Comptage de membres

• Pronóstico para pasado mañana ..

Lluvia Maxima acumulada mm.
De 29/ABRIL/2012 a 30/ABRIL/2012
Modelo WRF a 30 km





P96H Vld Mar-Tue 00Z 01 Mai-May 2012 NAEFS-raw-brute
Probability of precipitation > 2 mm
Probabilité de précipitations > 2 mm
24 hours/heures from/de 00Z 30 Avr-Apr 2012
to/à 00Z 01 Mai-May 2012
Issued/Émise 2012042700Z
Counting members/Comptage de membres



D.F.

YUC.

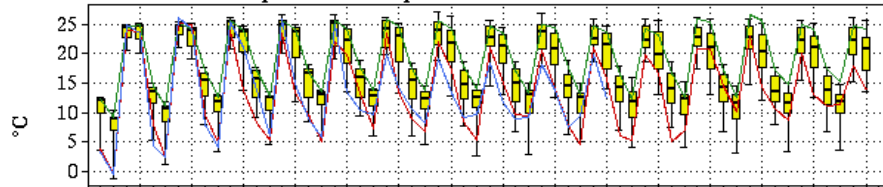
Environment Canada
Environnement Canada

NAEFS
SPENA

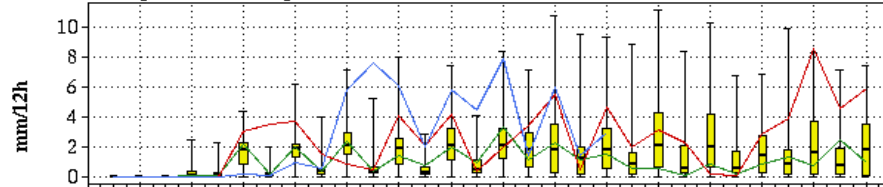


Ensemble and Deterministic Forecasts issued 27 April 2012 00 UTC
Prévision d'ensemble et déterministe émises le 27 Avril 2012 00 UTC
for/pour NAEFS / SPENA
CIUDAD DE MEXICO (MEX) 19.4 N 99.13 W/O

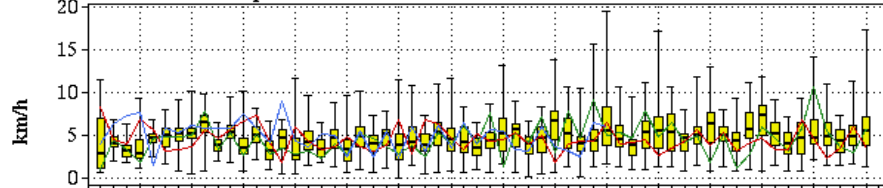
Surface Air Temperature/Température de l'air à la surface



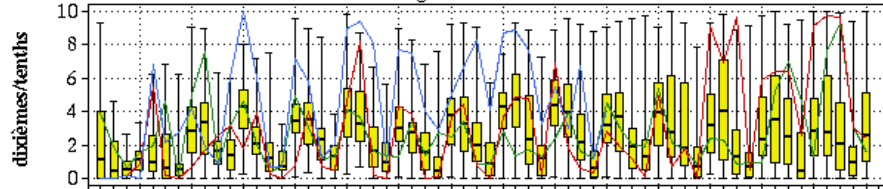
Precipitation/Précipitations



Surface Wind Speed/Vitesse du vent à la surface



Total Cloud Cover/Couvert nuageux total



27 28 29 30 01 02 03 04 05 06 07 08 09 10 11
April/Avril 2012 May/Mai 2012

max
75%
median/médiane
25%
min
— Global Model / Modèle global CMC
— Control Member / Membre contrôle CMC
— Control Member / Membre contrôle NCEP

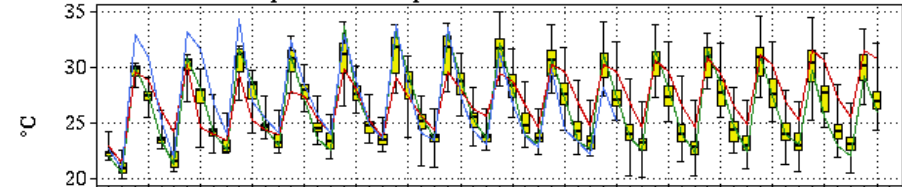
Environment Canada
Environnement Canada

NAEFS
SPENA

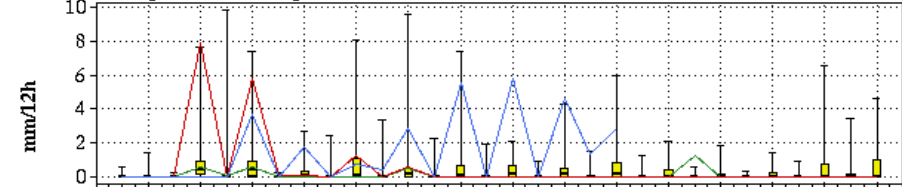


Ensemble and Deterministic Forecasts issued 27 April 2012 00 UTC
Prévision d'ensemble et déterministe émises le 27 Avril 2012 00 UTC
for/pour NAEFS / SPENA
MERIDA (MID) 20.98 N 89.62 W/O

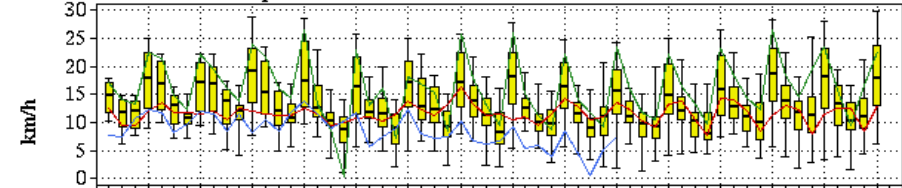
Surface Air Temperature/Température de l'air à la surface



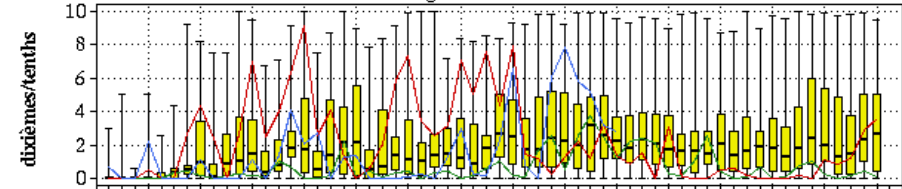
Precipitation/Précipitations



Surface Wind Speed/Vitesse du vent à la surface



Total Cloud Cover/Couvert nuageux total



27 28 29 30 01 02 03 04 05 06 07 08 09 10 11
April/Avril 2012 May/Mai 2012

max
75%
median/médiane
25%
min
— Global Model / Modèle global CMC
— Control Member / Membre contrôle CMC
— Control Member / Membre contrôle NCEP

Summary

- Mexico use of NAEFS data is very limited
- Design a plan to:
 - improve capacities on the use of NAEFS data applied to weather forecasting in Mexico
 - get involved in the validation process of NAEFS products for tropical regions
- Introductory capacitation on NAEFS (EPS) and its use on weather forecasting in Mexico (Martin Montero)
- Visits from USA & Canada experts to Mexico, and Mexico operational forecasters & developers to North America are necessary to support that.

In the mean time... Online Capacitation

ENSEMBLE PREDICTION SYSTEMS

A basic training manual targeted for operational meteorologists

"Unfortunately when you most need predictability, that's usually when the atmosphere is most unpredictable." - C. McElroy (NWS)

I. GOALS

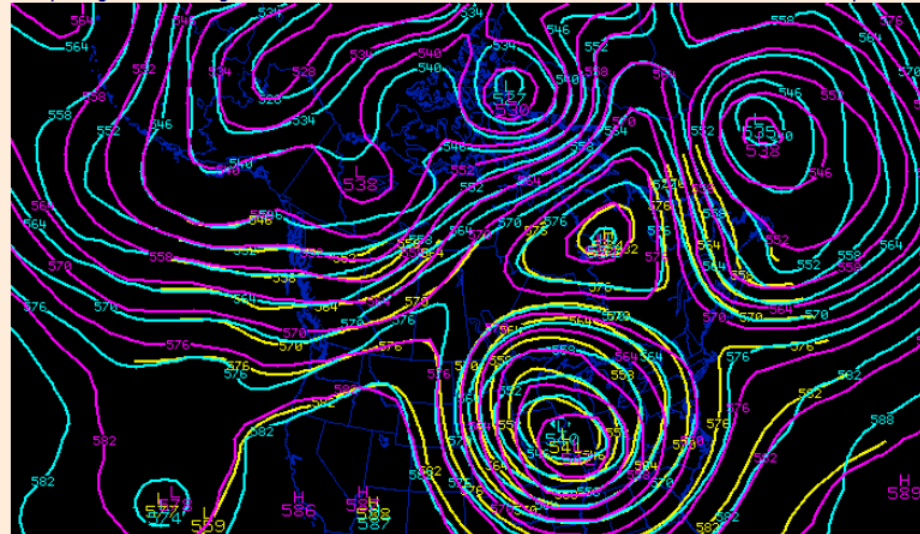
This training manual is intended to provide basic training on Ensemble Prediction Systems (EPS) for operational forecasters.

This manual attempts to provide sufficient background on EPS to facilitate practical inclusion of ensemble output in the forecast process by addressing EPS terminology, visualization, interpretation techniques and EPS strengths/limitations.

II. INTRODUCTION

What is an Ensemble Forecast ?

An ensemble forecast is simply a collection of two or more forecasts verifying at the same time. You are probably already an ensemble veteran - comparing 500 mb heights or PMSL forecasts from different models is a form of ensemble prediction.



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NACSP (NAEFS)

Title	North American Ensemble Forecast System		
Geographic Scope	North-America (with possible extension to Central America under WMO GFCS –Region IV)	Lead Agency	Co-leads: Meteorological Service of Canada: André Méthot NOAA/National Weather Service-/NCEP of USA: Yuejian Zhu Servicio Meteorológico Nacional (SMN) de México: Martin Montero and Rene Lobato
Current Partners	Environment Canada (MSC/WEPS, S&T-MRD), NOAA(US-NWS:EMC/CPC/; AFWA, USNavy-FNMOC) , SMN		
Current Activities	<p>Since 2006, both NCEP (USA) and the CMC (Canada) have been exchanging their [00, 06, 12, 18]Z analyses along with their [00,12]Z global ensemble 20 member forecast data in real-time within operational framework. Both centers are exchanging raw output data as well as bias corrected data. The method for bias correction is shared and was developed jointly. This leads to a large number of coherent operational shared products for North-America up to the 16 day forecast lead time. The inclusion of 20 more members from US-Navy FNMOC is now under assessment.</p>		
Proposed Activities and Collaboration	<p>Future and ongoing collaborations and activities are:</p> <ul style="list-style-type: none"> • Forecast systems inter-comparisons aiming at the improvement each centre's prediction system and the overall resulting combined prediction system • Development of common : statistical combination methods, calibration procedure, and products for seamless North American products (especially along the boundaries) • Diagnostics and verification methods targeted at monitoring performance of individuals and combined systems • Development and assessment specialized products useful for decision makers (e.g. probabilistic forecasts) • Addition of Regional Ensemble Prediction Systems (limited area models covering North America) into the exchange for short and medium time range • Extension of the current 16 day lead-time to one month • Collaboration into the generation of hind cast allowing calibration and leading to further improved products • Explore connection with NACSP (North American Climate Service Partnership) project for drought prediction and related activities • Explore connection with NEXGEN, 4D-cube for consistent North-American wide aviation-weather related products • Visit to NCEP or EC-MSC by Mexican meteorologists/climatologists to learn how to take full advantage of NAEFS products for forecasting issues. • Perform verification of NAEFS data in tropical regions (southern Mexico) and provide feedback to NWS and MSC. 		
Key Objectives and Deliverables	<p>The goal is to improve Operational intra seasonal predictions for North America by combining different Ensemble Prediction Systems into a super Ensemble. This is possible thanks to increased collaboration. Research and development work is shared by the participating centers. This collaboration will lead to acceleration in the schedule, and enhancement in the quality of ensemble related operational implementations at both centers. This partnership is an efficient</p>	Performance Metrics	<p>Combined Ensemble prediction systems show a clear overall predictability improvement over individual system. Verification methods are used to assess the improvement at each update in both Global Ensemble producer centres. The added value of the combined ensemble over each ensemble taken separately is also assessed at each updates. Feedbacks from North American</p>

Gracias!