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KALMAR – "Kurile-Kamchatka and Aleutean Marginal Sea-Island Arc Systems: Geodynamic and Climate Interaction in Space and Time" – an integrated science approach between Russia and Germany

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The exploration of the arctic seas require an integrated approach applying different infrastructures. In Fall 2009 German and Russian scientists performed a geo marine cruise off Kamchatka and in the western Bering Sea within the frame of the KALMAR-Project. Two main research subjects formed the scientific backbone of the cruise:

The first objective focuses on the geodynamic and volcanological-magmatic development of the Kuril-Kamchatka island arc system and the Kamchatka Aleutean Islands Triple-Junction.
Very little is known about the composition of the mantle and the oceanic crust as well as of the seamounts including their ages. The best studied site is the Volcanologist's Massif located between the Bering- and the Alpha Fracture Zone (Tsvetkov 1990, Volynets et al. 1992, Yogodzinsky et al. 1994), which structurally belongs to the Komandorsky Basin. The oldest rocks of the Volcanologist´s Massif show very similar trace element and isotope signatures like those rocks cropping out in the volcanoes on Kamchatka in the prolongation of the Alpha Fracture Zone (Portnyagin et al. 2005a), indicating similar conditions of magma formation. The top of the Volcanologist´s Massif is characterized by the young (< 0.5 Ma) and hydrothermally active Piip volcano, which consists of special magnesium rich andesites ("Piip type"). Another hot site was the Meiji-Seamount which is the northernmost Seamount of the hotspot spur of the Hawaii-Emperor-Seamount chain, having an age of probably > 85 Ma. The only existing basement rocks from this seamount were gained during DSDP Leg 19. These are basalts with MORB like trace element and isotope signatures (Keller et al. 2000, Regelous et al. 2003). These data indicate that the Hawaii-Hotspot was at a MOR in Cretaceous time and that large volumes of depleted mantle material played a role during the magma formation.

The second objective focuses on paleo-oceanographic investigations concentrating on the sediments along the eastern continental slope of Kamchatka, in the Komandorsky Basin, and on the Shirshov Ridge in order to explore paleoclimate archives to better understand the subpolar water mass transfer and the oceanographic and climatic development in the subarctic NW-Pacific. Comparisons of Late Pleistocene and Holocene temperature changes within the near surface water masses between the NW-Pacific and the N-Atlantic resulted in a new hypothesis, the "Atlantic-Pacific seesaw" (Kiefer et al. 2001, Kim et al. 2004, Kiefer and Kienast, 2005). This Atlantic-Pacific pattern of opposite temperature variations dominates the last 60ka on millennial timescales. Modelling results of Saenko et al. (2004) support the hypothesis of the "Atlantic-Pacific seesaw" and they postulate a mechanistic connection between the two regions driven by salinity variations, which couples both regions through the thermohaline circulation. A different model relates the Holocene Atlantic-Pacific dipole to the atmospheric tele-connection between the Arctic Oscillation/N-Atlantic Oscillation and the Pacific N-American Oscillation (Kim et al. 2004).

http://kalmar.ifm-geomar.de