Surface Flux Intercomparision: WGNE34 Phase 1 Update

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Motivation: Biases in surface fluxes were identified as an important and widespread issue during the WGNE Workshop on Systematic Errors 2017 and the PAN-WRCP and WGNE32 meeting in Exeter in October 2017. Recommendations from WGNE WSE-2017 included setting up a group to look at surface flux errors, and considering a cross weather-climate group looking at initial tendency analysis of common biases.

Progress:

- With feedback from WGNE members, CLIVAR/GSOP, GEWEX, and GLASS protocol was finalized and sent out to WCRP modeling group members in Feb 2019.
- Data collected and archived at Météo-France (original deadline of 1 June pushed to 1 July).
- 10 centers have participated (CMA, CPTEC, DWD, ECCC, ECMWF, MF, NCEP, NRL, RU, UKMO)

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1. Grid

All fields must be provided on a regular latitude – longitude grid at a grid spacing of 0.25° x 0.25°. CF compliant NetCDF format (http://cfconventions.org/) is recommended, but GRIB format is also accepted. Phase II may consider regional models

2. Initial time and forecast ranges

The aim is to compare surface fluxes in operational forecasts. Operational forecasts must start at 00 UTC.

The forecasts should be provided for July 2018 and January 2019 with the current operational model version. It is also possible to provide additional data from an experimental suite.

For accumulated values (where the accumulation starts at the 0-h forecast) and for instantaneous values (which are valid at the given forecast range) the following forecast ranges have to be provided: +6h, +12h, +18h, +24h and every 6 hours to +120h

Each forecast range has to be in a separate file.

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3. List of constant fields (to be provided only for the 0-h forecast range)

Name	Variable	Unit
ORO	Model orography (geometric height above msl)	m
LSM	Land sea mask (1: land, 0: water/sea ice)	Fraction

4. List of instantaneous variables

Name	Variable	Unit
SEAICE	Sea ice concentration (1: sea ice, 0: open water)	Fraction
T_Skin	Sea surface temperature or land surface temperature	K
W_SNOW	Water equivalent of accumulated snow depth	kg/m^2
U_10M	Zonal wind component at 10 m above surface	m/s
V_10M	Meridional wind component at 10 m above surface	m/s
T_2M	Temperature at 2 m above surface	K
Q_2M	Specific humidity at 2 m above surface	kg/kg
TD_2M	Dew point temperature at 2m above surface	K

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3. List of accumulated Variables (from the start of the forecast)

Name	Variable	Unit
LS_PREC	Cumulative large-scale precipitation (total) flux at surface	kg/m^2
CO_PREC	Cumulative convective precipitation (total) flux at surface	kg/m^2
LS_SNOW	Cumulative large-scale snowfall (solid) flux at surface if available	kg/m^2
CO_SNOW	Cumulative convective snowfall (solid) flux at surface if available	kg/m^2
EVAP	Cumulative total evaporation flux at surface	kg/m^2
SO_DOWN	Cumulative downward short-wave radiation flux at surface	$W\ m^{-2}\ s$
SO_NET	Cumulative net short-wave radiation flux at surface	$W\ m^{-2}\ s$
SO_NET_CS	Cumulative net short-wave clear sky radiation flux at surface if available	$W\ m^{-2}\ s$
TH_DOWN	Cumulative downward long-wave radiation flux at the surface	$W\ m^{-2}\ s$
TH_NET	Cumulative net long-wave radiation flux at the surface	$W\ m^{-2}\ s$
TH_NET_CS	Cumulative net long-wave clear sky radiation flux at the surface if available	$W\ m^{-2}\ s$
SH	Cumulative surface sensible heat flux	$W\ m^{-2}\ s$
LH	Cumulative surface latent heat flux	$W\ m^{-2}\ s$
U_MOM_FL	Zonal cumulative momentum flux (sum of all parameterized fluxes)	kg/m/s
V_MOM_FL	Meridional cumulative momentum flux (sum of all parameterized fluxes)	kg/m/s

Database

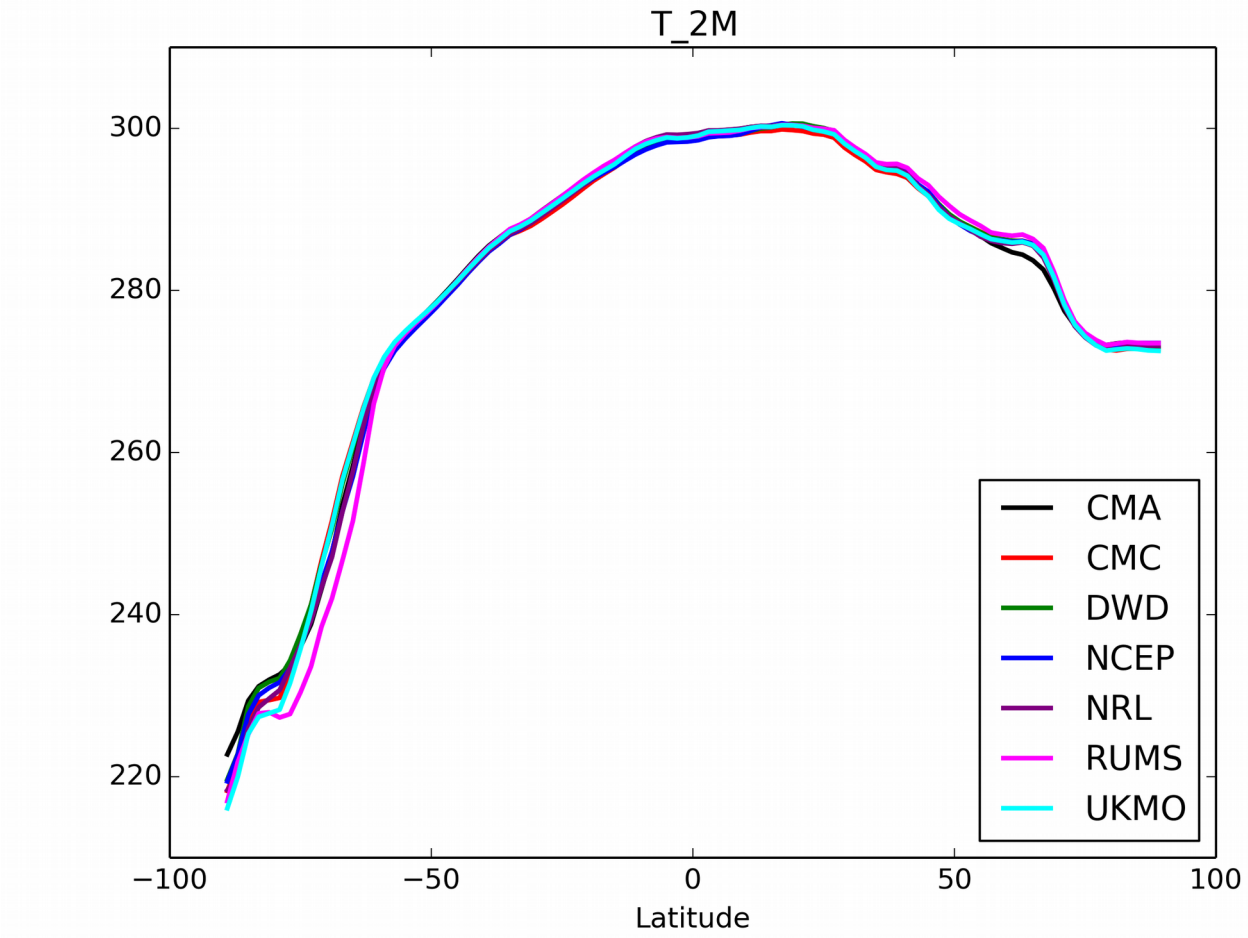
	Contact person	Data format	Comments
CMA	Jian Sun	NetCDF	No 'LS_SNOW', 'CO_SNOW', 'TH_NET_CS', 'U_MOM_FL', 'V_MOM_FL' EVAP, SH, LH opposite sign
CPTEC	Ariane Frassoni		Dataset to be provided
DWD	Günther Zängl	NetCDF	
ECCC	Ron McTaggart-Cowan	NetCDF	2 datasets provided (oper + new) U_MOM_FL, V_MOM_FL opposite sign
ECMWF	Souhail Boussetta	GRIB	
MF	François Bouyssel	GRIB	
NCEP	Weizhong Zheng	NetCDF	No 'LS_SNOW', 'CO_SNOW', 'SO_NET_CS', 'TH_NET_CS'
NRL	Carolyn Reynolds	NetCDF	No 'SO_NET_CS', 'TH_NET_CS' EVAP, SH, LH opposite sign
RU	Mikhail Tolstykh	NetCDF	No 'EVAP', 'SO_NET_CS', 'TH_NET_CS'
UKMO	Paul Earnshaw	NetCDF	No 'SO_NET', 'TH_NET', 'SO_NET_CS', 'TH_NET_CS', 'U_MOM_FL', 'V_MOM_FL' U10, V10 inverse

Name of the server: ftp.umr-cnrm.fr
Each participant was given a personal login/passwd to connect and upload its data in a specific directory.
Volume : about 1.5 Tb
Possibility to open the possibility to download data, if decided

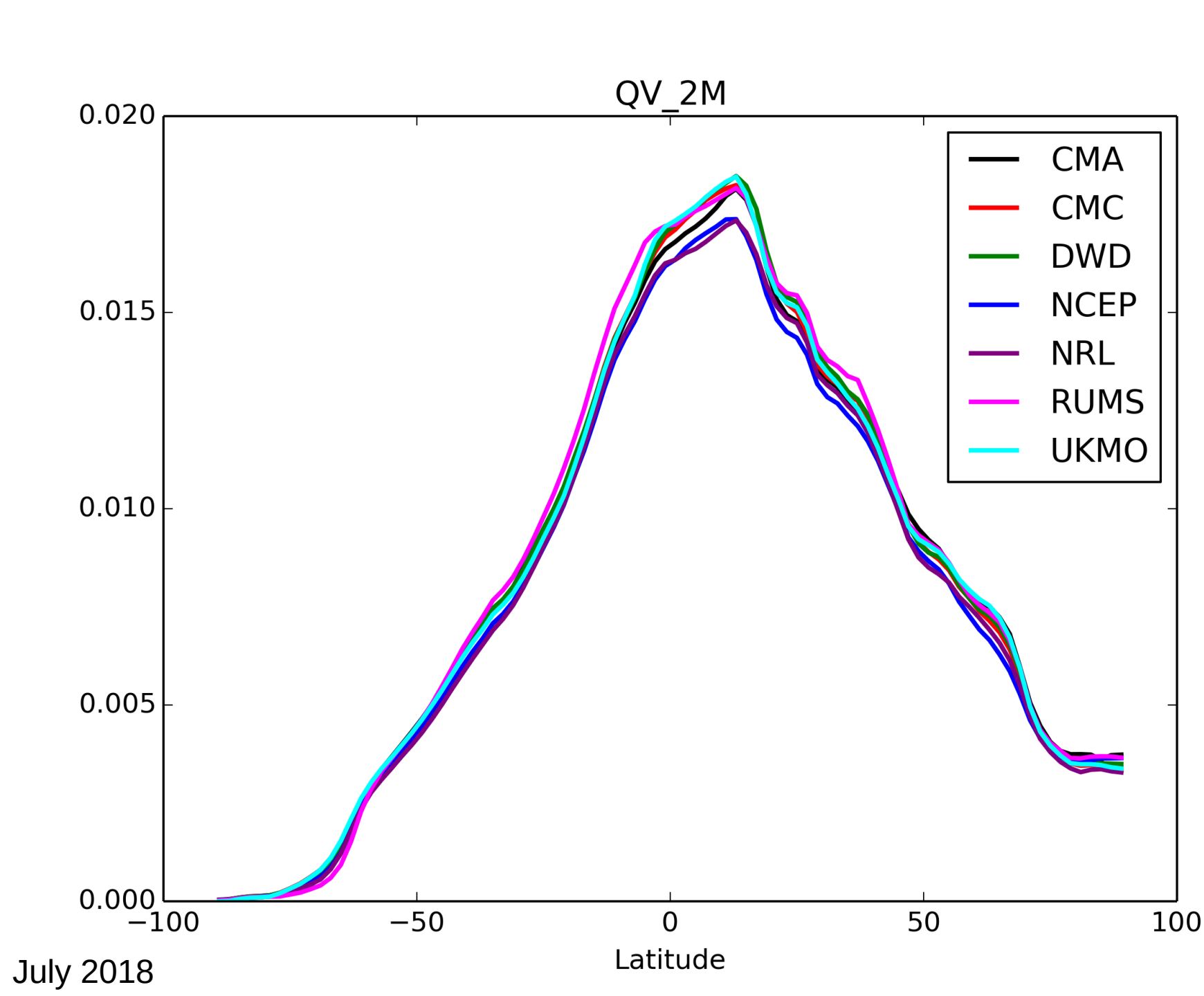
Database

Quality control and homogenization on-going on datasets:
- Bugs correction, Sign convention, Instantaneous instead of accumulated fluxes, etc.

Still some issues to be solved:
- TH_DOWN & TH_NET (CMA)
- LH & SH (RUMS)
- LS_PREC (NCEP)



July 2018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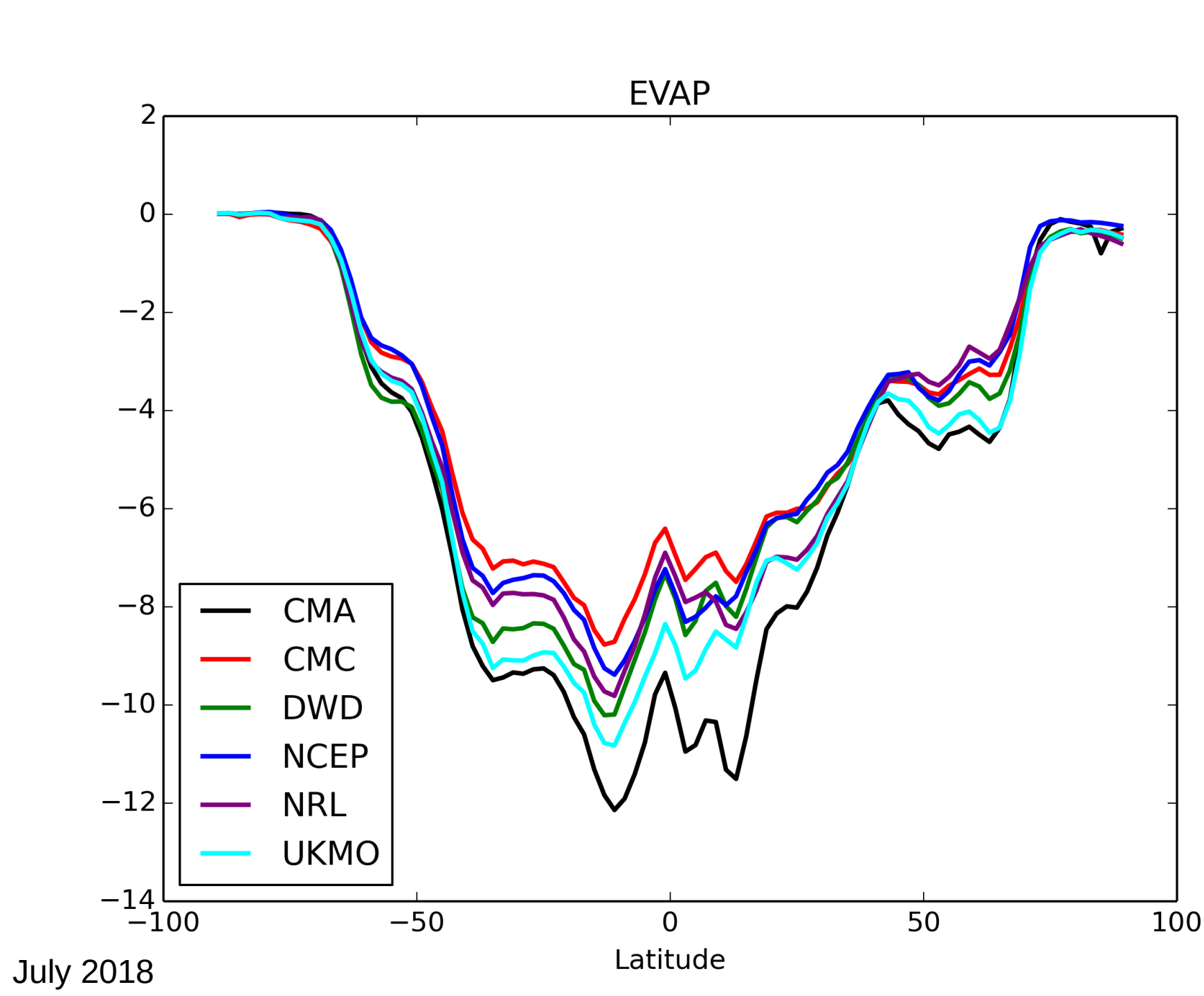
Latitude
CMA
CMC
DWD
NCEP
NRL
RUMS
UKMO
July 2018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Latitude
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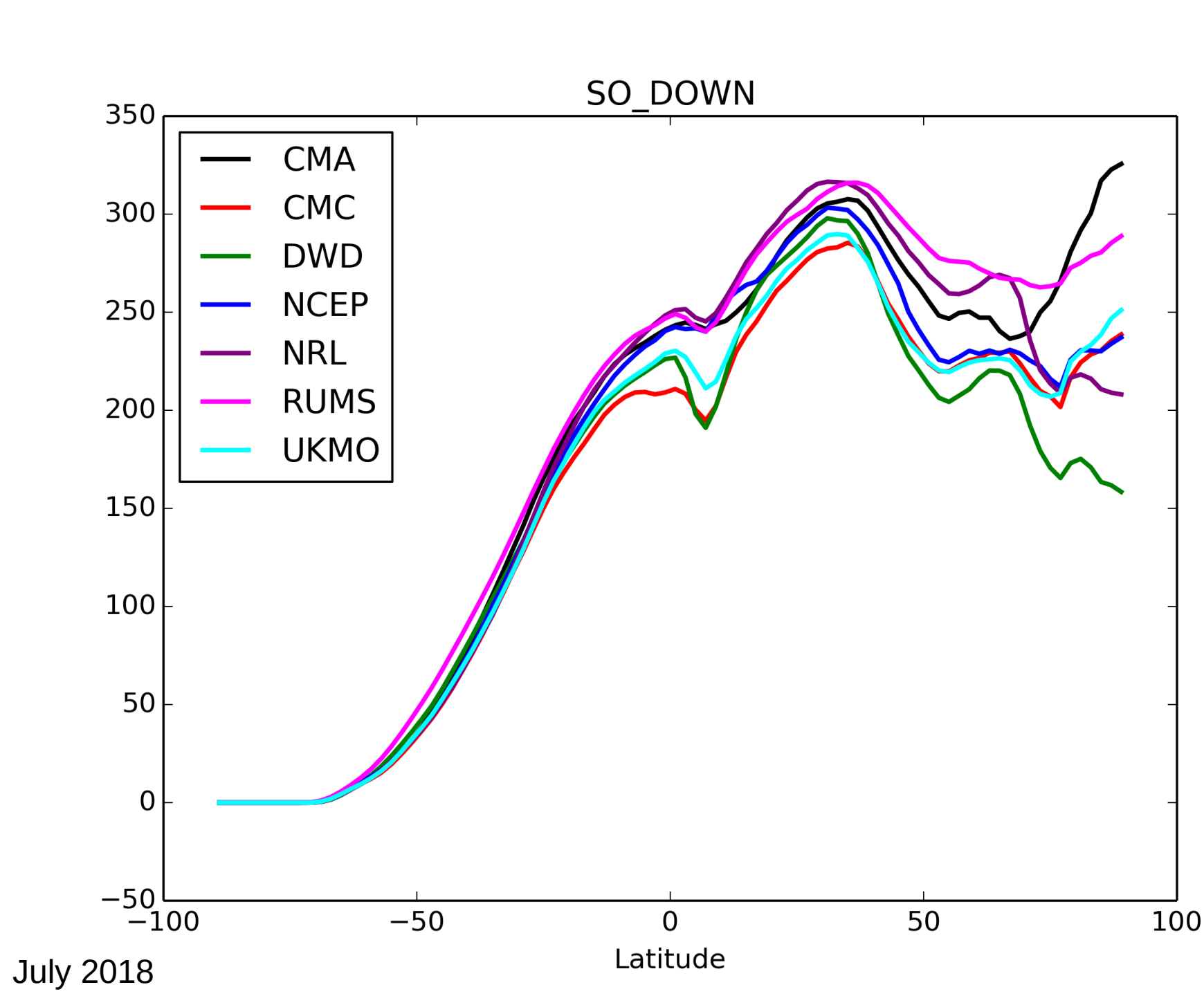
DWD
NCEP
NRL
UKMO

July 2018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CMA
CMC
DWD
NCEP
NRL
RUMS
UKMO
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200
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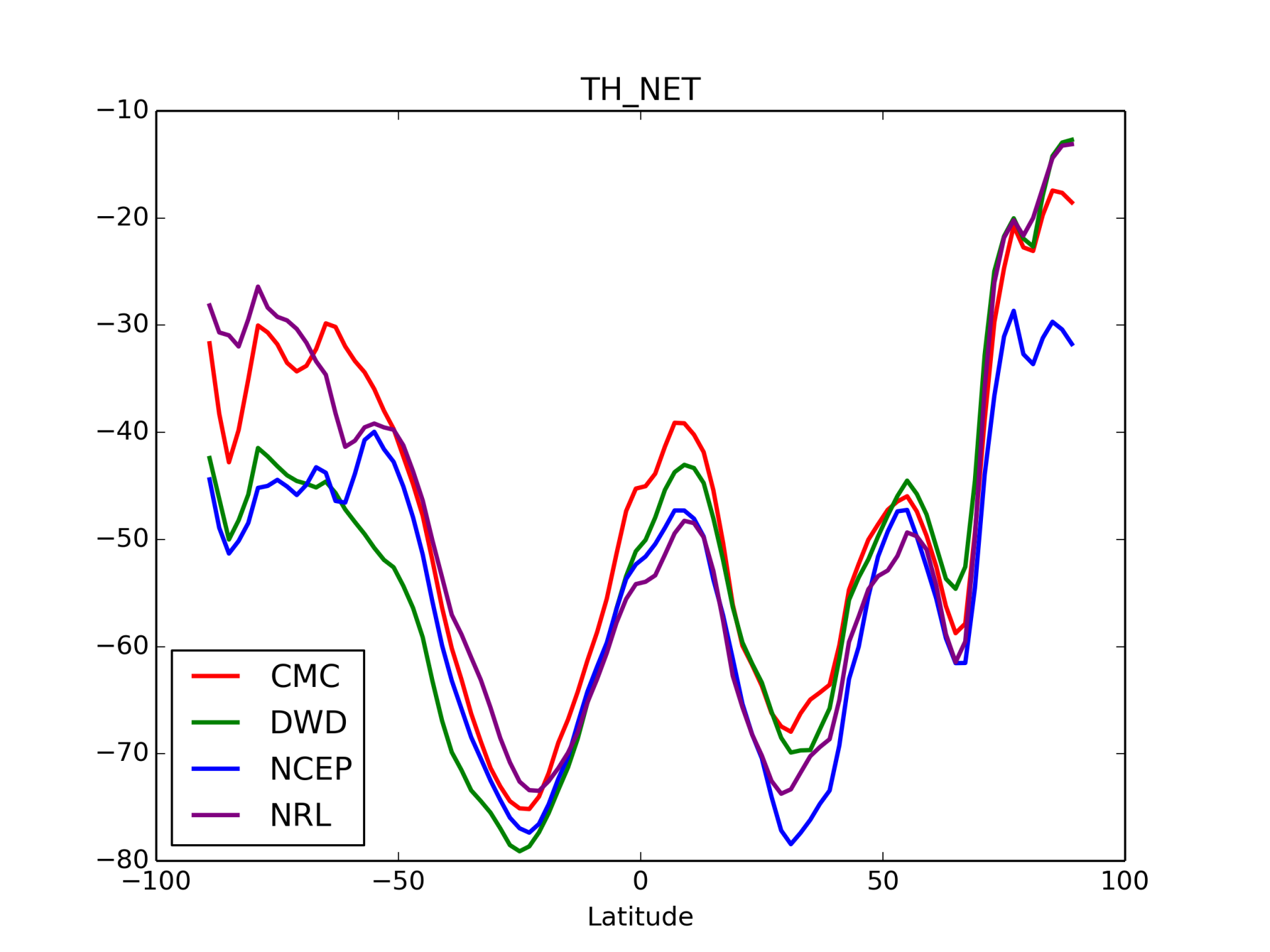
Latitude

July 2018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Latitude
CMC
DWD
NCEP
NRL

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Next Steps:

- Continue analysis of dataset

- Verification
  - Engage WCRP Surface Flux Task Team white paper on surface flux observations: https://www.wcrp-climate.org/JSC40/12.1(a).%20WDAC%20SurfaceFluxWhitePaper.pdf
  - IMET mooring of NW coast of Australia (by CISRO and Chinese researchers), in addition to RAMA and TAO moorings
  - Engage with GASS and GLASS on verification