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Hierarchical Climate Modeling for Cosmoclimatology

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It has been reported that there are correlations among solar activity, amount of galactic cosmic ray, amount of low clouds and surface air temperature (Svensmark and Friis-Chistensen, 1997). These correlations seem to exist for current climate change, Little Ice Age, and geological time scale climate changes. Some hypothetic mechanisms have been argued for the correlations but it still needs quantitative studies to understand the mechanism. In order to decrease uncertainties, only first principles or laws very close to first principles should be used.

Our group at Japan Agency for Marine-Earth Science and Technology has started modeling effort to tackle this problem. We are constructing models from galactic cosmic ray inducing ionization, to aerosol formation, to cloud formation, to global climate. In this talk, we introduce our modeling activities. For aerosol formation, we use molecular dynamics. For cloud formation, we use a new cloud microphysics model called "super droplet method". We also try to couple a nonhydrostatic atmospheric regional cloud resolving model and a hydrostatic atmospheric general circulation model.