[JJ] Evening Poster | A (Atmospheric and Hydrospheric Sciences) | A-CC Cryospheric Sciences & Cold District Environment

[A-CC28]Glaciology

convener:Takayuki Nuimura(Chiba Institute of Science), Ishikawa Mamoru(Hokkaido University), Kzutaka Tateyama(国立大学法人　北見工業大学, 共同), Hiroto Nagai(Japan Aerospace Exploration Agency)
Wed. May 23, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)
The cryosphere is a fundamental component of the earth system. It is a region where snow and ice exist in the form of glacier/ice sheet, snow cover and snowfall, frozen ground, sea ice and fresh water ice, and they play a critical role in the global environment under the interactions with atmosphere, ocean, ecosystem and others. In this session, research results on physical and chemical characteristics of snow and ice, variations and dynamics of cryospheric environment, roles of the cryosphere on the earth and other planets will be discussed broadly, regardless of the research method.

[ACC28-P09]Environmental conditions that determine the frost forms

★ Invited Papers

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Keywords:Frost, Frost damage, Frozen dew, TDR

Crop damages by frost resulted from freezing temperature due to radiative cooling in early spring and late autumn are called frost damage. Frost damage is one of the major damages for commercial crops in Japan. Freezing loss per unit area to agricultural crops in Japan in 2014 was twice as much as that due to birds and animals (Ministry of Agriculture, Forestry and Fisheries, 2015). Since frost locally forms affected by micro-topography and microclimatology, meteorological approaches to predict frost formation may be less accurate. There are two types of frost form: (1) frozen dew, in which condensed dew is frozen; and (2) sublimated frost, in which water vapor in the atmosphere is frozen. A different type of frost formed on the crop surface may alter the degree of damage impact on crops. It is thought that damage caused by frozen dew is less than that by sublimated frost (Tazawa, 1947). Therefore, the accuracy of frost damage prediction can be improved by considering the frost form. The development of direct and high-precision techniques for detecting frost forms has been demanded. We developed a high-precision frost detection sensor using time domain reflectometry (TDR), which detected differences in dielectric constant among substances of frost and dew condensed, i.e. air, water and ice. The TDR frost probe could differentiate whether it was condensed dew, frozen dew or sublimated frost only with a dielectric constant difference. The objective of this study was to gain knowledges on the effects of environmental conditions on frozen dew and sublimated frost. Frost forms were determined by absolute humidity. The frozen dew occurred with the absolute humidity of about 3 g/m^3 or more, and sublimated frost occurred with the absolute humidity of about 3 g/m^3 or less. Any frost was not formed when the absolute humidity became about 2 g/m^3 or less. A frost forming rate was found to be affected by the surrounding environments.