International studies of ice sheet and bedrock at Dome Fuji, East Antarctica

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Climatic histories from about 800 kyr BP up to present have been studied using very deep ice cores drilled at dome summits in East Antarctica at Dome Fuji and Dome C. Knowledge gained from ice cores studies are crucial to understand the past and present climate and to predict the impacts of future climate changes. International Partnership for Ice Core Sciences (IPICS) identified that ice cores covering ages of the mid-Pleistocene Transition are necessary step to better understand climate dynamics. Multiple ice cores older than 1 M yrs BP are necessary. Dome Fuji area in East Antarctica is one of the candidate areas where we may be able to find very old ice core near the bottom of the ice sheet. Japanese Antarctic Research Expedition (JARE) has conducted deep ice coring at Dome Fuji twice in the past decade. They recovered ice cores covering ages up to about 720 kyr BP. At the same time, they have accumulated radar sounding data in this area. Alfred Wegener Institute (AWI), Germany, made an extensive airborne radar survey in 2016/2017 season covering Dome Fuji with a basic survey line spacing of 10 km. In the following season of 2017/2018, JARE also made ground-based radar surveys over a distance of 2950 km with a line spacing of 5 km or less. Based on results of these surveys, we conducted a more detailed radar surveys at Dome Fuji in 2018/2019 season as a collaborative research between University of Alabama, the University of Kansas, National Institute of Polar Research under Research Organization of Information and Systems (Japan), and Norwegian Polar Institute. Norwegian Polar Institute joined also collaborating on these efforts with the European framework of Beyond EPICA - Oldest Ice (BE-OI). We used two state-of-the-art radars: A wideband radar ice sounder developed by CReSIS, University of Kansas and ultra-wideband radar developed by University of Alabama. In addition, we used a classical pulse-modulated VHF radar of JARE with high gain antennas. Using a traverse team of JARE and its snow vehicles, we investigated along 2,700 km in an area of about 1,000 km2. Final spacing between survey lines varied between 0.5 km and 0.25 km. The surveys were completed by the end of December, 2018. We will present preliminary results from these surveys. Preliminary quick-look results indicate that we collected an excellent radar data set with very good layering information including the bottom 10% of the ice. The data will be examined to identify candidate locations to drill very old ice.