	Realm: Atmosphere				
Date	**Reviewer's Name**	**Reviewer's Institution**	**Component**	**Comment**	**ES-DOC Response *(include the date, the responder's name, and the new version number if implementing any changes)***
Pre -stage 3	Bruce Wyman	GFDL	key properties	We use a different timestep for shortwave and longwave radiative transfer. It would be nice to have separate questions, but putting them both on the same answer (e.g. "longwave = 3 hours, shortwave = 1.5 hours") is doable.	Made separate entries for longwave and shortwave radiative transfer timesteps.
Pre -stage 3	Jeff Ridley	Met Office	radiation	The options under LW gases and SW gases are not appropriate and look like they have been copied from the aerosol component	removed optical methods for sw_gases and lw_gases
Pre -stage 3	Robert Pincus	University of Colorado (RFMIP)	radiation	I agree with Jeff Ridley's point above - since the spectral integration is defined in the _radiation node, there is no need for optical methods for [ls]w_gases. (What's currently there is inappropriate.)	removed optical methods for sw_gases and lw_gases
Pre -stage 3	Robert Pincus	University of Colorado (RFMIP)	radiation	"Greenhouse gases" should be made specific to LW and SW. This is because some models may treat, for example, the LW effects of CH4 but not the SW effects	Users will give separate answers for sw_ghg and lw_ghg representations.
Pre -stage 3	Robert Pincus	University of Colorado (RFMIP)	radiation	The CMIP6 protocol offers three options for specified greenhouse gas concentrations (see section 2.1.10 of doi:10.5194/gmd-2016-169). The list of greenhouse gases used here should be harmonzied with this protocol (although as yet the future protocol is not specified)	Updated the questions about GHGs in the radiation scheme to account for the 3 protocols in section 2.1.10 of doi:10.5194/gmd-2016-169. Uses will now provide information about the complexity of GHG representation.
Pre -stage 3	Robert Pincus	University of Colorado (RFMIP)	radiation	For liquid clouds, optical_methods cloud be restricted to Mie theory and geometric optics. The other methods are used only for non-spherical particles	New enumeration for cloud liquid optical methods.
Pre -stage 3	Robert Pincus	University of Colorado (RFMIP)	cloud_scheme	The entries under cloud_inhomogeneity describes methods used to calculate radiative transfer. This should be moved to lw_ and sw_ nodes under radiation	moved cloud_inhomogeneity to the radiation scheme as lw_cloud_inhomogeneity and sw_cloud_inhomogeneity.
Pre -stage 3	Robert Pincus	University of Colorado (RFMIP)	cloud_scheme	There should be a sub_grid_scale_ice_distribution that mirrors the node for water	added sub-process for sub_grid_scale_ice_distribution
Pre -stage 3	Robert Pincus	University of Colorado (RFMIP)	radiation	It would be surprising if the general_interactions for each component (which will be emission/absorption and possibly scattering) will vary across components (aerosols, cloud ice, cloud water). Unless modeling centers suggest otherwise I'd suggest this node moves to e.g. shortwave_radiation.	Moved the general_interactions property for aerosols, cloud water and cloud ice sub-processes of shortwave_radiation and longwave_radiation up to sit within the main shortwave and longwave radiation processes. Commented out sub-processes for shortwave_gases and longwave_gases because general_interactions was the only property under each of these.
Pre -stage 3	Robert Pincus	University of Colorado (RFMIP)	cloud_simulator	This is more appropriately called "observation_simulator" or "observation_proxy"	Changed name of this component to atmos_observation_simulation. Updated the description to "Characteristics of observation simulation".
Pre -stage 3	Steve Garner	GFDL	grav waves - orog	Suggest option for treatment of anisotropy, probably in 35.2. Dissipation scheme (presumably means deposition scheme?) could include wave saturation vs Richardson number vs other options. There are different treatments of boundary layers and partial ducting which don't seem to fit anywhere, except maybe in propagation mechanisms. I'm not sure what "calculation method" is getting at, but "nonlinear calculation" is not a very useful header in that section.	Added 'wave saturation vs Richardson number' to dissipation mechanisms. I think dissipation scheme (not deposition scheme) is the correct term in this context, the dissipation of gravity waves will result in momentum deposition. I'm not sure from this comment where to address gravity wave anisotropy. Is this a reference to the source mechanisms (anisotropic source spectrum) or wave propagation (anisotropy of propagation) or both? Added boundary layer ducting to orographic_gravity_wave_propagation_scheme
Pre -stage 3	Ming Zhao	GFDL	deep convection	It is not clear what this exactly mean. Does this mean closure method for determining cloud-base mass flux. If yes, one may want to ask CAPE/WFN based or TKE/CIN based (i.e., quasi-equilbrium of free tropopshere or quasi-equilibrium of boundary layer)?	Updated enumeration for deep_convection_scheme_method to include 'CAPE/WFN based' and 'TKE/CIN based' closure methods.

Pre -stage 3	Ming Zhao	GFDL	deep and shallow convection	We should add descriptions for convective microphysics, which is very important for simulations of both present-day climate and climate sensitivity (e.g., Zhao 2014 and Zhao et. al 2016).	Added a 'microphysics' property to deep_convection and shallow_convection with the enumeration: 'tuning parameter based', 'single moment', 'two moment'.
Pre -stage 3	Ming Zhao	GFDL	deep and shallow convection	Does vertical momentum transport mean if the scheme carries a vertical velocity equation or does the scheme transport large-scale vertical momentum? if latter, one may need to add if the scheme carry a vertical velocity equation.	This is about whether the convection scheme includes the vertical transport of momentum. The questions is to do with listing the physical processes that are represented by the convection scheme rather than how the scheme is encoded.
Pre -stage 3	Ming Zhao	GFDL	deep and shallow convection	Add a description on re-evaporation of convective precipitation.	Added re-evaporation of convective precipitation to deep_convection_scheme.processes and shallow_convection_scheme. processes
Pre -stage 3	Ming Zhao	GFDL	microphysics	In most GCMs, separate microphysics schemes are used in moist convection and large-scale clouds. Should we move the descriptions of microphysics under large-scale cloud scheme and convection scheme?	Changed the description of the atmos_microphysics_precipitation component to "Large Scale Cloud Microphysics and Precipitation". Changed the name of the cloud_microphysics sub-process to large_scale_cloud_microphysics. Note that we now also ask for information about microphysics scheme included in deep and shallow conveciton.
Pre -stage 3	Ming Zhao	GFDL	cloud scheme	It may be better to separate the radiative effects of cloud representation (i.e., optical properties: overlap assumption, inhomogeniety) from other properties of cloud scheme?	Moved cloud_overlap_method from a property of the toplevel to a property of a new sub-process called optical_cloud_properties. Added an additional property cloud_inhomogeneity to the sub-process optical_cloud_properties.
Pre -stage 3	Ming Zhao	GFDL	cloud scheme	add entry for prognostic or diagnostic scheme, in the case of prognostic scheme, what are those prognostic variables, cloud amount, liquid, ice, rain, snow et.al.	Added prognostic_scheme, diagnostic_scheme boolean properties to the toplevel. Added a prognostic_variables property to the top level with possible attributes: cloud amount, liquid, ice, rain, snow.
Pre -stage 3	Lucas Harris	GFDL	horiz grid discretisation	Scheme order should be "second", "third", or "fourth"	Changed grid discretisation:horizontal scheme_order parameter from string type to enumeration type with options: second, third, fourth
Pre -stage 3	Lucas Harris	GFDL	horiz grid discretisation	Many modern grids, particularly the cubed-sphere used by GFDL's AM3 and AM4, do not have any poles at all. This would be better to be a "grid type" question, with values such as: Gaussian grid, Latitude-Longitude grid, Cubed-sphere grid, Icosahedral grid	Changed response type for horizontal pole so that users can leave blank if not appropriate for their model. Added grid_type attribute to discretisation: horizontal with options: Gaussian, Latitude-Longitude, Cubed-Sphere and Icosoahedral.
Pre -stage 3	Lucas Harris	GFDL	vert grid descretisation	should include "Vertically-lagrangian hybrid-pressure" to cover GFDL, NCAR, and DoE models.	Added "hybrid pressure" and "vertically lagrangian" to the discretisation: vertical coordinate_type options.
Pre -stage 3	Lucas Harris	GFDL	dy core - advection tracers	Conserved quantities should include "tracer mass" in addition to "dry mass" as a conserved quantity.	Added "tracer mass" to the options for advection_tracers conserved_quantities.
Pre -stage 3	Levi Silvers	GFDL	cloud_simulator	I agree with Robert's comment above, that 'cloud simulator' is not the best terminology, I would follow his suggestion for 'observation simulator' instead, or perhaps 'satelite simulator'. Although 'satelite simulator' may be too restrictive for future components of COSP.	Changed name of this component to atmos_observation_simulation. Updated the description to "Characteristics of observation simulation".
Pre -stage 3	Levi Silvers	GFDL	cloud_sim 30.1	Top Height Estimation Method' would be more clear than 'Top Height'	Updated isscp_attribute property top_height to top_height_estimation_method
Pre -stage 3	Levi Silvers	GFDL	cloud_sim 31.3	Is this meant to be the number of subcolumns that cosp uses to simulate subgrid variability? If so this should be made explicit.	Updated cosp_attributes property number_of_columns to number_of_sub-columns
Review phase 3	David Neubauer	ETH Zürich	cloud_scheme	Atmos Coupling: an option for atmosphere_aerosol_microphysics should be added as many models compute aerosol-cloud interactions (AerChemMIP) and those two schemes need to be linked therefore	The atmosphere_cloud_scheme already has an option to specify coupling to atmosphere_microphysics_precipitation. The aerosol component "aerosol_model" has an option to specify coupling to "clouds".
Review phase 3	David Neubauer	ETH Zürich	cloud_scheme	Prognostic variables: add options for cloud droplet number concentration and ice crystal number concentration to have the use of two-moment cloud microphysics schemes documented	added prognostic variables: "cloud droplet number concentration" and "ice crystal number concentration" with explanatory text: "to document the use of two-moment cloud microphysics schemes.
9 April	Mark Elkington	MOHC	radiation	topic: radiation, subtopic: shortwave radiation - duplicate overview property	Removed the overview property from the shortwave_radiation process as this will be inserted at a later stage.

10 April	Mark Elkington	MOHC	radiation	subtopic: longwave radiation - duplicate overview property	Removed the overview property from the longwave_radiation process as this will be inserted at a later stage.
10 April	Mark Elkington	MOHC	cloud_scheme	id: cmip6.atmos.cloud_scheme.scheme_type - missing choice "other"	cmip6.atmos.cloud_scheme.scheme_type is an open enumeration so the "other" property will be added to the list during the rendering process.
10 April	Mark Elkington	MOHC	grid	id: cmip6.atmos.grid.discretisation - duplicate overview property	Removed the overview property from the grid discretisation section as it will be inserted at a later stage.