Environment Canada Environnement Canada

Canada

Towards a Coordinated North American Daily Precipitation Analysis

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American Meteorological Society; Atlanta, Georgia, U.S.; 2-6 February 2014

Introduction

- Accurate and timely information on past precipitation is crucial for hydrological forecasting, drought monitoring and forest fire prevention

- North American Climate Services Partnership (NACSP) initiative

- Parties involved:
  - US Climate Prediction Centre (CPC),
  - the Canadian Meteorological Centre (CMC) and
  - the Mexican National Water Commission (CONAGUA)

- working towards the development of a coordinated daily precipitation analysis for North America

Introduction

- The first phase: identify national networks which could participate in a coordinated daily precipitation analysis, in addition to obsevations already shared over The Global Telecommunication System (GTS)

- The second phase: evaluate skill and bias of existing analysis systems using the agreed same input and verification datasets, in order to identify their strengths and weaknesses

- The third phase: coordination of methodology for combining two systems and came up with unified precipitation analysis for North America

- The fourth phase: Share results with other NACSP projects and made available to general public

Coordinated Daily Precipitation Analysis

6.1 Coordination of observations	6.1.1	Identify and share Canadian observations which should participate in the analysis	6.1.1 2013
	6.1.2	Identify and share US observations which should participate in the analysis	6.1.2 2013
	6.1.3	Identify and share Mexican observations which should participate in the analysis	6.1.3 2013
6.2 Coordination of skill assessment	6.2.1	Identify a subset of stations to be used for model verification and two test periods (one in summer, one in winter or whole year)	6.2.1 2013
	6.2.2	Agree on a set of metrics for the evaluation of gridded precipitation analyses	6.2.2 2014
	6.2.3	Evaluate the Canadian precipitation analysis (CaPA) using the agreed upon metrics for the test periods	6.2.3 2014
	6.2.4	Evaluate the NCEP CPC precipitation analysis using the agreed upon metrics for the test periods	6.2.4 2015
6.3 Coordination of methodology	6.3.1	Compare various techniques for obtaining a seamless analysis for North America	6.3.1 2014-2015
	6.3.2	Compare various techniques for combining Canada and US global analyses outside of North America	6.3.2 2015-2016
	6.3.3	Develop and implement a methodology for obtaining a unified precipitation analysis on a North American domain	6.3.3 2015-2016
6.4 Coordination of services	6.4.1	Assess if and how a unified precipitation analysis product could contribute to the success of other NACSP projects	6.4.1 2013
	6.4.2	Identify requirements from other NACSP projects for a unified precipitation analysis, in terms of skill, bias, horizontal and temporal resolution, record length and timeliness	6.4.2 2014
	6.4.3	Ensure that the unified precipitation analysis is available to other NACSP projects in a timely manner	6.4.3 2015-2016
	6.4.4	Ensure that the unified precipitation analysis is available to the general public	6.4.4 2016

Main presentation objectives

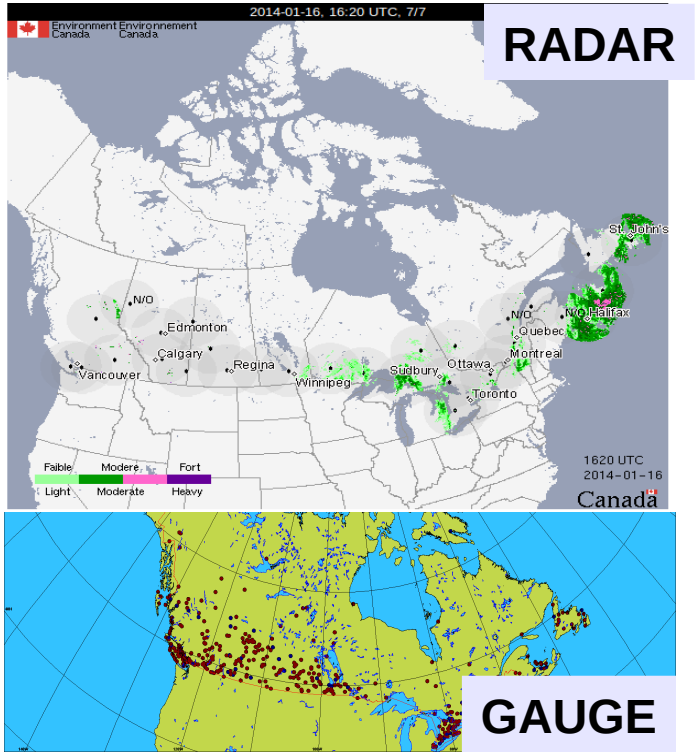
- Present CaPA system as it is used in CMC and preliminary results for NA region for summer months

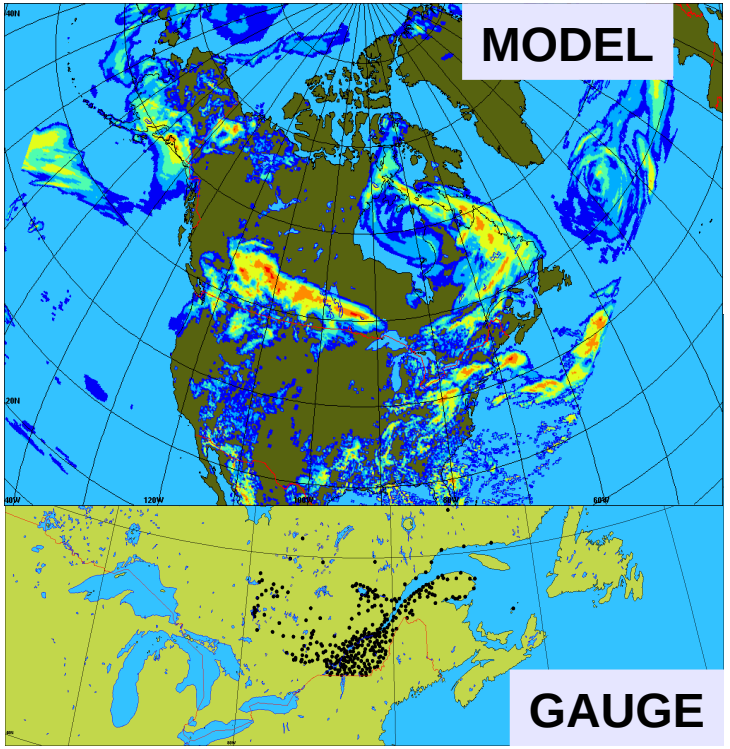
- CaPA system is principally used for:
  - Operational purposes: to improve precipitation analysis in near-real-time application using maximum of observation available in near real-time trough GTS systems

- But CaPA can also be used in:
  - Climate-historic perspective: Improve precipitation analysis of the past for North-American region using maximum of observation available with some time flag

Canadian Precipitation Analysis (CaPA)

- CaPA system combines near real time different sources of information on precipitation with a short term forecast provided by Regional Deterministic Prediction System (RDPS) at 10 km resolution in order to provide a gridded analysis for Canada or wider North America domain

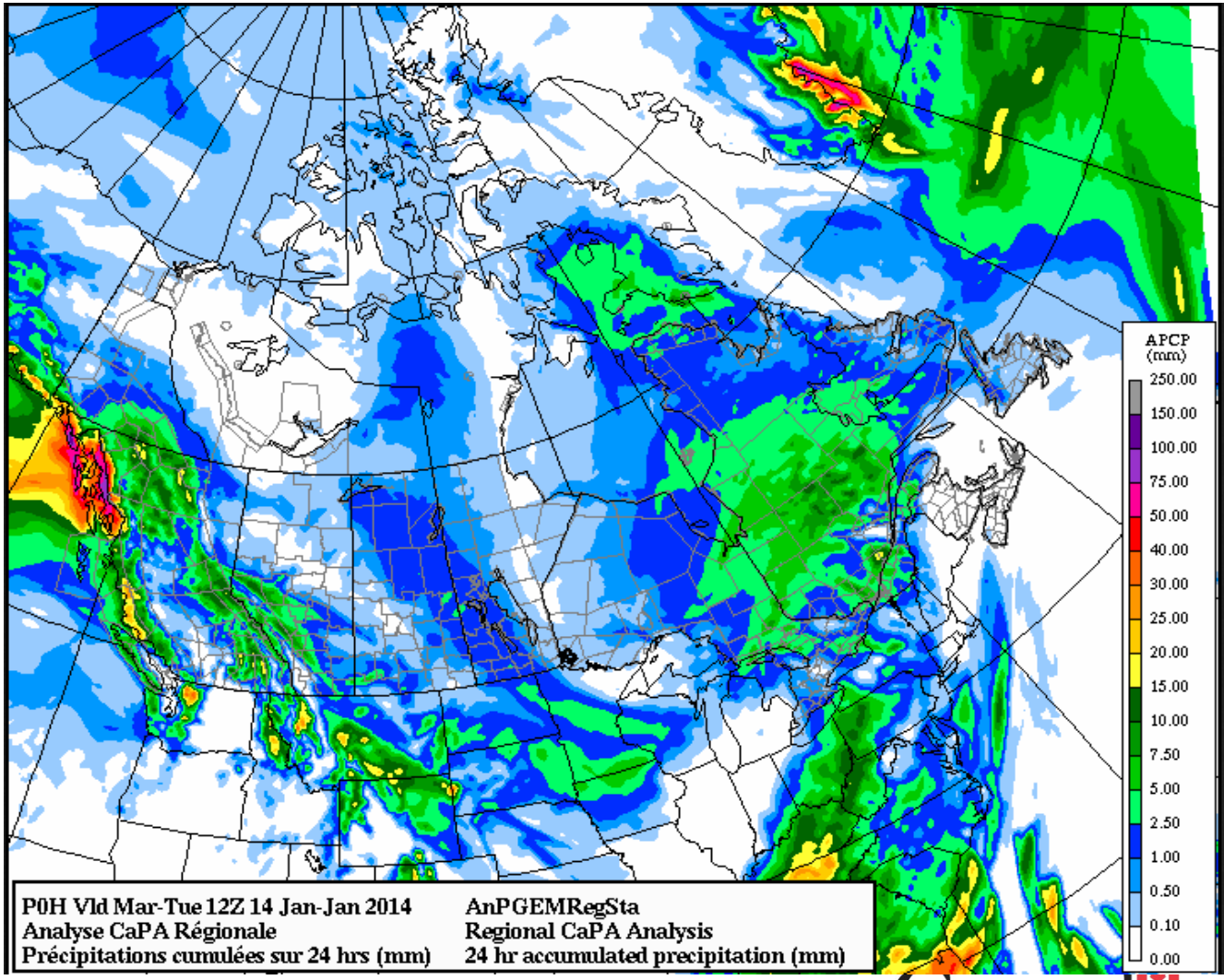




Operational CaPA

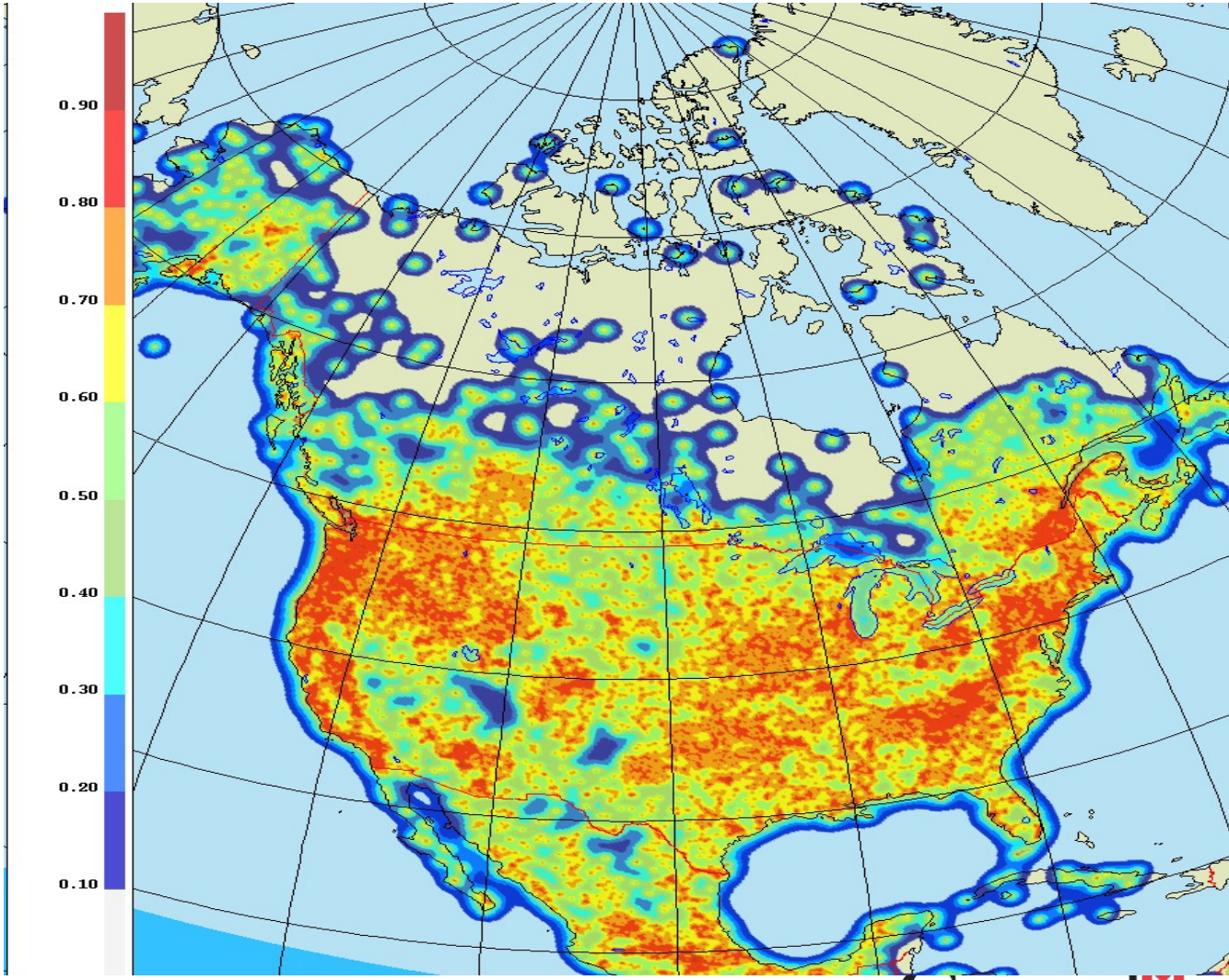
http://weather.gc.ca/analysis

- 6h accumulations valid at synoptic times (00, 06, 12, 18Z) available ~T+1h
- 24 h accumulations valid at 12Z available at ~T+7h

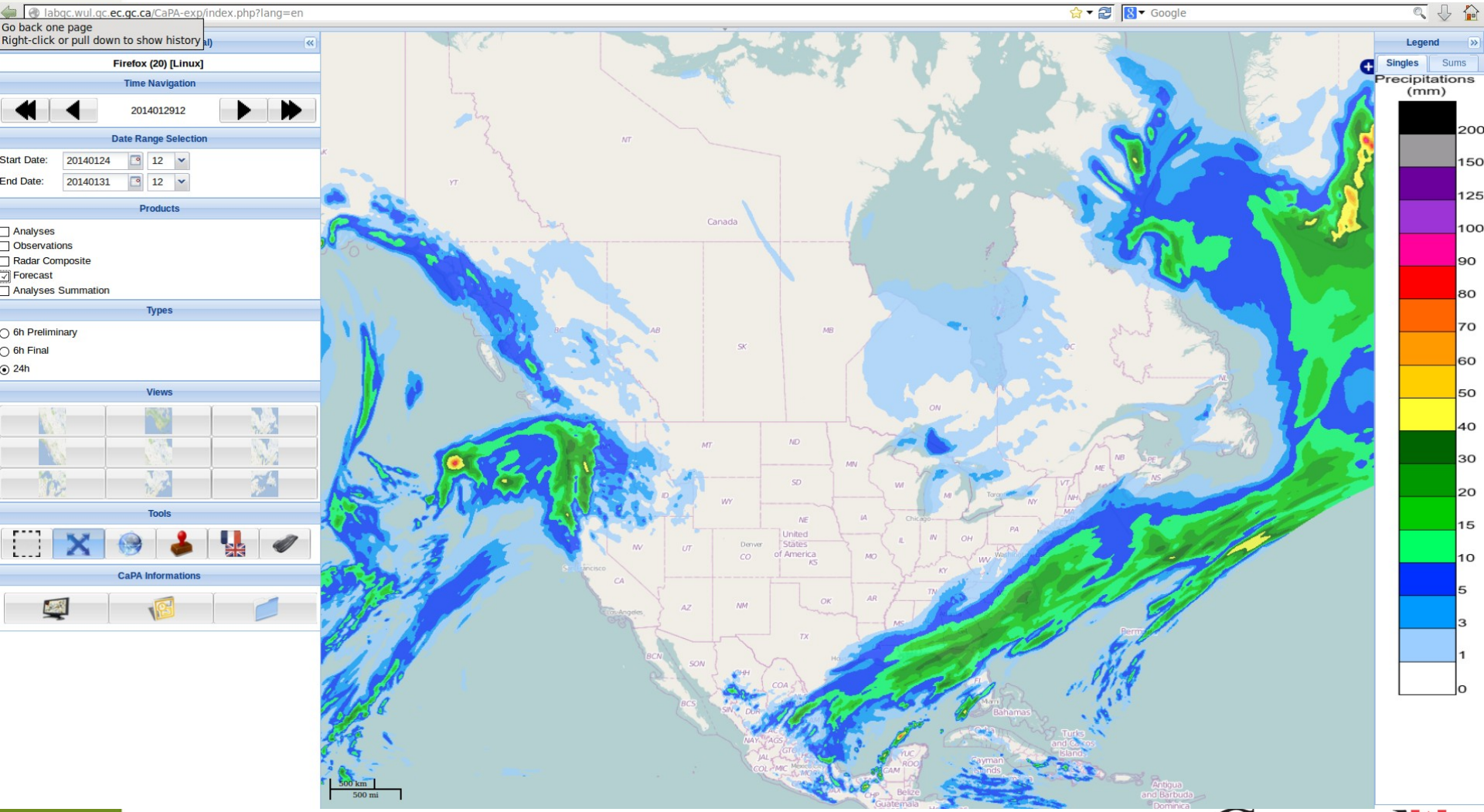


Operational CAPA

- Confidence Index CFIA for summer
- Much more observation in US than in Northern Canada
- Shef observation available for 24 h CaPA analysis



Canadian Precipitation Analysis (CaPA) -web interface



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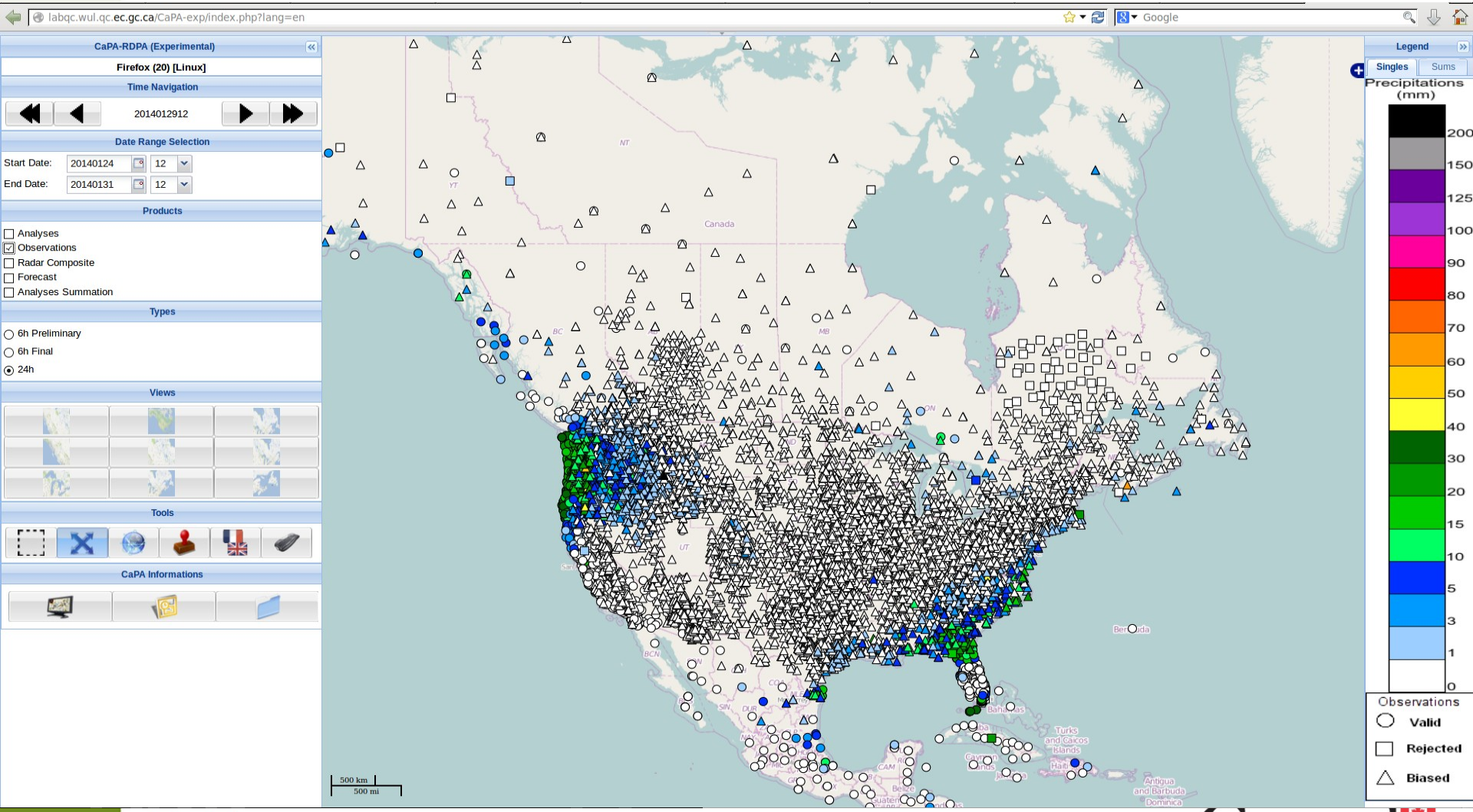

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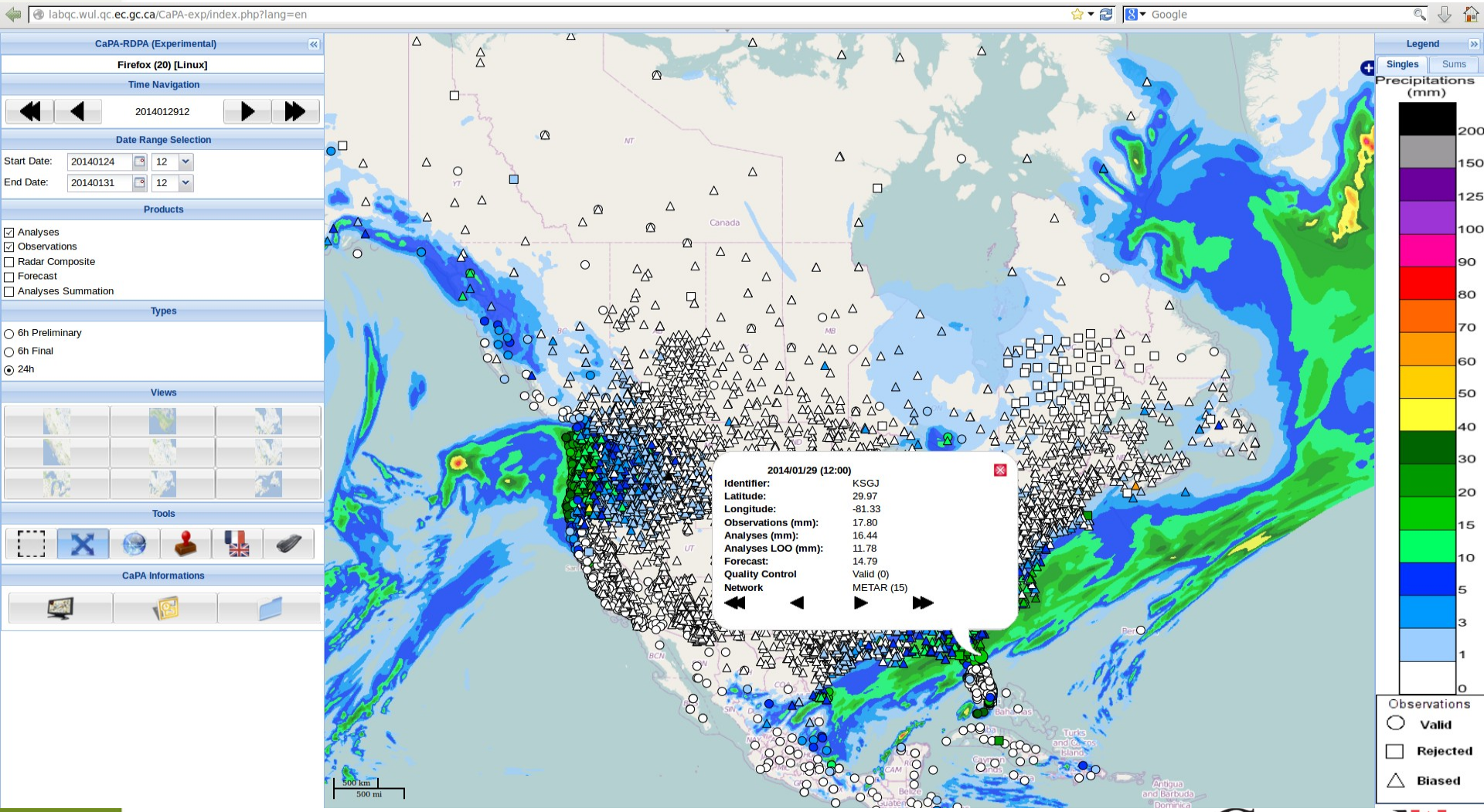
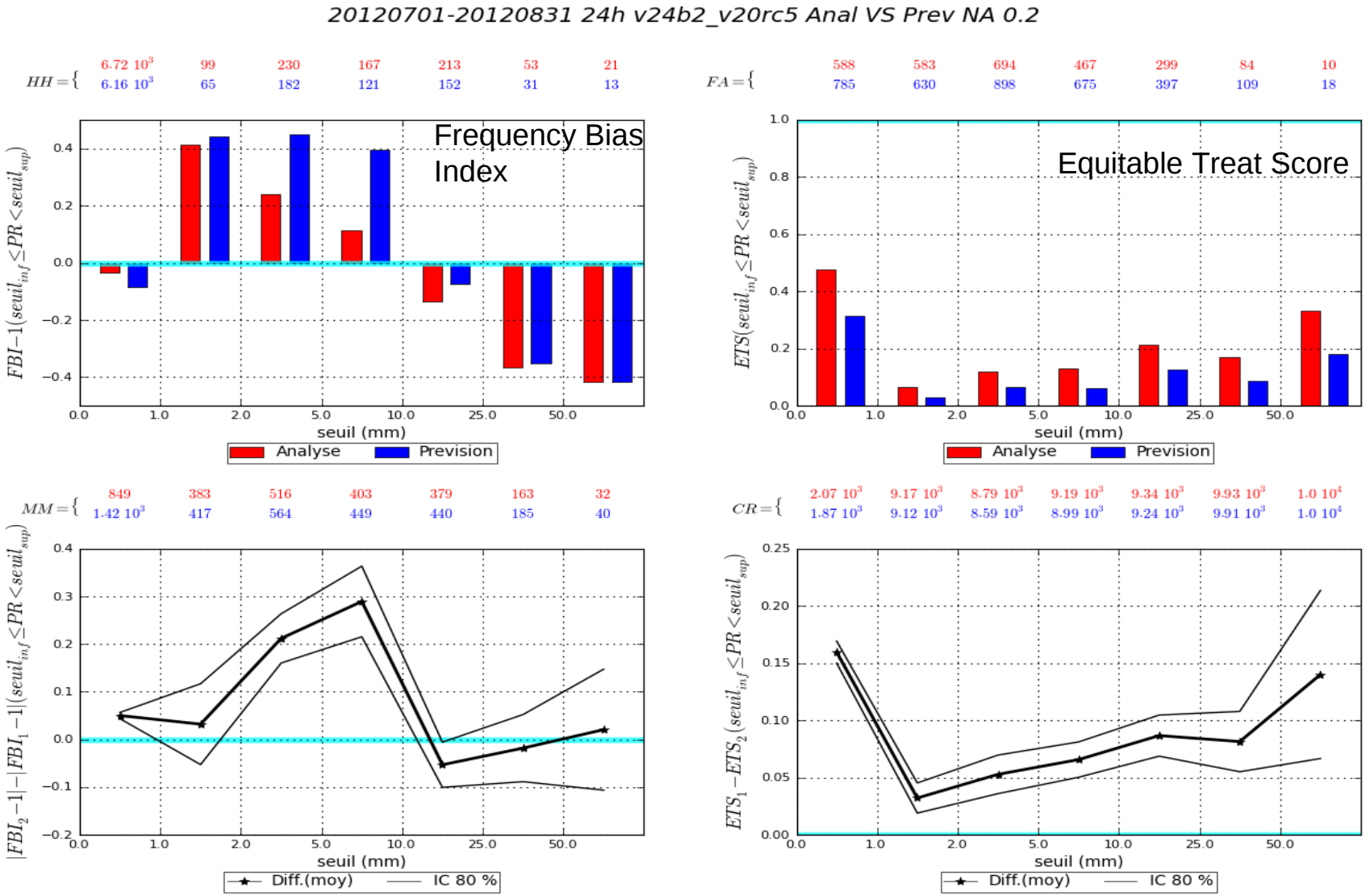


Preliminary results with CaPA

- 2 months period: July and August 2012
- Quick preliminary test with recent data when usually the maximum of observation is available and no biased observations of precipitation in winter
- an average of 12 000 stations are assimilated by CaPA, each day
- about 170 stations evenly distributed across North America are used for verification purposes (not used to run CaPA)
- Stations in 5 km radius around verification stations not used in CaPA
- Frequency Bias Index (FBI) and equitable Threat Score (ETS) are calculated
- Test without background field is also completed
- Improvement due to background field are quantified

Stations selected for verification

Preliminary results - evaluation



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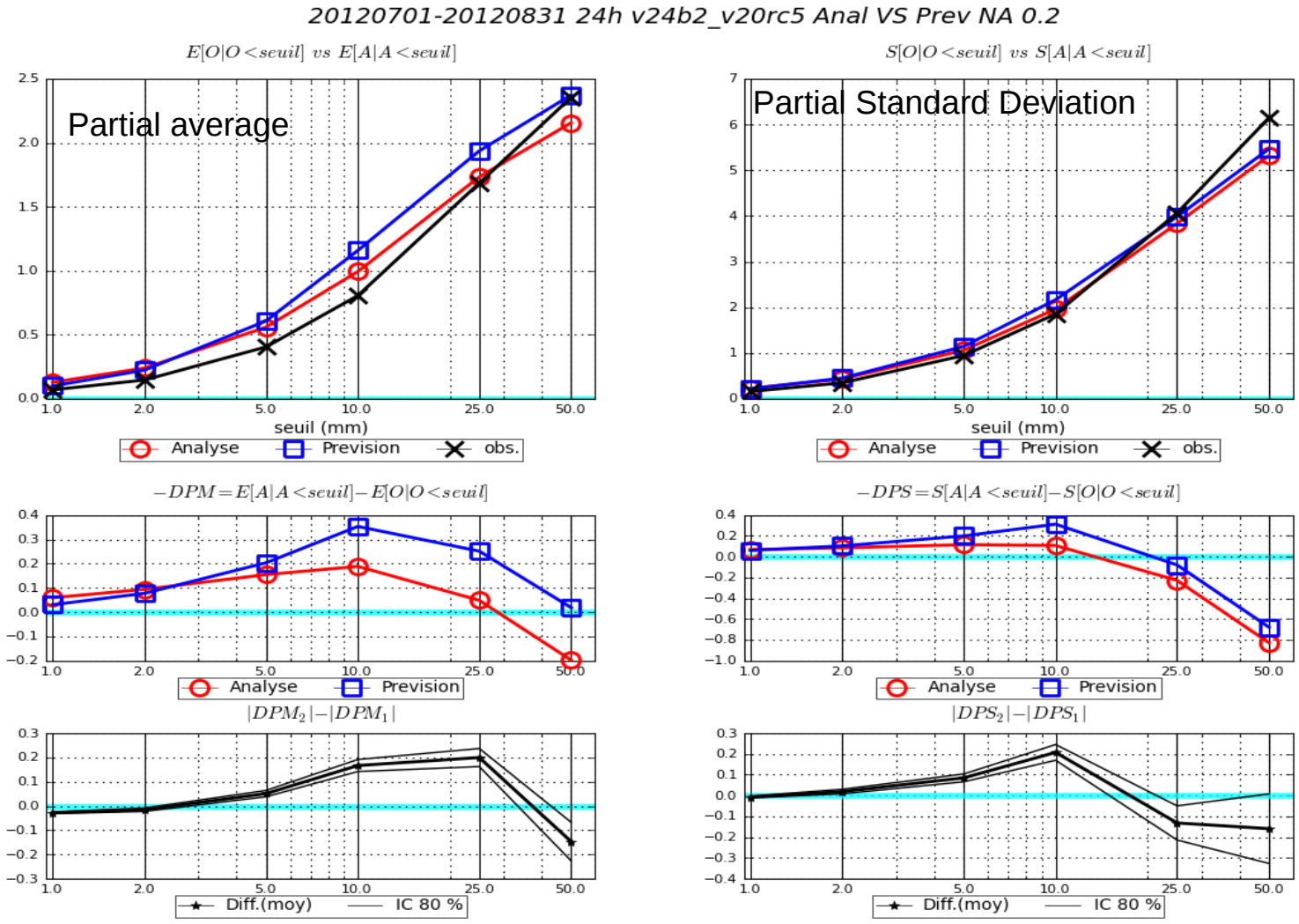
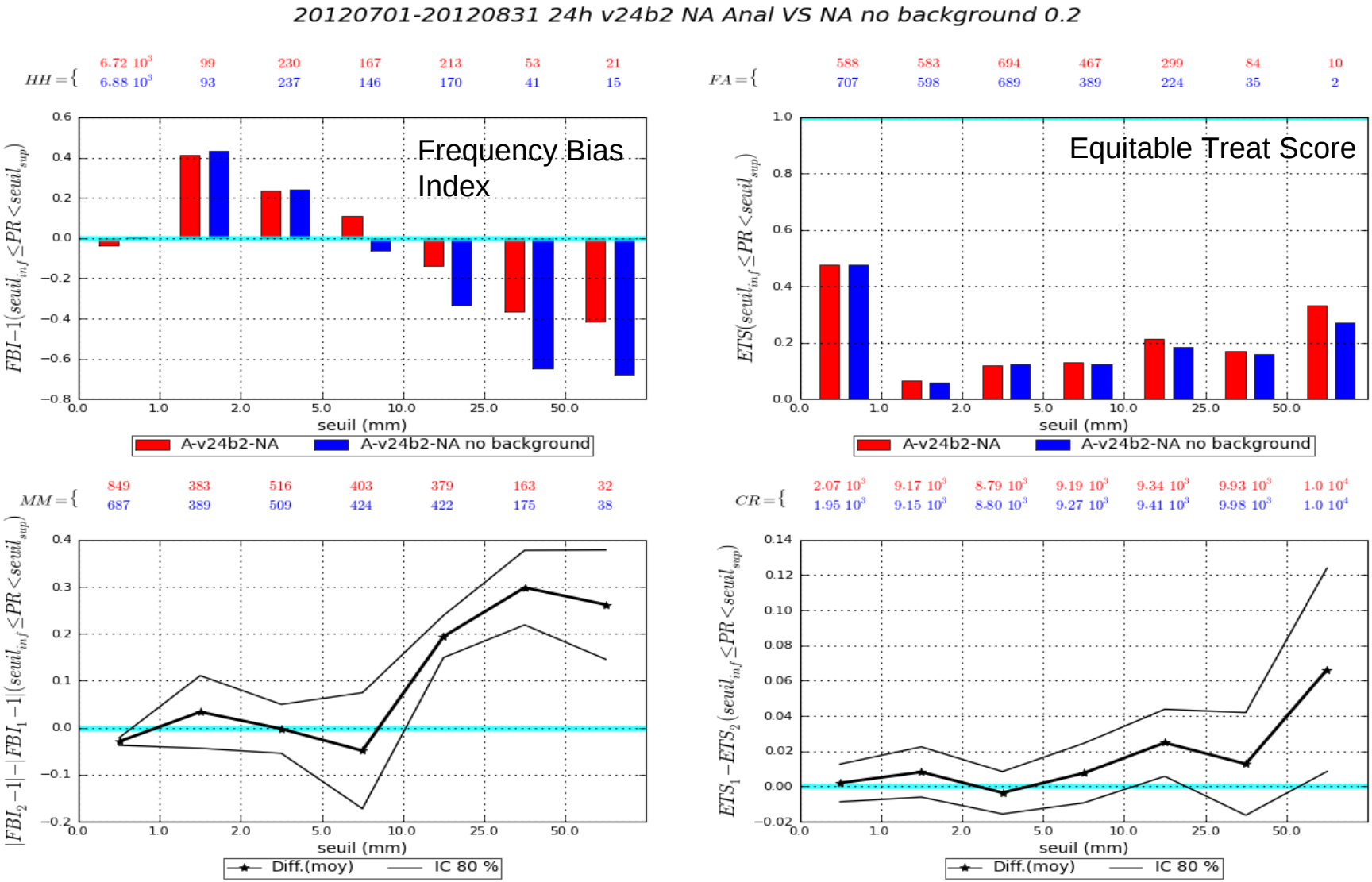


Preliminary results – influence of background field



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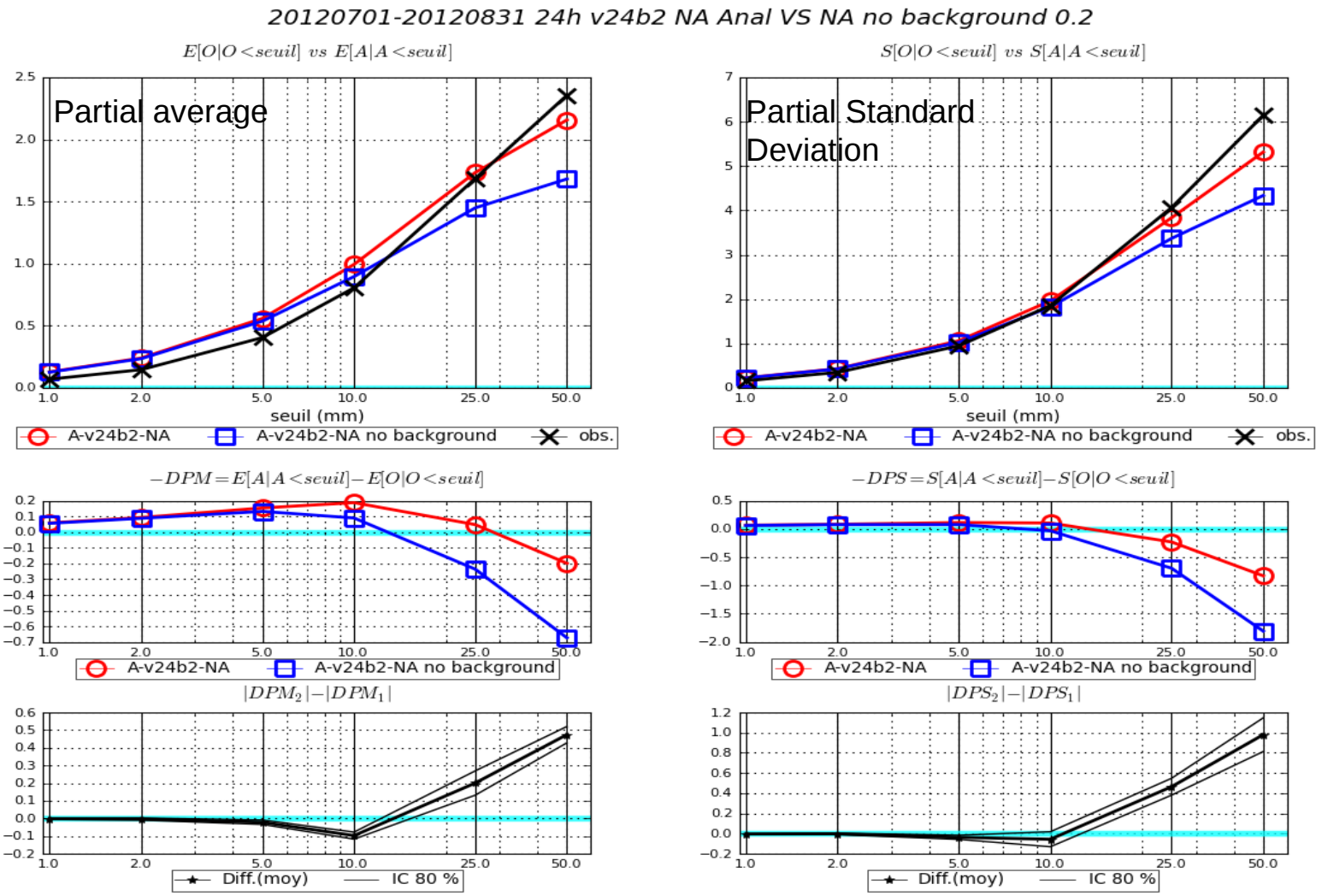

Future plans

- CMC and CPC will run their analysis on 2005 shared between parties including Mexican data in 2014
- Exchange information and share documentation on the NCEP CPC analysis and MSC CAPA analysis systems will continue
- Evaluate both systems on exactly the same input data on North American domain
- Final goal will be to produce 10 -30 year precipitation re-analysis for North America
- Ensure that the unified precipitation analysis is available to other NASCP* projects and to the general public

*North American Climate Services Partnership

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Thank you!

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Statistical concepts

Categorical scores

Contingency table for a set *B* defined by a threshold or by a bin:

		Observed	
		yes: $O_i \in B$	no: $O_i \notin B$
Forecasted	yes: $A_i \in B$	Hits $H = ¿\{(O_i \in B) \wedge (A_i \in B)\}$ $h = H / N$	False alarms $F = ¿\{(O_i \notin B) \wedge (A_i \in B)\}$ $f = F / N$
	no: $A_i \notin B$	Misses $M = ¿\{(O_i \in B) \wedge (A_i \notin B)\}$ $m = M / N$	Correct rejections $C = ¿\{(O_i \notin B) \wedge (A_i \notin B)\}$ $c = C / N$

Frequency bias index (*FBI*):

$$FBI = \frac{h + f}{h + m}$$

Equitable threat score (*ETS*):

$$ETS = \frac{h - h_R}{h + f + m - h_R}$$ where $h_R = (h + f)(h + m)$ is the frequency of hits expected by chance