

Summary of SOUSEI-B: Five-year research program on earth system modeling

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The Program for Risk Information on Climate Change (SOUSEI) is a national project for projection of global change, with an aim to provide information for adaptation and mitigation, based on scientific evaluation of changes in extreme events and carbon cycle etc. This project began in FY2012 and comes to an end in March, 2017. Amongst other themes of the SOUSEI program, Theme B (SOUSEI-B) focuses on earth system modeling incorporating sophisticated carbon and nutrient cycles, and its application for examining future socio-economic pathways of mitigation. MIROC-ESM, an earth system model (ESM) developed under SOUSEI-B has been significantly improved since the 5th phase of coupled model intercomparison (CMIP5), which has made essential contributions to the 5th Assessment Report of Intergovernmental Panel on Climate Change (IPCC AR5). New features for the ocean geochemistry part include: explicit iron and phosphate cycle, nutrient deposition via atmosphere, and nutrient transport by rivers from land to ocean. Besides these model improvements, understandings have been obtained regarding ocean's role in regulating the earth system response to, and impacts on the ocean from, anthropogenic forcings, such as those on mechanism of acidification in the middle layer in the western North Pacific, impact of ocean heat uptake on transient climate response to emission (TCRE), and identification of uncertainty sources for sea level rise due to ice sheet melting. Besides, SOUSEI-B yielded many results for other fields than oceanography, including multi-model estimates of the effect of geoengineering, impact of earth system uncertainty on future cost for global change mitigation, and dependence of precipitation change on aerosol emission scenario. It is hoped that these results will contribute to IPCC's special reports and subsequent Working Group I assessment report. Although the SOUSEI program come to an end quite soon (as of February, 2017), the community has been striving to establish a follow-on program so scientists can further contribute to the next phase of CMIP (CMIP6). By the time of presentation, outline of the new program should be clear and will be explained in the presentation.

Keywords: Earth System Model, Global Warming, Intergovernmental Panel on Climate Change (IPCC), Ocean Acidification, Transient Climate Response to Emission (TCRE), Geoengineering