

DEMETER: A multi-model ensemble seasonal prediction experiment

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The idea behind DEMETER

- Growing demand for reliable seasonal forecasts
- Two main sources of uncertainty
 - ⇒ error in initial conditions
 - ⇒ error in model formulation
- Install a Multi-Model Ensemble System
- Evaluate the skill and potential utility

Multi-model ensemble system

- DEMETER system: 7 coupled global circulation models

Partner	Atmosphere	Ocean
ECMWF	IFS	HOPE
LODYC	IFS	OPA 8.3
CNRM	ARPEGE	OPA 8.1
CERFACS	ARPEGE	OPA 8.3
INGV	ECHAM-4	OPA 8.2
MPI	ECHAM-5	MPI-OM1
UKMO	HadCM3	HadCM3

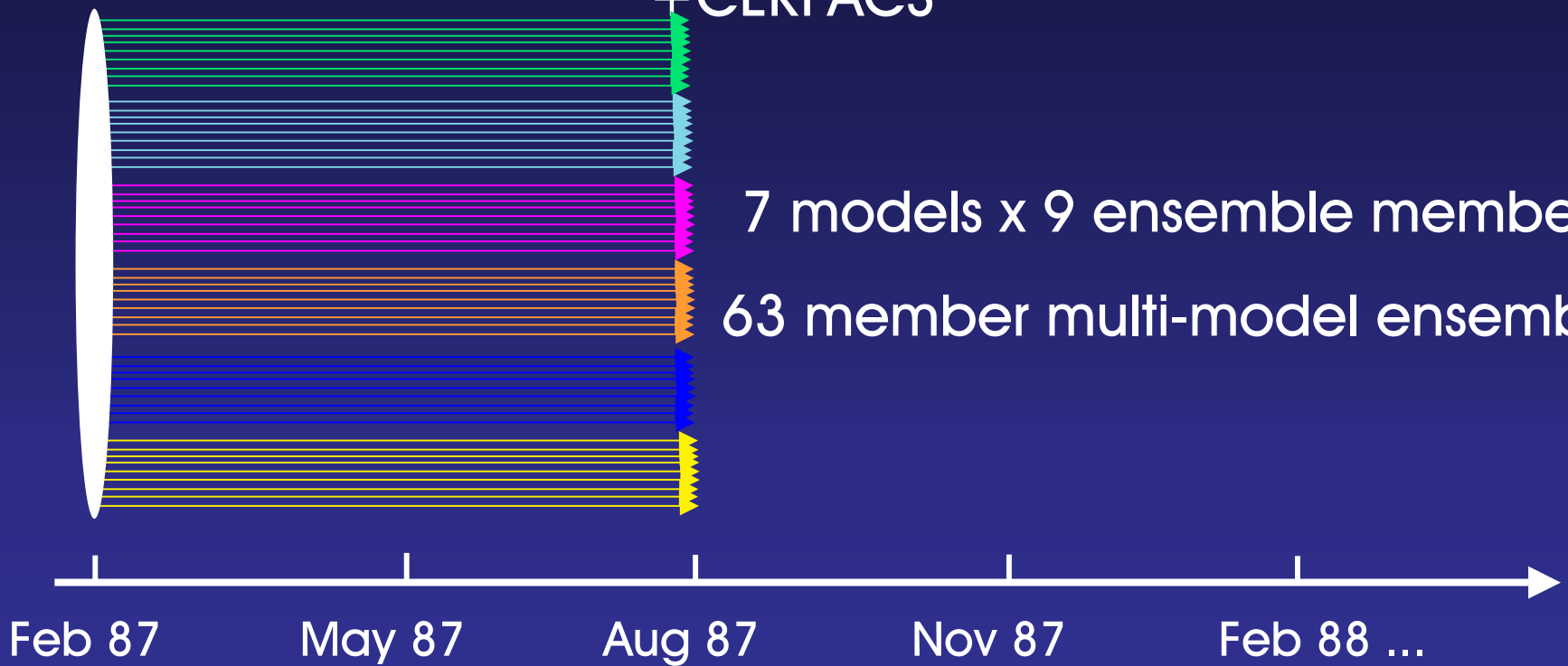
9 member ensembles
ERA-40 initial conditions
SST and wind perturbations
4 start dates per year
6 months hindcasts

- Hindcast production for: 1987-1999 (1958-2001)

Multi-model ensemble system

DEMETER system: 6 coupled global circulation models
CNRM (FR) ECMWF (INT) INGV (IT) LODYC (FR) MPI (DE) UKMO (UK)

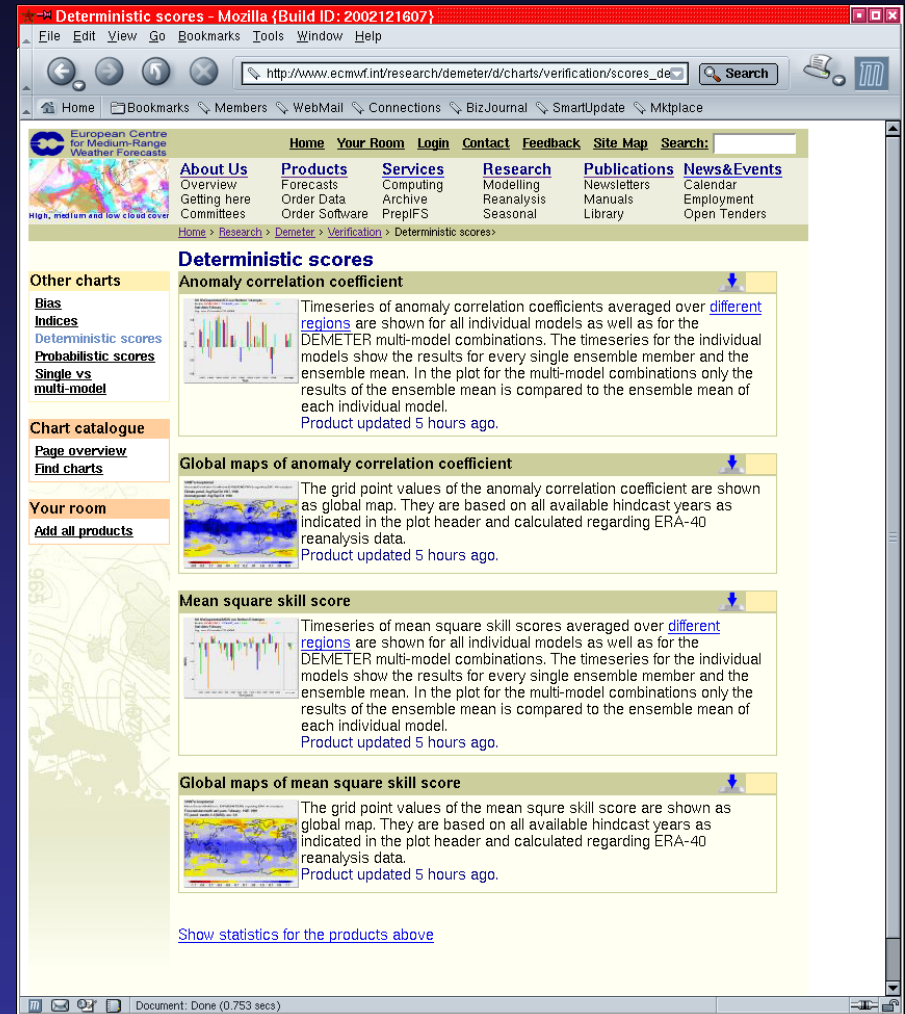
+ CERFACS



7 models x 9 ensemble members
63 member multi-model ensemble

Verification

- Bias
- Indices
- Deterministic Scores
- Probabilistic Scores
- Single vs. multi-model



www.ecmwf.int/research/demeter/verification

Verification

Start date



Lead time



Parameter

Model

Parameter

ECMWF assim

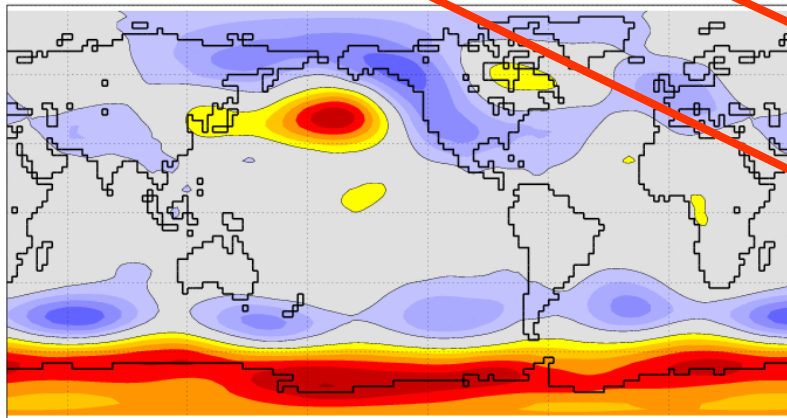
500 hPa Geopotential

500hPa Geopotential [dam]

Bias: EXP(ECMWF_assim) regarding ERA-40 reanalysis

Forecast start month and years: November / 1987-2000

FC period: months 2-4 (DJF), ens: 0-8



Model

Demeter: Bias - Mozilla {Build ID: 2002121607} <2>

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http://www.ecmwf.int/research/demeter/d/charts/verification/bias/bias/

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Show guide

Start

February
May
August
November

Lead

2-4 months
4-6 months

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<http://data.ecmwf.int/data>

Demeter - Mozilla {Build ID: 2002121607}

http://data.ecmwf.int/data/d/demeter/pi/1990/hindcasts/

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Demeter

Select Experiment

CERFACS ECMWF INGV LODYC Météo France Max Planck Institute
 UK Met Office

Select All or Select None

Select Starting date

1990-02 1990-05 1990-08 1990-11 1991-02 1991-05 1991-08 1991-11
 1992-02 1992-05 1992-08 1992-11 1993-02 1993-05 1993-08 1993-11
 1994-02 1994-05 1994-08 1994-11 1995-02 1995-05 1995-08 1995-11
 1996-02 1996-05 1996-08 1996-11 1997-02 1997-05 1997-08 1997-11

Select All or Select None

Select Level and Parameter

200 500 850

Geopotential
Temperature
U velocity
V velocity
Specific humidity

Select All or Select None

Select Forecast month

1 2 3 4 5 6

Select All or Select None

Select Ensemble member

0 1 2 3 4 5 6 7 8

Select All or Select None

Retrieve GRIB Retrieve NetCDF Plot data

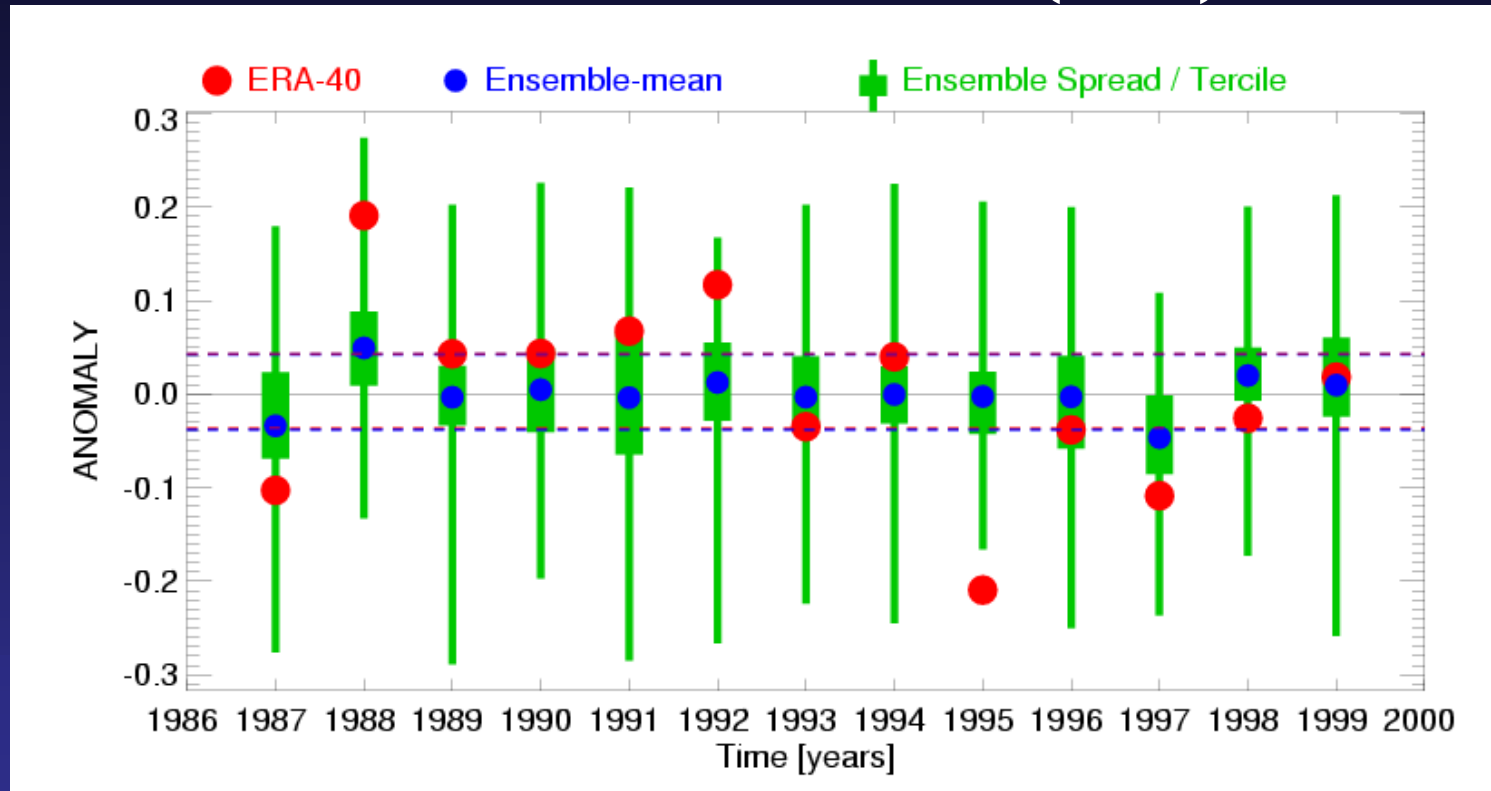
http://data.ecmwf.int/about/feedback/

Public data
Distribution
(both model
and ERA40)



North Atlantic Oscillation index

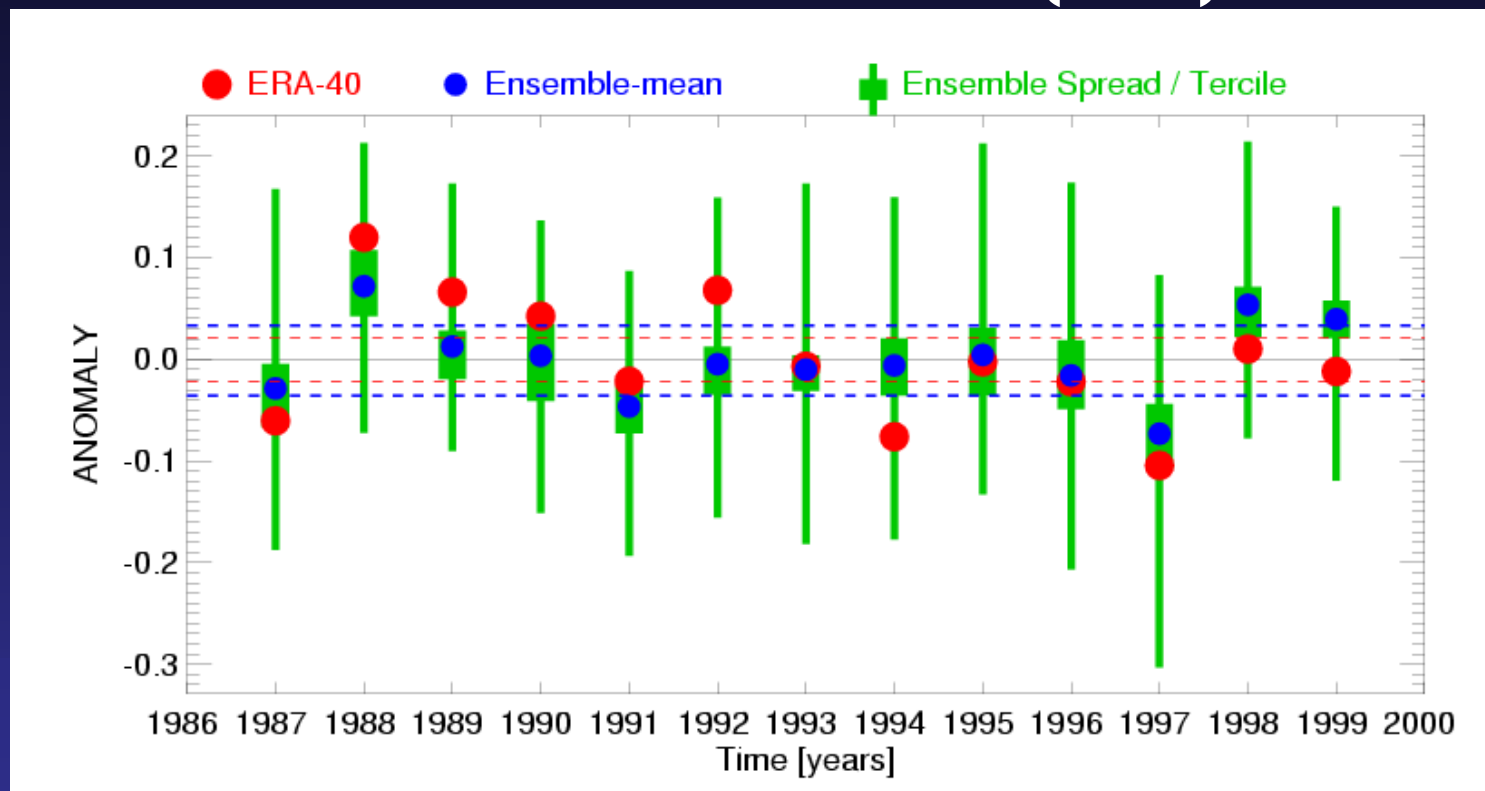
1-month lead time (DJF)



	Multi-Model	CERFACS	CNRM	ECMWF	INGV	LODYC	MPI	UKMO
Correlation	0.68	0.48	0.44	0.43	0.37	0.49	0.23	0.31
RPSS	23.5	15.3	17.1	21.3	7.4	18.5	7.9	8.8

Pacific/North American pattern

1-month lead time (DJF)



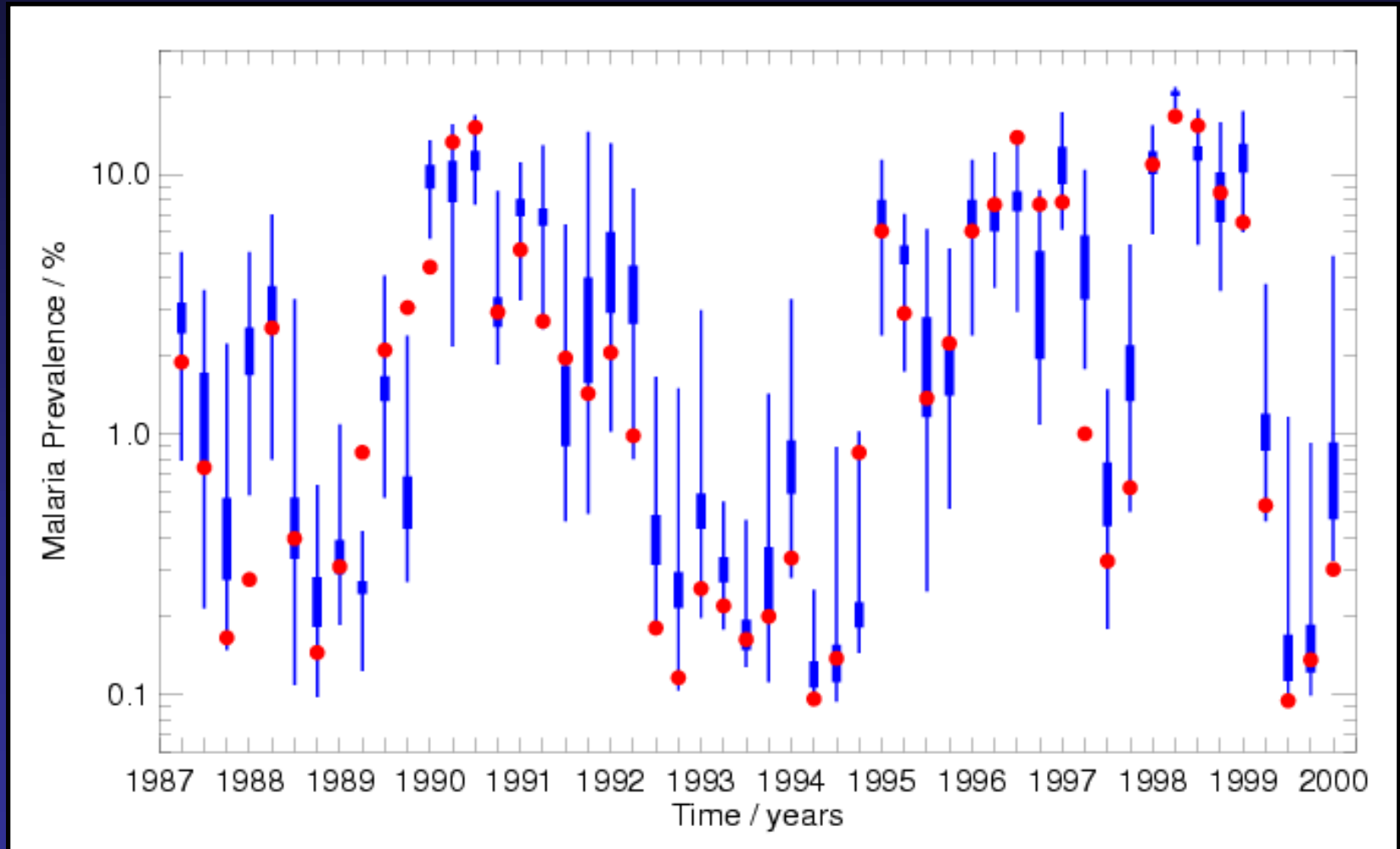
	Multi-Model	CERFACS	CNRM	ECMWF	INGV	LODYC	MPI	UKMO
Correlation	0.75	0.19	0.20	0.80	0.57	0.75	0.68	0.62
RPSS	19.3	-1.8	-26.9	21.8	-4.6	27.3	37.5	0.9

End-user modelling

- DEMETER ensemble hindcasts input for
 - health application (malaria model)
 - agriculture application (crop model)
- Basic idea:
 - explore utility of DEMETER hindcasts
 - give range of uncertainty
- Main problems:
 - sparse data to validate malaria in Africa
 - need of downscaled data

Malaria modelling

Malaria model forced by ERA-40 and DEMETER data



Towards a new FP-6 Project ENSEMBLES

- Integrated prediction system for time scales from seasons to decades and beyond
- Incorporation of a complete earth modelling system
- Greater diversity of applications

Malaria is a common disease in developing countries. It is caused by a parasitic infection carried in the blood and is spread by the bite of infected mosquitoes

