

Simulation Studies of Solar Activities as a Cause of Solar-Terrestrial Environment Variation

*Kanya Kusano¹, Hideyuki Hotta²

1. Institute for Space-Earth Environmental Research, Nagoya University, 2. Faculty of Science and Engineering, Chiba University

Solar activity is the main driver of disturbance of solar-terrestrial environment, and an extreme space weather disaster caused by a giant solar eruption is a potential risk to modern society. The prediction is just a way to mitigate the space weather disaster. In this study, in order to improve our understanding and predictability of the solar-terrestrial environmental variation, we are developing the various types of simulations of solar activities. In this paper, we will report the recent progress of the following two topics. The first topic is for the comprehensive simulation of the whole solar convection zone. Since comprehensive calculation covering whole convection zone has not been carried out ever due to significant temporal and spatial differences between deep and surface layers, our understanding for connection between the solar surface and the deep solar interior has been limited. Here we succeed in carrying out such a calculation for the first time. The results show that the surface region has an unexpectedly small effect on the deep convection zone. The second topic is for the physics-based prediction of imminent giant solar flares. The results indicate that the non-linear force-free modeling based on the vector magnetic field data can be a powerful tool to predict when, where and how large giant solar flares will occur.

Keywords: solar convection zone, solar flares, space weather