3rd International Conference on Earth System Modelling
Vol. , 3ICESM-355, 2012
3rd International Conference on Earth System Modelling

Analysis of permafrost thermal dynamics and response to climate change in the CMIP5 Earth System Models

C. Koven and W. Riley
United States (cdkoven@lbl.gov)

We analyze global climate model predictions of soil temperature from the Coupled Model Intercomparison Project 5 (CMIP5) database to assess the models' representation of current-climate soil thermal dynamics, and their predictions of permafrost thaw during the 21st century. We compare the models' predictions to observations of active layer thickness, and the mean and seasonal amplitudes of air temperature and soil temperatures. Models show a wide range of current permafrost areas, active layer statistics (cumulative distributions, correlation with mean annual air temperature, and amplitude of seasonal air temperature cycle), and ability to accurately model the coupling between soil and air temperatures at high latitudes. Many of the between-model differences occur between the near-surface air and soil surface temperatures, emphasizing the crucial role of surface exchange and snow insulation in determining ground thermal regime. We discuss ways of improving the model realism and of combining the resulting thaw indices with vertical information on soil C distributions in permafrost regions to estimate the magnitude of soil C thawed as a result of warming at high latitudes.