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Time-series observation for the biogeochemistry at station K2 in the northwestern North Pacific

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The northwestern North Pacific has large seasonal variability in nutrients, pCO_2, primary productivity and particulate organic carbon flux. Thus time-series observation is very important in order to quantify carbon cycle in the ocean and air-sea exchange of CO_2 by, especially, the biological activity (biological pump). Since 2001, time-series observation has been conducted at station K2 (47N/160E), which is located in the North Pacific Western Subarctic Gyre (WSG), by using mooring systems and research vessel. Our mooring system is tethered to deep seafloor ($\sim$ 5000 m) and its top is located within the surface euphotic layer ($\sim$ 35 m). This system consists of various automatic samplers such as an optical sensor package (BLOOMS), a water sampler (RAS) and multiple sediment traps. Time-series observation of optical field and nutrients at $\sim$ 35 m by BLOOMS and RAS, respectively, revealed that phytoplankton increases and nutrients, especially silicate, decreases largely between late June and early July. During this time, increase of fluxes of particulate organic carbon and biogenic opal at $\sim$ 150 m was observed by sediment trap. It is indicative of that primary produced or assimilated organic carbon is transported quickly to the ocean interior. Multiple sediment traps from 150 m to 5000 m revealed that 1) biogenic materials are transported vertically without significant lateral transport, 2) sinking velocity of particles increases with depth, and 3) biogenic opal plays an important role in organic carbon transport. Seasonal observation of primary productivity, nutrients and natural radionuclide (thorium 234) by research vessel has revealed that new production, export flux and export ratio are higher than those in other oceans, indicating that the

biological pump at station K2 is efficient for uptake of atmospheric CO_2. On the other hand, long-term increase of dissolved inorganic carbon following increase of atmospheric CO_2 has been observed at station K2. It is suspected that this increase will change carbon chemistry and ecosystem at station K2 or the WSG. In order to predict change in the biological pump and its feedback to the atmosphere, time-series observation at station K2 should be continued.