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Projected Future Changes in Equatorial Wave Spectrum in CMIP6 - Online Resource 1

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Table 1 below shows the resolution of the models and some general information about their convection schemes, as both might be hypothesized to influence the representation of convectively coupled waves by the models. Differences due to resolution are most apparent for the two MPI models (MPI-ESM-2-HR and MPI-ESM-2-LR), which has the same convection scheme but different resolution. MPI-ESM-2-HR, which has finer resolution, has a smaller bias in the historical simulations and projects a larger intensification for future KW.

Having said that, the various convection schemes seem more significant for understanding differences among the models. They differ in parameterizations, emphasis and time of latest significant update. Most models have both deep and shallow convection schemes, but their focus is on different parameters depending on the general goal of the model. The least updated convection scheme is used in the INM models (1986), while the most updated is UKESM1-0-LL, and the differences between those models are robust.

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Table 1: Data products used

data source	resolution	convective scheme	references
BCC-CSM2-MR	$T106(1.7^\circ)$	Deep convection: processes of entrainment/detrainment, budgets for mass, dry static energy, moisture, cloud liquid water and momentum. Shallow: local convective transport scheme.	Wu et al (2019)
CESM2	1°	Simplified cumulus parameterization scheme. No separate shallow-convection, boundary layer and grid-scale condensation schemes. Cloud Layers Unified By Binormals (CLUBB).	Danabasoglu et al (2020) Zhang and McFarlane (1995)
CNRM-CM6-1 CNRM-ESM2-1	T127 (1.4°)	Two-time level semi-Lagrangian numerical integration scheme: a continuous and prognostic treatment of dry, shallow, and deep convection. Entrainment and detrainment of energy and moisture. Dilute CAPE relaxation.	Séférian et al (2019) Voldoire et al (2019) Voldoire et al (2013)
EC-Earth3	T255 (0.7°)	Integrated Forecast System (IFS) CY36R4 of the European Centre for Medium Range Weather Forecasts (ECMWF). Deep: CAPE calculations. Shallow: mass flux, without entrainment/detrainment processes.	Döscher et al (2021) ECMWF (2010)
FGOALS-g3	$2^\circ(180 \times 80)$	Convective momentum transport (CMT) scheme: Vertical momentum advection. Detrainment of excess momentum from clouds. Convection-induced pressure gradient force.	Li et al (2020) Wu et al (2007)
GFDL-CM4	C192	double plume convection scheme, connecting deep and shallow convection plumes.	Held et al (2019) Zhao et al (2018)
INM	$2^\circ \times 1.5^\circ$	Basic deep and shallow convection parameterizations, which have not been updated significantly since 1986.	Volodin et al (2017)
MIROC6	T85 (2.1°)	Multiple cloud types, with an emphasis on shallow convection. The cloud-base mass flux is controlled by turbulent kinetic energy within the sub-cloud layer and convective inhibition. The shallow convective parameterization is a mass flux scheme based on a buoyancy-sorting, entrainment detrainment, single-plume model.	Watanabe et al (2010) Tatebe et al (2019)
MPI-ESM1-2-HR	T127 (1.4°)	Mass flux scheme with penetrative convection, and a Stochastic Multicloud Model (SMCM).	Ma et al (2019) Müller et al (2018) Peters et al (2017)
MPI-ESM1-2-LR	T63 (2.9°)		
UKESM1-0-LL	$1.25^\circ \times 1.875^\circ$	Mass flux scheme with extensions (including CAPE closure and CRM) and CMT. See references for more details.	Sellar et al (2019) Walters et al (2019) Williams et al (2018) Martin et al (2011)

Table 1 The data sources used in this study, the resolution of the models (in parenthesis is the effective resolution at the equator for spectral models), and their convection schemes.

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