Previsioni a lungo termine da una a sei settimane

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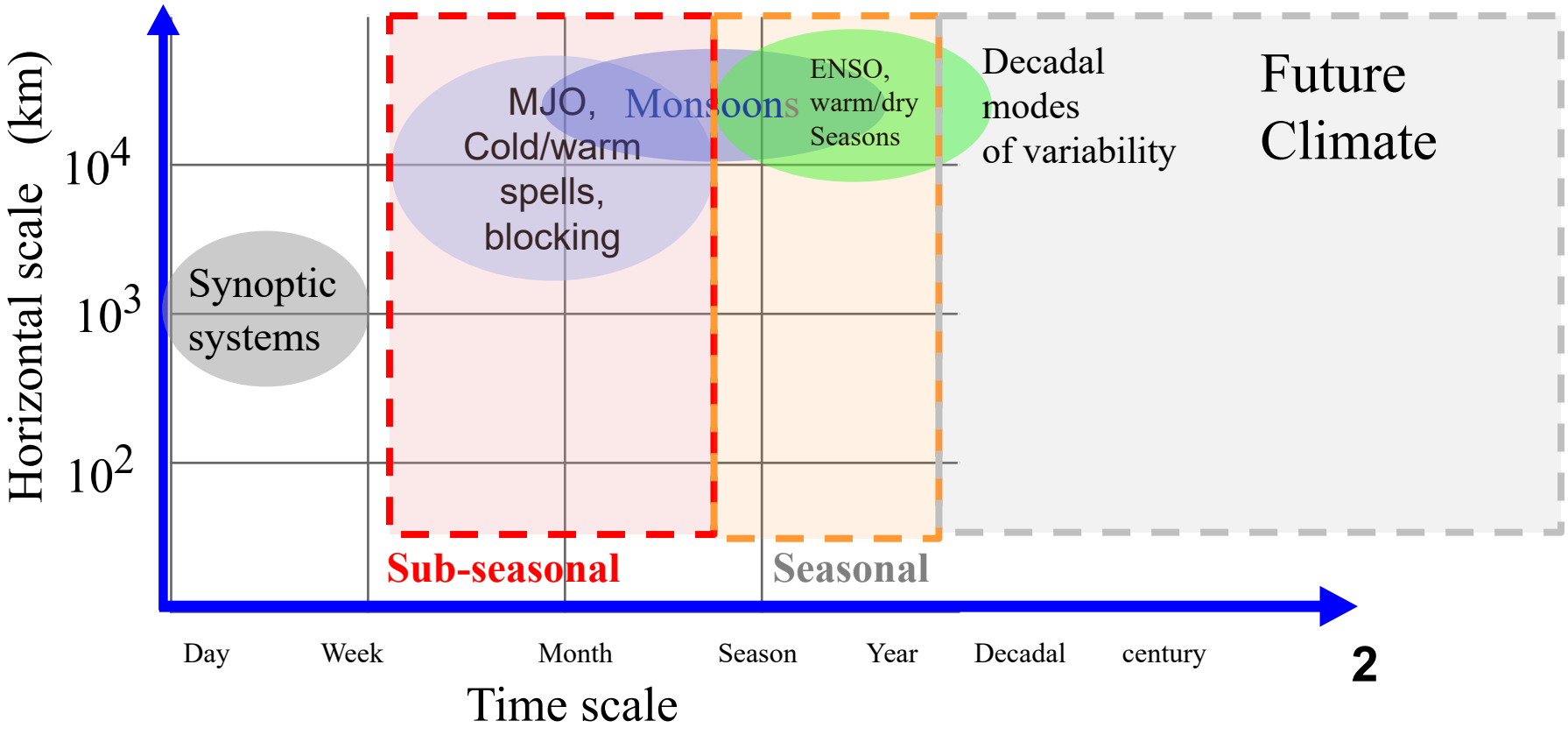
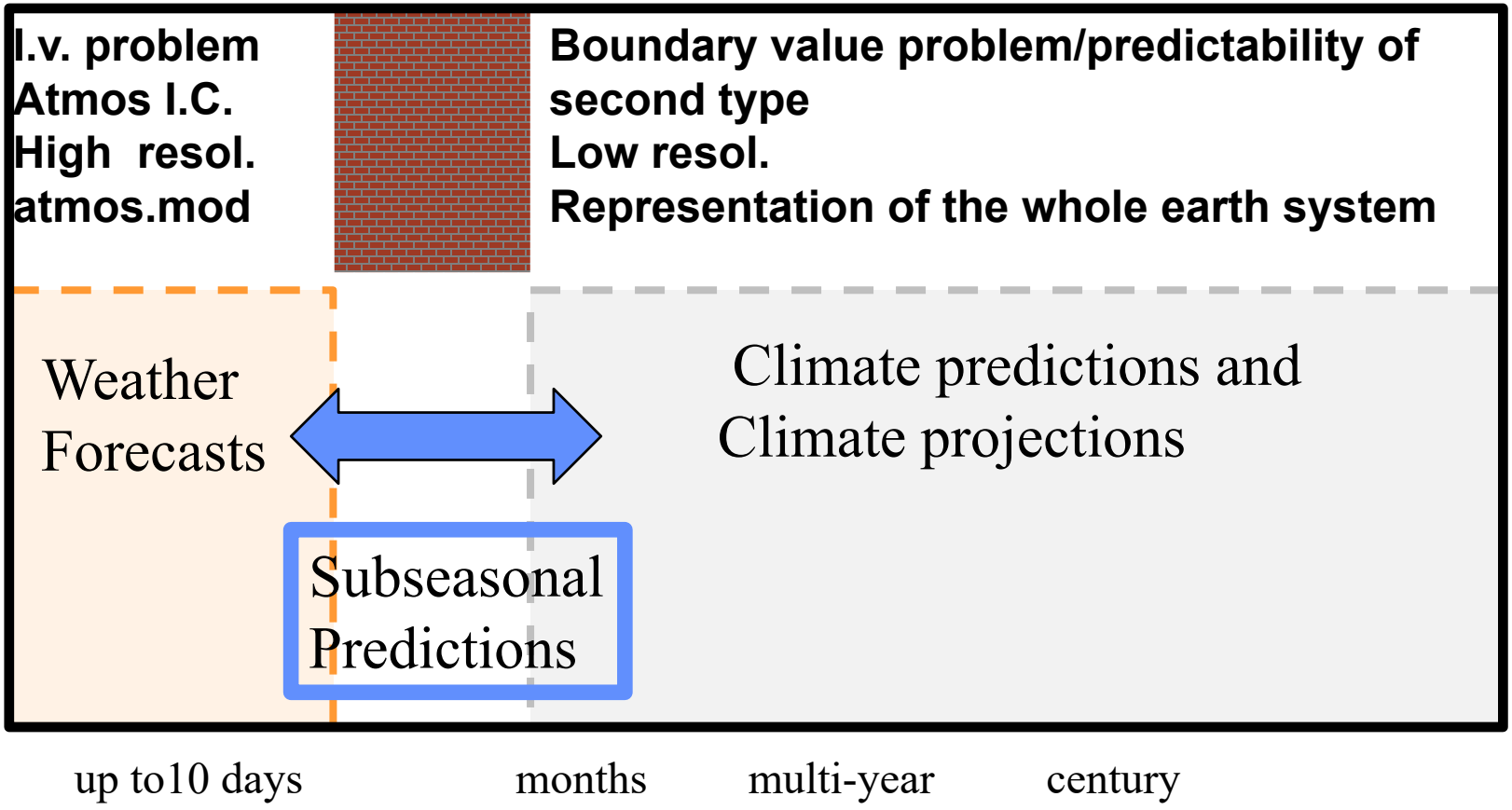
1ª Conferenza Nazionale sulle previsioni meteorologiche a climatiche

Bologna 17-18 June 2019

Subseasonal time scale: longer than 2 weeks but shorter than a season



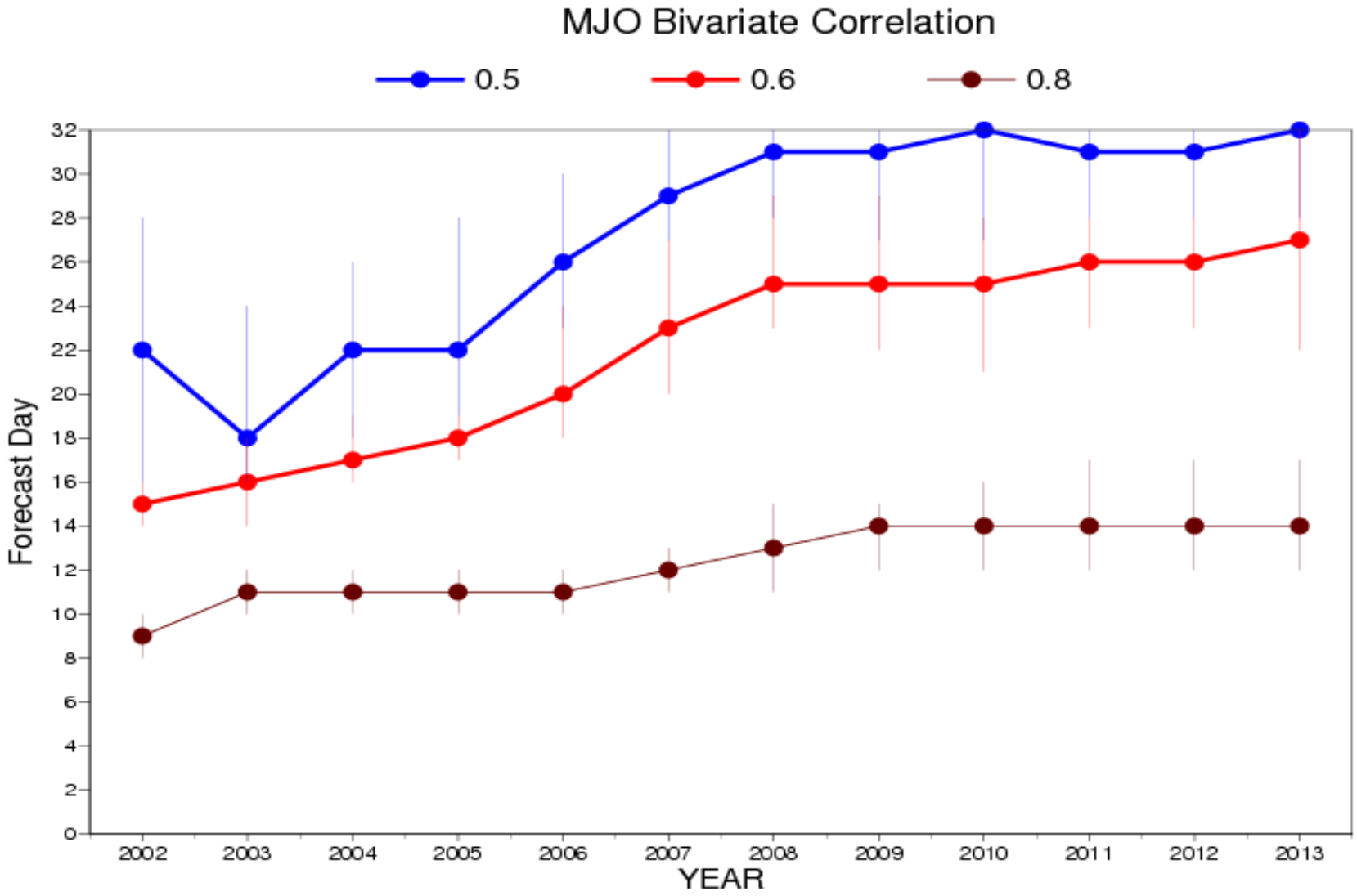
Historical separation between weather and climate research



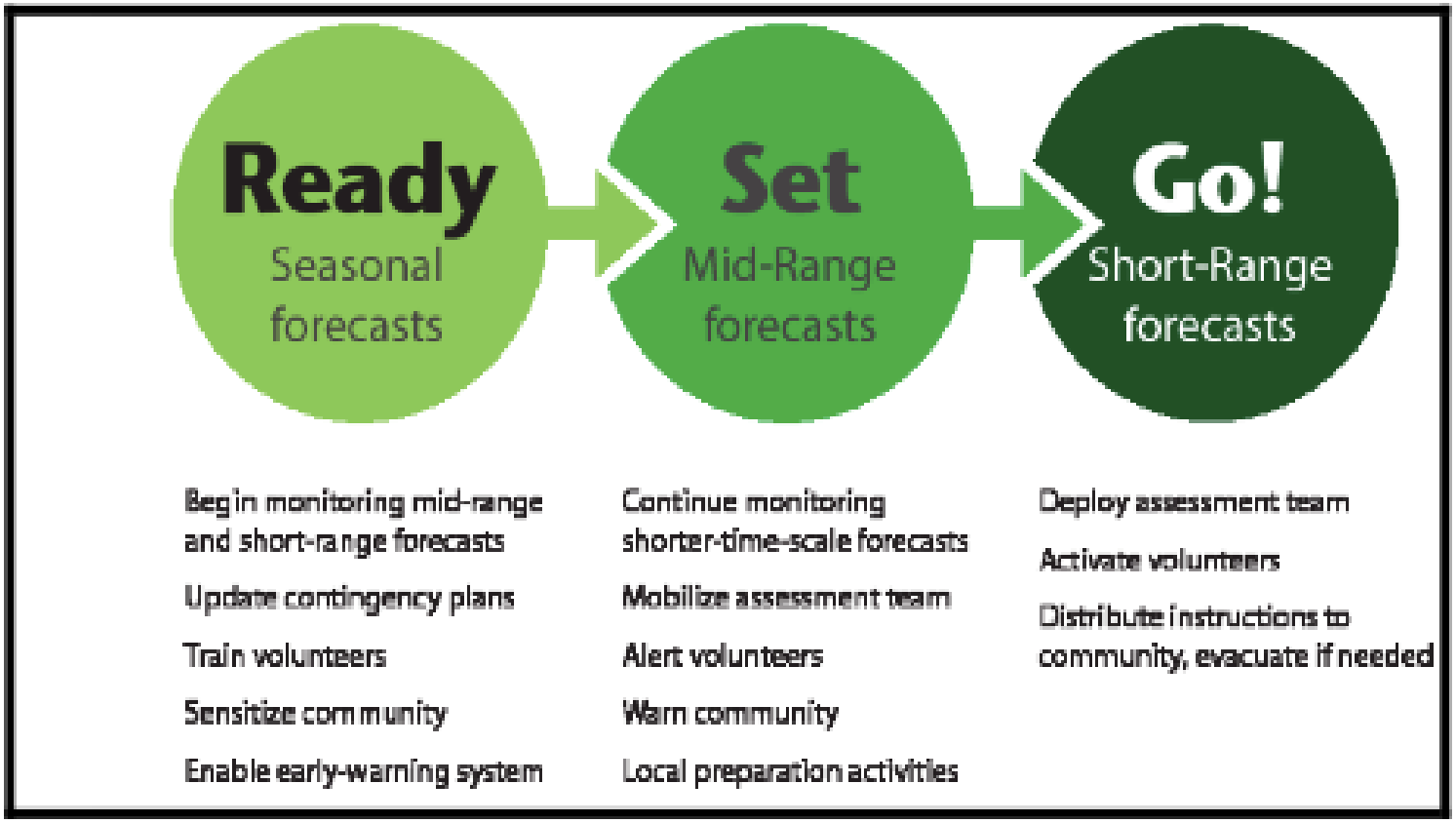
Sources of sub-seasonal predictability

- Madden-Julian Oscillation (MJO)
- Stratospheric Sudden Warming
- Extra-tropical modes (RW, weather regimes: blockings, NAO, PNA, SAM..)
- Slowing varying processes: Soil moisture/vegetation, snow, sea ice, ocean SSTs/heat content
- Quasi-Biennal Oscillation, ENSO, etc….

MJO skill scores

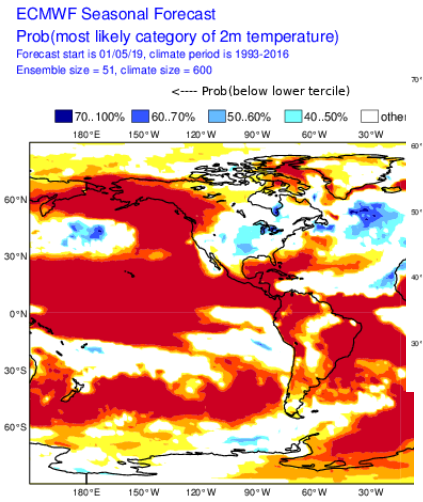


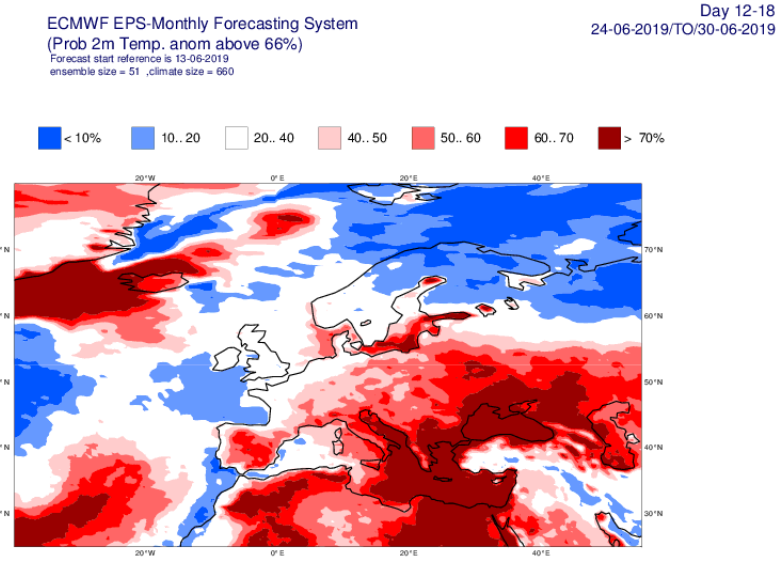
Opportunity to use information on *multiple* time scales

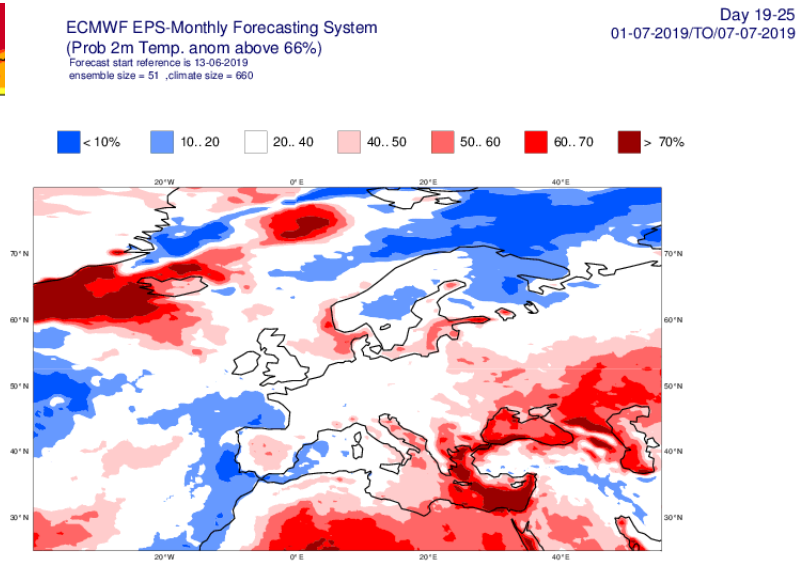


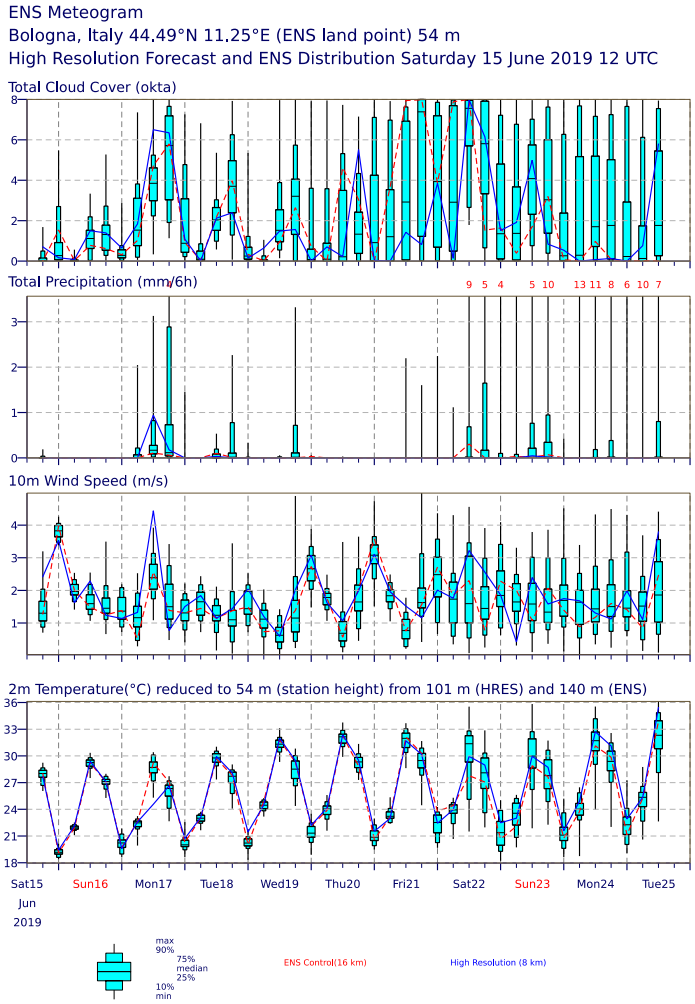
Red Cross - IRI example

Seasonal → sub-seasonal → medium range









The operational forecasting system

High resolution forecast: twice per day Tco 1279 ~ 9km 137-level, to 10 days ahead

Coupled atmosphere-ocean system

Ensemble Prediction System (ENS): twice daily Tco 639/L91, 51 members to 15 days ahead (next update Tco639 – 18Km)

Extended range forecasts /ENS extension: twice a week (Mon/Thu)

Tco 639/319 ~ 18/36 km 91 levels, 51 members to 46 days ahead

Long range forecasts: once a month 51 members, ~36 km 91 levels, to 7 months ahead

ECMWF

Skill of the ECMWF Monthly Forecasting System

2-meter temperature in upper tercile - Day 12-18

ROC score Reliability diagram

Day 12-18

Persistence of day 5-11

Monthly forecast day 12-18

Day 19-25

Persistence of day 5-18

Monthly forecast day 19-32

ECMWF

Probabilistic skill scores – NDJFMA 1989-2008

Reliability Diagram
Probability of 2-m temperature in the upper tercile
Day 19-25

N. Extratropics

0.04
-0.06

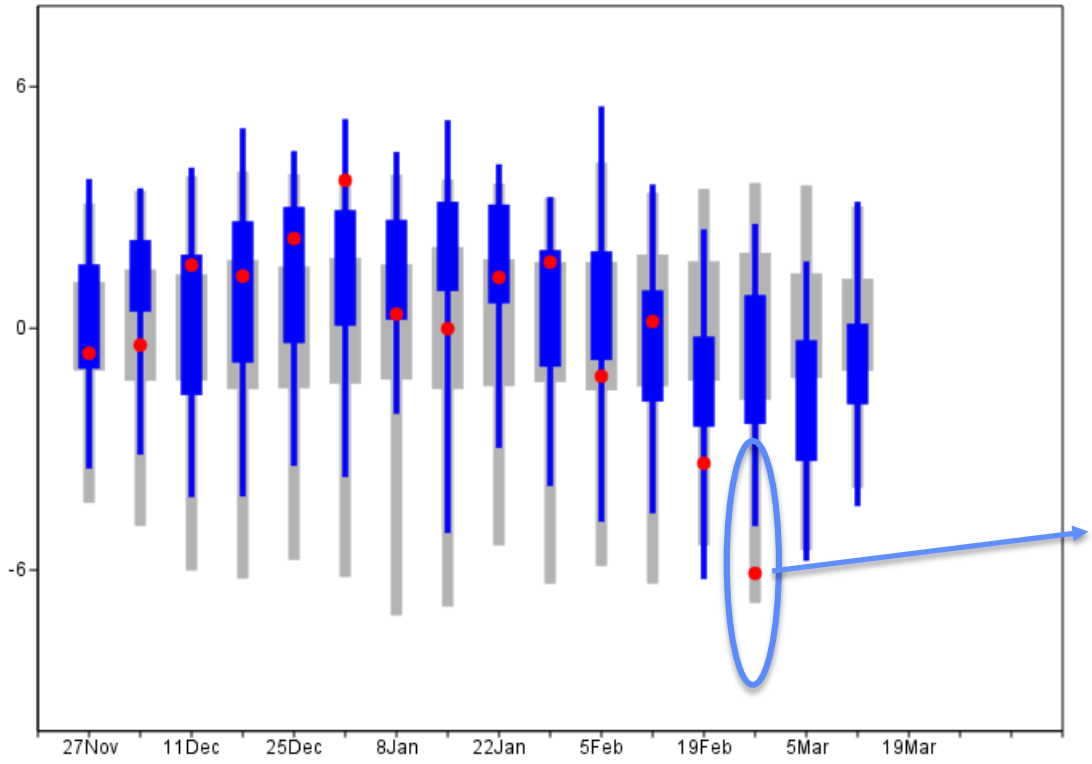
EUROPE

0.03
-0.09

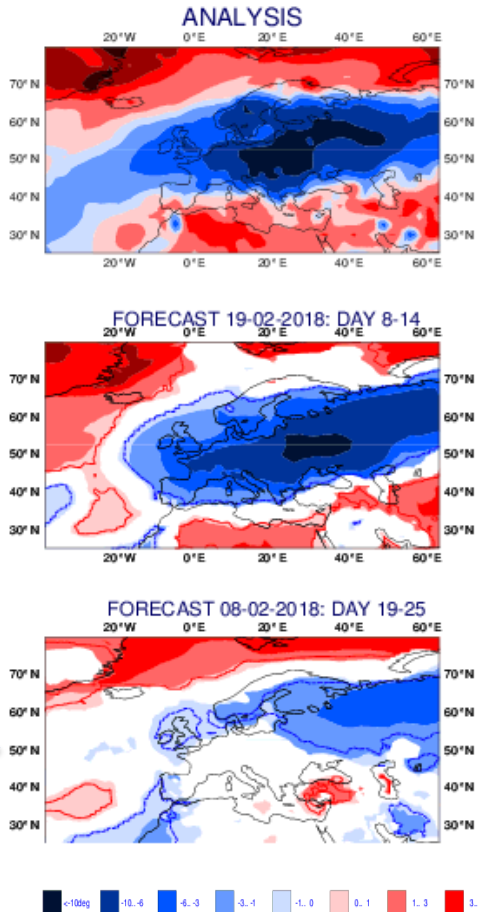
MJO in IC NO MJO in IC

Severe cold spell end of February 2018:

2mt over Europe weekly means anomalies at 19-25 days (3.5weeks)



26/2-4/3 2018

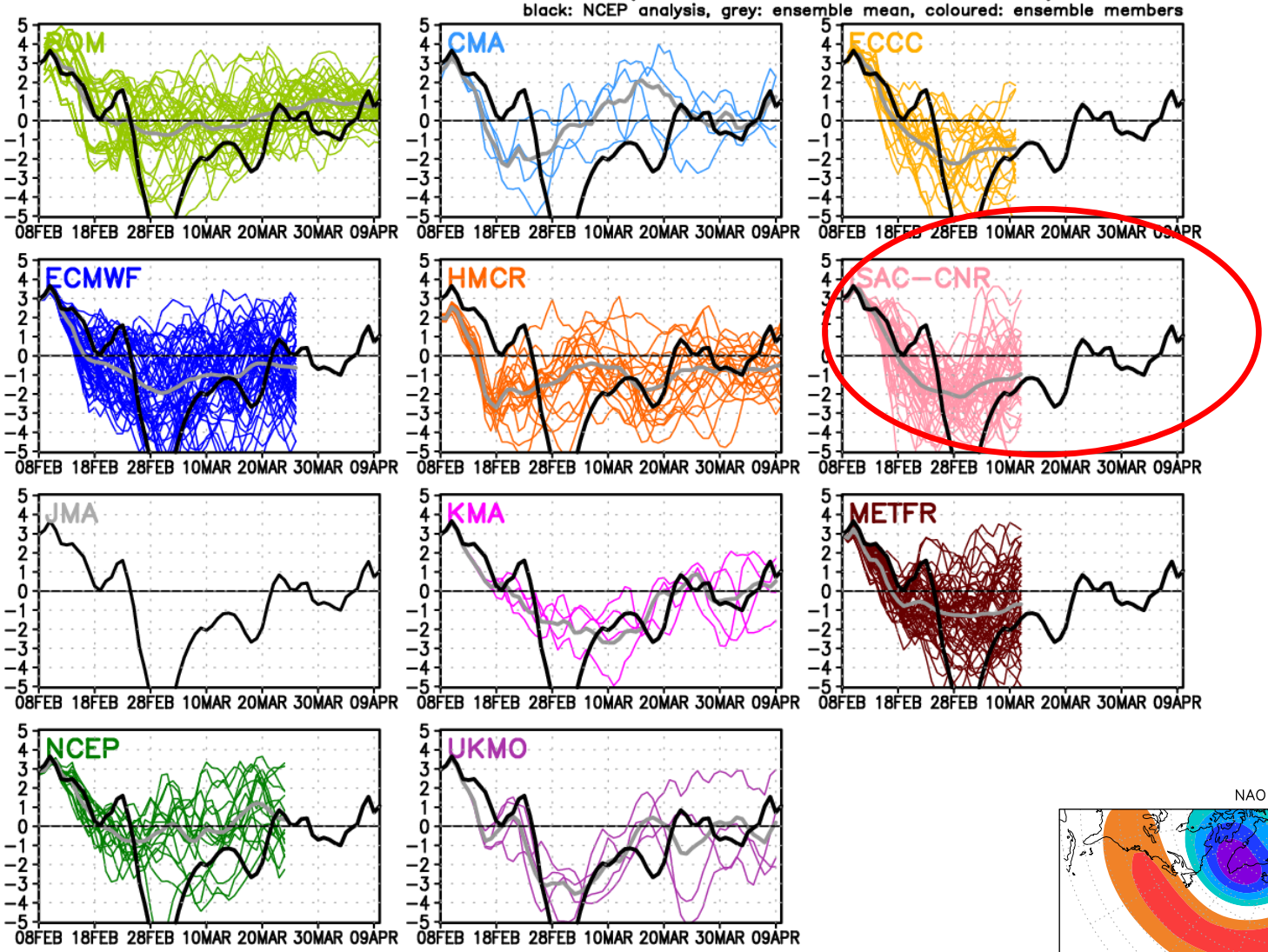


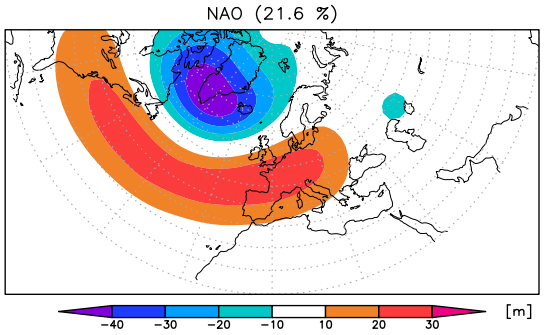
2 weeks

3.5 weeks

S2S NAO index forecasts (initial: 2018.02.08, Thu)

black: NCEP analysis, grey: ensemble mean, coloured: ensemble members





http://gpvjma.ccs.hpcc.jp/S2S/

The Sub-seasonal to Seasonal (S2S) Prediction Project

- improve forecast skill and understanding on the sub-seasonal to seasonal time scale

- promote its uptake by operational centres and exploitation by the applications community

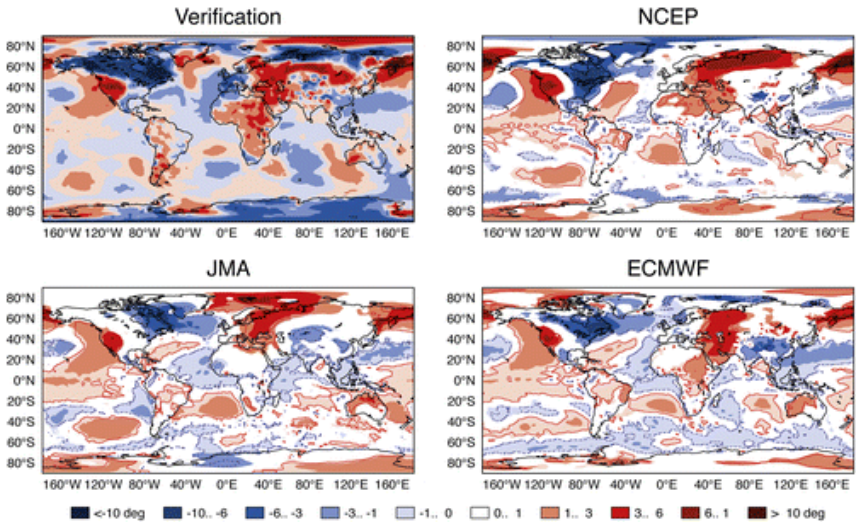
- special emphasis on high-impact weather events

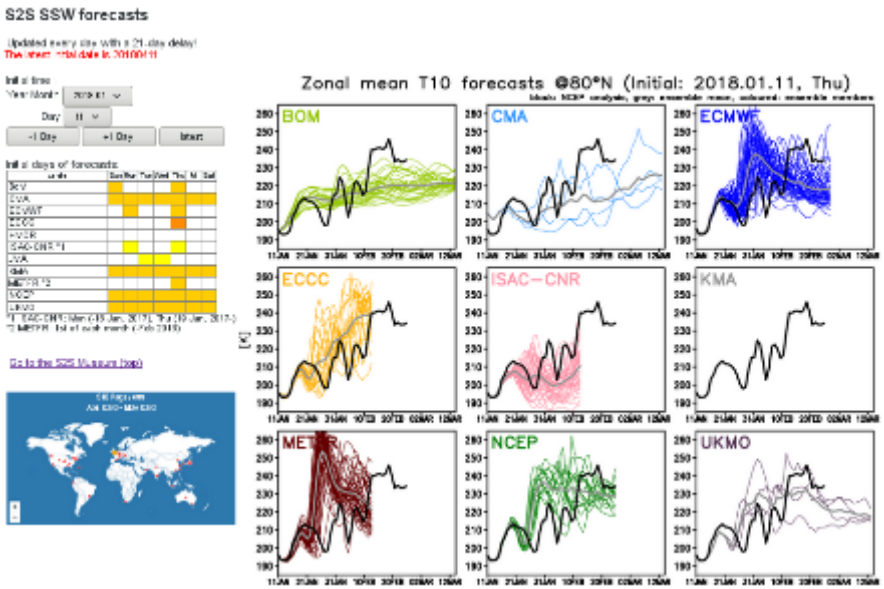
- S2S data is available to everyone https://software.ecmwf.int/wiki/display/S2S/Models

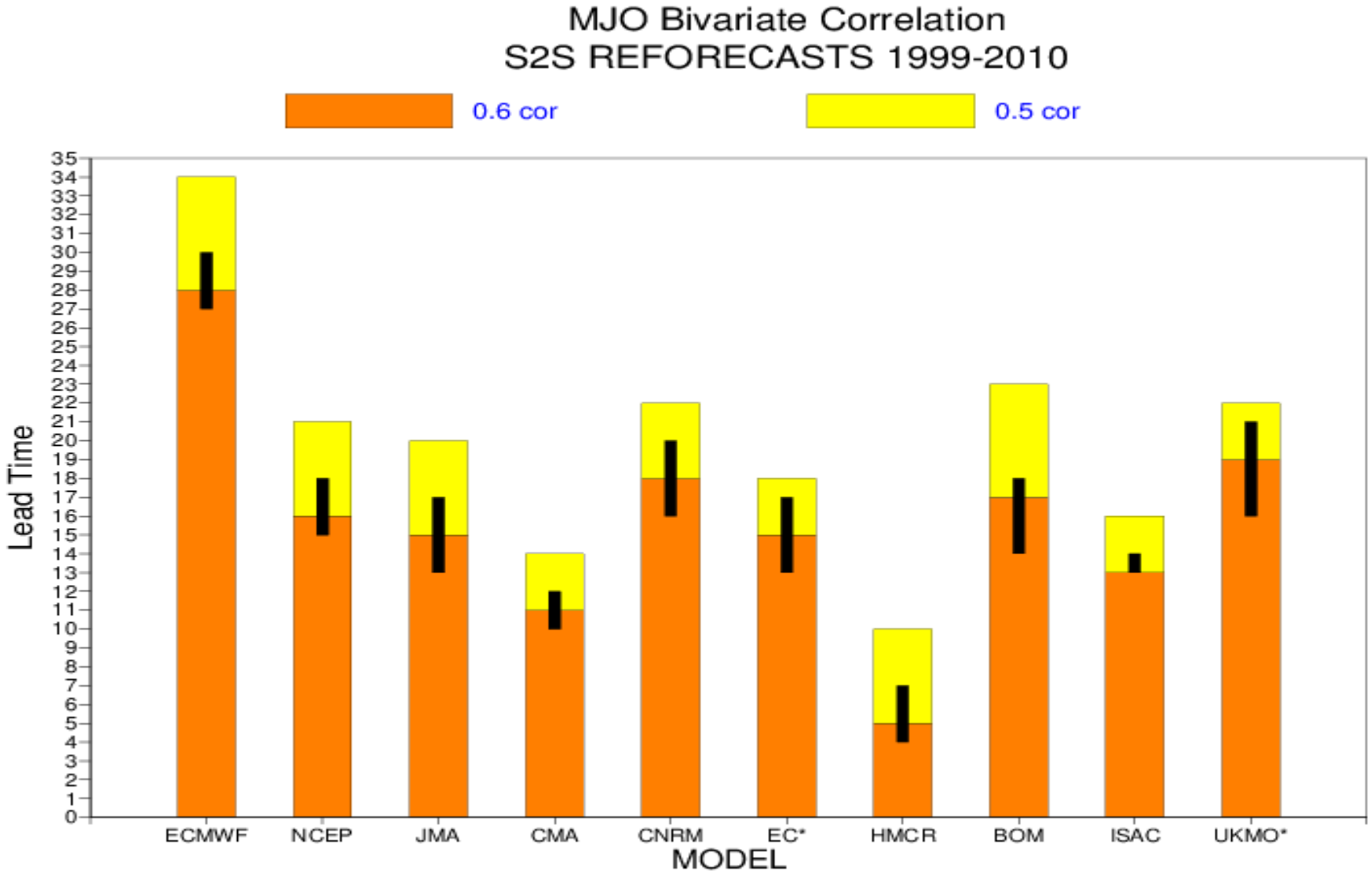
S2S Product Websites (3 weeks behind real-time)

- S2S product website at ECMWF: Contains near real-time products (2mtm precip, Z500 anomaly maps, MJO forecasts, EFI…) from S2S models from 1st January 2016. http://www.ecmwf.int/en/research/projects/s2s/charts/s2s/

- "S2S museum" at university of Tsukuba, Japan: Contains near real time indices (MJO, AO, NAO. SSW…)
  http://gpvjma.ccs.hpcc.jp/S2S/S2S_SICmap.html






MJO Bivariate Correlation
S2S REFORECASTS 1999-2010
0.6 cor
0.5 cor
Lead Time
35
34
33
32
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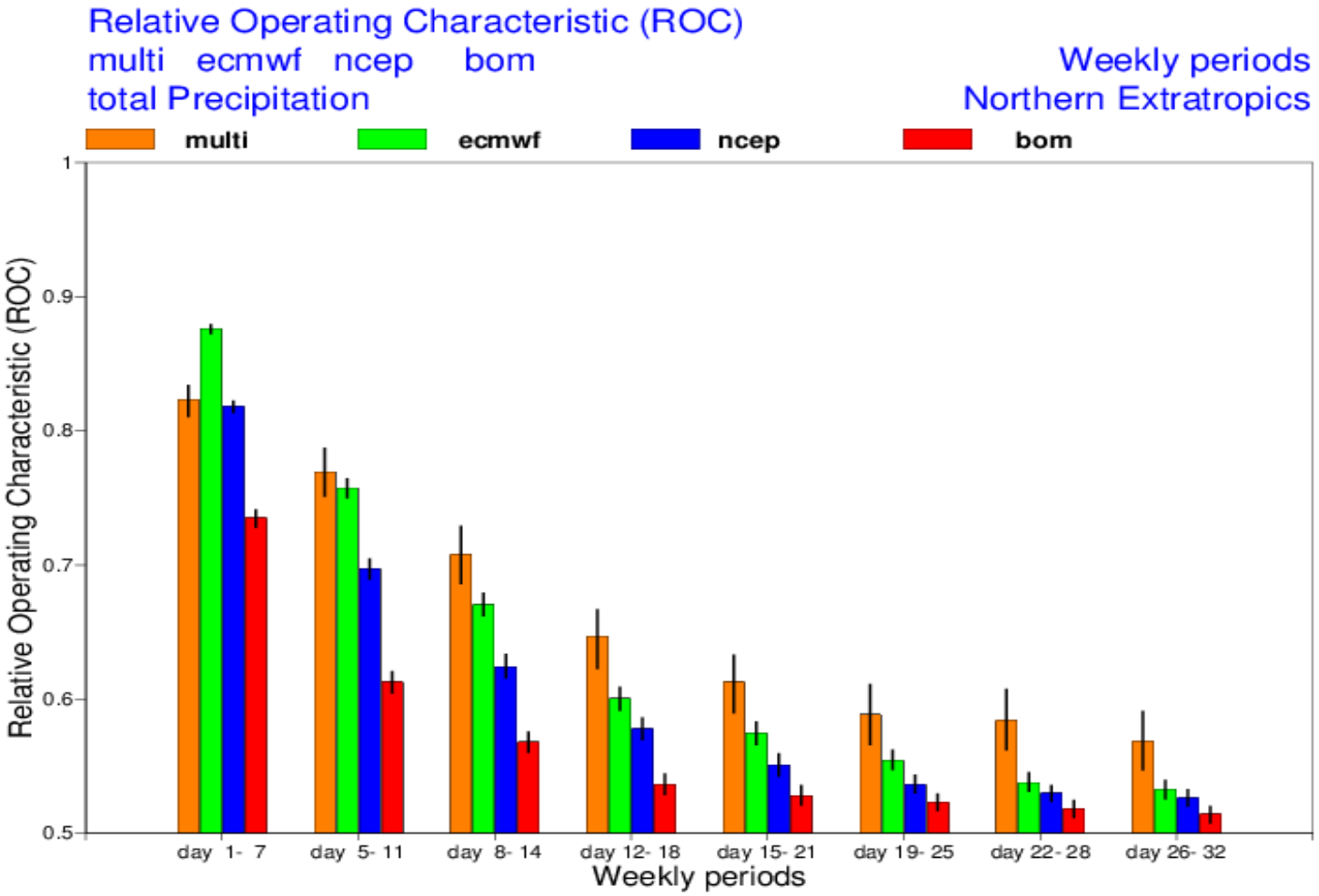
2
1
0
ECMWF
NCEP
JMA
CMA
CNRM
EC*
HMCR
BOM
ISAC
UKMO*
MODEL

2015/2016 Real-time Forecast verification



Conclusions:

La scale temporale “sub-seasonal” rappresenta il punto di incontro tra la scala meteorologica e quella climatica colmando la divisione tra previsioni meteorologiche e quelle climatiche.

The subseasonal forecasts 12-18 days ahead are generally better than climatology and persistence of day 5-11.

There has been a clear improvement in the subseasonal forecast skill scores since 2002. This improvement is related to improved prediction in the Tropics and most especially improved MJO prediction.

The S2S WWRP/THORPEX-WCRP joint project (http://s2sprediction.net) is the ideal platform to improve our understanding of predictability at sub-seasonal time scales. S2S database is available to everyone.