Information and Research Institute of Meteorology, Hydrology and Environment, NAMEM, MONGOLIA

Current status and future perspective of climate prediction over Mongolia

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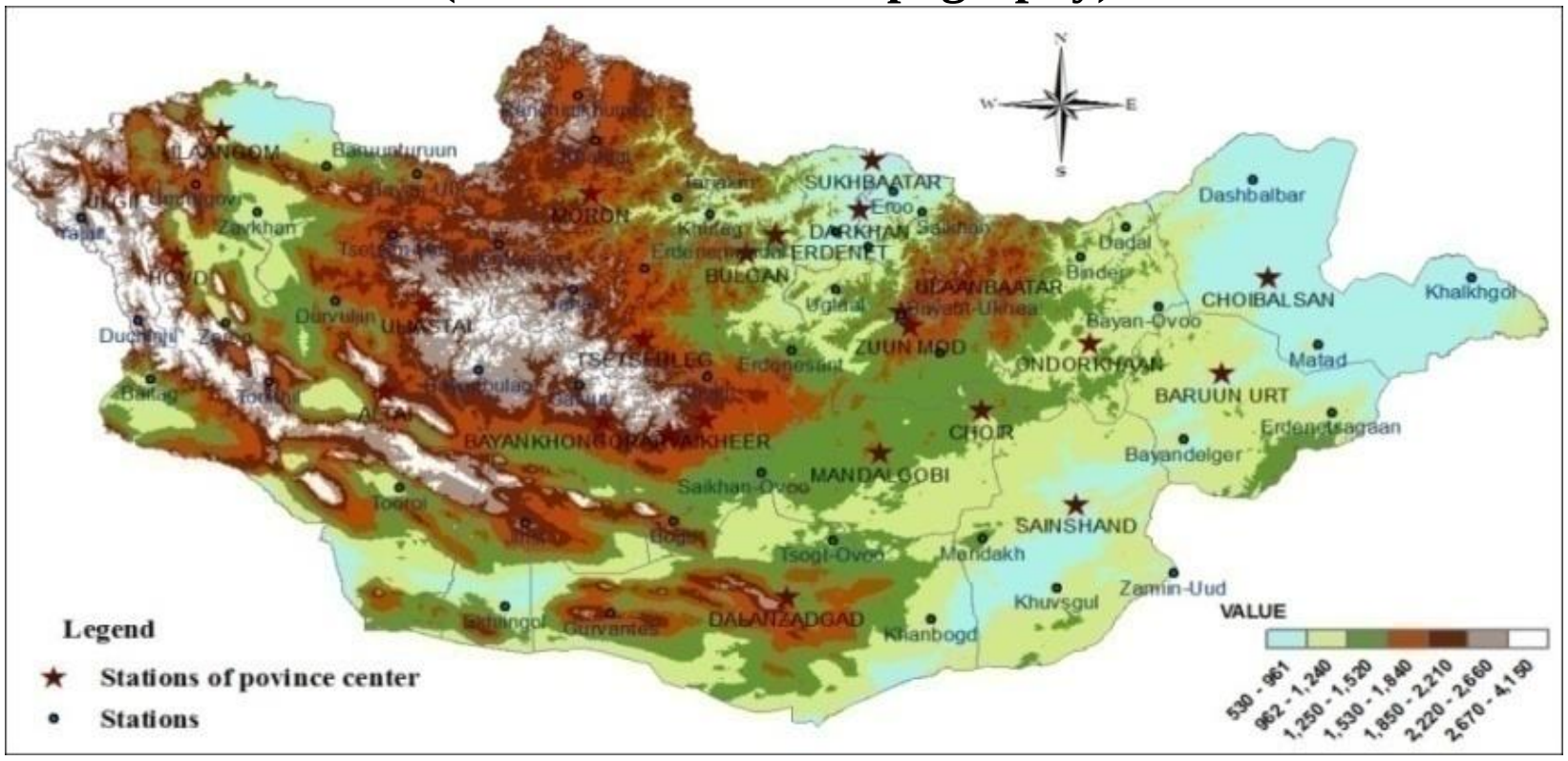
A.Davaadorj, CH.Sarantuya,P.Gomboluudev and L.Oyunjargal
Weather and Environmental, Numerical Modeling Research Division, IRIMHE,NAMEM

Outline

- Current status of Climate prediction
  - Plan for Types
  - Methods
    - Statistic methods
    - Dynamic methods
  - S2S project validation
- Further plan

Plan for type & content

Stations used in monthly and seasonal forecast (filled colors show topography)



Definition of the categories used in monthly and seasonal forecast, 1981-2010

Category	Temperature /ºC/, T	Precipitation /%/, P
Above norm	T>+1	P>80
Near norm	-1<T<+1	50<P<80
Below norm	T<-1	P<50

Plan for type & content

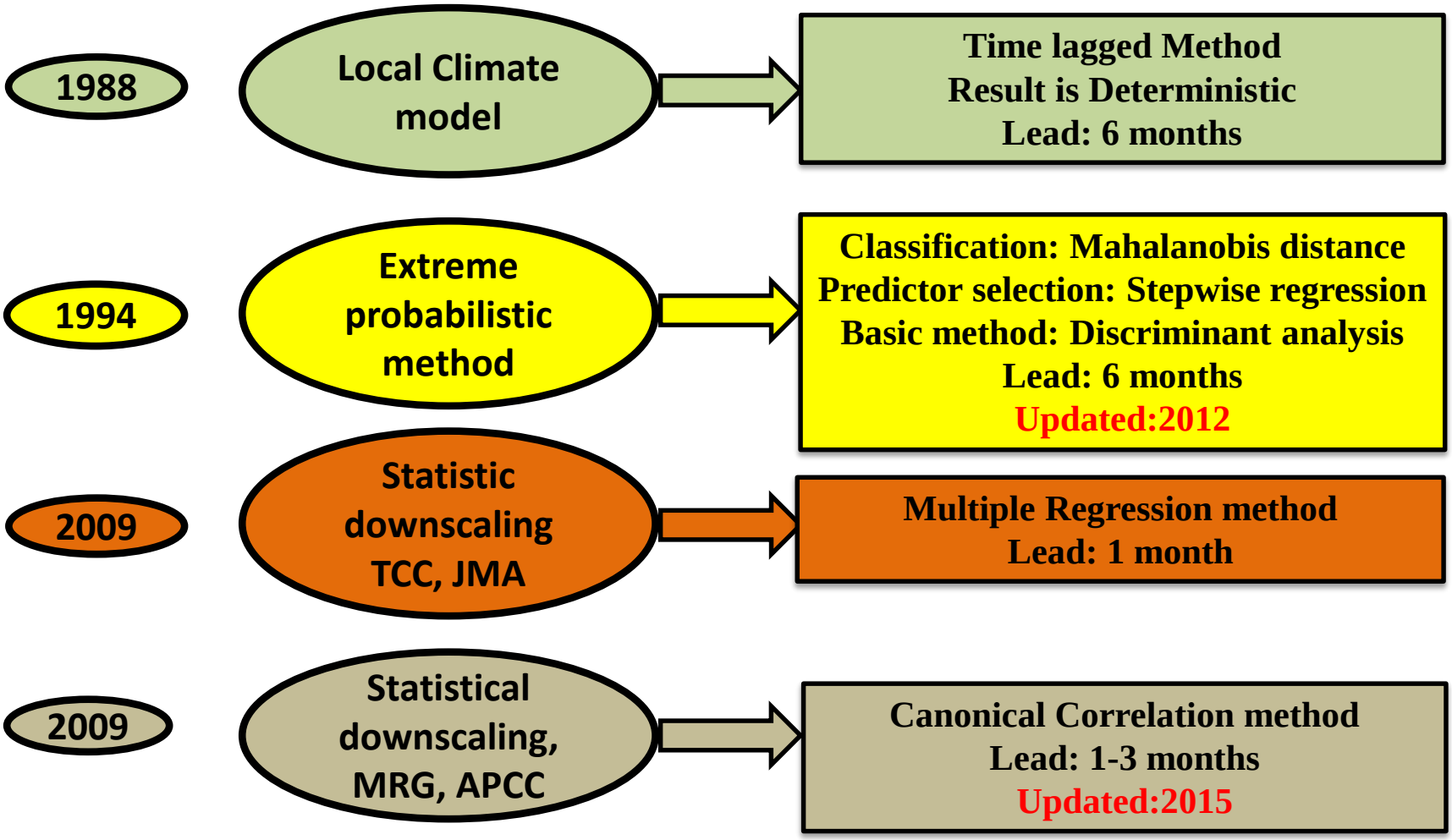
Monthly forecast
20-23th every month
In addition 3 months outlook

Seasonal outlook

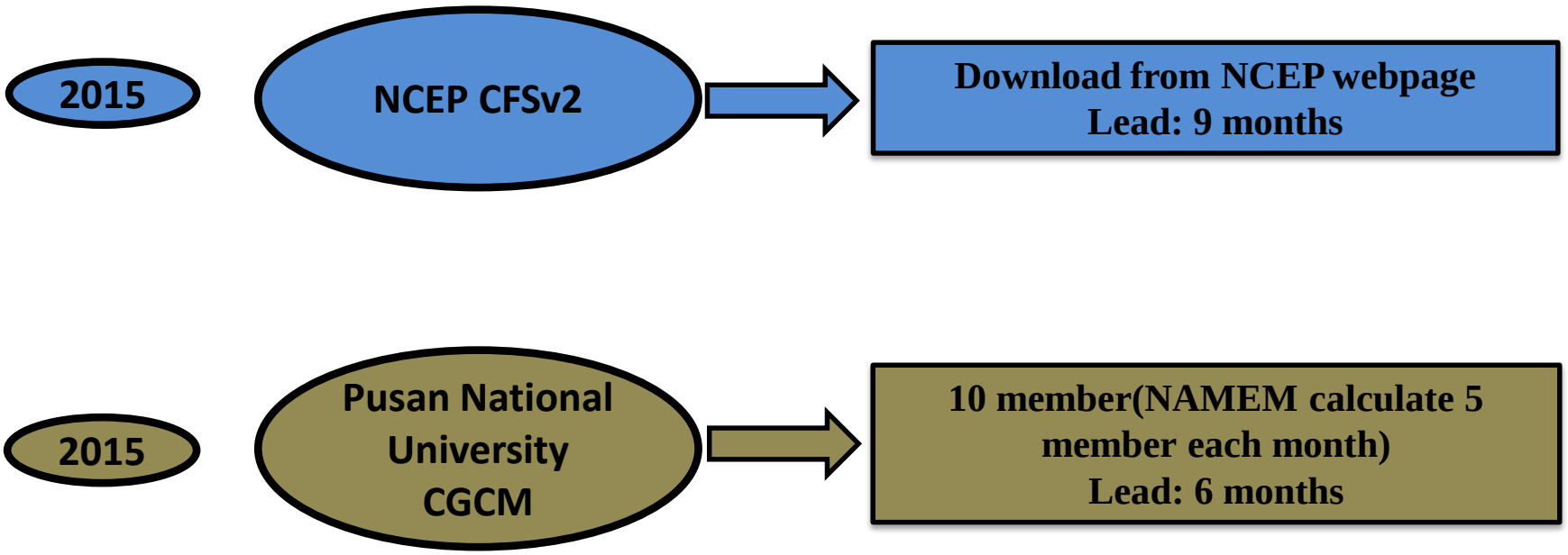
2 times a year /Summer outlook in end of March
Winter outlook in end of August /

Methods

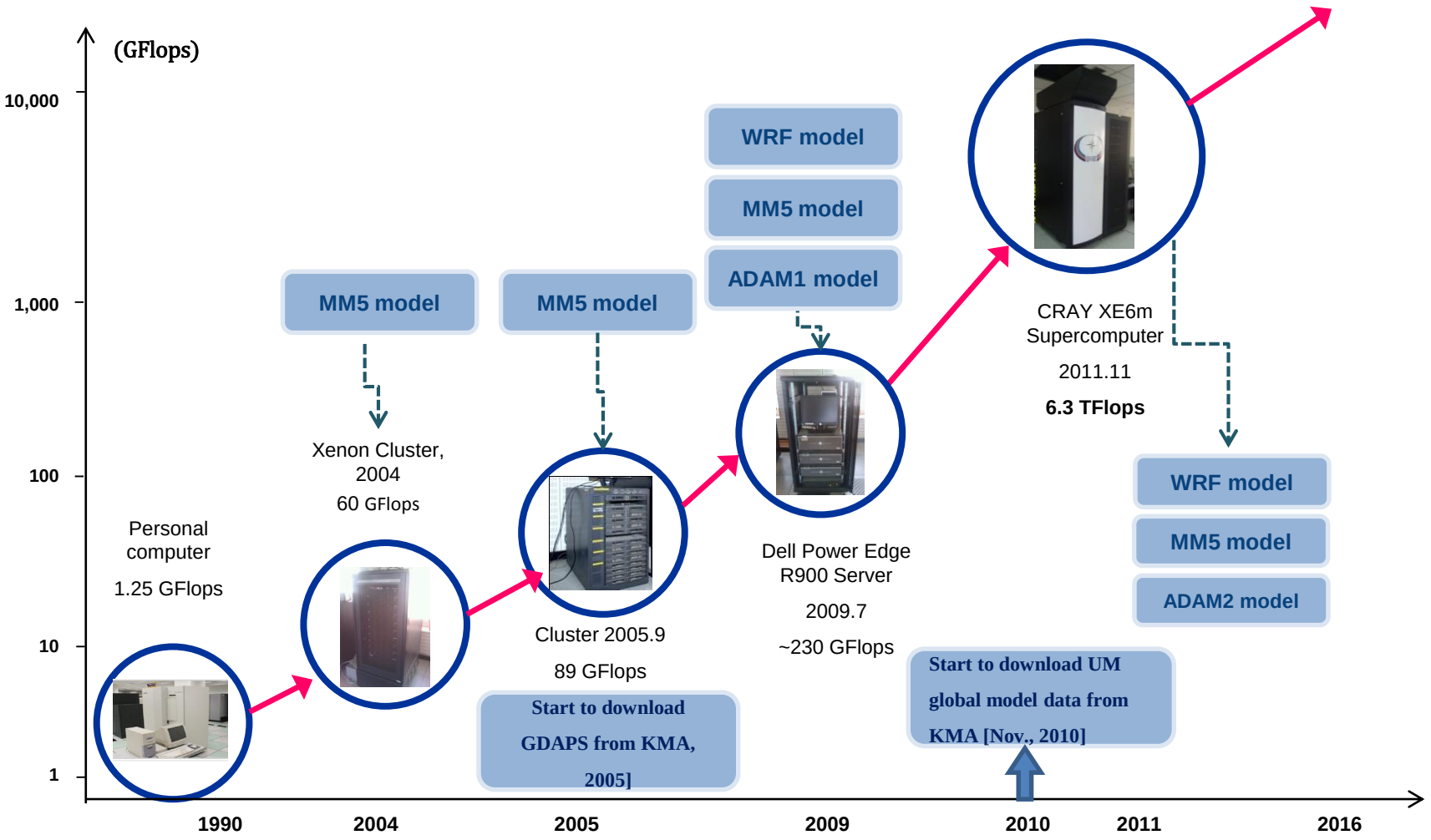
Statistic methods



Dynamic methods



Development of the technology of NWPs



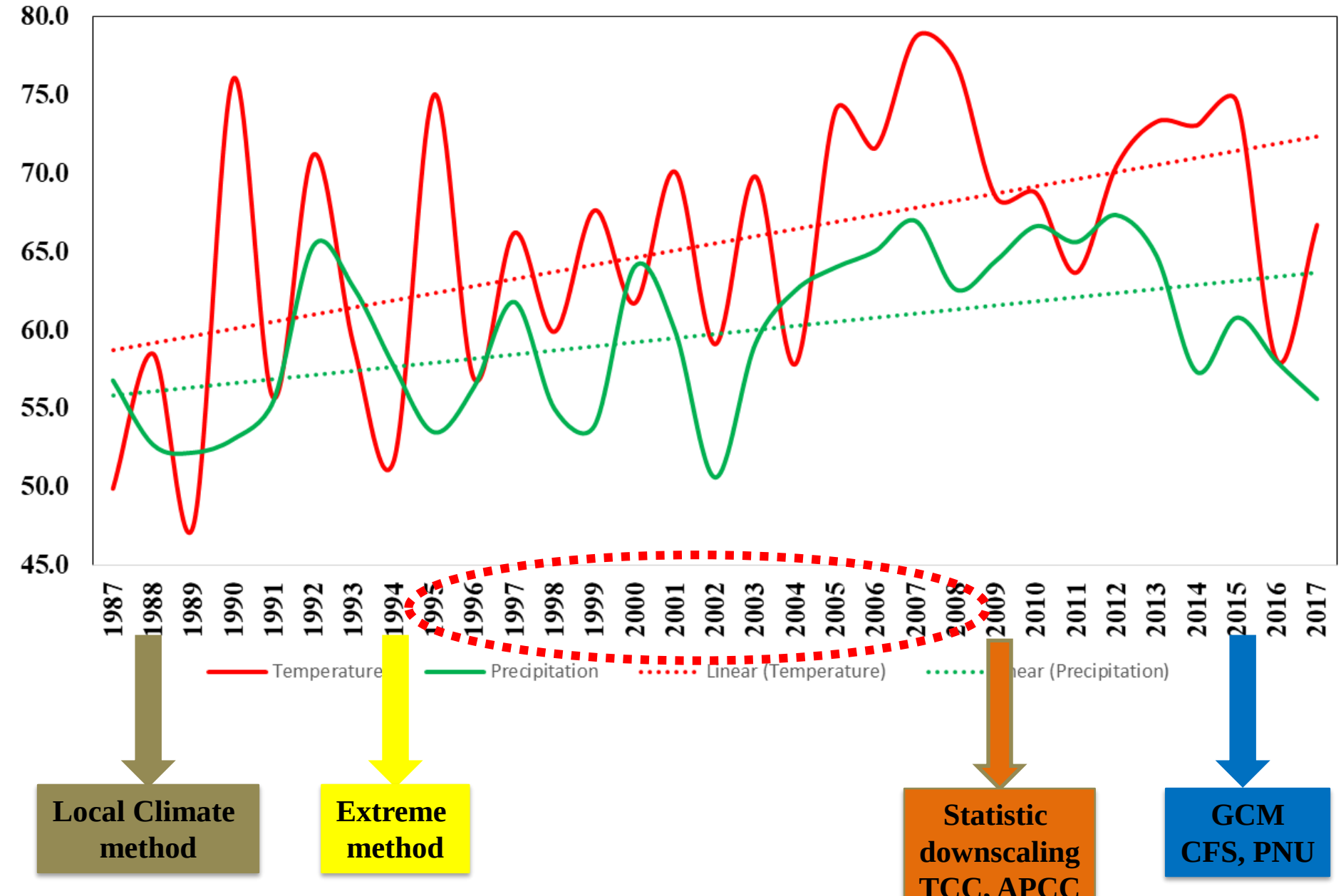
Development of NWPs

Dell PowerEdge R900 Server

	Хуучин	Шинэ
	"Dell PowerEdge R900" Server	"Cray XE6m" Supercomputer
Installation	2009.07	2011.11
Core Number	24	768
Core Type	8-Core Intel Xeon® 2.4 GHz	16-Core AMD Opteron(TM) 2.1 GHz
Peak performance	~230 GFlops	6,457.2 GFlops
Main Memory	64 GB (256 GB)	1.5 TB
Capacity of Storage	15 TB	128 TB
OS	Red Hat (RHEL) Linux 4	Suse (SLES) Linux 11

Cray XE6m Supercomputer

Accuracy of monthly weather forecast



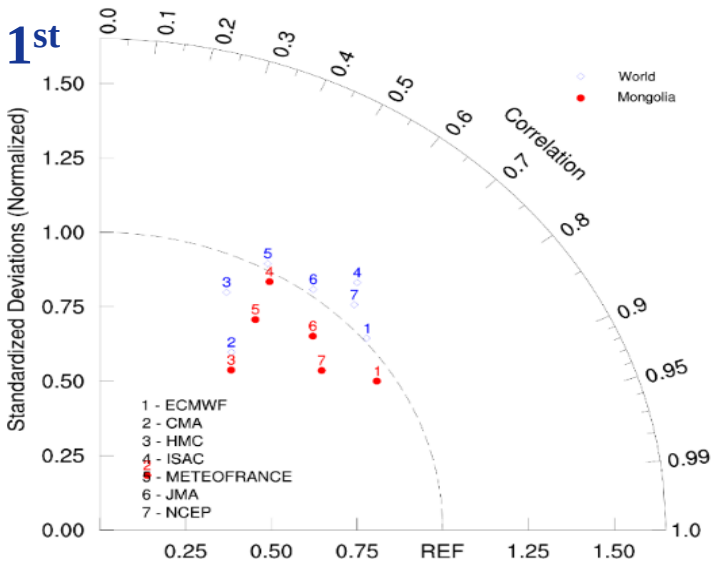
Subseasonal to Seasonal project validation over Mongolia

Model	Time-Range	Ens	Freq.	Hcst length	Hcst Freq	Ocean coupling	Active Sea Ice	Case-2015
ECMWF	0-46	10	2/weekly	Past 20 y	2/weekly	**Yes**	Planned	**77**
NCEP	0-34	40	4/daily	1999-2010	4/daily	**Yes**	**Yes**	**334**
CMA	0-45	4	daily	1992-now	daily	**Yes**	**Yes**	**334**
JMA	0-34	50	2/weekly	1981-2010	3/month	No	No	**94**
Met.Fr	0-60	51	monthly	1993-2014	monthly	**Yes**	**Yes**	**7**
ISAC-CNR	0-32	40	weekly	1981-2010	6/month	No	No	**4**
HMCR	0-63	20	weekly	1981-2010	weekly	No	No	**47**

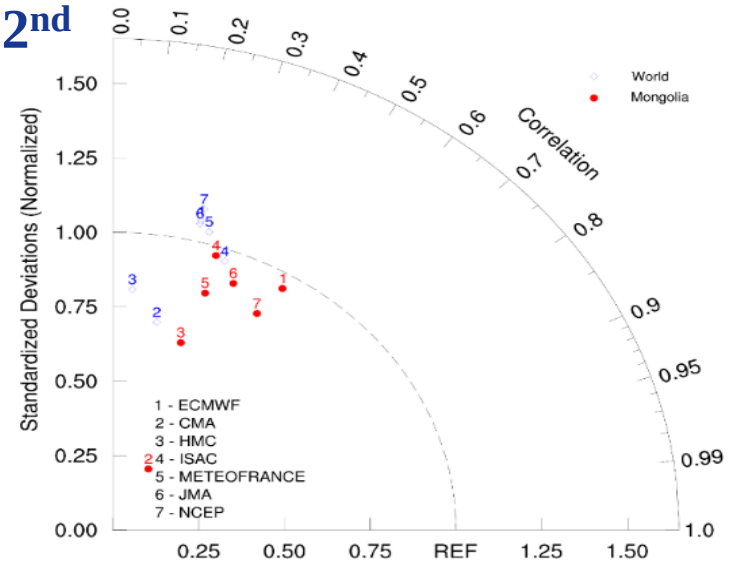
S2S Model experiment /2015/

Taylor Diagram for Temperature

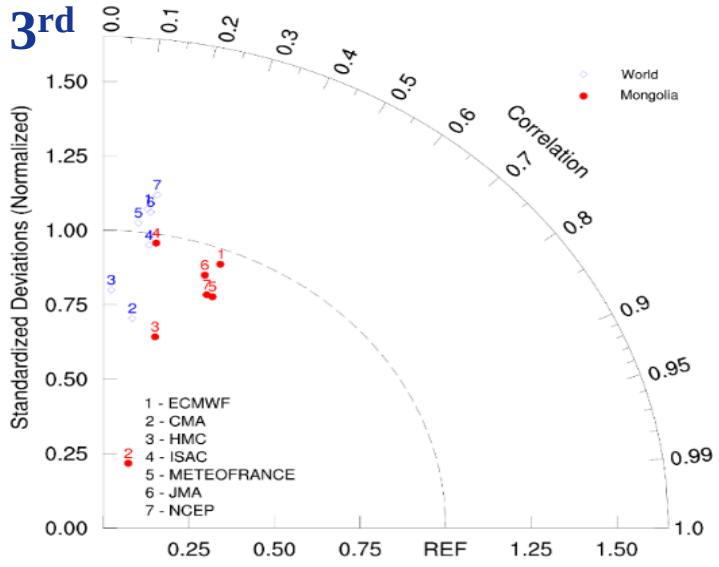
1st



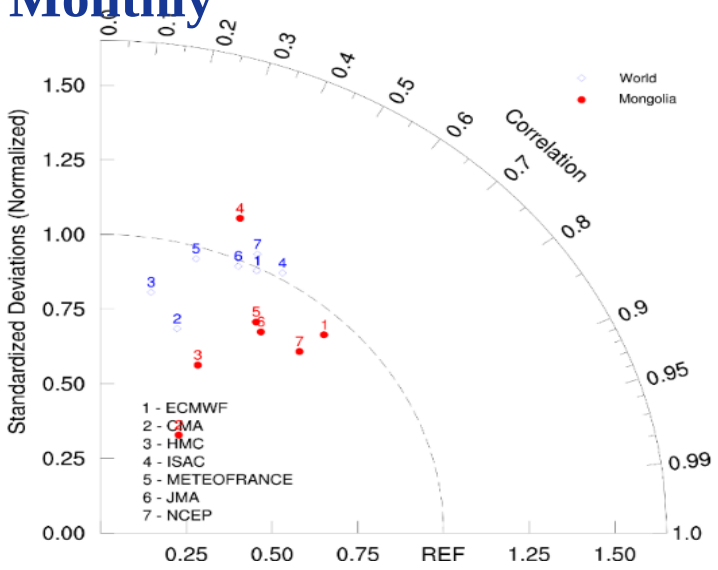
2nd



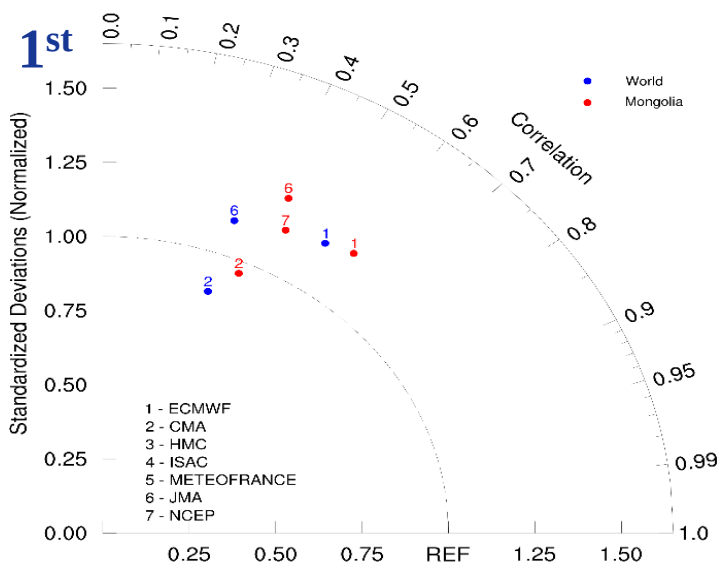
3rd

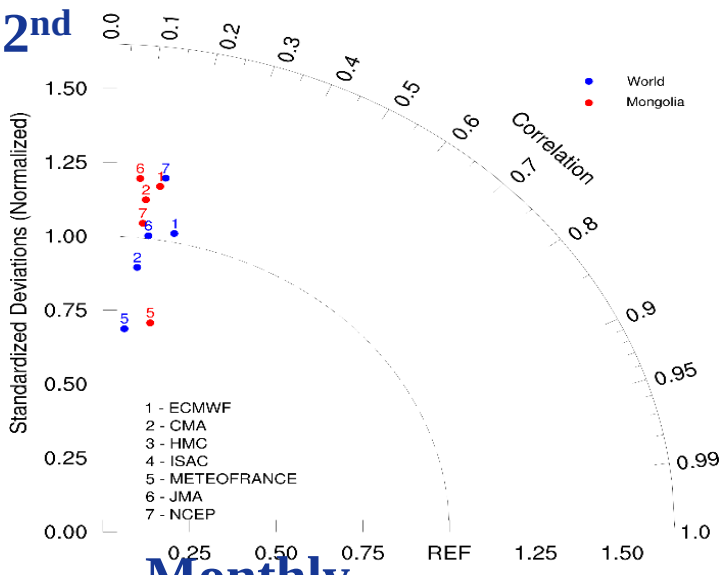


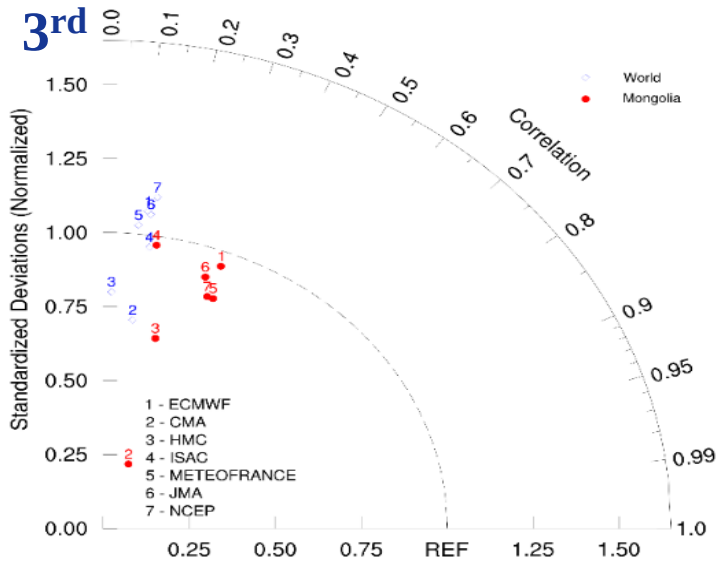
Monthly

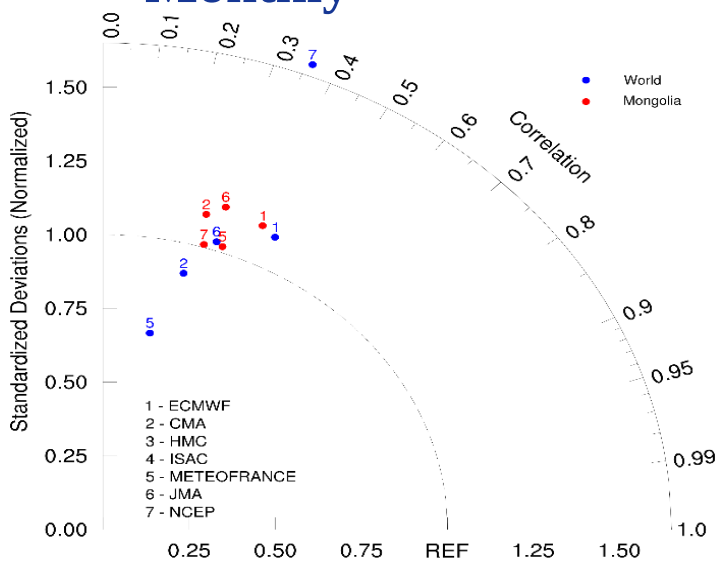


Taylor Diagram for Precipitation









Future Perspective

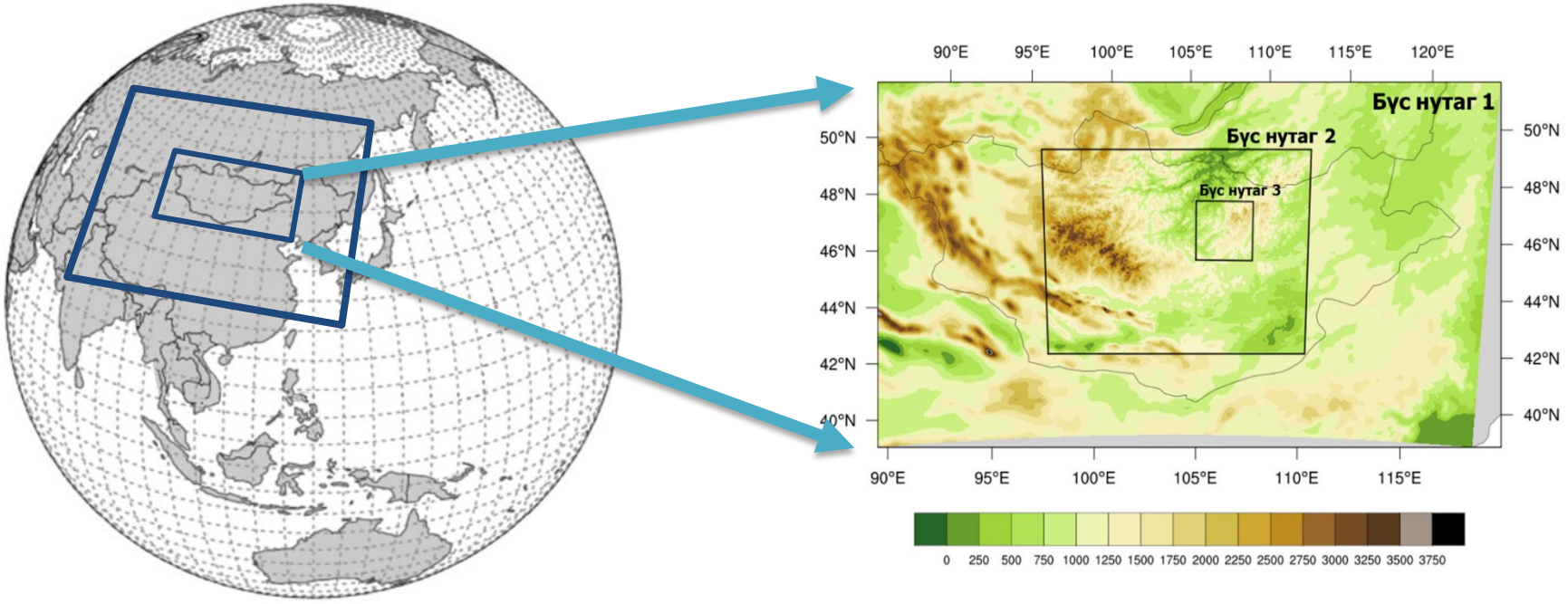
Were requested Climate Change Adaptation Project to Green Climate Fund. UNDP passed our project to Green Climate Fund. We plan to update our supercomputer Cray XC40 or Cray XC50, if this project will be begin.

Dynamic downscaling

PNU

NCEP_CFSv2

CESM and CAM



Summary

Since 1987, meteorological service of Mongolia have started to produce the monthly weather forecast. The main method for long range weather prediction was solely synoptic method. As long range weather prediction is challenging issue, we needs to focus on not only seasonal prediction, but also climate analysis.

Since then, our researchers developed some classic statistical methods based on Multiple Linear Regression and Discriminant Analysis. In 2009, we developed two statistic downscaling methods one from APCC MME model output, and second one from TCC model outputs.

However, recent years our statistic methods is not enough for seasonal climate prediction. Therefore, we need new dynamic approach for long range weather prediction. In 2014, we started to run PNU model, but that is very expensive in term of computation and storage. Thus, we have not made it fully operation yet.

In the future, we are planning to run General circulation model. This year we have started to study and test Community atmosphere model.

Thank you for your attention