



Met Office and ECMWF Asian Monsoons

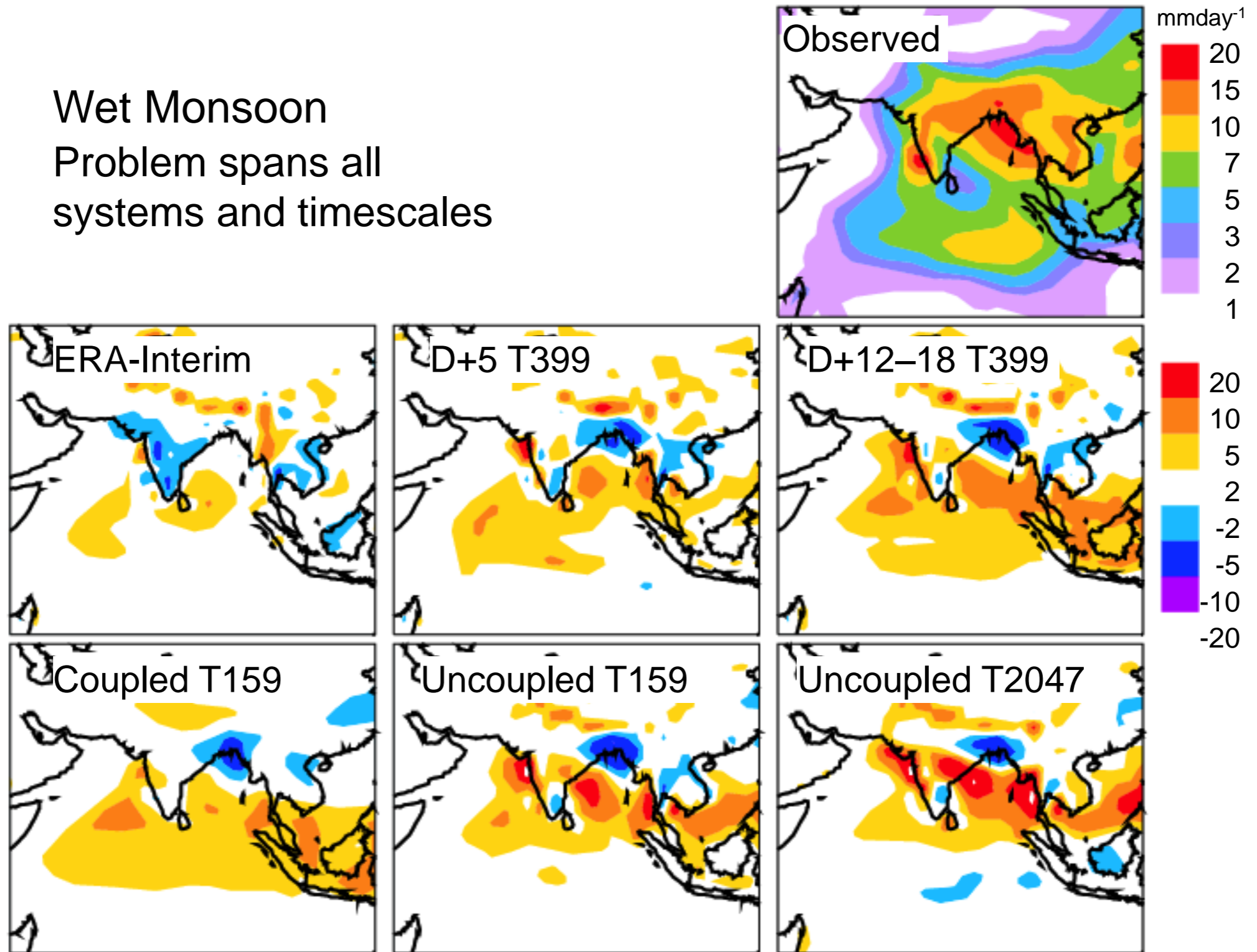
WGNE November 2012

Andy Brown presenting work by Sean Milton, Mark Rodwell and Martin Willett



Mean monsoon precipitation and errors in July

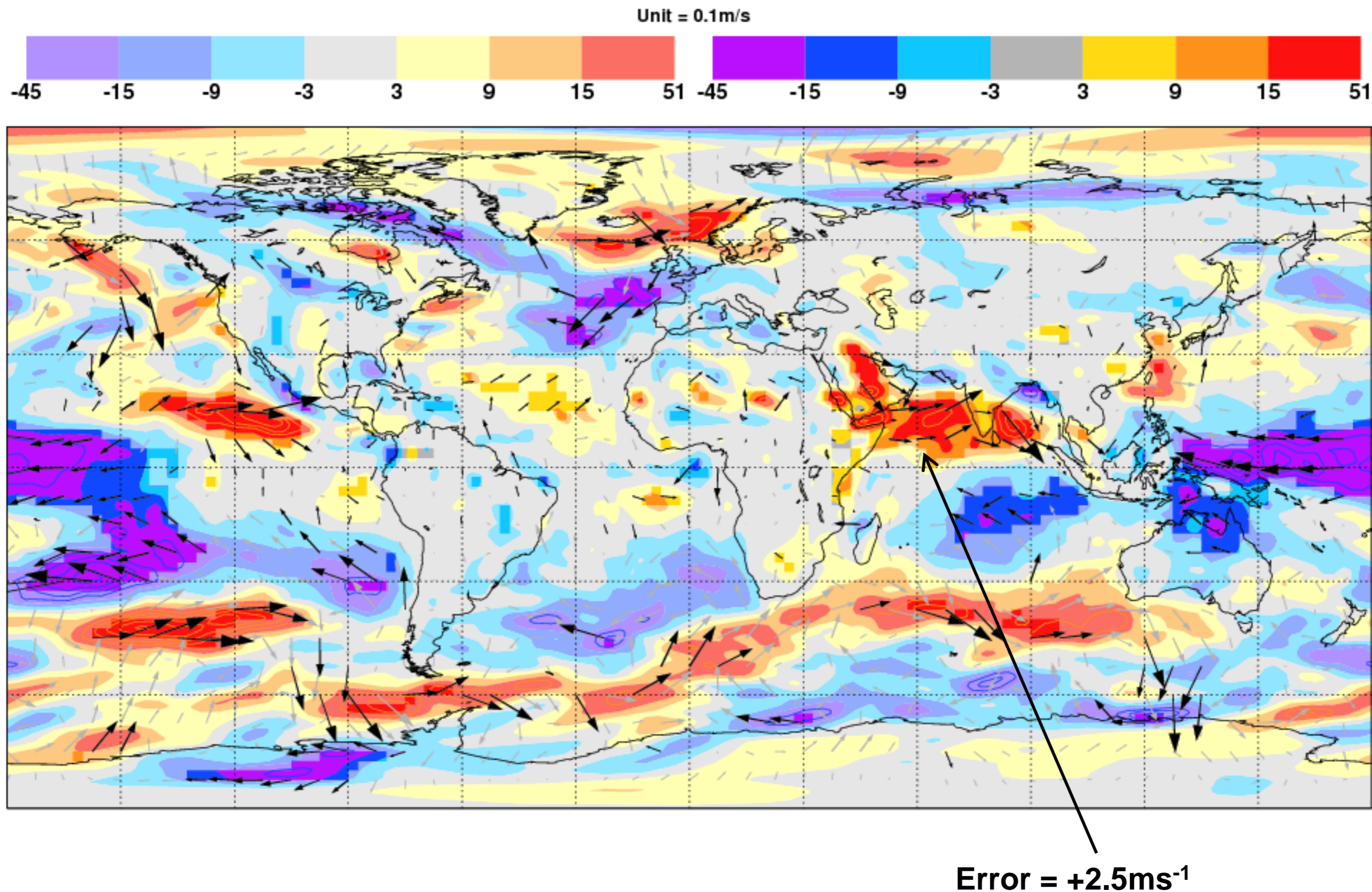
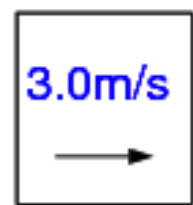
Wet Monsoon
Problem spans all
systems and timescales



GPCP mean precipitation 1991-2007 and anomalies from it. ERA Interim based on 12 hr forecasts using cycle 31R2. Lead-times of 5 and 12-18 days based on hindcasts (5 members once a week) using cycle 35R2 with persisted SST to day 10. Coupled results based on start-date 1 May using cycle 36R1. Uncoupled T159/T2047 -start- 1 November.



Mean forecast error D+10 u_{1000} JJA 2009

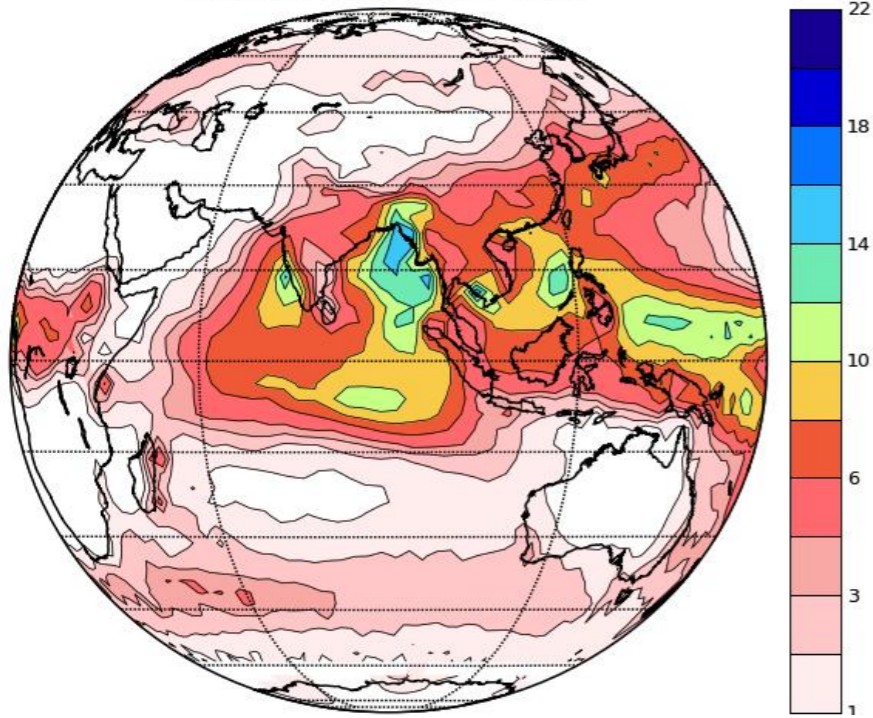




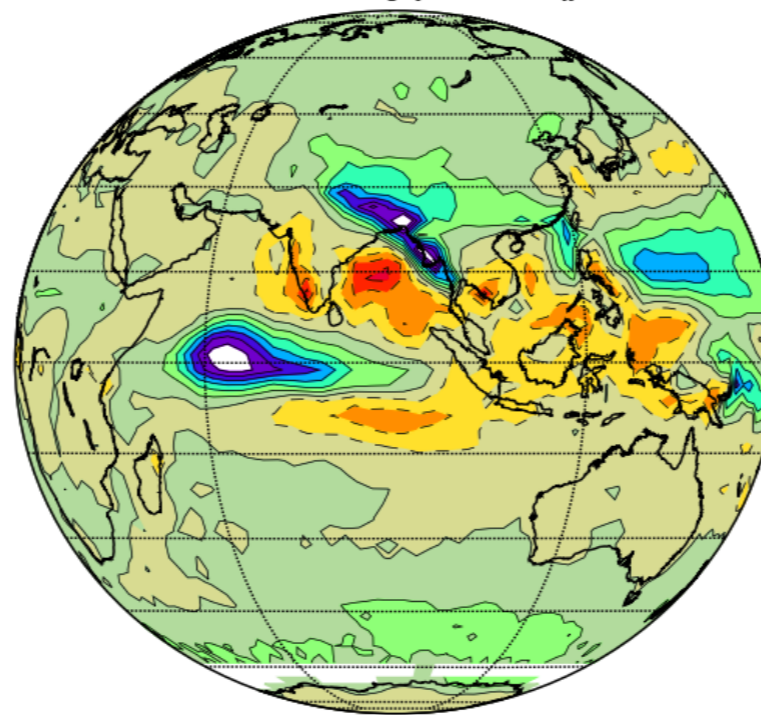
Dry Monsoon

Seamless Monsoon Precipitation & Low Level Flow Errors

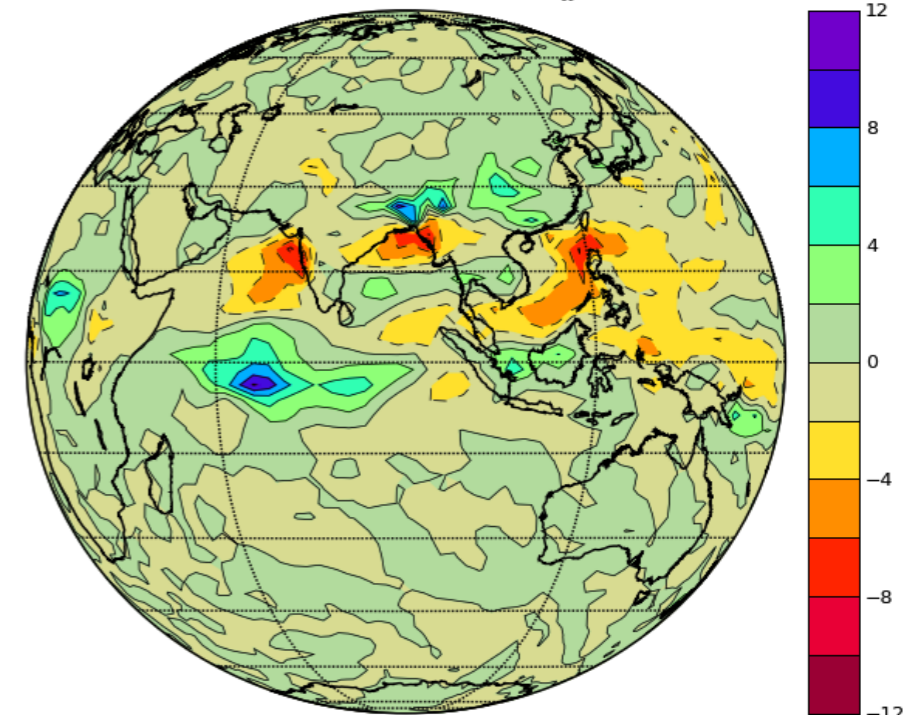
CMAP (Xie & Arkin) JJA 1979-1998



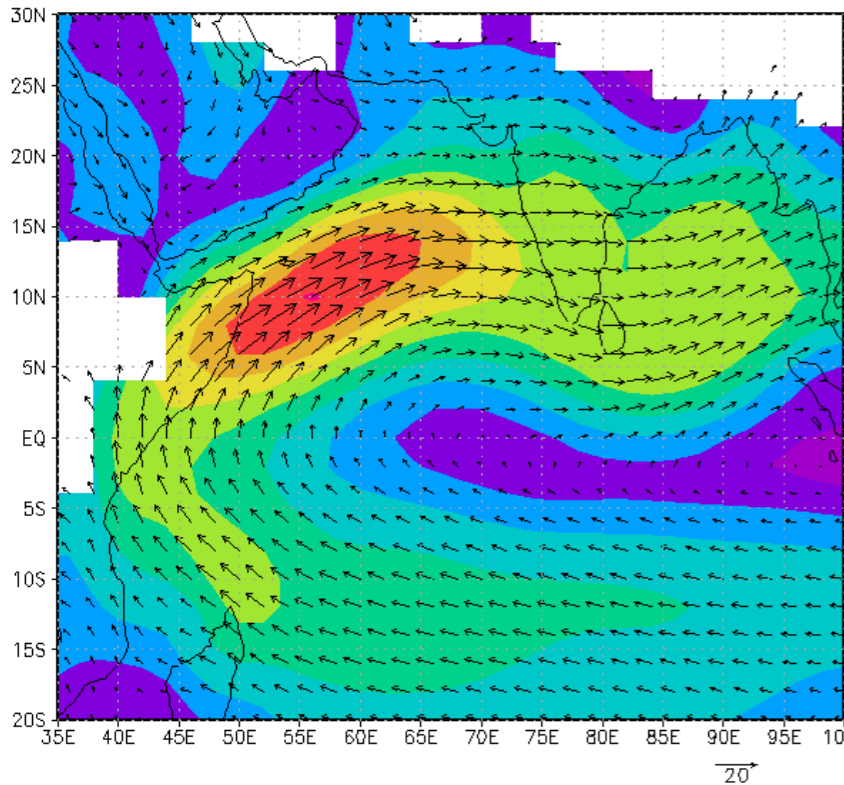
HadGEM2-AO (ageyba) - CMAP JJA



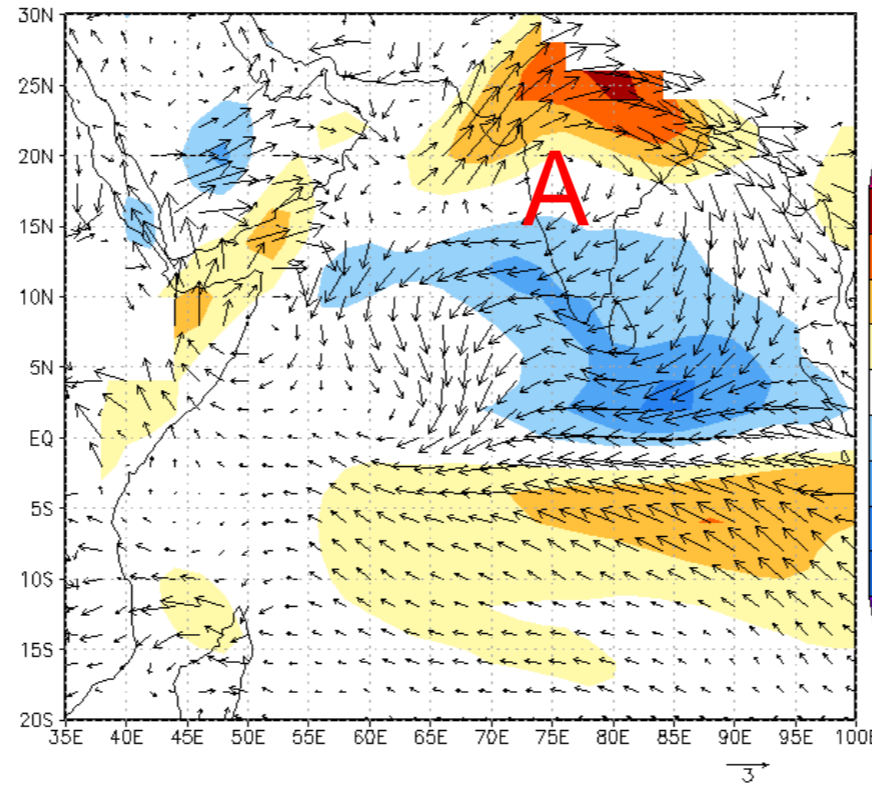
Global NWP (N320) T+120 - T+24 JJA 2008



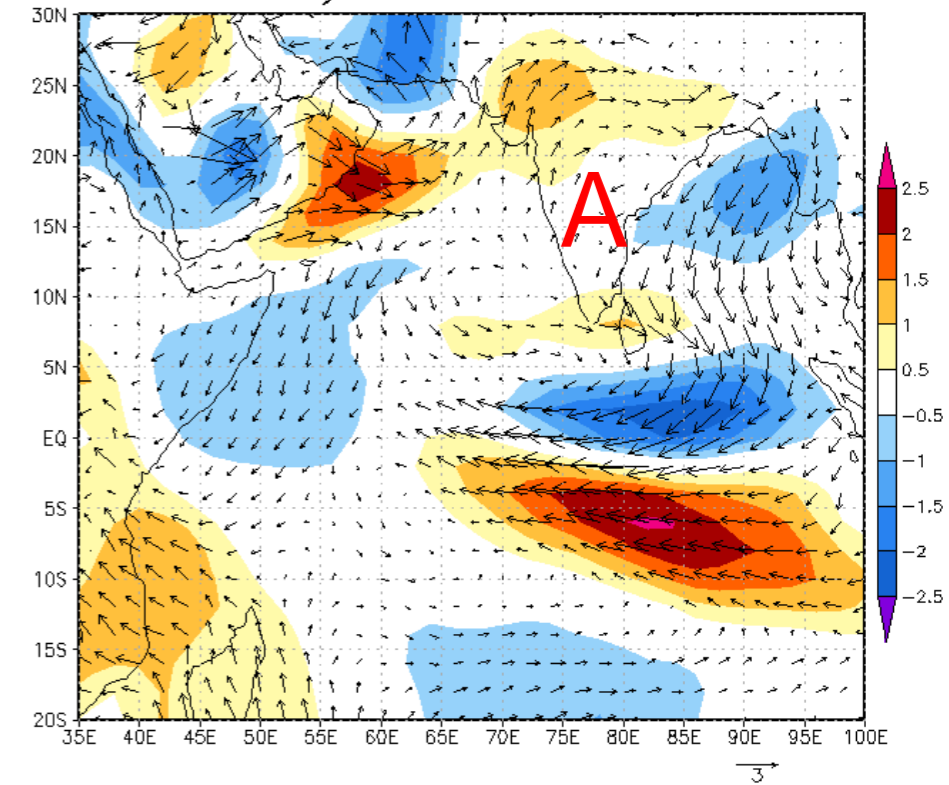
ERA40 JJA 1979-1998 850hPa



HadGEM2 - ERA40 JJA 1979-1998



NWP Day 5 Mean Error JJA 2008





Met Office

Diagnosing Asian Monsoon Errors



- MO “dry” monsoon and EC “wet” monsoons develop within a few forecast days
- EC model boundary layer over Arabian Sea implicated in monsoon problem
 - Which process is at fault?
 - Is it really a model problem?
- How well do we know the ‘truth’ ?

Phase 1 -2012

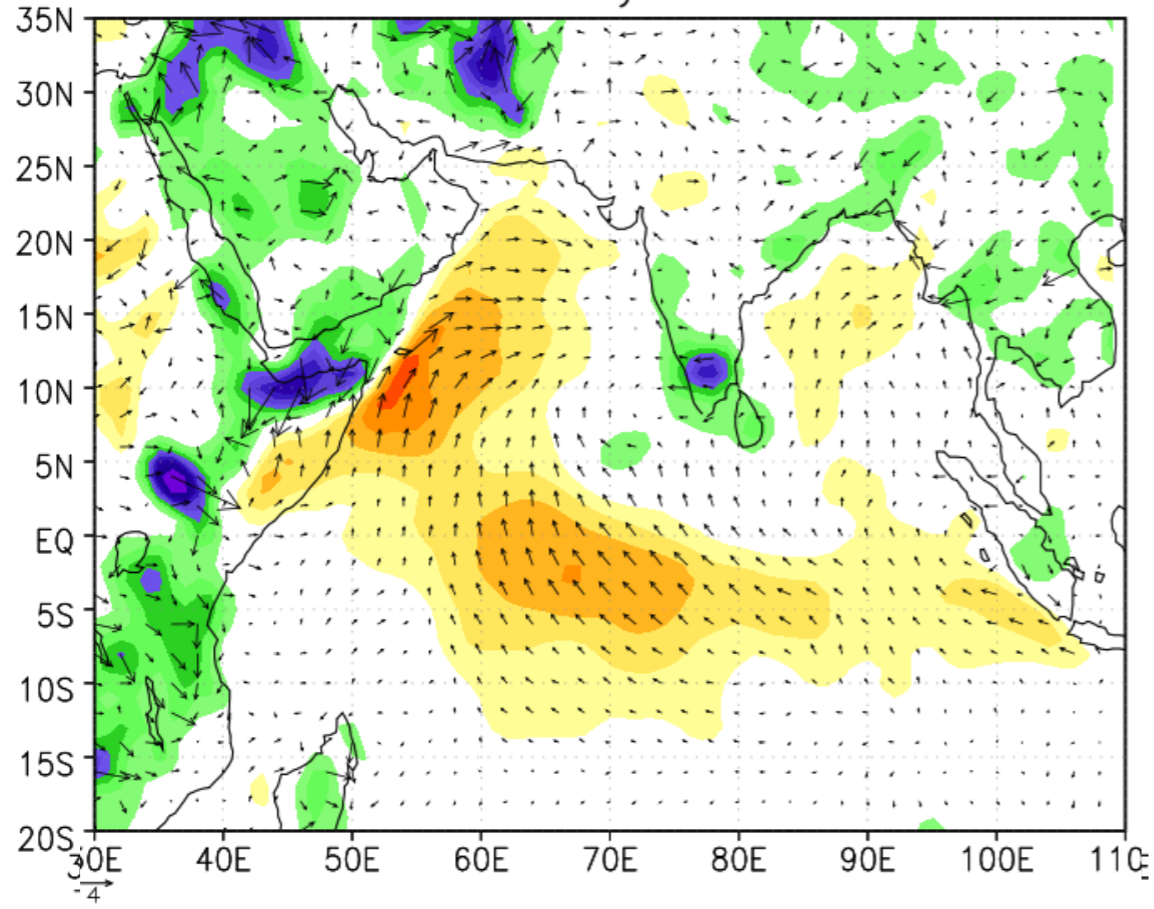
- Compare UKMO and ECMWF analyses and FC (July 2009) – **Done**
- *Interest in comparing forecasts and analyses from other OP NWP centres e.g. TIGGE archive?*

Phase 2 – MO & EC Lead – 2012-13

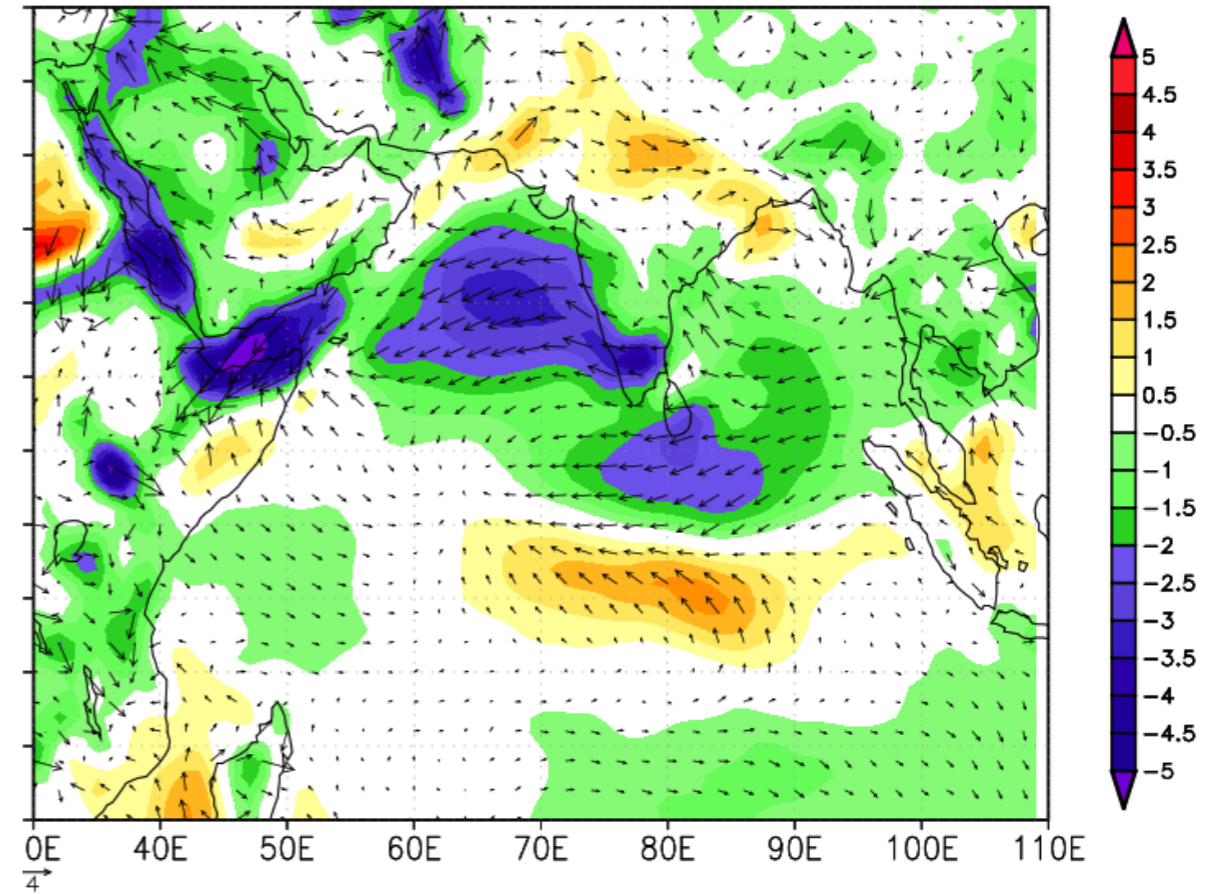
- Compare physical tendencies from short-range forecasts.
- Compare analysis increments from DA systems.

Phase 3 – *Interest in Extending Phase 2 to other NWP centres or academic community?*

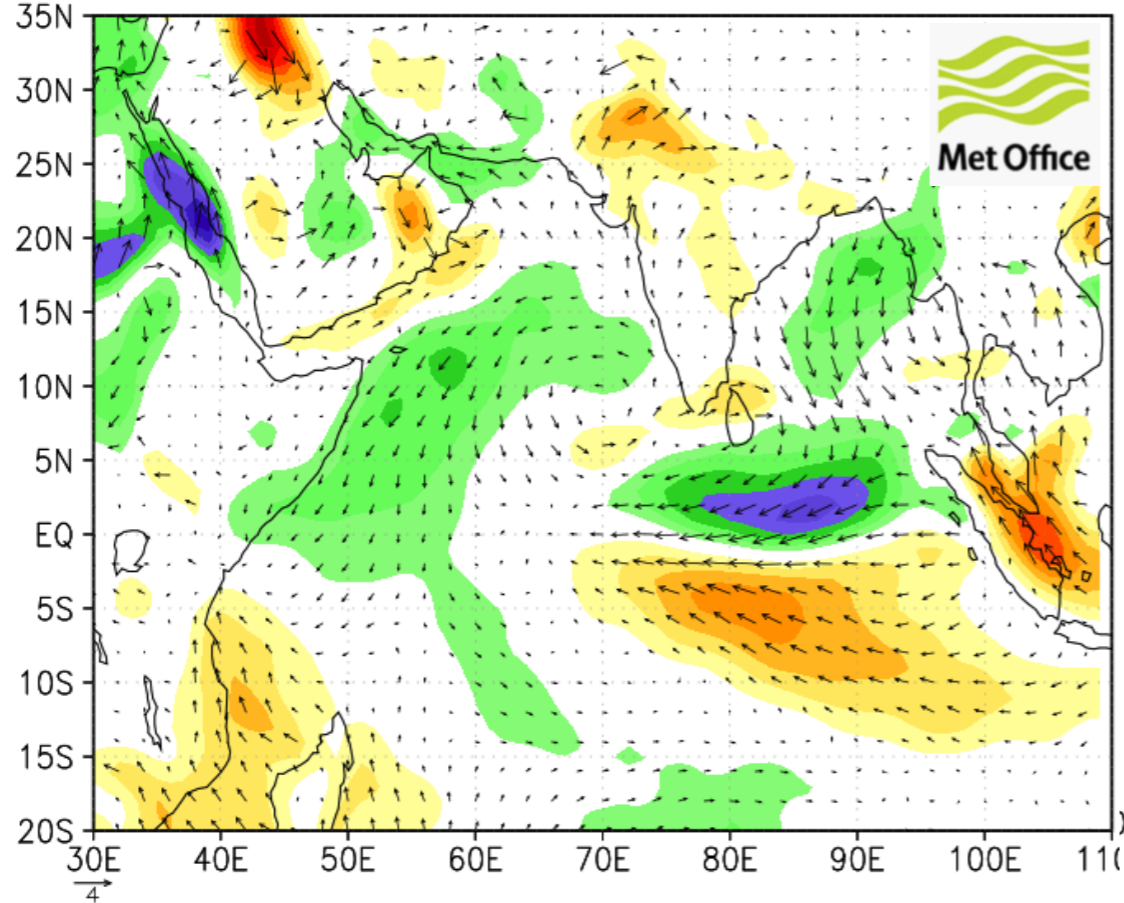
MetOffice-ECMWF Analysis JJA2009 925hPa



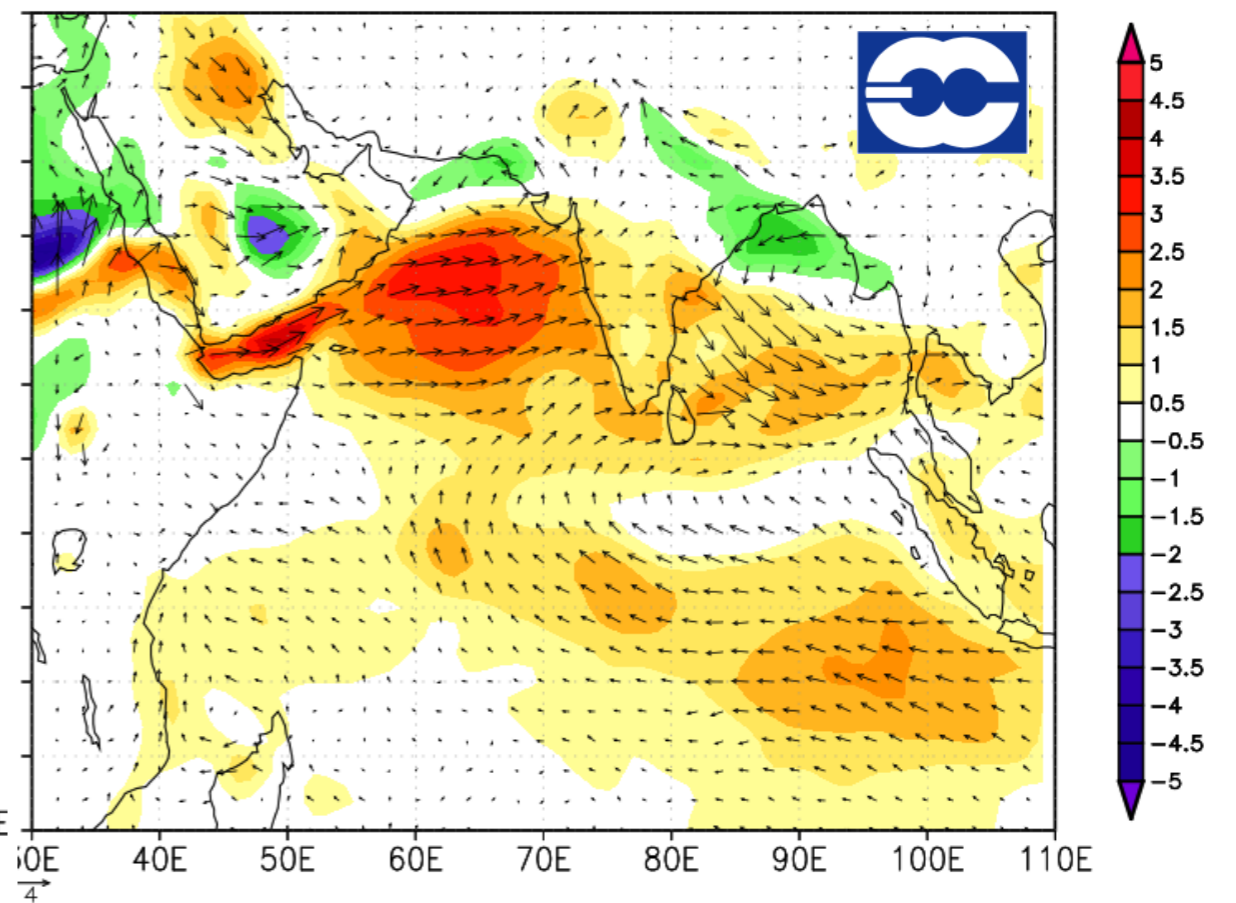
MetOffice-ECMWF Forecast T+120 JJA2009 925hPa



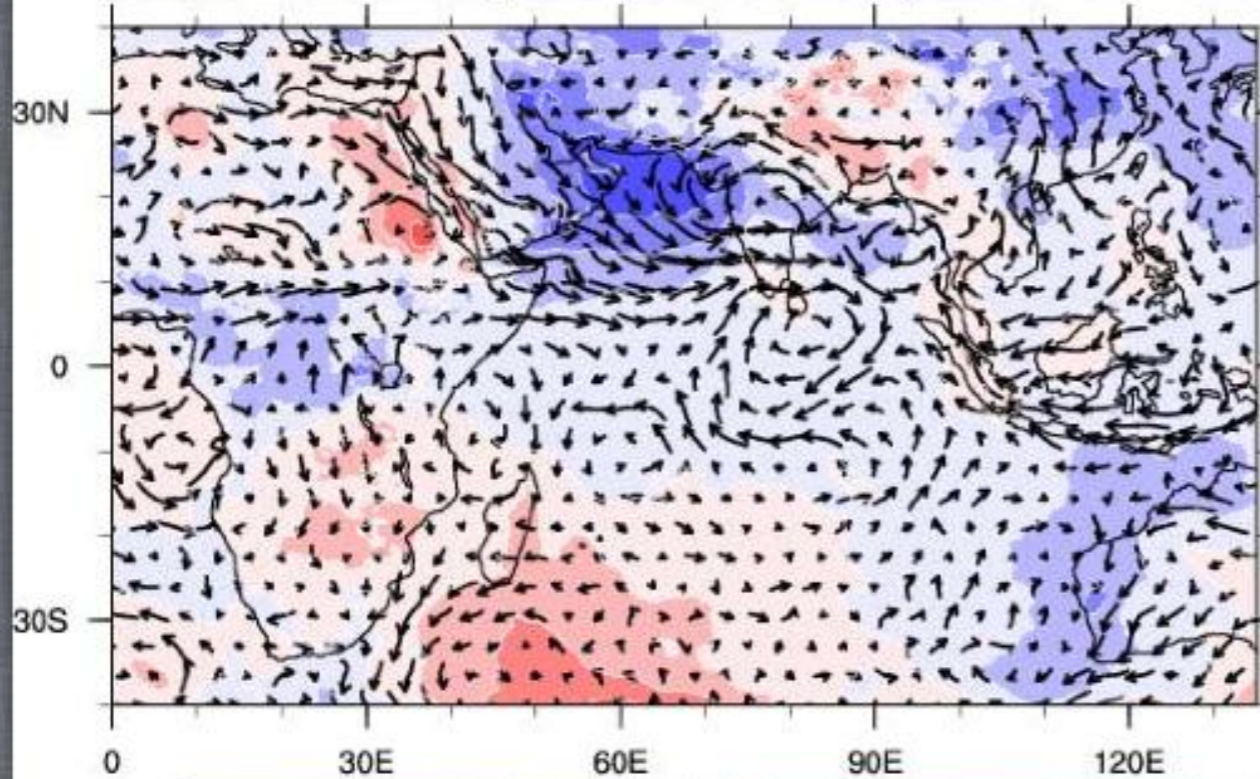
MetOffice Mean Error T+120 JJA2009 925hPa



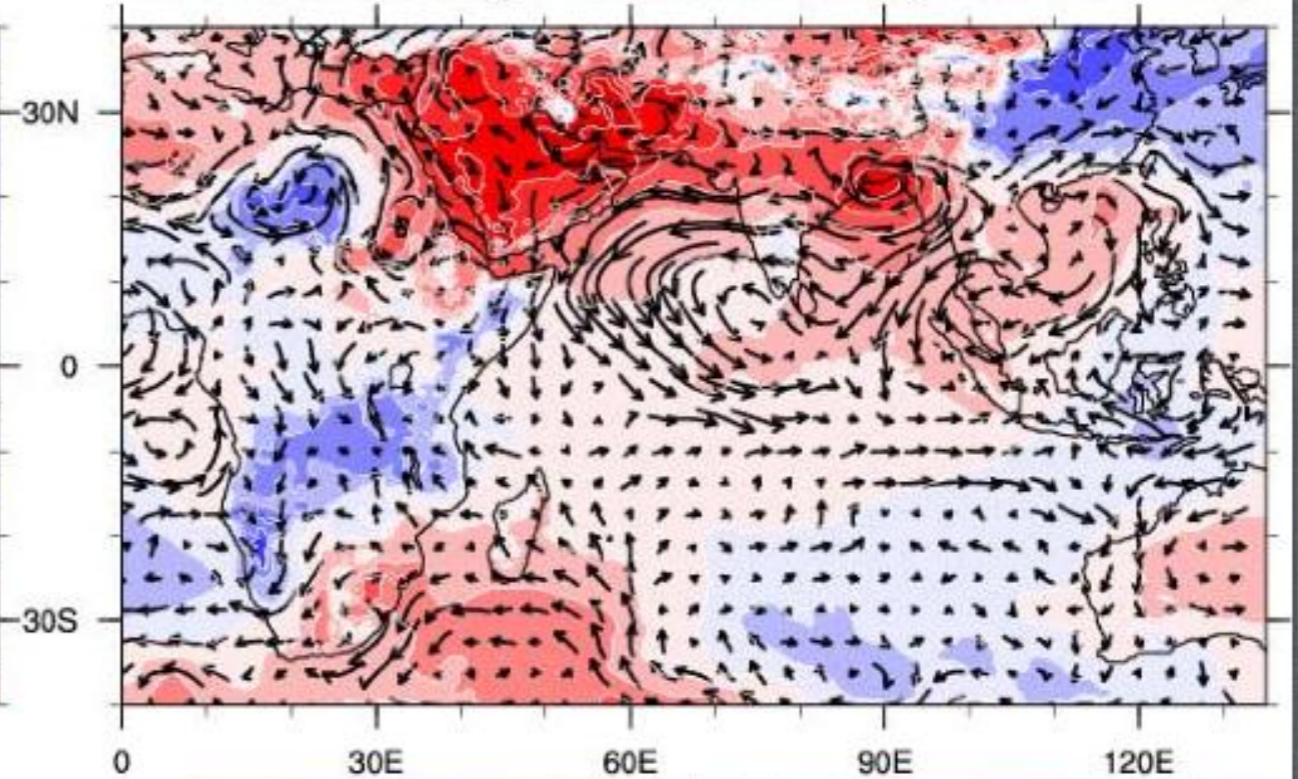
ECMWF Mean Error T+120 JJA2009 925hPa



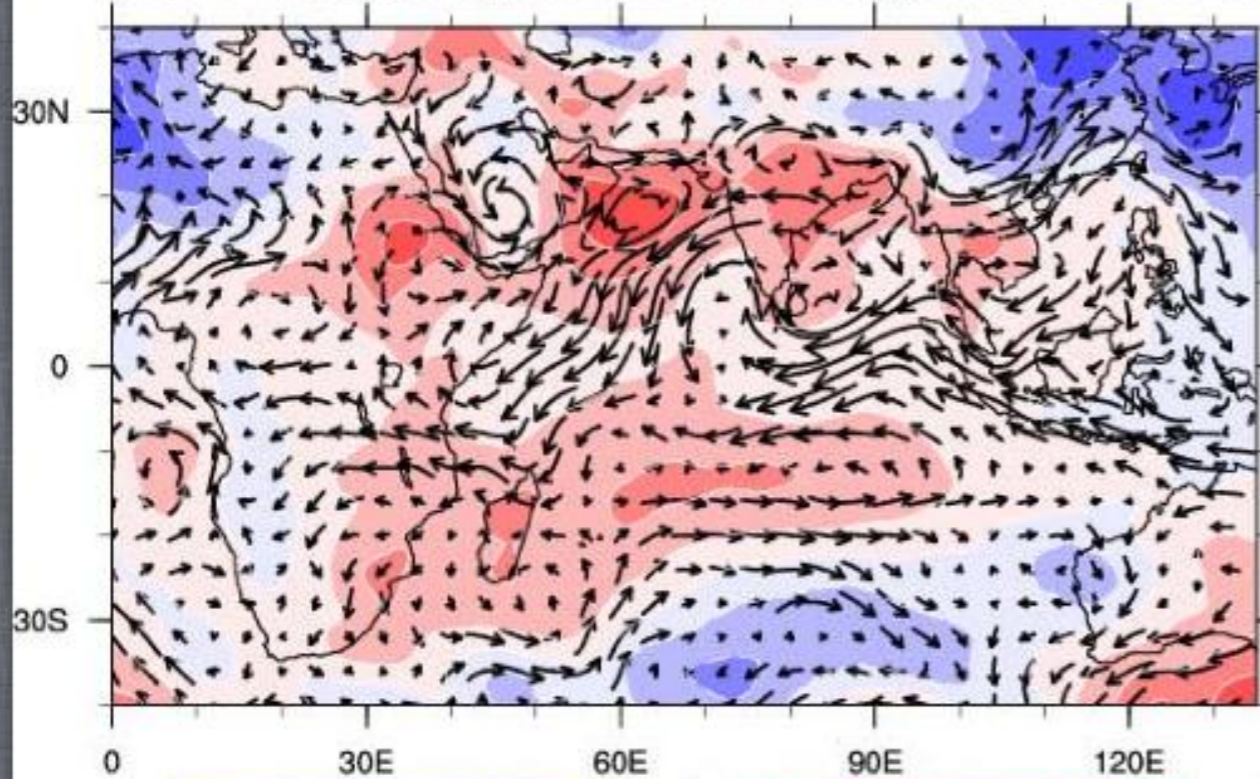
ECM 2008JJA Syserr in 850-wind, MSLP FT=120



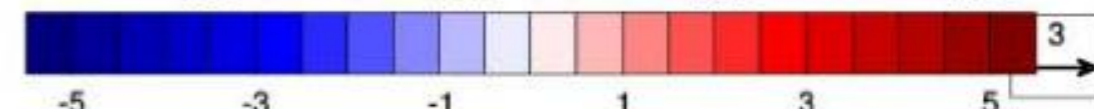
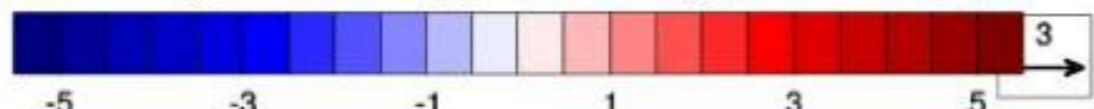
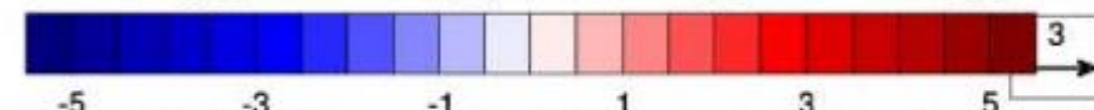
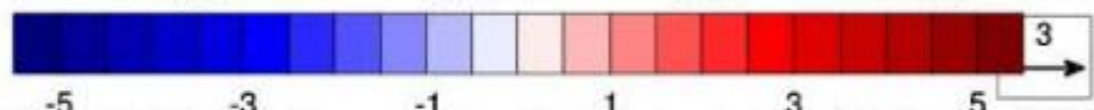
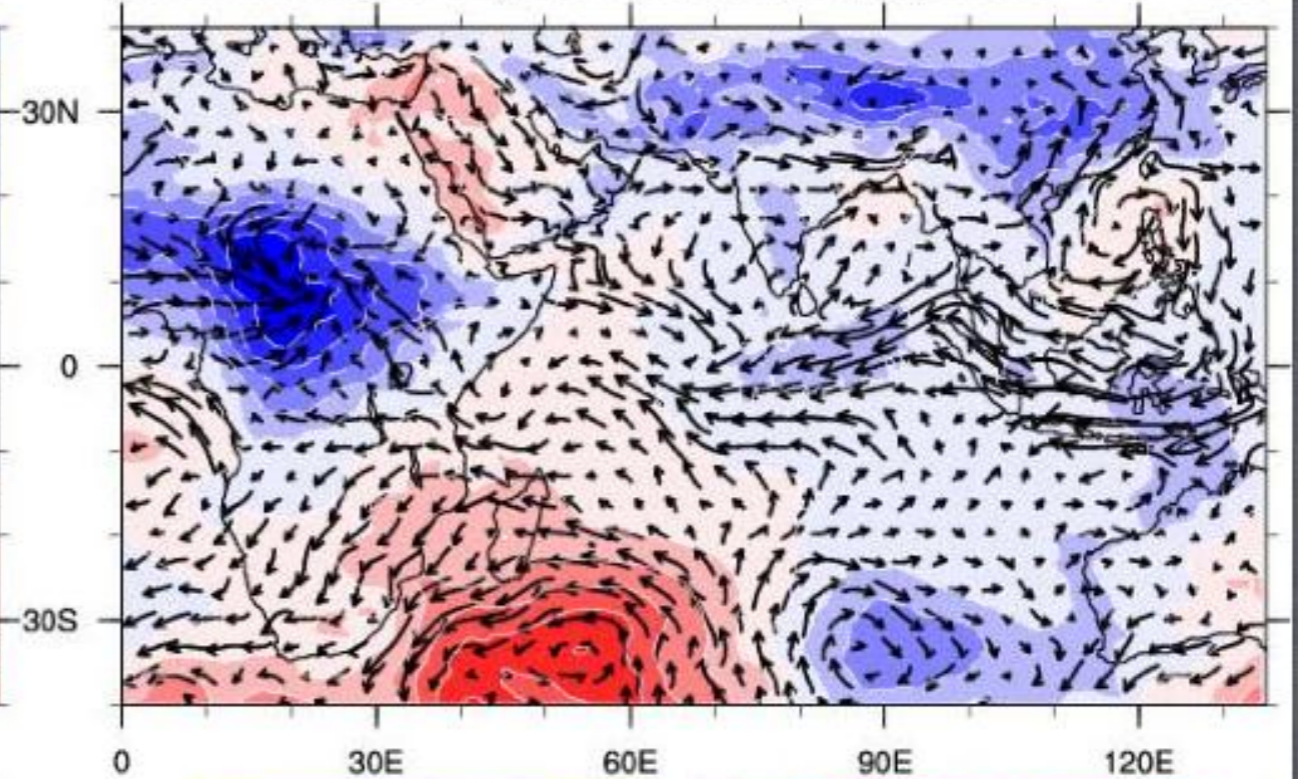
JMA 2008JJA Syserr in 850-wind, MSLP FT=120



NRL 2008JJA Syserr in 850-wind, MSLP FT=120



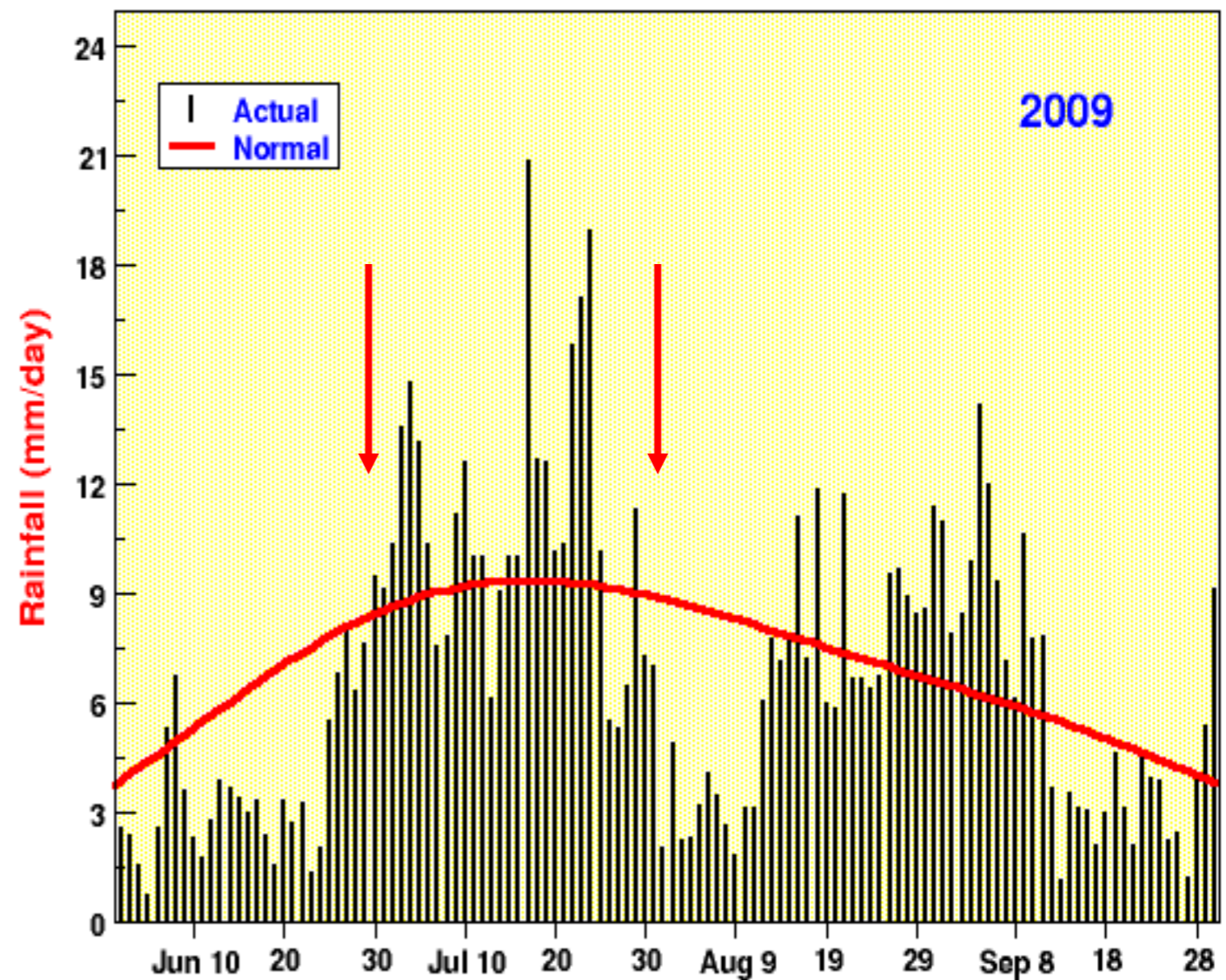
UKM 2008JJA Syserr in 850-wind, MSLP FT=120



Follow “Initial Tendency”
approach of Klinker &
Sardeshmukh (1992), Rodwell
and Palmer (2008)

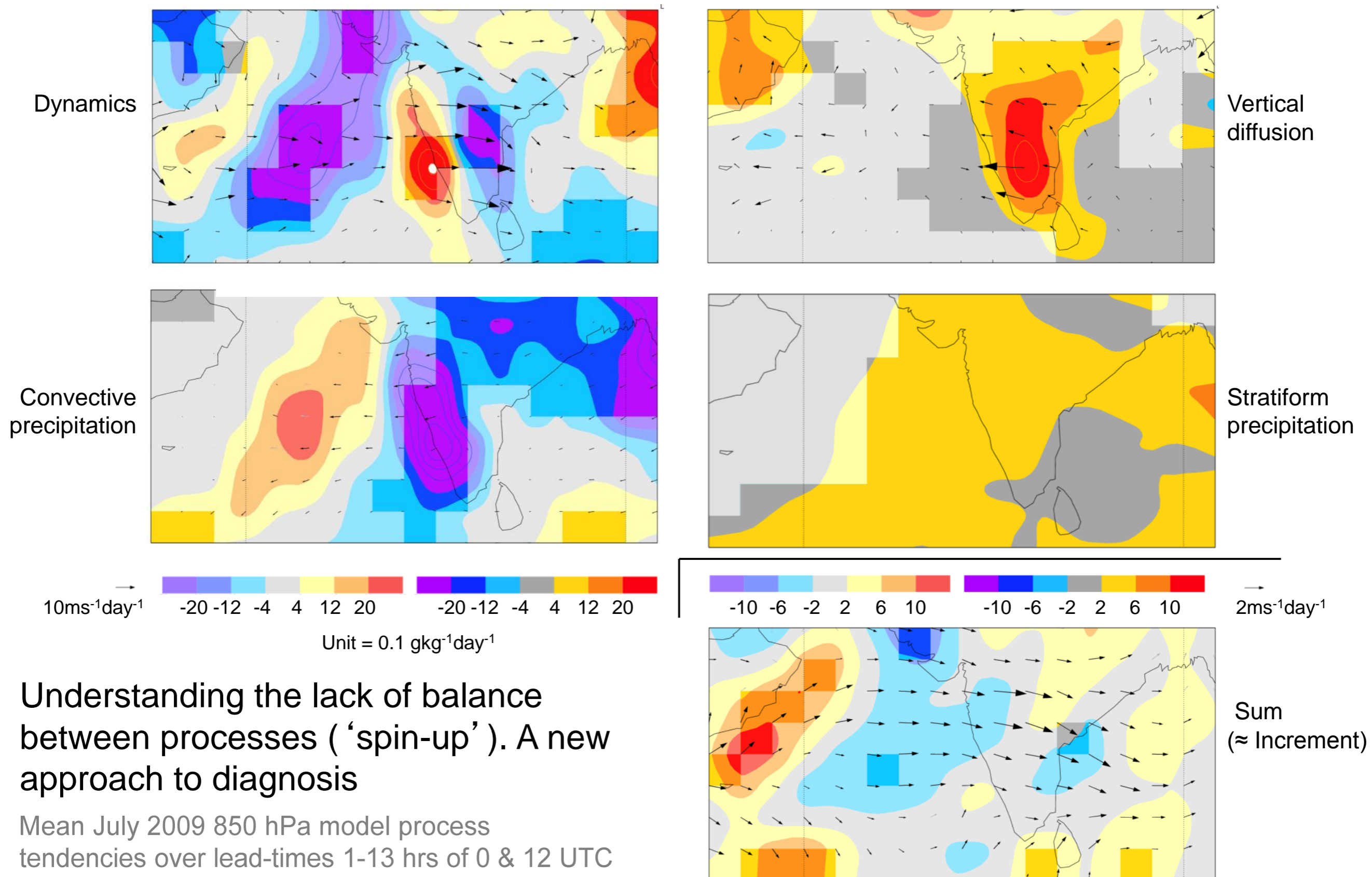
JJA 2009 Monsoon season

- ECMWF YOTC Tendencies
(3hourly T+00-36h)
- Met Office 24 hour average
physics tendencies from OP
NWP model - N320 (40km)





• Effects of modelled processes on wind and humidity



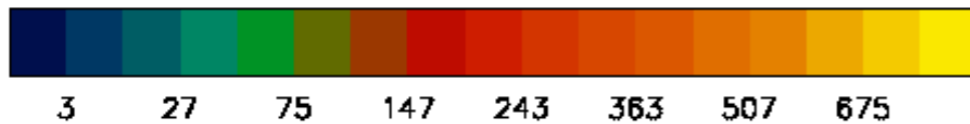
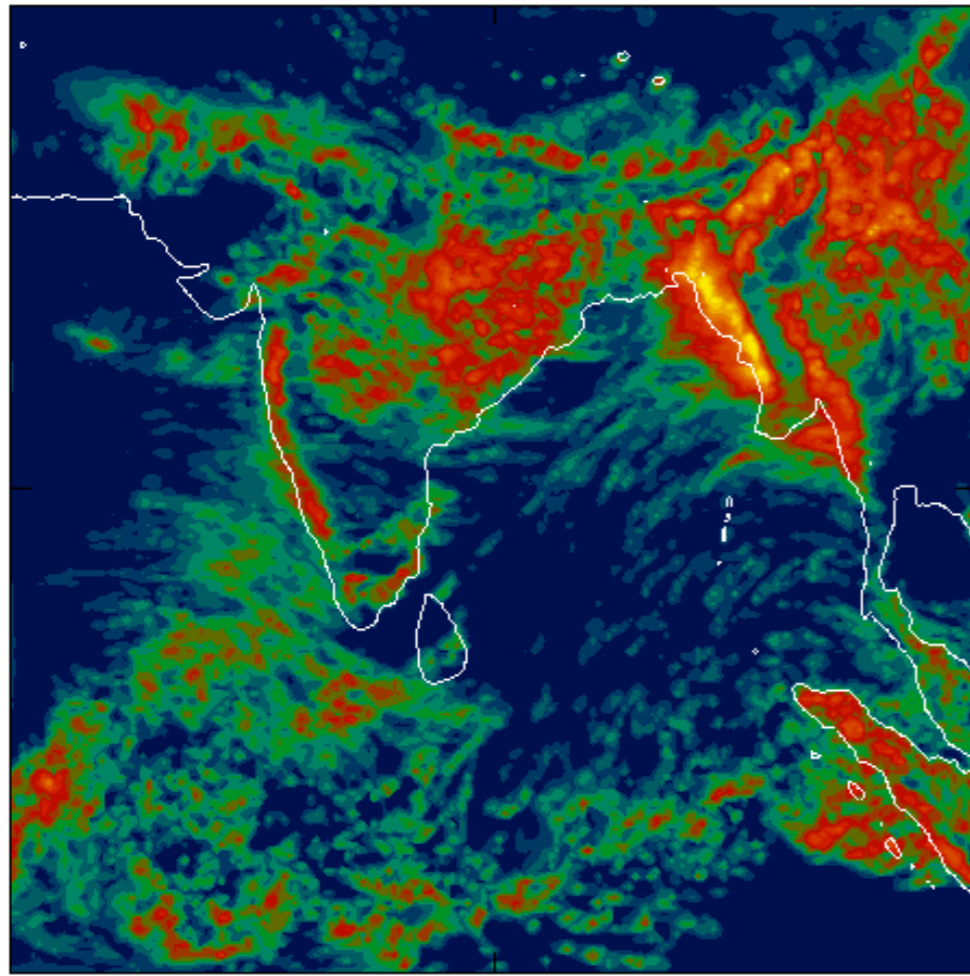
Understanding the lack of balance between processes (‘spin-up’). A new approach to diagnosis

Mean July 2009 850 hPa model process tendencies over lead-times 1-13 hrs of 0 & 12 UTC forecasts. Bold: 5% significance

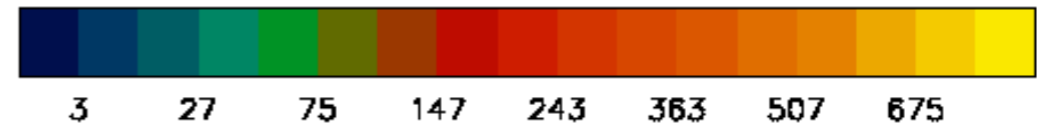
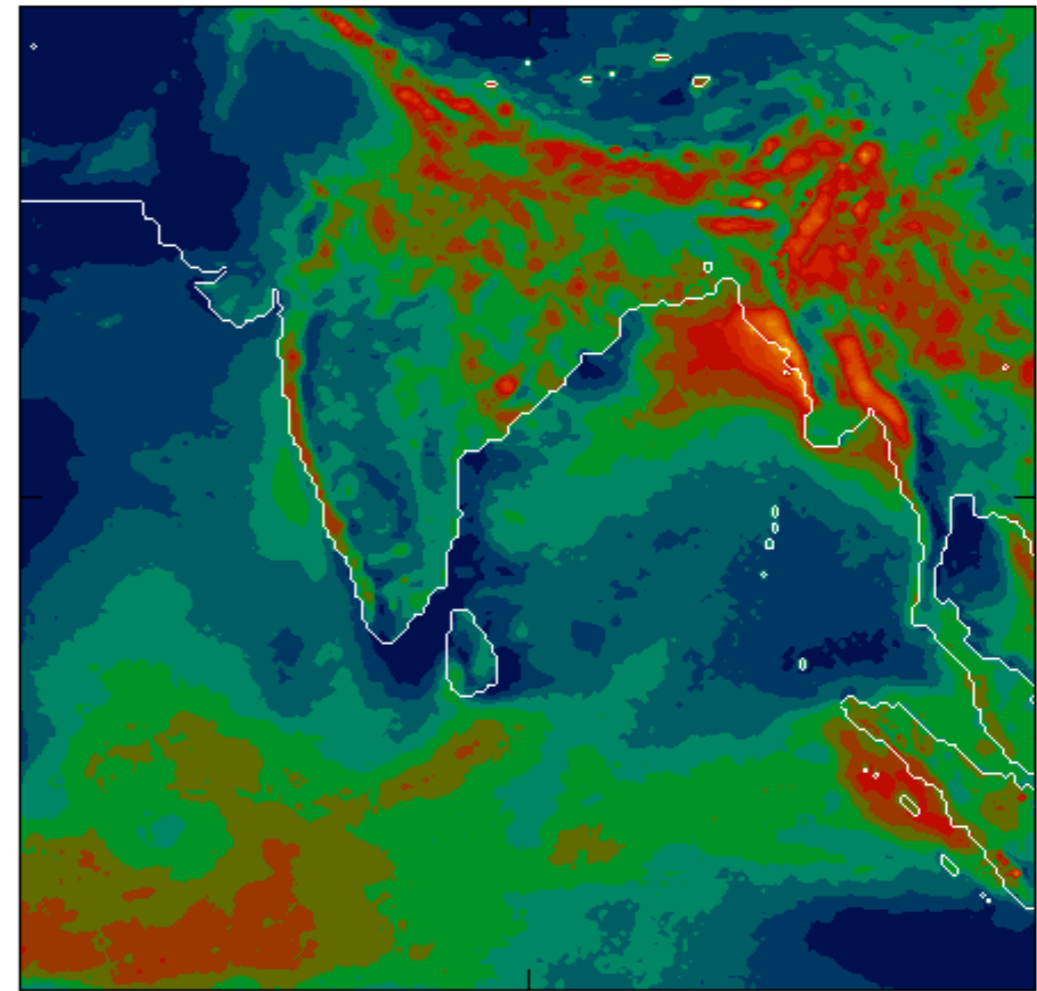


High resolution monsoon simulations

1km Model Accumulated Rainfall (mm) on 24km grid
Area average = 40.66 Land=27.36 Sea=13.30

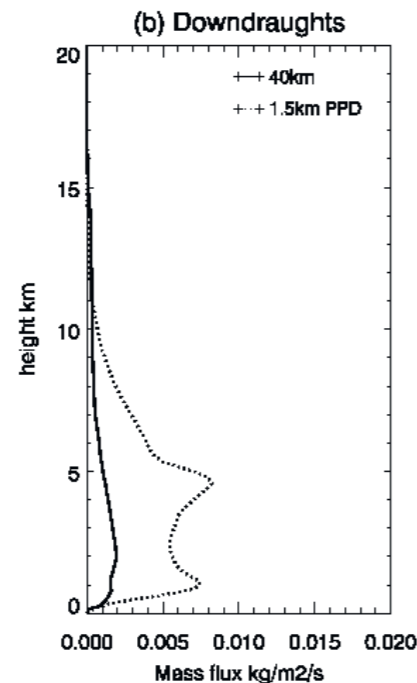
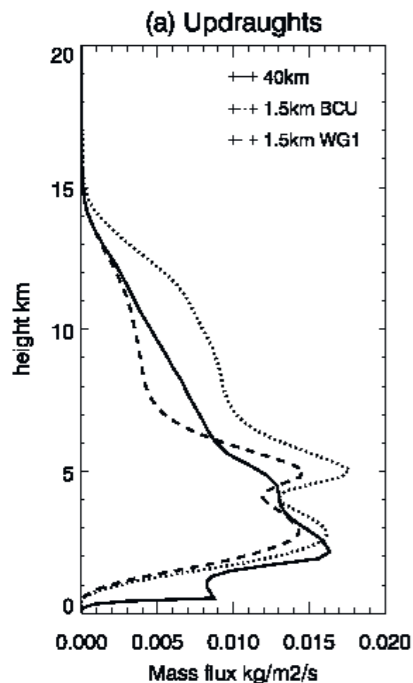
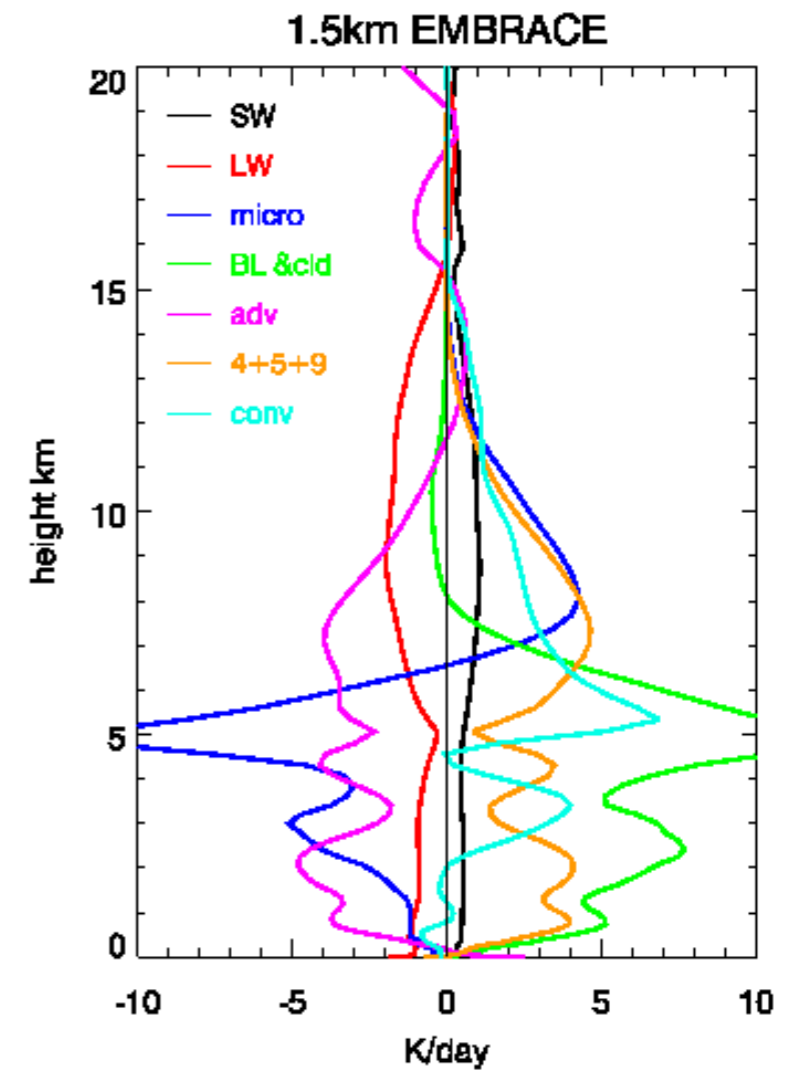
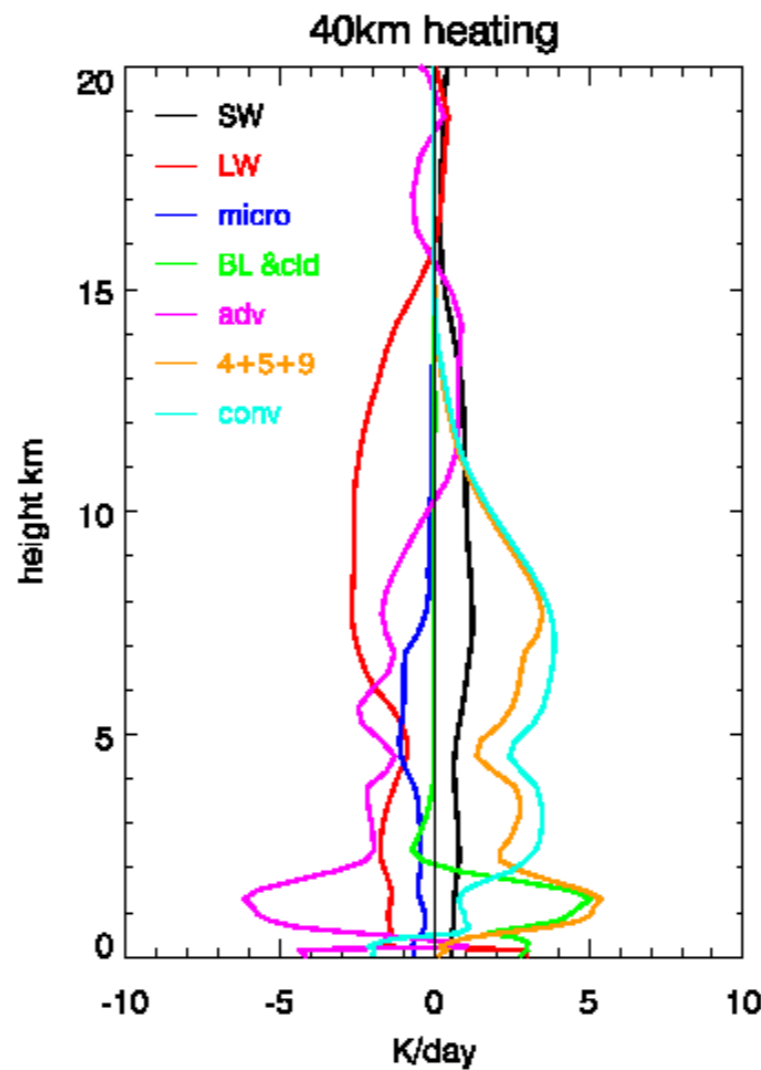
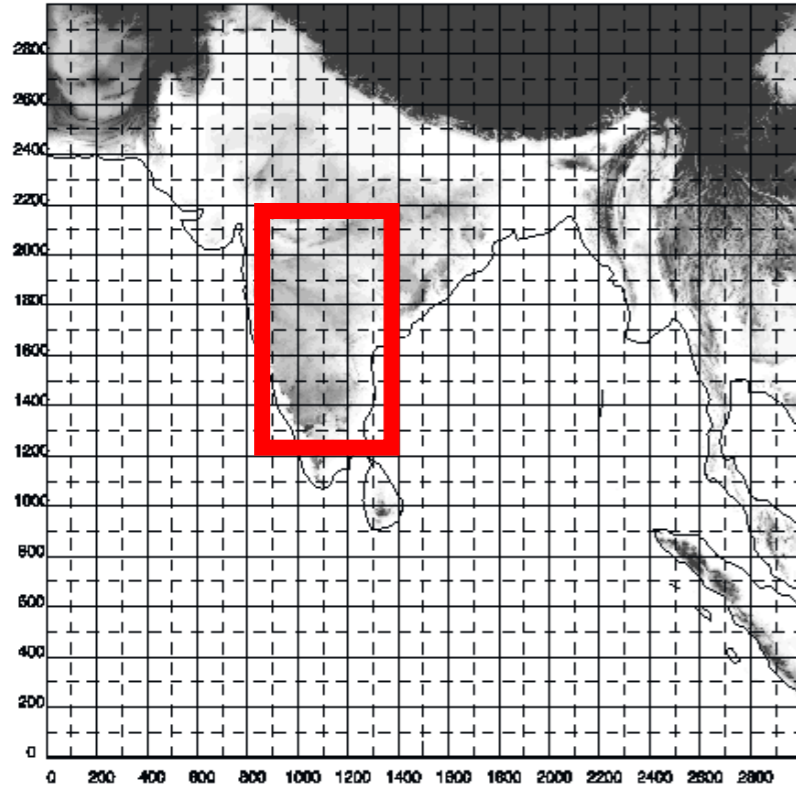


24km Model Accumulated Rainfall (mm)
Area average = 46.43 Land=22.15 Sea=24.28





EMBRACE – 24 hr mean heating increments and mass flux for 17/6/11





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Spares