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INTRODUCTION OF NEW LAND PROCESSES AND ITS CONTRIBUTION TO AN ATMOSPHERE-OCEAN GENERAL CIRCULATION MODEL

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Since the water and heat balance at the land surface plays an important role on the earth's climate, the atmosphere-ocean general circulation models (AOGCM) employ the major land processes related to water and heat in order to represent influences of the land upon the atmosphere. However, both the inacurracy of introduced processes and the lack of processes may cause climate biases related to land. So it is important both to improve introduced processes and to introduce new processes, for the reduction in climate biases. In the present study, we improved follwoing three processes in the land surface submodel MATSIRO which is a land part of the AOGCM, MIROC.

(1) The introduction of a sub-grid snow disdistribution model SSNOWD (Liston 2004): Nitta et al. (2014a) introduced SSNOWD to the off-line MATSIRO and revealed that the snow cover distribution and seasonality are closer to the observation compared with the previous snow cover scheme. Hence, the introduction of SSNOWD into MIROC GCM is expected to reduce the biases of the GCM. (2) The introduction of a short-term pool of snow melt water: Nitta et al. (2014b) introduced a pool for snow melt water into off-line MATSIRO and revealed that the Eurasian summer temperature bias is reduced. The same effect is expected in the MIROC AOGCM. (3) The introduction of a soil albedo dependency to soil wetness: In the present version of MATSIRO, soil albedo is fixed to a satellite-based observation and does not depend on the soil wetness. This treatment amplifies temperature bias in a specific area. The introduction of an observed relationship between soil albedo and soil wetness (Idso et al. 1975 and Post et al. 2000) could improve the summer temperature bias in semi-arid area. Impacts of these improvements in the land surface submodel on the atmosphere will be presented.