

MEMBER COUNTRY: Japan
National Report to SCAR for year: 2008-09

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SCAR DATABASE						
insert name of database for which your country has responsibility						

A BRIEF SUMMARY OF SCIENTIFIC HIGHLIGHTS:

Selected Highlights of the Japanese Antarctic Research Expedition, 2008-09

JARE 49 Winter

1. Year-round observations on atmospheric aerosols and green house gases

(Makoto Wada, wada@nipr.ac.jp and Shinji Morimoto, mon@nipr.ac.jp)

JARE 49 carried out new measurement on aerosols with X ray fluorescence analysis to see seasonal contribution of elements to aerosols in coastal atmosphere and started precise measurement of oxygen concentration, which closely relates to CO₂ concentration through biological activities and combustion of fossil fuel, as well as the long-term monitoring on aerosols and green house gases (CO₂, methane) at Syowa station. Preliminary analysis revealed that sulfuric aerosols varied differently from those containing chlorine, calcium and sodium, with a tendency to decrease in concentration in winter and to increase in summer.

Syowa is the only one site for observing oxygen concentration continuously in the Antarctic now.

2. Experimental airborne observation using UAV

(Naohiko Hirasawa, hira.n@nipr.ac.jp)

Experimental long-distance airborne meteorological observation using a small semi-autonomous UAV (Unmanned Aerial Vehicle) was carried out near Syowa station successfully for the first time in Antarctica in December 2008. The aircraft of 3 meter in wingspan was radio-controlled for take-off and landing and measured meteorological parameters from the surface up to 1,000 meters in altitude during autonomous flight controlled by a micro-computer. The flight took 60 minutes covering 110 km in total.

Fixed wing aircrafts had been used for research observations and logistic support in JARE, overwintering at Syowa station for thirty years. However, decision was made to stop operation of the aircrafts in January 2005 because of the high cost of the maintenance and no hanger to conserve. In order to fulfill the needs of airborne observation in the Antarctic, Ant Plane Project was started in 2002 at NIPR to develop a small autonomous UAV. So far, the small UAV succeeded a long-distance flight of 1,000 km and a high altitude flight up to 5,700 m in Japan. It is expected that the small UAV can contribute as a platform for a wide variety of research and logistic operations in the Antarctic.

3. Study of the upper atmosphere with remote sensing of the OH airglow

(Hidehiko Suzuki, hsuzuki@nipr.ac.jp and Masaki Tsutsumi, tutumi@nipr.ac.jp)

Detailed observation of emission from excited OH molecules (OH airglow) in the upper atmosphere can tell us the temperature of the area. In 2008, a newly developed high-performance spectrometer was installed at Syowa Station to observe the OH airglow layer at an altitude of about 87 km. The observation revealed a unique seasonal variation in the upper atmosphere showing higher temperatures in winter than summer and a large fluctuation on the scale of several tens of degrees in several days. In order to acquire an understanding of global environmental changes, research is underway to continuously monitor the temperature in the polar mesopause region so as to identify the relationship between temperature changes in the polar upper atmosphere and auroral precipitations.

JARE 50 Summer

1. Special cooperation with the Australian Antarctic Division

(Kazuo Shiraishi, kshiraishi@nipr.ac.jp)

As Japanese icebreaker R/V Shirase decommissioned in 2008 and the next one was under construction, it asked the Australian Antarctic Division (AAD) for transporting expedition personnel and cargo to Syowa station for the last season, 2008-2009 under a framework of cooperative MOU between the National Institute of Polar Research (NIPR) of Japan and AAD. The 50th JARE members, 46 expedition personnel and one observer, embarked the Australian icebreaker, R/V Aurora Australis, in Fremantle and carried out cooperative oceanographic observation aboard.

A total of about 90 tons of cargo was transported to Syowa by three helicopters chartered in Australia. Over-wintered personnel of the JARE 49 arrived in Hobart with summer members of the JARE 50 aboard the R/V Aurora Australis on 21 February 2009. The new Japanese icebreaker was commissioned in May 2009 and departed Tokyo for transporting JARE 51 personnel and cargo to Antarctica in 10 November 2009.