気象研究所陸面モデル HAL

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MRI New Landsurface Model HAL

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A land surface model HAL is newly developed (Hosaka et al. in preparation) for MRI-ESM1 and it is used for the CMIP simulations (Yukimoto et al. 2011). HAL consists of three submodels: SiByl (vegetation), SNOWA (snow) and SOILA (soil) in the current version. It also contains a land surface coupler LCUP which connects some submodels and an atmospheric model.

The vegetation submodel SiByl has surface vegetation processes similar to JMA/SiB (Sato et al. 1987, Hirai et al. 2007). SiByl has 2 vegetation layers (canopy and grass) and calculates heat, moisture, and momentum fluxes between the land surface and the atmosphere. The snow submodel SNOWA can have any number of snow layers and the maximum value is set to 8 for the CMIP5 experiments. Temperature, SWE, density, grain size and the aerosol deposition contents of each layer are predicted. The snow properties including the grain size are predicted due to snow metamorphism processes (Niwano et al. in preparation), and the snow albedo is diagnosed from the aerosol mixing ratio, the snow properties and the temperature (Aoki et al. 2011). The soil submodel SOILA can also have any number of soil layers, and is composed of 14 soil layers in the CMIP5 experiments. The temperature of each layer is predicted by solving heat conduction equations. The soil moisture is predicted by solving the Darcy equation, in which hydraulic conductivity depends on the soil moisture.

HAL can include some competing submodels (more precise and detailed "reference models" and simpler "standard models"). The reference models can be directly validated with the observational data, whereas the standard models are compared with the reference models. This strategy enables us to develop the HAL with the physical bases and the self confidence.

References

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