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Site Testing at Dome Fuji for Submillimeter and Terahertz Astronomy: 220 GHz Atmospheric Transparency

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We measured the 220 GHz atmospheric transparency at the Dome Fuji station in Antarctica from 18 December 2006 to 14 January 2007 using a tipping radiometer. The mean optical depth at zenith was 0.045 ± 0.007 , and during 98% of this period we measured an optical depth of less than 0.06. These data indicate that the atmospheric transparency in summer at Dome Fuji is comparable to that of well-known submillimeter astronomical sites such as the Atacama desert in Chile in their best seasons.

Titanium behavior in quartz during retrograde hydration: occurrence of rutile exsolution and implications for metamorphic processes in the Soer Rondane Mountains, East Antarctica

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In the central Soer Rondane Mountains, East Antarctica, orthopyroxene felsic gneiss (OPG) was converted to hornblende-biotite felsic gneiss (HBG) by hydration that accompanied the intrusion of pegmatite. The retrograde HBG contains exsolved rutile in quartz. The composition of orthopyroxene and clinopyroxene in OPG suggests a temperature of 840°C (interpreted as the near-peak temperature), and the composition of hornblende and plagioclase in HBG suggests a temperature of $670\text{--}700^{\circ}\text{C}$ (interpreted as the temperature during hydration). Ti concentrations in quartz were measured using an electron probe micro-analyzer, and Ti-in-quartz thermometers were applied. Measured Ti concentrations were 110 ppm (equivalent to $760\text{--}820^{\circ}\text{C}$) for homogeneous quartz from OPG and 35 ppm ($650\text{--}700^{\circ}\text{C}$) for an exsolution-free area of a quartz grain from HBG. The pre-exsolution Ti concentration in quartz from HBG was reconstructed with 100 μm beam diameter and 25 keV of accelerating voltage, giving 103 ppm, similar to the value obtained for homogeneous quartz in OPG. The temperatures obtained using a Ti-in-quartz thermometer are consistent with those estimated using other thermometers.

Although analysis of the main constitute minerals in HBG yields the conditions of hydration, the reconstructed pre-exsolution Ti content in quartz within HBG yields the pre-hydration conditions. Thus, the Ti-in-quartz thermometer is a potentially powerful tool with which to identify the peak or near-peak temperature conditions, even for retrogressed metamorphic rocks.

Surface zooplankton distribution in the Drake Passage recorded by Continuous Plankton Recorder (CPR) in late austral summer of 2000

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We investigated the composition, distribution, and abundance of zooplankton in the Drake Passage in February 2000 using a Continuous Plankton Recorder. Zooplankton abundance varied considerably, between 1 and 1,537 individuals/segment (where a segment is 5 nautical miles of surface towing) (mean \pm SD = 121.3 \pm 200.9). The highest abundances were recorded in the vicinity of the Polar Front (PF).

Abundances increased at low latitudes north of the Sub-Antarctic Front (SAF) and decreased northward. A positive correlation was observed between zooplankton abundance and chlorophyll *a* concentration, reflecting the higher abundance of zooplankton north of the SAF, where higher abundances of phytoplankton were also observed. A total of 21 species/taxa of zooplankton were classified. Small calanoid copepods were found throughout the transect and accounted for 57.5% of total zooplankton abundance, followed by the Cyclopoid copepods *Oithona* spp. (25.9%) and *Calanus simillimus* (8.4%). The results of cluster analyses reveal that small calanoid copepods were the most important contributors to the high zooplankton abundance around the PF and north of the SAF in the Drake Passage. We suggest that a change in species composition has occurred since Hardy's descriptions in 1927, from abundant larger copepods and chaetognaths to smaller copepods and other species.

Evaluating the impact of environmental pollution on fish in McMurdo Sound, Antarctica: A biomarker approach

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To assess the ongoing effects of anthropogenic pollutants on the Winter Quarters Bay (WQB) fauna, resident *Trematomus hansonii* and *T. hansonii* from a control site, Backdoor Bay (BDB) were caught. A suite of biomarkers, namely ethoxyresorufin- σ -deethylase (EROD), pentoxyresorufin- σ -deethylase (PROD) and biliary naphthalene and phenanthrene were measured. EROD activity was significantly higher in the WQB resident *T. hansonii*, while the remaining parameters were unaffected, and no differences in the hepatosomatic index or condition factor were evident. Additionally, *Trematomus bernacchii* were collected from BDB and placed in cages within WQB

and at Cape Armitage (another control site near McMurdo Station) for 2 and 4 weeks. No differences in EROD and PROD activities were found between any of the caged *T. bernacchii*. Naphthalene was significantly elevated in WQB caged *T. bernacchii* after both 2 and 4 weeks even though phenanthrene was elevated in WQB caged fish only after 4 weeks. Again, there were no significant morphological differences between groups. It is evident from both the resident and caged fish that the legacy left by the pollution in WQB is still affecting the local marine fauna.

Development of Antarctic herb tundra vegetation near Arctowski station, King George Island

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We studied the development of the Antarctic herb tundra vegetation formation in relation to the history of deglaciation across a range of habitats near H. Arctowski Research Station (King George Island, South Shetland Islands). Across the three identified environmental zones (coastal, intermediate, periglacial), we quantified the total vegetation cover, cover of the two indigenous flowering plants and bryophytes, age structure and reproductive features of the two flowering plants, and species diversity of mosses and liverworts. Analysis of these data supported the recognition of the three environmental zones; however, there were few indications of systematic differences in biological features of the two higher plants across the three zones, generally supporting the view that these, and the grass *Deschampsia antarctica* in particular, are effective primary colonists of recently deglaciated ground in this region.

Limnological characteristics of vertical structure in the lakes of Syowa Oasis, East Antarctica

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We investigated the vertical structure of physicochemical properties in 27 lakes at Skarvsnes and Langhovde, Syowa Oasis, East Antarctica, from December 2003 to February 2004. The lakes were classified into three types based on their origin and geographical characteristics: non-marine relic lakes, marine relic and lotic lakes, and marine relic and lentic lakes. We describe the physicochemical characteristics of each lake type. When the non-marine relic lakes were partly covered with ice, the water column was stratified beneath the ice. In the non-marine relic lakes, during the season with no ice cover, physicochemical parameters were uniform throughout the water column, probably due to frequent vertical mixing induced by wind force and thermal convection within the shallow basins. Similarly, in marine relic and lotic lakes, lake waters appeared to be completely mixed because of a large inflow of

meltwater from glaciers and outflow to other lakes and the coastal sea. In the marine relic and lentic lakes, except for Lake Himebati-ike, the lake water was vertically stratified with a strong halocline. In Lakes Suribati-ike and Hunazoko-ike, salinity was very high (up to 20%) due to evapoconcentration. Lake Suribati-ike is a meromictic lake, with a monimolimnion developed below 10 m water depth.

Discovery 1 of the Yamato Meteorites in 1969

Masaru Yoshida

The first discovery of Yamato Meteorites by an inland survey team of the Japanese Antarctic Research Expedition (JARE) in 1969 was reported by Yoshida et al. (1971). However, there are important events, issues, and data related to this discovery that have so far not been published. Prior to the author's departure for Antarctica, M. Gorai suggested the author to consider collecting meteorites during the trip. On 21 December 1969, when geodetic measurements for the 250 km span of a triangulation chain were approaching its completion, members of the inland survey team collected three stones on the surface of the ice sheet in the southeastern marginal area of the Yamato Mountains. The author realized that these rocks were possibly meteorites, recalled the suggestion by M. Gorai, and requested all members of the team to collect other possible meteorites while conducting the geodetic survey. After returning to Japan, the nine stones collected in Antarctica were all identified as meteorites by M. Gorai. The concept of a mechanism by which meteorites became concentrated in the area in which they were found, involving the flow, structure, and ablation of the ice sheet, was developed in the field in 1969 during the collection program, and was mentioned briefly in Yoshida et al. (1971); a schematic figure was shown in a Japanese newspaper in the same year. With all these as background, further collections of meteorites in the Yamato Mountains were conducted in the 1973 and 1974–1975 seasons, and a project involving the collection of meteorites was formally incorporated as an important component of the work undertaken by the geology group within JARE from the 1975–1976 season onwards.