Validation of Biome-BGC model at flux towers in East Asia

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Biome-BGC is one of a standard terrestrial ecosystem model. It is a process-based model and used for global NPP estimation with MODIS. This model ingests daily meteorological data as inputs and produces outputs of more than 500 ecological variables. This model had been validated mainly for North American continent as well as Europe but relatively less for East Asia. In this paper, we validated Biome-BGC with observed tower flux data and some biophysical data in the following three sites in East Asia: A temperate grassland site with mixture of C3 and C4 grasses at Terrestrial Environment Research Center (TERC; Tsukuba, JAPAN), a temperate deciduous broad leaf forest site at Takayama (Gifu, JAPAN) and a tropical rain forest site at Pasoh (MALAYSIA).

In TERC, we run Biome-BGC model for 17 years from 1983 to 2000 except 1988. Maximum LAI value of outputs was approximately from 1/5 to 1/3 of the observed data. Concerning to daily sensible heat flux, daily output was less than observed data over year. Especially, in summer there was a great discrepancy.

In Takayama, we run the model for 2 years of 1999 and 2000. Maximum LAI value of outputs was approximately from 1/4 to 2/3 of the observed data. But in winter and spring the agreement of daily LAI was fairly good between the model output and the observed data. Concerning to daily NEE, output was nearly consistent with the observed data over winter at negative value, but inconsistent in summer with discrepancy of approximately 75% of the observed data at positive value (positive value means absorption of carbon). As for daily latent heat flux, output was nearly consistent with the observed data over summer, but was bigger than the observed data in winter. The period with big disagreement in winter between the observed data and the model output of latent heat flux in Takayama corresponded to the period of snow cover.

In Pasoh, we run the model for 4 years from 1996 to 1999. As for daily NEE, outputs was approximately from 1/4 to 1/2 of the observed data at 9, 11, and 12 March 1998. As for yearly NPP and NEP, outputs were approximately 1/2 of their observed data.

As a conclusion, in TERC and Takayama, the maximum values of variables which are related to carbon dynamics such as LAI and NEE were estimated too small by the model. Concerning to latent heat flux, we need more investigation about the reason of discrepancy between simulated and observed data. Especially in Pasoh, we need NEE data more than a few days. Although we have shortage of validation data, this model under-estimated the intensity of carbon budget at least on yearly basis.