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Simultaneous ground–based and satellite observations of natural VLF waves in Antarctica: A case study of downward ionospheric penetration of whistler–mode waves

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To investigate downward ionospheric–penetration characteristics of VLF (several hundred Hz to 17.8 kHz) whistler–mode waves, we conducted simultaneous observations (in 2006) of natural VLF waves using both ground stations in Antarctica and the Japanese Akebono satellite. The ground–based and satellite observations included an interesting event for which both observed similar VLF waves. In this study, we theoretically calculate down–going whistler–mode wave propagation based on ground–satellite observations using the full–wave analysis. In a case study, the observed wave–normal angles were approximately 140–160 degrees for a dayside chorus event on 15 March 2006. The theoretical calculation showed that the wave–normal angles for ionospheric penetration should be around 155.6 degrees, with its angular width of approximately 2 degrees. Moreover, the wave–energy loss due to ionospheric penetration is estimated at 20.4 dB based on our theoretical calculation, in accordance with the observed 17–19 dB.

Fluctuatuions in the flow velocity of the Antarctic Shirase Glacier over an 11 –year Period

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Temporal fluctuations in the flow velocity of Shirase Glacier in Antarctica were studied using 15 synthetic aperture radar (SAR) scenes obtained by the Japanese Earth Resources Satellite–1 (JERS–1) in 1996–1998 and 9 phased–array–type L–band SAR (PALSAR) scenes obtained by the Advanced Land Observing Satellite (ALOS) in 2007–2008. The scenes were analyzed using image correlation. The relative accuracy of the determined velocities was ±0.03 km/a for JERS –1 and ±0.02 km/a for ALOS. No marked temporal changes in ice flow velocity at the grounding line (GL) were noted during either period; the ice velocity varied from 2.33 km/a (1996) to 2.27 km/a (2007). However, a marked difference between the two periods was found upstream from the GL on the central streamline, as a function of

distance from the GL. Between the GL and the point 30 km downstream, ice velocities tended to be lower in 2007–2008 than in 1996–1998. Upstream from the GL, the velocities were higher in 2007–2008 than in 1996–1998, increasingly so with distance upstream, reaching a maximum of approximately 0.54 km/a at around 17–18 km upstream from the GL before diminishing again to a value of ~0.25 km/a at 30 km upstream. No clear seasonal variations in flow velocity were observed at 17 –18 km upstream from the GL in 1996–1998; however, in 2007–2008, the summer (December 2007–February 2008) velocity was 1.27 km/a, whereas the winter (June–August 2008) velocity was 1.06 km/a, representing a marked difference of 0.21 km/a. A larger difference between these seasons (0.38 km/a) was found at 20 km above the GL.

Limnological characterization of freshwater systems of the Thomas Point Oasis (Admiralty Bay, King George Island, West Antarctica)

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Hydrochemical research into the small, shallow water bodies and wetland areas around the Henryk Arctowski Polish Antarctic Station (King George Island) is presented. Concentrations of nitrite, nitrate, ammonium, and total nitrogen in these waters were determined, as were those of reactive and total phosphorous, inorganic carbon, organic carbon, total carbon, silicate, and chloride and sulfate ions. Conductivity and pH were also measured. Average concentrations ranged widely, e.g., total nitrogen 0.176–29.21 mg L^{-1}, total phosphorus 0.022–18.35 mg L^{-1}, total carbon 1.38–26.90 mg L^{-1}, Cl^- 30.17–850 mg L^{-1}, and SO_4^{2-} 2.11–236 mg L^{-1} . The trophic status was influenced by influxes of nitrogen and phosphorus from penguin rookeries. Selected water bodies supported 31 taxa of algae and 11 invertebrate taxa, with Euglenophyta dominating in waters with high concentrations of ammonium–nitrogen, whereas diatoms characterized Lake Wujka, with low ammonium concentrations. All water bodies studied had rotifers, but crustaceans were only represented in Lake Wujka.

Molecular evolution and variability of ITS1–ITS2 in populations of *Deschampsia antarctica* from two regions of the maritime Antarctic

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Only two vascular plants, *Deschampsia antarctica* Desv. (Poaceae) and *Colobanthus quitensis* Kunth. Bartl. (Caryophyllaceae), inhabit the Antarctic. To clarify the taxonomic position, phylogeographic origin, genetic heterogeneity, and population dynamics of D. *antarctica*, we comparatively analyzed the ITS1 and ITS2 sequences for several populations from two geographically distant regions of the maritime Antarctic (the South Shetland Islands and the Argentine archipelago). All accessions

of D. *Antarctica* formed a strongly supported clade in the phylogenetic dendrograms constructed. Despite the high degree of sequence similarity at ITS1–ITS2 (97%–100%), the populations of D. *antarctica* in Tierra del Fuego, Falkland Islands and Antarctic can be discriminated at the molecular level. Our data indicate that the majority of D. *antarctica* populations originated from South America. Different populations may have invaded Antarctic at different times. Genetically distinct plants may coexist within the same or adjacent populations on Antarctic islands.

Spatial and temporal variability in soil CO_2–C emissions and relation to soil temperature at King George Island, maritime Antarctica

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Few studies have examined the effects of temperature on spatial and temporal trends in soil CO2–C emissions in Antarctica. In this work, we present *in situ* measurements of CO2–C emissions and assess their relation with soil temperature, using dynamic chambers. We found an exponential relation between CO_2 emissions and soil temperature, with the value of Q_{10} being close to 2.1. Mean emission rates were as low as 0.026 and 0.072 g of CO2–Cm^{-2} h^{-1} for bare soil and soil covered with moss, respectively, and as high as 0.162 g of CO2–C m^{-2} h^{-1} for soil covered with grass, *Deschampsia antarctica* Desv. (Poaceae). A spatial variability analysis conducted using a 60–point grid, for an area with mosses (*Sannionia uncianata*) and D. *antarctica*, yielded a spherical semivariogram model for CO_2–C emissions with a range of 1 m. The results suggest that soil temperature is a controlling factor on temporal variations in soil CO_2–C emissions, although spatial variations appear to be more strongly related to the distribution of vegetation types.

Stability of palsa at the southern margin of its distribution on the Kola Peninsula

Valery Sh. Barcan

This study investigated palsa located at the southern margin of palsa extent upon the Kola Peninsula, Russia. Thirteen palsa bogs were analyzed, two of which had intervals between surveys of either 67 years (1935–2002) or 82 years (1920–2002). The thickness of the active layer of palsa during the warm season varied from 44 to 64 cm, consistent with existing data. The height and number of bog mounds, as well as the thickness of the active layer, are unchanged over the past 80 years.