The EC-Earth consortium

The Netherlands*
KNMI, U Utrecht, WUR,
VU. SARA

Ireland*
MetEireann, UCD,
ICHEC

Switzerland
ETHZ, C2SM

Denmark*
DMI, Univ Copenh

Portugal*
IM, U Lisbon

Norway
NTNU, Bjerkn. C.

Sweden*
SMHI, Lund U, Stockholm
U, IRV

Italy*
ICTP,CNR, ENEA

Spain*
AEMET, BSC, IC3
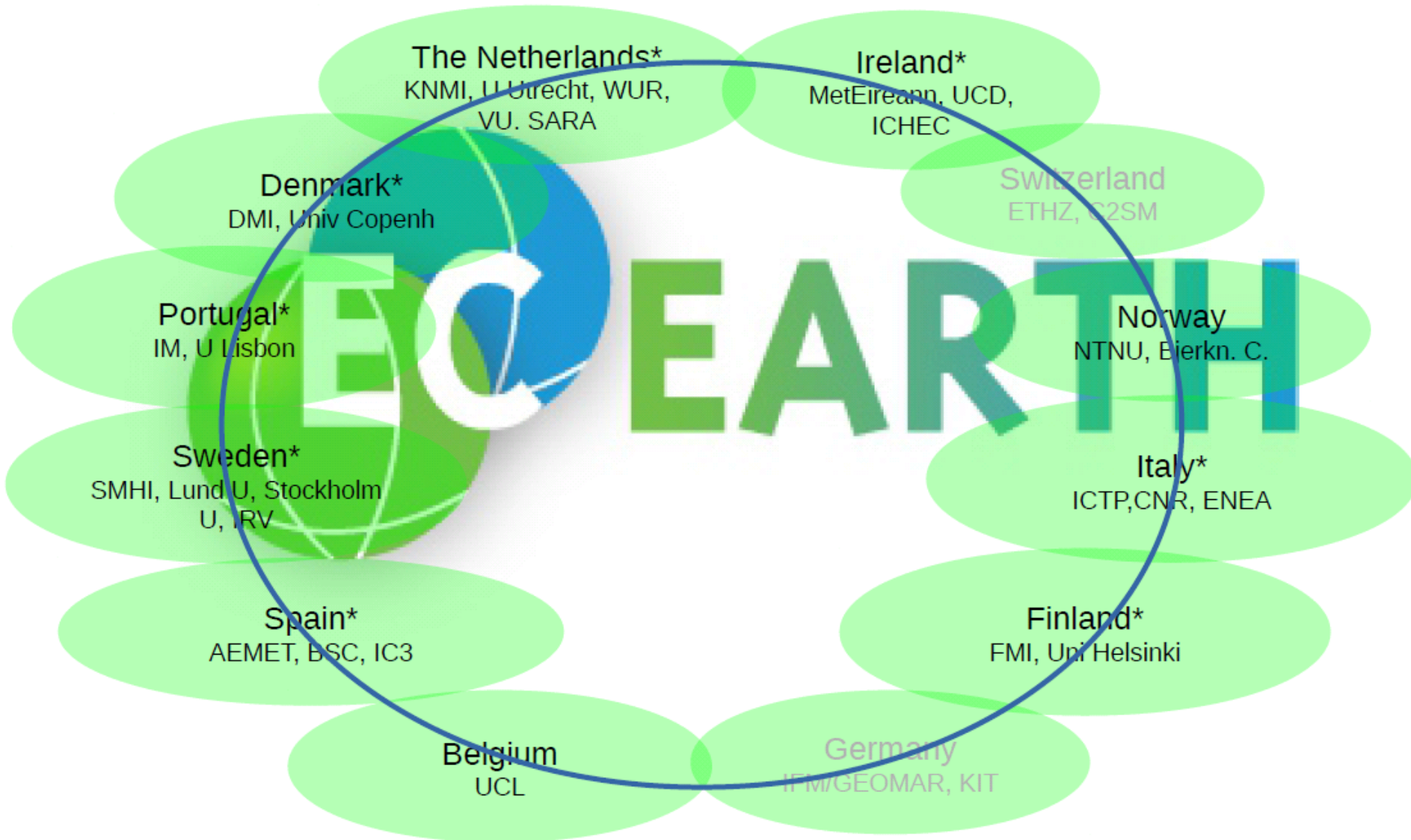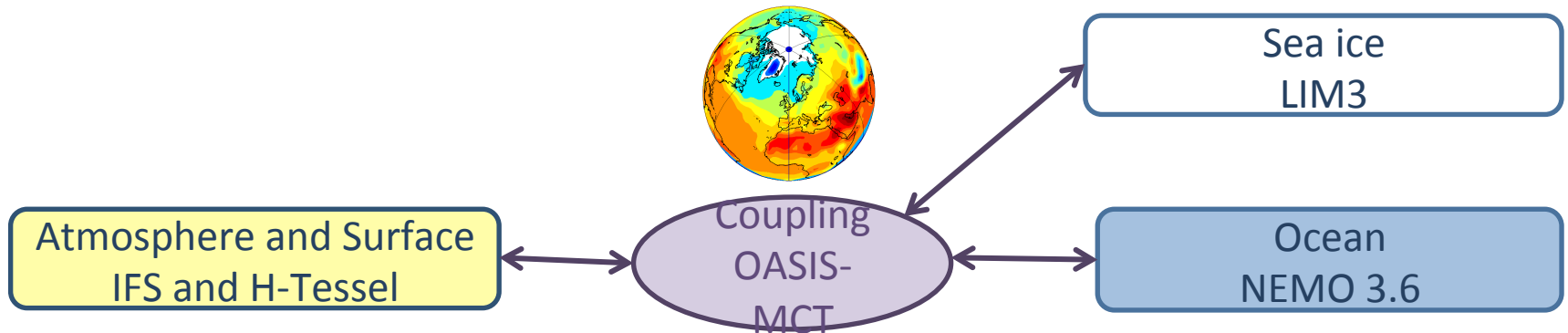
Finland*
FMI, Uni Helsinki

Belgium
UCL

Germany
IFM/GEOMAR, KIT

GCM

EC-EARTH 3

Standard: T255
  DECK+Hist., DPCC, LS3MIP, ScenarioMIP, VolMIP, CORDEX, DynVar, SIMIP, VIACS
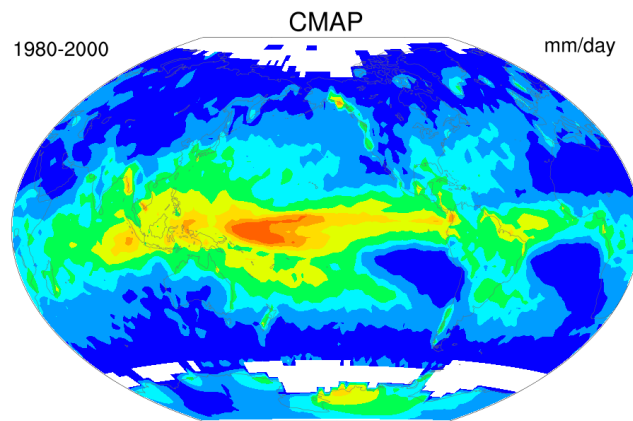Lowres: T159
  DECK+Hist., PMIP
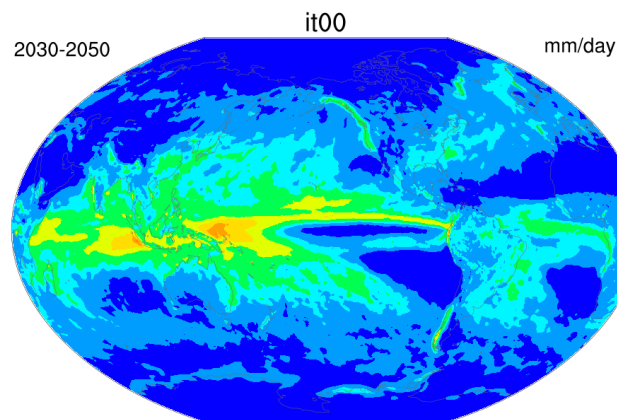Highres: T511
  HighresMIP, DCPP

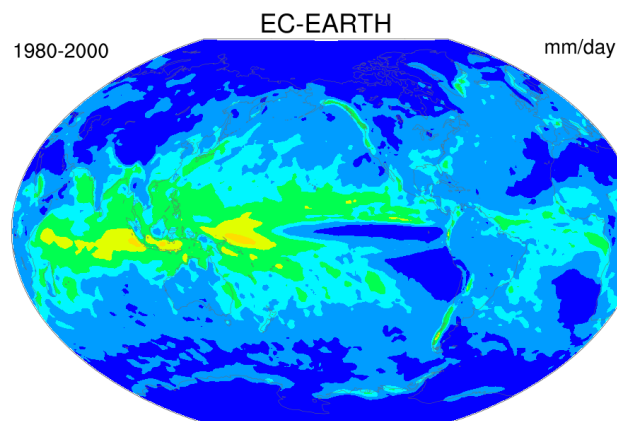# Precipitation variability

The new version (3.2) is much better in the tropics, South America, ITCZ and in warm pool regions

Obs

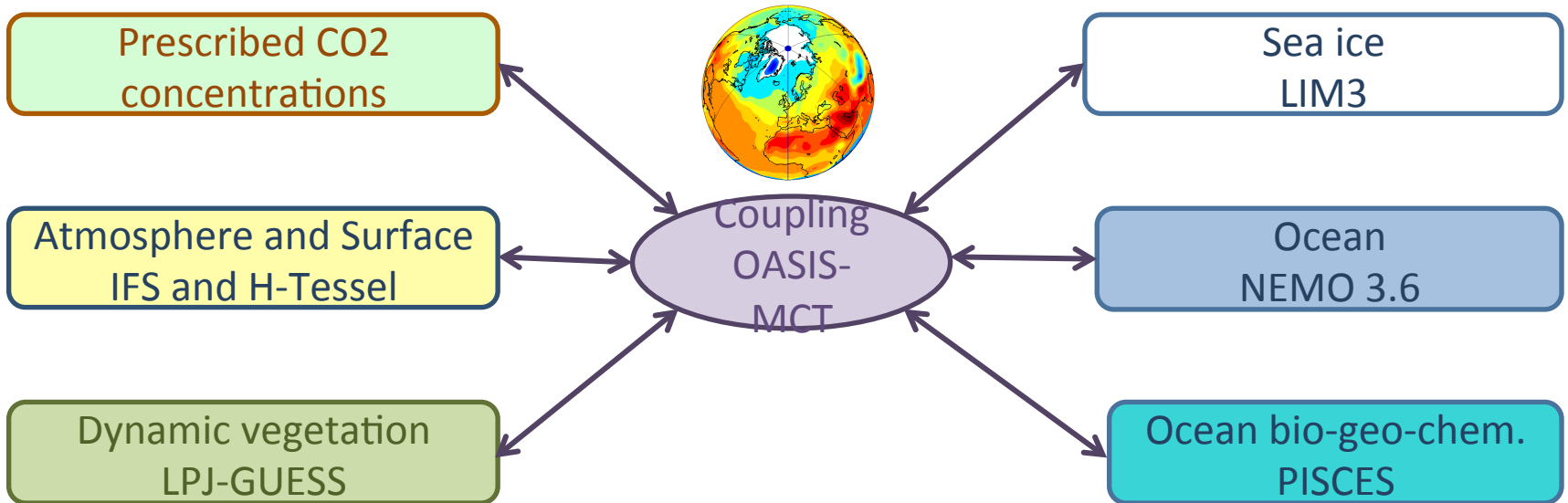EC-Earth 3.2 (80yr 2000forc)

EC-Earth 2 (historic forc)

EC-EARTH 3 - Greenland

Greenland ice sheet

Sea ice
LIM3

Atmosphere and Surface
IFS and H-Tessel

Coupling
OASIS-
MCT

Ocean
NEMO 3.6
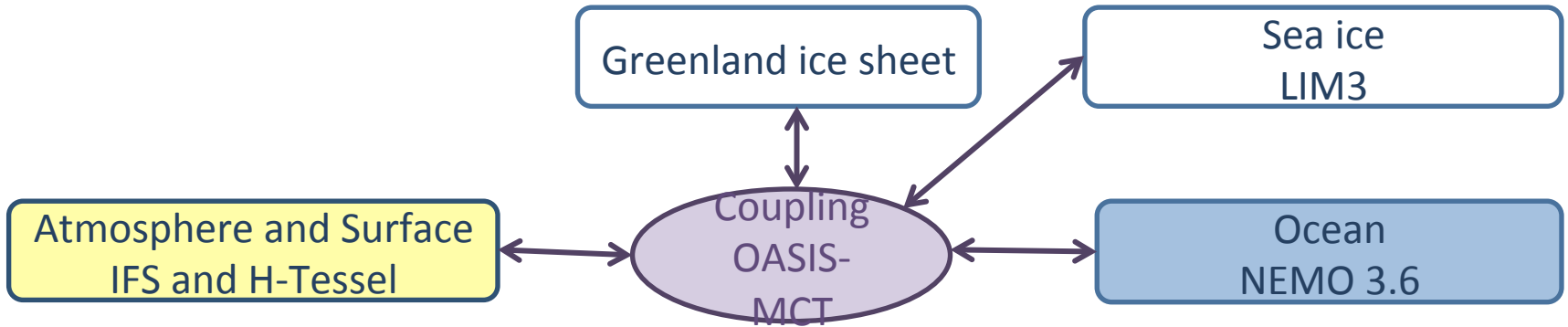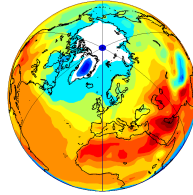
Standard: T255
DECK+Hist., ISMIP6, PMIP

EC EARTH

ESM

EC-EARTH 3 AerChem

Atmosphere chemistry TM5

Sea ice LIM3

Atmosphere and Surface IFS and H-Tessel

Coupling OASIS-MCT

Ocean NEMO 3.6
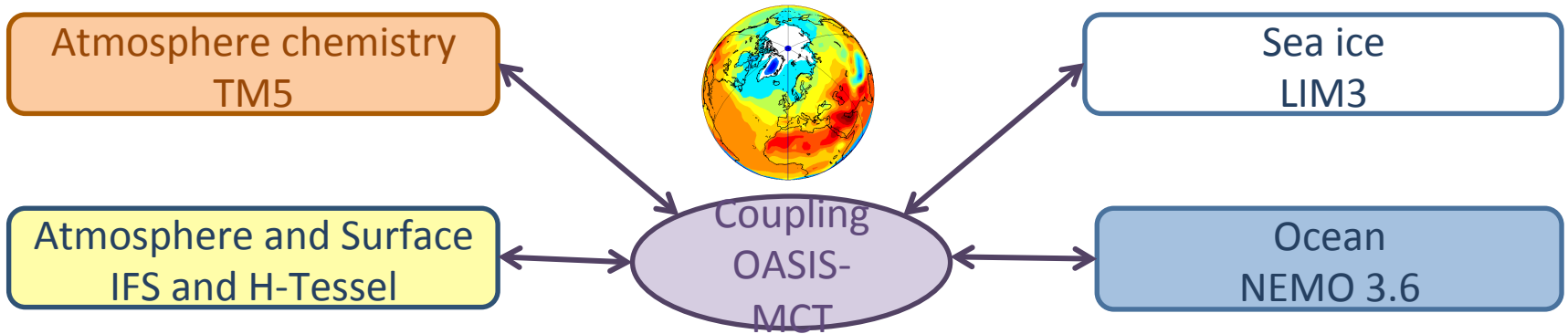
Standard: T255
  DECK+Hist., ScenarioMIP, AerchemMIP

EC EARTH

Collocated AOD bias

TM5 vs MODIS

Annual means

MODIS   0.16

TM5   0.12

AOD collocated annual mean (TM5-MODIS)

AOD bias [TM5-MODIS]

ESM

EC-EARTH 3 CC

Atmosphere chemistry
TM5, Carbon only

Atmosphere and Surface
IFS and H-Tessel

Dynamic vegetation
LPJ-GUESS

Coupling
OASIS-MCT

Sea ice
LIM3

Ocean
NEMO 3.6

Ocean bio-geo-chem.
PISCES
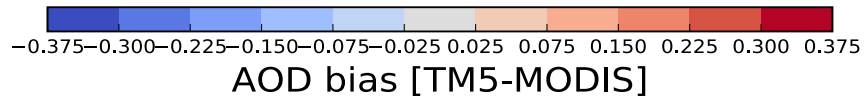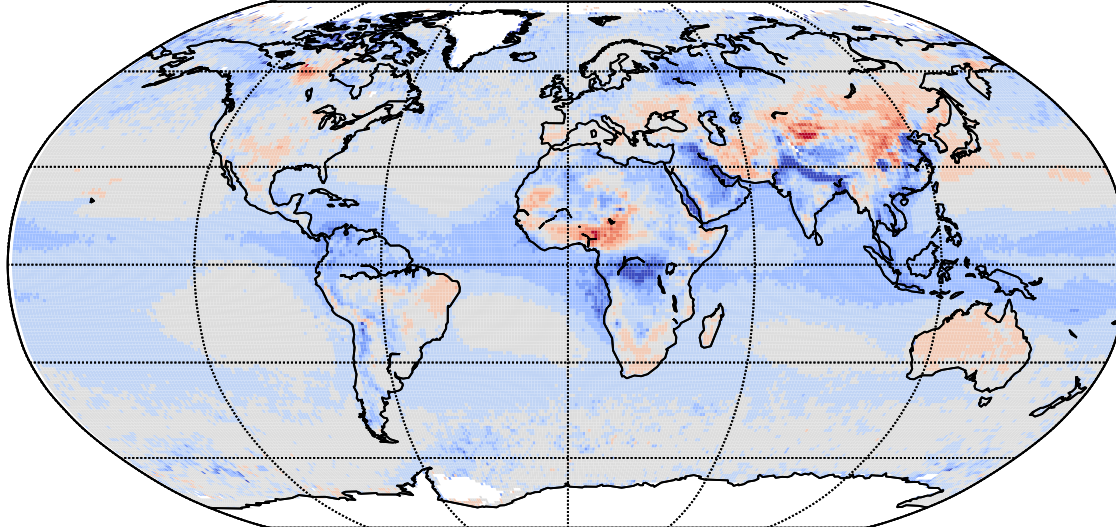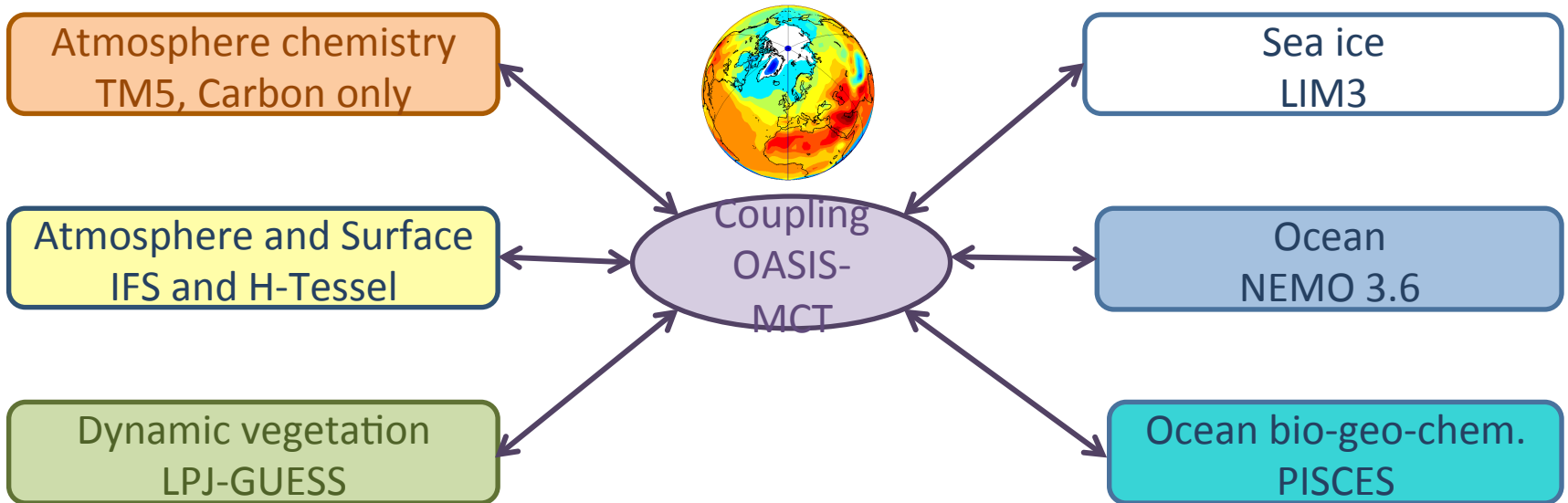
Standard: T255
DECK+Hist., C4MIP, LUMIP

EC·EARTH

ESM

EC-EARTH 3 VEG

Prescribed CO2 concentrations

Atmosphere and Surface IFS and H-Tessel

Dynamic vegetation LPJ-GUESS

Coupling OASIS-MCT

Sea ice LIM3

Ocean NEMO 3.6
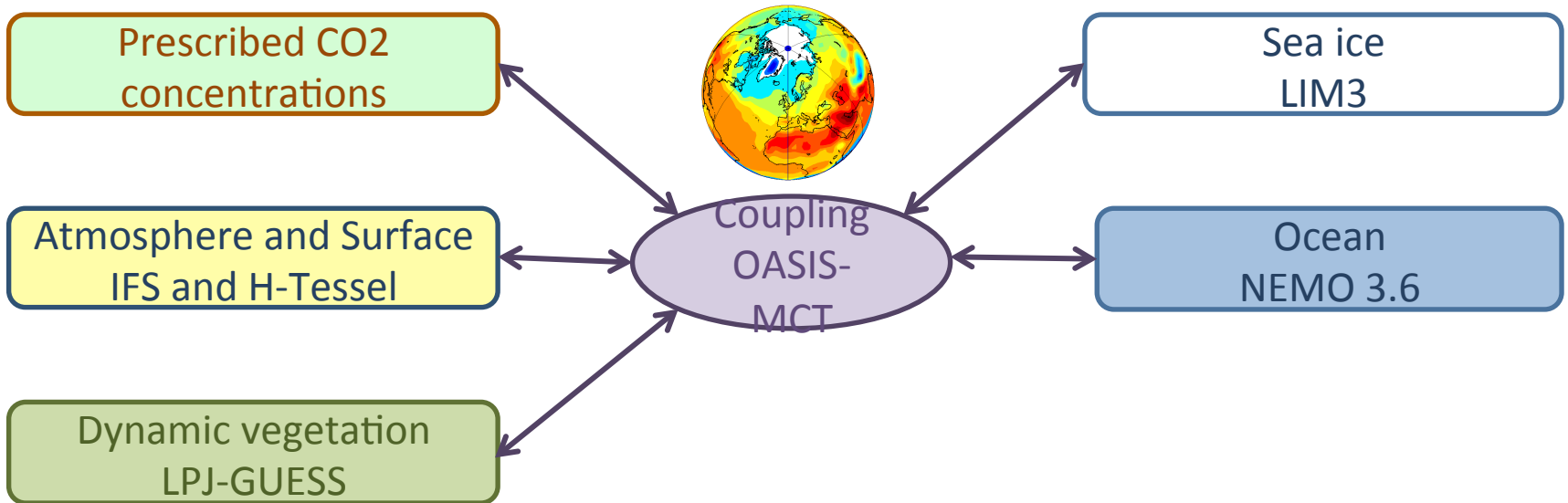
Standard: T255
DECK+Hist., LUMIP, LS3MIP, ScenarioMIP

EC EARTH

Terrestrial ecosystem C pools
in IPCC-AR5 carbon-climate ESMs* and
EC-Earth ESM (LPJ-GUESS)@

@ LPJ-GUESS in EC-Earth, forced offline with EC-Earth AMIP output, 1850-2014
CMIP6 forcing: N deposition, LULCC (LUH2)

* **Baseline (1986-2005)**
Anav et al. 2013
J. Climate 26: 6801

EC-Earth participation in CMIP6

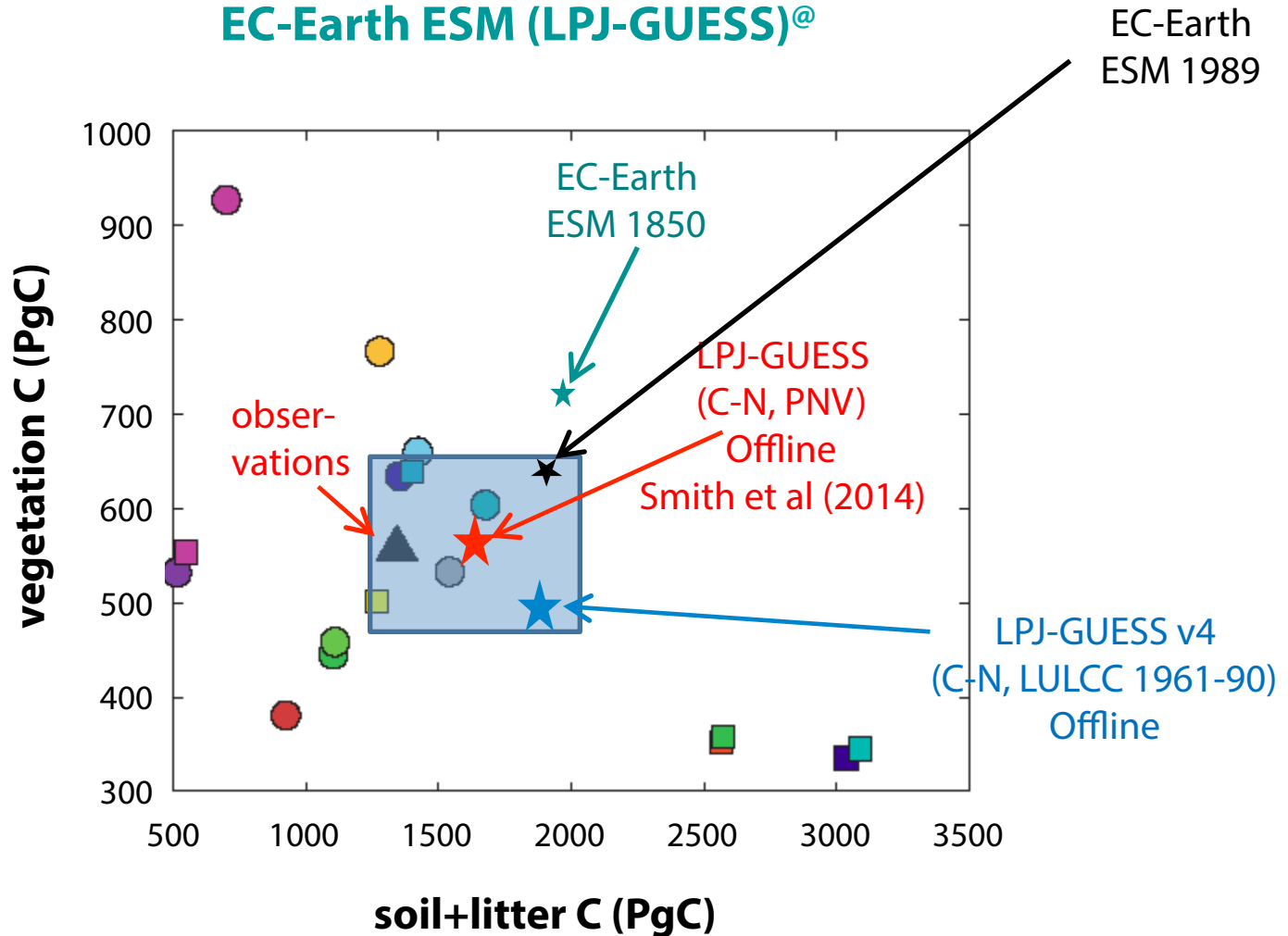|	Configurations	Components and Resolutions						Participating MIPs
		Atm. (IFS cy36r4)	Oce + Seaice (NEMO3.6+ LIM3)	Atm. Chem. (TM5)	Land Veg. (LPJ-GUESS)	Ocean BiogeoCh. (PISCES)	Greenland Ice Sheet (PISM)	
1	EC-earth3	T255 (~80 km) L91	1°x 1° L75	3°x 2° L34				DECK+Hist., DPCC, LS3MIP, ScenarioMIP, VolMIP, CORDEX, DynVar, SIMIP, VIACS
2	EC-Earth3-LR	T159 (~125 km) L62	1°x 1° L75					DECK+Hist., PMIP
3	EC-Earth3-HR	T511 (~40km) L91	0.25° x 0.25° L75					HighResMIP, DCPP
4	EC-Earth3-CC	T255 (~80 km) L91	1°x 1° L75	3°x 2° L34	T255	1°x 1° L75		DECK&Hist., C4MIP, LUMIP
5	EC-Earth3-AerChem	T255 (~80 km) L91	1°x 1° L75	3°x 2° L34	T255	1°x 1° L75		DECK&Hist., AerChemMIP, ScenarioMIP
6	EC-Earth3-Veg	T255 (~80 km) L91	1°x 1° L75		T255			DECK&Hist., LS3MIP, LUMIP, ScenarioMIP
7	EC-Earth3-Veg-LR	T159 (~125 km) L91	1°x 1° L75		T159			DECK+Hist., PMIP, ScenarioMIP
8	EC-Earth3-GrIS	T255 (~80 km) L91	1°x 1° L75				5 x 5 km L442	DECK+Hist., ISMIP6, PMIP

Tuning strategy

present day GCM tuning
   (1) atm-standalone, (2) coupled

PI GCM spin-up

transient GCM tuning

ESM testing based on the GCM tuning

Status

EC-Earth branches for CMIP6

    3.2.1 for atm-only tuning

    3.2.2 for coupled GCM tuning

    3.2.3 for ESM configurations

Resolutions

    Standard GCM **T255-ORCA1**

    High res GCM **T511-ORCA025**

    Low res GCM **T159-ORCA1**

Current issues

    CMIP6 forcing (see feedback to Veronica)

    Tuning issues: Arctic Sea Ice, ocean still too cold, ocean bio-geochem untuned.

Status of ESM configurations

Components:

GCM: systematic tuning starting

LPJ_GUESS (dynamic vegetation, land use and C-N cycling, ...): spin-up is running

PISCES (ocean bio-geo-chemistry): problems with BGC-NEMO physics interaction, no spin-up yet

TM5: working in full and carbon-only configurations, interacting well with IFS

Coupling

GCM: technically running

IFS+NEMO+PISCES is technically up and running

IFS+NEMO+LPJ-GUESS is technically up and running

IFS+TM5+LPJ-GUESS coming soon

Model Name: EC-Earth3 and the EC-Earth3 family;
Institution: EC-Earth-consortium; Country: European countries

Forcing Dataset	Will be used (YES/NO)	Pre-industrial	Historical
SLCF Emissions	Yes	OK	OK
GHG Emissions	Yes	Not available yet	Not available yet
Land-use	Yes*	Testing	Testing
GHG concentrations	Yes	OK	OK
Ozone concentrations	Yes	Testing	Testing
Nitrogen deposition	No	Testing	Testing
Simple plume aerosol	Yes	OK	OK
Solar	Yes	OK	OK
Stratospheric aerosol	Yes	Preliminary	Preliminary
AMIP SST and SIC	Yes	OK	OK

* Technically no. We will use prescribed land cove which has been derived from the LUH2 forcing.

KEY: | OK | Testing | Preliminary | Unknown |

See CMIP Panel website at https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6 for details

Model Name: EC-Earth3; Institution: EC-Earth-consortium; Country: European countries

Forcing Dataset	Will be used (YES/NO)	Pre-industrial	Historical
SLCF Emissions	No	N.A.	N.A.
GHG Emissions	No	N.A.	N.A.
Land-use	Yes	Testing	Testing
GHG concentrations	Yes	OK	OK
Ozone concentrations	Yes	Testing	Testing
Nitrogen deposition	No	N.A.	N.A.
Simple plume aerosol	Yes	OK	OK
Solar	Yes	OK	OK
Stratospheric aerosol	Yes	Preliminary	Preliminary
AMIP SST and SIC	Yes	OK	OK

KEY: | OK | Testing | Preliminary | Unknown |

See CMIP Panel website at https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6 for details

Model Name: EC-Earth3-CC; Institution: EC-Earth-consortium; Country: European countries

Forcing Dataset	Will be used (YES/NO)	Pre-industrial	Historical
SLCF Emissions	No	N.A.	N.A.
GHG Emissions (CO2)	Yes	Not available yet	Not available yet
Land-use	Yes	Testing	Testing
GHG concentrations (non-CO2)	Yes	OK	OK
Ozone concentrations	Yes	Testing	Testing
Nitrogen deposition	Yes	Testing	Testing
Simple plume aerosol	Yes	OK	OK
Solar	Yes	OK	OK
Stratospheric aerosol	Yes	Preliminary	Preliminary
AMIP SST and SIC	Yes	OK	OK

KEY: | OK | Testing | Preliminary | Unknown |

See CMIP Panel website at https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6 for details

Model Name: **EC-Earth3-AerChem**; Institution: **EC-Earth-consortium**; Country: **European countries**

Forcing Dataset	Will be used (YES/NO)	Pre-industrial	Historical
SLCF Emissions	Yes	Testing	Testing
GHG Emissions (CH4)	Yes	Not available yet	Not available yet
Land-use	Yes	Testing	Testing
GHG concentrations	Yes	OK	OK
Ozone concentrations (in stratosphere)	Yes	Testing	Testing
Nitrogen deposition	No	N.A.	N.A.
Simple plume aerosol	No	N.A.	N.A.
Solar	Yes	OK	OK
Stratospheric aerosol	Yes	Preliminary	Preliminary
AMIP SST and SIC	Yes	OK	OK

KEY: | **OK** | **Testing** | **Preliminary** | **Unknown** |

See CMIP Panel website at https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6 for details

Model Name: EC-Earth3-Veg; Institution: EC-Earth-consortium; Country: European countries

Forcing Dataset	Will be used (YES/NO)	Pre-industrial	Historical
SLCF Emissions	No	N.A.	N.A.
GHG Emissions	No	N.A.	N.A.
Land-use	Yes	Testing	Testing
GHG concentrations	Yes	OK	OK
Ozone concentrations	Yes	Testing	Testing
Nitrogen deposition	Yes	Testing	Testing
Simple plume aerosol	Yes	OK	OK
Solar	Yes	OK	OK
Stratospheric aerosol	Yes	Preliminary	Preliminary
AMIP SST and SIC	Yes	OK	OK

KEY: | OK | Testing | Preliminary | Unknown |

See CMIP Panel website at https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6 for details

Please insert any additional feedback on the forcings or other comments for WGCM here

- In the MACv2-SP code, there is an error in the calculation of the background optical depth, which subsequently is used in the calculation of the CDNC scale factor (dNoverN). This factor effectively sets the aerosol indirect effect. The error persists in the latest release (MACv2-SP_v1). The error has been reported to MPI-M.

- The distribution of the single-scattering albedo (SSA) from MACv2-SP_v1 shows some unrealistic small-scale features (see figure below). The impact is expected to be small.

- Anthropogenic (CEDS) emissions and biomass burning emissions are provided as separate data sets, resulting in different file conventions and NMVOC splits.

T255L91
1990-01-01

SSA
0,85 0,86 0,87 0,88 0,89 0,9 0,91 0,92 0,93 0,94