Prediction of the BSISO and Asian monsoon in the WWRP/WCRP S2S Database

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Improve forecast skill and understanding on the sub-seasonal to seasonal timescale with special emphasis on high-impact weather events

Promote the initiative's uptake by operational centres and exploitation by the applications community

Capitalize on the expertise of the weather and climate research communities to address issues of importance to the Global Framework for Climate Services

- 10-year Project currently in phase 2 (2019-2023)
- International Coordination Office hosted by KMA.

The project focuses on the forecast range between 2 weeks and a season.







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- Daily 3-week behind real-time forecasts + re-forecasts
- 11 models currently available (3 new ones will be included)
- Same grid (1.5 degree) / GRIB2 format (netcdf converter available)
- About 80 variables available, including 3D variables on 10 pressure levels
- Currently at about 130 TBs

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S2S Database Models

Forecasts

Hindcasts

Status on 5th January 2018	Time range	Resolution	Ens. Size	Frequency	Re-forecasts	Rfc length	Rfc frequency	Rfc size
BoM (ammc)	d 0-62	T47L17	3*11	2/week	fix	1981-2013	6/month	3*11
CMA (babj)	d 0-60	T106L40	4	daily	fix	1994-2014	daily	4
CNR-ISAC (isac)	d 0-32	0.75x0.56 L54	41	weekly	fix	1981-2010	every 5 days	5
CNRM (lfpw)	d 0-32	T255L91	51	weekly	fix	1993-2014	2/month	15
ECCC (cwao)	d 0-32	0.45x0.45 L40	21	weekly	on the fly	1995-2014	weekly	4
ECMWF (ecmf)	d 0-46	Tco639/319 L91	51	2/week	on the fly	past 20 years	2/week	11
HMCR (rums)	d 0-61	1.1x1.4 L28	20	weekly	on the fly	1985-2010	weekly	10
JMA (rjtd)	d 0-33	TI479/TI319L100	50	weekly	fix	1981-2010	3/month	5
KMA (rksi)	d 0-60	N216L85	4	daily	on the fly	1991-2010	4/month	3
NCEP (kwbc)	d 0-44	T126L64	16	daily	fix	1999-2010	day	4
UKMO (egrr)	d 0-60	N216L85	4	daily	on the fly	1993-2015	4/month	7

see <u>s2sprediction.net</u> for details and to access data

MJO prediction skill of S2S models JJA

MJO Bivariate Correlation 1999-2010 re-forecasts



Boreal Summer intra-seasonal Oscillation (BSISO)

Same methodology as in June-Yi Li et al, Clim. Dyn. 2013

EOFs modes of daily OLR and U850



EUROPEAN CENTRE FOR MEDIUM-RANGE WEATHER FORECASTS

Boreal Summer Intraseasonal Oscillation Index



Lee et al. 2013



BSISO predictive skill in S2S models



BSISO predictive skill in S2S models

Impact of Ensemble Prediction



BSISO amplitude error in S2S models



All the S2S models strongly underestimate the amplitude of the BSISO.

Biases associated to the BSISO in the ECMWF model



BSISO predictive skill in S2S models

BSISO1





Jie et al., 2017

S2S Predictive skill of several monsoon indices







Indian Summer monsoon index





South-east Asian Monsoon Precipitation Prec (5–25°N, 100–130°E)



Example: Precipitation Forecasts May-June 2018 ECMWF model

ECMWF analysis

























-90.-60 -60..-30 -30..-10 -10..



> 90mm

10.. 30

S2S Multi-model prediction of weekly mean precipitation MJJAS



RPSS



ROC AREA



S2S Multi-model prediction of weekly mean precipitation MJJAS



Conclusions

- The WWRP/WCRP S2S database represents an important resource for monsoon predictability studies
- The analysis of the BSISO in S2S models indicate that BSISO2 (north-westward propagation) is less predictable than BSISO1, with a forecast skill horizon of only 2 weeks.
- South Asian and South-east Asian monsoon indices display predictive skill up to 2 weeks
- Probabilistic skill scores of weekly mean precipitation indicate skill up to week 4 for some model over the India region in MJJAS. The Multi-model combination does not outperform the best model.
- AI/ML methods may help produce better calibration of individual models and multi-models. A S2S AI/ML competition will take place in 2021 to assess the potential benefit of these methods for 2-metre temperature and precipitation forecasts.