

## Development of Integrated Terrestrial Model: a biogeophysical land surface model with human components

\*Tokuta Yokohata<sup>1</sup>, Akihiko Ito<sup>1</sup>, Naota Hanasaki<sup>1</sup>, Gen Sakurai<sup>2</sup>, Tsuguki Kinoshita<sup>3</sup>, Toshichika Iizumi<sup>2</sup>, Yoshimitsu Masaki<sup>1</sup>, Tomoko Nitta<sup>4</sup>, Yadu Pokhrel<sup>5</sup>, Seita Emori<sup>1</sup>

1.National Institute for Environmental Studies, 2.National Institute for Agro-Environmental Sciences, 3.Ibaraki University, 4.Atmosphere Ocean Research Institute, University of Tokyo, 5.Rutgers University

Future climate changes possibly affect eco-system services, water resources, food production, energy supply, etc. It is important to understand the interaction between the changes in these complicated factors. In the present study, we develop an integrated terrestrial model which describes the natural biogeophysical environment as well as human activities. In the integrated model, a global vegetation model VISIT (Ito et al. 2012), water resource model H08 (Hanasaki et al. 2008, Pokhrel et al. 2012), crop growth model PRYSBI2 (Sakurai et al. 2015), and land use model TELMO (Kinoshita et al., in preparation) are coupled to a land surface model MATSIRO (Takata et al. 2003, Nitta et al. 2014), which is a component of global climate model MIROC (Watanabe et al. 2010). Output variables of each sub-model are passed to other sub-models during the time integration. The time interval of variable exchange is a few hourly or daily. For example, the crop yields [ton/ha] calculated by PRYSBI2 is used in TEMO which calculate the land use change (crop or natural vegetation area) of next year. The projected land-use map is used in all other sub-models. The water resource model H08 considers the irrigation process (water withdrawal from rivers) as well as dam operations in large rivers, which affects the state of the soil moisture and the river flows in the land surface model. We will present the state of the model development, and results from the historical and future simulation.

Keywords: Earth system model, climate change, human activity