

Realm: Land					
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	Christine Delire	CNRM	Land soil	soil map : is organic matter taken into account beside texture	Added a question on organic matter (0.2.0) David Hassell
Pre-stage 3	Christine Delire	CNRM		hydrology : there should be vertical discretization (like for heat treatment) and something about the coupling between heat and water	Added vertical discretization, and a question on heat/water coupling (0.2.0) David Hassell
Pre-stage 3	Christine Delire	CNRM		hydrology : is flooding represented ? (coupling with river processes)	Added question on flooding to river routing section (0.2.0) David Hassell
Pre-stage 3	Christine Delire	CNRM	Land vegetation	texture : doesn't belong here. Should only be in the soil part	Fixed (0.2.0) David Hassell
Pre-stage 3	Christine Delire	CNRM		water table: is it necessary if the info is already in the hydrology part	Fixed (0.2.0) David Hassell
Pre-stage 3	Christine Delire	CNRM		root depth instead of soil depth ? (soil depth should be in soil)	Fixed (0.2.0) David Hassell
Pre-stage 3	Christine Delire	CNRM	Land albedo	snow albedo already in component snow	Fixed - albedo now dealt with in each component rather than its own "process" (0.2.0) David Hassell
Pre-stage 3	Christine Delire	CNRM	Land carbon cycle:	there should be information on tiling or better all the tiling for all the land subcomponents should be in the key properties. Right now it only appears for some subcomponents	Fixed (and added to nitrogen cycle) (0.2.0) David Hassell
Pre-stage 3	Christine Delire	CNRM	Land-use/Land cover change	required to describe how land-cover change is managed	Added to key properties (0.2.0) David Hassell
Pre-stage 3	Christine Delire	CNRM		required to describe how water and carbon conservation is ensured with land-cover change	Covered in key properties. David Hassell
Pre-stage 3	Christine Delire	CNRM		required to describe anthropogenic carbon pool (Grand Slam protocol or else with residence/decay time)	Added to carbon cycle process (0.2.0) David Hassell
Pre-stage 3	Christine Delire	CNRM	land/river tracers	maybe indicated how the coupling between land processes and river routing is handled	Added to river routing process (0.2.0) David Hassell
Pre-stage 3	Christine Delire	CNRM	model name	in other mindmap model name seems to be required, it might be relevant to mention it there also	Added to key properties (0.2.0) David Hassell
Pre-stage 3	Bart vd Hurk	KNMI	Land surface	Number of levels may be different for different components (temperature, soil moisture, snow)	OK. I have removed the general vertical number_of_levels from the grid section (each component already has a question on number of vertical levels) (0.2.0) David Hassell
Pre-stage 3	Bart vd Hurk	KNMI	Land surface	Somewhere in the Land realm a proper description of the tiling procedure and use of physiography must be documented: land/sea, (dynamic) vegetation coverage, orography/roughness	Tiling in Key Properties promoted to a description (from a logical), Tiling for individual components already there (0.2.0) David Hassell
Pre-stage 3	Sergey Malyshev	GFDL	1.2 Matches Atmosphere Grid	Typo in 1.2: atmpsphere -> atmosphere	Fixed (0.2.0) David Hassell
Pre-stage 3	Sergey Malyshev	GFDL	3.1. Basic Approximations	"Description of the basic approximations made in the LandSurface model" sounds vague; it would be helpful if the question was made more specific.	Changed the field name to "description" with the instruction "General description of the processes modelled (e.g. dynamic vegetation, prognostic albedo, etc.)" (0.2.0) David Hassell
Pre-stage 3	Sergey Malyshev	GFDL	3.5 Prognostic variables	Given that "snow temperature", "snow density", etc. exist in the list of valid choices, what does non-specific "snow" mean list? Or is it just a typo?	Fixed typo (0.2.0) David Hassell
Pre-stage 3	Sergey Malyshev	GFDL	3.5. Prognostic variables	In 3.5: There may be other prognostic variables besides the ones listed; e.g. various biomasses; carbon can be split between soil and vegetation, etc. Is there a place to enter additional variables, if necessary?	Carbon now split between soil and vegetation. you can enter as many "other" variables as you like when entering information (0.2.0) David Hassell
Pre-stage 3	Sergey Malyshev	GFDL	5.1 Timestepping	Not clear what "Is a time step dependent on the atmosphere coupling?" means, needs clarification.	Changed the description to "Is a time step dependent on the frequency of atmosphere coupling?" (0.2.0) David Hassell
Pre-stage 3	Sergey Malyshev	GFDL	7. Soil->Soil Map	Should "soil map structure" be "soil structure map"? Or is it a reference to the data structure of complex data sets? Similarly, should "soil map texture" and "soil map albedo" be "soil texture map" and "soil albedo map"?	You are right - all references updated (0.2.0) David Hassell

Pre-stage 3	Sergey Malyshev	GFDL	14. Vegetation	This section appears to be an exact copy of the soil section above; is it intentional?	Unintentional, and fixed (0.2.0) David Hassell
Pre-stage 3	Sergey Malyshev	GFDL	15.9 Stomatal resistance	"Specify the dependancies on vegetation stomatal resistance." It sounds like the question asks what quantities depend <b>on</b> stomatal resistance, but from the list of choices it appears it's the other way around: what the stomatal resistance in the model depends <b>on</b> . In particular, light is unlikely to depend on stomatal resistance, while stomatal resistance is likely to depend on ligh. Should be clarified.	Clarified (0.2.0) David Hassell
Pre-stage 3	Sergey Malyshev	GFDL	16.2. Number of surface temperatures used.	Not clear what this means exactly. It this a number of distinct prognostic temperatures influencing outgoing longwave radiation (i.e. radiative temperature)? Or is it the number of distinct surfaces interacting with the atmosphere? In most cases these numbers should be the same, but the question would benefit from being more specific.	Updated description: ""The maximum number of distinct surface temperatures in a grid cell (for example, each subgrid tile may have its own temperature)" (0.2.0) David Hassell
Pre-stage 3	Sergey Malyshev	GFDL	16.3. Evaporation	Does this refer to evaporation from soil surface, or to the entire evapotranspiration formulation? If the latter, different evaporative pathways (e. g. evap from soil and transpiration) may have different formulations.	This is from soil and vegetation. Updated do that you can choose more than one option, and improved description (0.2.0) David Hassell
Pre-stage 3	Sergey Malyshev	GFDL	20.3 Biomass; 20.4 Biogeography; 20.5 Stomatal Resistance.	Not clear why these three sub-sections ar in albedo section; e.g. stomatal resistance typically should have little to do with albedo. This appears to be a direct copy-paste from Section 15...	Albedo section has been removed. Albedo is now dealt with in the relevant components (0.2.0) David Hassell
Pre-stage 3	Sergey Malyshev	GFDL	23 Autotrophic respiration	Not clear what "Parametrized?" means in this context. Is this just asking whether this process is included or not? If it is included, it is very likely to be parametrized: it's hard to imagine full mechanistic biochemical model of plant physiology in the global GCM (yet). So perhaps just ask if it is included, leave space for more detailed description if needed?	Removed the "Parametrized?" question, retaining the questions on maintenance and growth repsiration (0.2.0) David Hassell
Pre-stage 3	Sergey Malyshev	GFDL	24.2 Allocation bins	"Specify the allocation of vegetation carbon bins" -- perhaps it better expressed as "Specify distinct carbon bins used in allocation"?	Done (0.2.0) David Hassell
Pre-stage 3	Sergey Malyshev	GFDL		There should be a question asking how does model implement land use transitions. Are net or gross transitions used? Model implementing gross transitions can easily represent processes like shifting cultivation; in net transition treatment this is more difficult. This would affect carbon/nitrogen balance.	This question is now asked in key properties (0.2.0) David Hassell
Pre-stage 3	Chris Milly	GFDL	grid>vertical	add total depth?	Added total_depth property (0.2.0) David Hassell
Pre-stage 3	Chris Milly	GFDL	grid>vertical	need vertical for snow, lake, land ice,...	Have put a property into land_lakes, snow is already their and land ice is dealt with in the "land ice" realm (0.2.0) David Hassell
Pre-stage 3	Chris Milly	GFDL	key properties>basic approx	I think this is both too vague and too general. Perhaps the same information could be requested at finer granularity in the tree.	Changed the field name to "description" with the instruction "General description of the processes modelled (e.g. dymanic vegation, prognostic albedo, etc.)" Further questions are in each process (0.2.0) Daivd Hassell
Pre-stage 3	Chris Milly	GFDL	key props>landatm flux exch	Not clear what info belongs here. Is it just binary yes/no this quantity is or is not exxchanged?	These is a list of fluxes from which you can choose as many or as few as you need. David Hassell
Pre-stage 3	Chris Milly	GFDL	key props>atm coupling	There might be different answers for different entities (e.g., vapor flux vs dust flux)	Changed this question to "Describe the treatment of land surface coupling with the Atmosphere model component, which may be different for different quantities (e.g. dust: semi-implicit, water vapour: explicit)", which has a free text answer (0.2.0) David Hassell
Pre-stage 3	Chris Milly	GFDL	key props>prog vars	Wha is "snow" as distinct from other snow variables?	This was a typo - now removed (0.2.0) David Hassell
Pre-stage 3	Chris Milly	GFDL	key props>prog vars	It might be better to create another level in the hierarchy here, to differentiate soil, snow, lake, river, land ice,vegetation. Then, each of these would (potentially) have prog vars for water/ice mass, T/heat content, carbon, N, P...	Moved questions on prognostic variables to individual processes (0.2.0) David Hassell
Pre-stage 3	Chris Milly	GFDL	key props>prog vars	missing lake temperature or heat content, lake depth, lake ice content, etc.	These questions are asked in the land_lakes process. David Hassell
Pre-stage 3	Chris Milly	GFDL	key props>prog vars	missing river volume, temperature or heat content, ice volume...	Questions asked as free text in river routing process (0.2.0) David Hassell

Pre-stage 3	Chris Milly	GFDL	key props>prog vars	many of these are unlikely to be prog, but rather diagnostic, e.g., skin temperature(s?), river discharge	Questions on prognostic variables asked as free text in individual processes (0.2.0) David Hassell
Pre-stage 3	Chris Milly	GFDL	key props>tiling	more detail would be appropriate. static vs dynamic, prescribed vs predicted, types of disturbances (fire, harvest, etc.)	Tiling in Key Properties promoted to a description (from a logical), Tiling for individual components already there (0.2.0) David Hassell
Pre-stage 3	Chris Milly	GFDL	key props>cons props	energy appears twice	Fixed (0.2.0) David Hassell
Pre-stage 3	Chris Milly	GFDL	key props>cons props	descriptions are vague. could we say such and such is conserved globally to within X [units]/year?	Added the suggested descriptions (0.2.0) David Hassell
Pre-stage 3	Chris Milly	GFDL	key props>time steps	No distinction is allowed here for multiple time step levels, e.g., soil physics, river physics, vegetation growth, disturbances...	I have updated the overall timestep description and added the possibility of providing timesteps for individual subprocesses (0.2.0) David Hassell
Pre-stage 3	Chris Milly	GFDL	soil>map>water table	I presume most models will predict water table depth, not use an input map.	Map descriptions are now optional. Can say if water table is prognostic, or not, in the general "what the prognostic variables" question (0.2.0) David Hassell
Pre-stage 3	Chris Milly	GFDL	soil>map>depth	More flexibility advised here. Some models will not have a specific soil depth but rather a continuous representation of property variations with depth.	Added "continuously_varying_soil_depth" question (0.2.0) David Hassell
Pre-stage 3	Chris Milly	GFDL	soil>hydrology>description	This entry is vague. What are soil hydrological properties? Would this belong over with texture, structure etc?	I have re-described this as "General description of the soil hydrological model" (0.2.0) David Hassell
Pre-stage 3	Chris Milly	GFDL	soil>hydrology> GW layers	Some models do not have separate soil and GW modules, but rather represent these continuously in the vertical, with layers potential switching from saturation to non-saturation.	I have changed the questions on how many soil/GW layers. I'm not sure if this addresses the comment, so more feedback would be appreciated. (0.2.0) David Hassell
Pre-stage 3	Chris Milly	GFDL	soil>hydrology>water storage method	I can't guess what a water storage method is.	I have renamed this "hydrological method " (the hydrological dynamics scheme in the land surface model) (0.2.0) David Hassell
Pre-stage 3	Chris Milly	GFDL	soil>hydrology>freezing	I think most models will have number of ground ice layers being a dynamics subset of number of soil layers, not worthy of distinguishing here. Likewise, permafrost will likely be dynamically computed within the soil module. What is an "ice storage method?"	I have changed the description to "How many soil layers may contain ground ice". I have left the question, and that on permafrost, where it is because it is still in the "soil" process, but am not sure that it is any better in the "heat treatment" sub-process. (0.2.0) David Hassell
Pre-stage 3	Chris Milly	GFDL	soil>hydrology>drainage/runoff	Combine these two. "Gravity drainage" could be one option for runoff. There are several other options that could be included. Maybe "topmodel-based." Horton mechanism. Dunne mechanism. Lateral subsurface flow. Baseflow from groundwater.	Merged runoff into drainage and added a list of the types you suggest (from which you can select as many or as few as apply) (0.2.0) David Hassell
Pre-stage 3	Chris Milly	GFDL	soil>hydrology	Add lateral connectivity between tiles, which could be (a) perfect connectivity (i.e., common soil for multiple veg tiles), (b) Darcian flow among hillslope tiles, ...?	I have added a question on lateral connectivity, including the options you suggest (you can always add any other, unspecified options to these predefined lists) (0.2.0) David Hassell
Pre-stage 3	Chris Milly	GFDL	LAND general	I don't have time to go through the whole realm in detail. General comment is that the overall hierarchy is not perfect, and I've commented specifically on this at points. Also, there are lots of redundancies, where the same information could be contained in different places in the hierarchy. It looks a bit like it was designed by just adding together lots of suggestions, without much thought about how the different pieces are related. Admittedly, this would require subject-matter expert time, which is in short supply...	This is a welcome comment. I hope that by addressing the various comments here I have improved the hierarchy and at least reduced the redundancies. I shall review the whole realm again now that I have thought about all of the excellent additions given here. David Hassell
Pre-stage 3	Eric Guilyardi	IPSL	short table	I would add the model name (top of key properties)	Added (0.3.0) David Hassell
Pre-stage 3	John Scinocca	CCCma	Land Atmosphere Flux	over land, physical and biogeochemical fluxes are all lumped into one, including river routing. For ocean, however, the physical and biogeochemical stuff is kept separate. Why?	I believe that the separation between realms follows the CMIP6 scheme ( <a href="https://github.com/WCRP-CMIP/CMIP6_CVs/blob/master/CMIP6_realm.json">https://github.com/WCRP-CMIP/CMIP6_CVs/blob/master/CMIP6_realm.json</a> ), which has much history behind it! David Hassell
Pre-stage 3	John Scinocca	CCCma	all	It is not always clear what is being requested in some boxes. For example, under "Land Atmosphere Flux Exchanges" what does "Enum Is Open ?" mean? As a general comment, some examples beside each requested field would be very helpful.	We are in the process of updating the descriptions to avoid such technical jargon. David Hassell

2019-06-24	Marie-Pierre Moine	CERFACS	River routing	When defining the Source and Target of a coupling, we are limited to a choice among the 8 realms. However, this does not necessarily matches the reality of the coupling. For instance, there is no "river routing" realm but in our climate model, land-surface and river-routing model components exchange coupling fields.	The river routing process has a property for describing the coupling to land ("coupled_to_land"). David Hassell
2019-06-24	Marie-Pierre Moine	CERFACS	Carbon cycle	What is excepted is sometime unclear. For example, in 7.3.1.3 "Decomposition: List the decomposition methods" we do not really understand what "methods" means.	
2019-06-24	Marie-Pierre Moine	CERFACS	Key Properties	A typo in: "1.2.1 Key Properties --> Conservation Properties / Convservation"	Fixed (1.1.1) David Hassell
				7.1.1.4 * Time Step INTEGER Time step of carbon cycle in seconds: in our land model, we use 2 different time steps, one for photosynthesis, respiration and turn over and an other one for carbon allocated to plant organs. However there is only place for one time step.	time_step : 'Time step of carbon cycle in seconds. Specify if there is a single time step for the whole scheme.'; time_step_photosynthesis_respiration_turn_over : 'Time step of photosynthesis, respiration and turn over in seconds'; time_step_carbon_allocated_to_plant_organs : 'Time step of carbon allocated to plant organs in seconds'. Fixed (1.1.2) David Hassell