CORDEX South Asia Climate Model Outputs

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CORDEX South Asia Evaluation Experiments

Evaluation runs driven by ERA-Interim boundary conditions (1989 – 2008)

Institute	Model	Resolution	Status
IITM	WRF3.1.1 (Kain Fritsch Cumulus Scheme)	50 km; Mercator	Finished
IITM	WRF3.1.1 (Betts Miller Janjic Scheme)	50 km; Mercator	Finished
IITM	RegCM3.0 (Grell Cumulus Scheme)	50 km; Mercator	Finished
IITM	RegCM3.0 (Emanuel Cumulus Scheme)	50 km; Mercator	Finished
IITM	RegCM4.1.1 (Mixed Cumulus Scheme: Grell - Land & Emanuel-Ocean)	50 km; Mercator	Finished
IITM	LMDZ Variable Resolution GCM (Emanuel Cumulus Scheme)	35 km zoom over South Asia (Nudged with ERA-Interim at lateral boundaries)	Finished
IITM	LMDZ Variable Resolution GCM (Tiedtke Cumulus Scheme)	35 km zoom over South Asia (Nudged with ERA-Interim at lateral boundaries)	Finished
SMHI, Sweden	RCA4	0.44 degree	Finished
Uni Frankfurt	CCLM	0.44 degree	Finished
MPI Hamburg	REMO	0.44 degree	Finished
IITM / UKMO	HadRM3P	0.44 degree	Ongoing
BCCR, Norway & TERI, India	WRF Tropical Channel Model	50 km	

CORDEX-South Asia: Archival of RCM Outputs

CORDEX Archive Design available in the document:
http://cordex.dmi.dk/joomla/images/CORDEX/cordex_archive_specifications_120126.pdf
for variables to be saved, output format and frequency, file naming and archiving

(a) Three classes of data are defined:

Core, relevant to all communities: monthly and seasonal means;
Tier 1, relevant to most communities: daily surface/selected upper air data;
Tier 2, higher frequency and more complete atmospheric/surface variables.

(b) Core data should be easily accessible as data-files (on standard lat-long grids).

(c) Core and Tier 1 variables will be held in a central archive in easily downloadable quality controlled netCDF files conforming to agreed standards.

(d) Tier 2 variables will be stored locally at Modeling centers and made available on a more informal basis, e.g. bilaterally or with projects.

(e) Experience from existing archives should inform the development of the CORDEX archive with the Danish Meteorological Institute (which holds the ENSEMBLES RCM archive) taking the role as initial host for the first set of experiments. Data can be transferred either by sending a USB disk to the DMI or can be put up for download by the delivering institution.

(f) **All specified Core data must be present**, if the model produces them (e.g., snow depth may be exempt). Some Tier-1 variables may not be defined in the model or may be absent for other reasons.

Core: Monthly and seasonal output

1	2-metre Air Temperature	K
2	Maximum 2-metre Air Temperature (monthly average of daily maximum)	K
3	Minimum 2-metre Air Temperature (monthly average of daily minimum)	K
4	Precipitation	$kg/m^2/s$
5	Mean Sea Level Pressure	Pa
6	2-metre Specific Humidity	1
7	10-metre Wind Speed	m/s
8	Maximum 10-metre Wind Speed (monthly average of daily max)	m/s
9	Total Cloud Cover	%
10	Sunshine Hours (duration when surface solar radiation flux exceeds 120 W/ m^2)	s
11	Surface Downwelling Shortwave Radiation	W/ m^2
12	Surface Downwelling Longwave Radiation	W/ m^2
13	Surface Latent Heat Flux	W/ m^2
14	Surface Sensible Heat Flux	W/ m^2
15	Upwelling Surface Shortwave Radiation	W/ m^2
16	Upwelling Longwave radiation	W/ m^2
17	Surface Evaporation	$kg/ m^2/s$
18	Soil Frozen Water Content	kg/ m^2
19	Surface Runoff	$kg/ m^2/s$
20	Total Runoff	$kg/ m^2/s$
21	Total Soil Moisture Content	kg/ m^2
22	Snow Amount	kg/ m^2
23	Snow Melt	$kg/ m^2/s$
24	TOA Outgoing Longwave Radiation	W/ m^2
25	TOA Incident Shortwave Radiation	W/ m^2
26	TOA Outgoing Shortwave Radiation	W/ m^2
27	Eastward 10-metre Wind Velocity	m/s
28	northward 10-metre Wind Velocity	m/s
29	Zonal (eastward) Wind at 850 hPa	m/s
30	Meridional (northward) Wind at 850 hPa	m/s
31	Temperature at 850 hPa	K
32	Specific Humidity at 850 hPa	1
33	Zonal (eastward) Wind at 500 hPa	m/s
34	Meridional (northward) Wind at 500 hPa	m/s
35	Geopotential Height at 500 hPa	m
36	Temperature at 500 hPa	K
37	Zonal (eastward) Wind at 200 hPa	m/s
38	Meridional (northward) Wind at 200 hPa	m/s
39	Temperature at 200 hPa	K
40	Geopotential at 200 hPa	m
41	Snow Area Fraction	%
42	Snow Depth	m
43	Sea Ice Fraction	%

Tier 1: Daily average output (for some variables minimum, maximum)

1	2-metre Air Temperature	K
2	Maximum 2-metre Air Temperature	K
3	Minimum 2-metre Air Temperature	K
4	Precipitation	kg/m2/s
5	Surface Pressure	Pa
6	Mean Sea Level Pressure	Pa
7	2-metre Specific Humidity	1
8	10-metre Wind Speed	m/s
9	Maximum 10-metre Wind Speed	m/s
10	Total Cloud Cover	%
11	Sunshine Hours	s
12	Surface Downwelling Shortwave Radiation	W/ m^2
13	Surface Downwelling Longwave Radiation	W/ m^2
14	Surface Latent Heat Flux	W/ m^2
15	Surface Sensible Heat Flux	W/ m^2
16	Surface Upwelling Shortwave Radiation	W/ m^2
17	Surface Upwelling Longwave radiation	W/ m^2
18	Surface Evaporation	kg/ m^2/s
19	Potential Evapotranspiration (if available)	kg/ m^2/s
20	Soil Frozen Water Content	kg/ m^2
21	Surface Runoff	kg/ m^2/s
22	Total Runoff	kg/ m^2/s
23	Total Soil Moisture Content	kg/ m^2
24	Snow Amount	kg/ m^2
25	Snow Melt	kg/ m^2/s
26	Maximum 1-hour Precipitation Rate within the 24 hour period	kg/ m^2/s
27	Convective Precipitation	kg/ m^2/s
28	TOA Outgoing Longwave Radiation	W/ m^2
29	TOA Incident Shortwave Radiation	W/ m^2
30	TOA Outgoing Shortwave Radiation	W/ m^2
31	Eastward 10-metre Wind Speed	m/s
32	Northward 10-metre Wind Speed	m/s
33	Maximum 10-metre GUST Wind Speed if available	m/s
34	Surface Downward Eastward Wind Stress	Pa
35	Surface Downward Northward Wind Stress	Pa
36	Surface (skin) Temperature	K
37	Atmospheric Boundary Layer Thickness	m
38	Column Water Vapour	m
39	Column Condensed (liquid+ice) Water Content	m
40	Column Ice Water Content	m
41	Zonal (eastward) Wind at 850 hPa	m/s
42	Meridional (northward) Wind at 850 hPa	m/s
43	Temperature at 850 hPa	K
44	Specific Humidity at 850 hPa	1
45	Zonal (eastward) wind at 500 hPa	m/s
46	Meridional (northward) wind at 500 hPa	m/s
47	Geopotential height at 500 hPa	m
48	Temperature at 500 hPa	K
49	Zonal (eastward) wind at 200 hPa	m/s
50	Meridional (northward) wind at 200 hPa	m/s
51	Temperature at 200 hPa	K
52	Geopotential at 200 hPa	m
53[6]	High Clouds (p<440 hPa) if available	%
54	Medium Clouds (680 hPa < p < 440 hPa) if available	%
55	Low Clouds (p>680 hPa) if available	%
56	Snow Area Fraction	%
57	Snow depth	m
58	Sea Ice Fraction	%
59	Snowfall Flux	kg/ m^2/s

Tier 2: Sub-daily output

Group 1: 3-hourly fields.
Fields 1-17 of the Tier 1 variables excepting 2, 3 and 9, plus 27.

State variables should be instantaneous, fluxes and cloud cover as averages.

Instantaneous = 1,5,6,7,8 and averages=4,10,12-17,27, and sum=11.

Group 2: 6-hourly fields.
Fields 18-55 of the Tier 1 variables excepting 26, 27 and 33.

Instantaneous = 20, 23, 24, 31, 32, 36-52, 56-57

Averages = 18, 19, 21, 22, 25, 28-30, 34, 35, 53-55

CORDEX South Asia Model Data Archival & Management

using the Integrated Rule-Oriented Data System (iRODS)

- ESG is a data distribution system that integrates supercomputers with large scale data and analysis servers located at various national labs and research centers throughout the world
- It is the portal through which the PCMDI, BADC etc. are distributing data for the upcoming IPCC AR5
- In the long term CCCR, IITM is planning to participate as an ESG data node for publishing CORDEX, IITM-ESM contributions to AR5
- However ESG does not provide the data archive management capabilities we need as a data hosting center
- We need to manage the intermediate data products and processes relating to the pre-publishing tasks of IPCC research
- We also need independent access to IPCC products for other uses
- In CCCR, we have installed the basic iRODS server and web browser, and is implementing rules for secure data management and sharing (Thanks to Sandip Ingle)

  - Phase I: on LAN- internal data management and data sharing
  - Phase II: on Internet- In house CORDEX data sharing
  - Phase III: on Data grid- CORDEX data publishing

- The NASA Center for Climate Simulation (NCCS) finds iRODS useful in managing large-scale collection of observational data, managing model output data in a cloud computing context, and managing NCCS-hosted data products that are published through ESG

Schnase et. al NCCS DMS

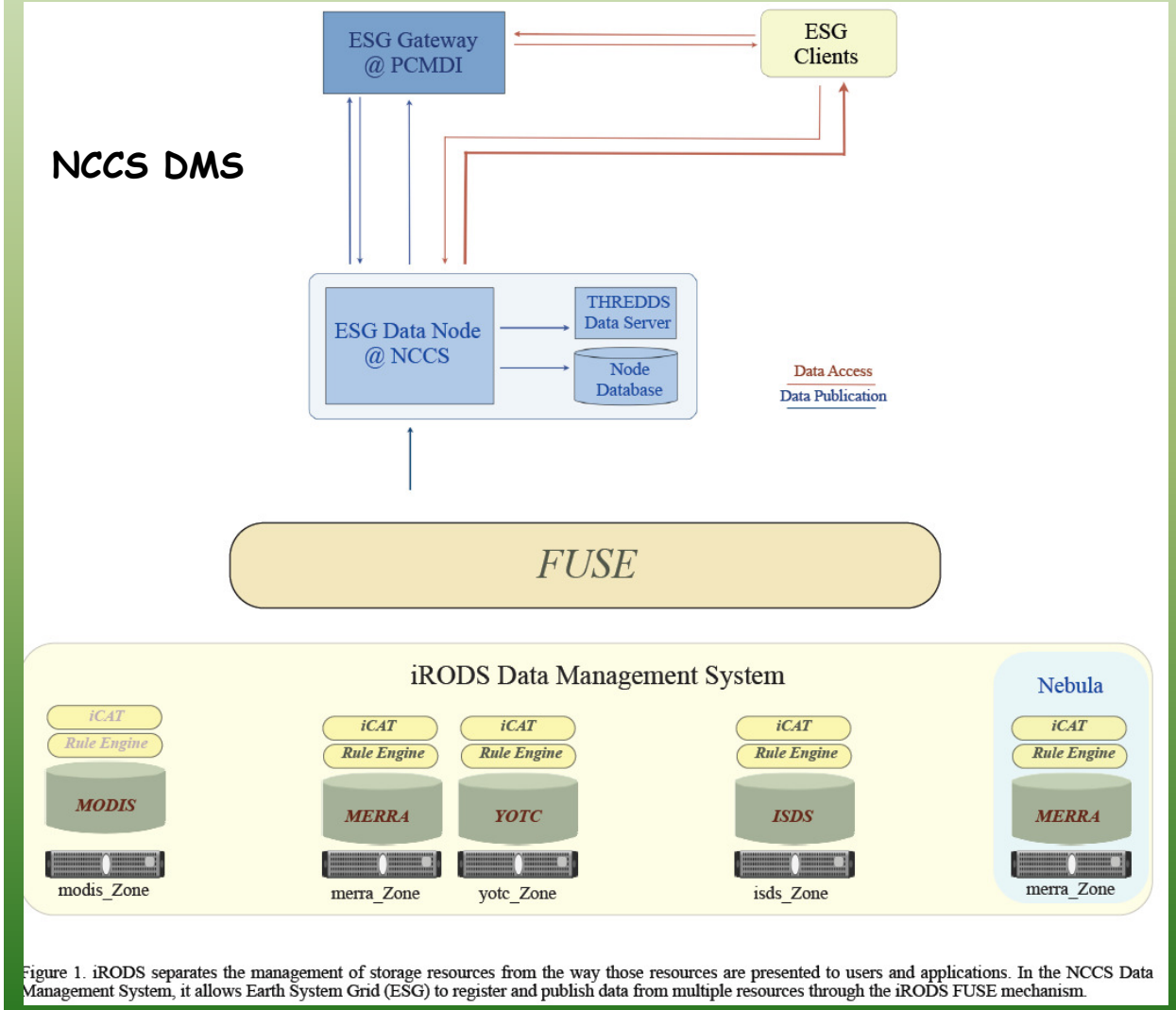

Figure 1. iRODS separates the management of storage resources from the way those resources are presented to users and applications. In the NCCS Data Management System, it allows Earth System Grid (ESG) to register and publish data from multiple resources through the iRODS FUSE mechanism.

- Filesystem in Userspace (FUSE) interface
- merra_Zone and yotc_Zone, manage simulation data products
- modis_Zone and isds_Zone, manage observational data products

Proposed Plan

To establish a CORDEX-Sasia_Zone in CCCR to manage RCM data products that can be published through IITM ESG

JPL Regional Climate Model Evaluation System (RCMES) for CORDEX South Asia

(in JPL, NASA) **(in CCCR,IITM)**

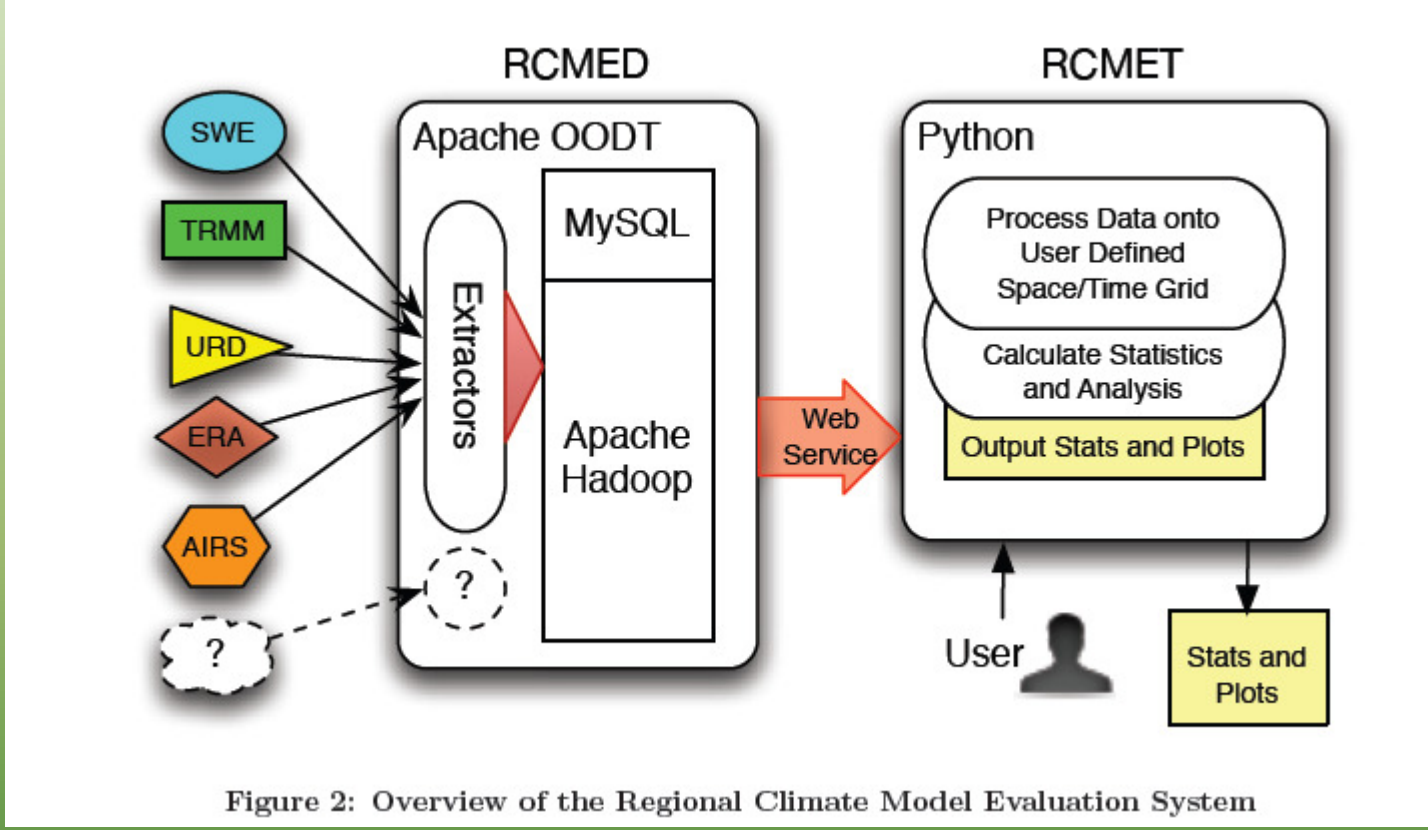

Figure 2: Overview of the Regional Climate Model Evaluation System

Hart et al., 2011: SECLOUD

- RCMETv1 with GUI packed in Virtual Box installed in CCCR, IITM
- RCMETv2 with added features under development in JPL (Kim et al.)
- Exploring the use of RCMES as an online evaluation tool integrated in the CCCR Climate data portal (Thanks to RCMES team in NASA JPL)

Thanks for your attention

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