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SHIP-BASED ATMOSPHERIC AND SEA-STATE MEASUREMENTS TO SUPPORT THE PACIFIC ARCTIC GROUP (PAG) CLIMATE OBSERVING SYSTEM

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The Pacific Arctic is considered to be a “hot spot” in the Arctic Ocean with significant heat fluxes through the Bering Straits that are dramatically changing the regional sea-ice distribution, ocean heat transports and the structure and function of local ecosystems. The Pacific Arctic Group (PAG) was organized under the International Arctic Science Committee (IASC) to promote, plan and coordinate measurement programs and surveys in the Pacific Arctic region. The Pacific Arctic Group has 10 principal science themes; theme 2 “Understanding oceanic and atmospheric processes in the pacific Arctic including the feedback loops, are critical to mid-latitude climate variability” is currently the only theme that mentions the atmosphere. Due to recent studies, for instance by Choi et al. 2014[i] that show how cloud and atmospheric radiation may be controlling sea-ice extent, the PAG is now developing observing strategies to include an optimum set of atmosphere measurements that can be deployed to support the science objectives of a proposed set of coordinated cruises and mooring arrays[ii].

The atmospheric sensors under discussion will be designed to measure radiation, atmosphere-ocean energy exchanges and balances, cloud and aerosol properties, relevant greenhouse gases, standard meteorological measurements and the closely related (by wind) sea-surface state (waves). The instruments under consideration include broad-band and spectral radiometers, cloud lidars and ceilometers, aerosol filter samplers, radars, sounding systems, and weather stations. The many processes that could potentially be observed are partially illustrated in Figure 1 and would include cloud microphysical processes, cloud-aerosol interactions, turbulent and radiative exchanges between the atmosphere and the sea-surface, biogenic emissions, and large and mesoscale atmospheric advection.

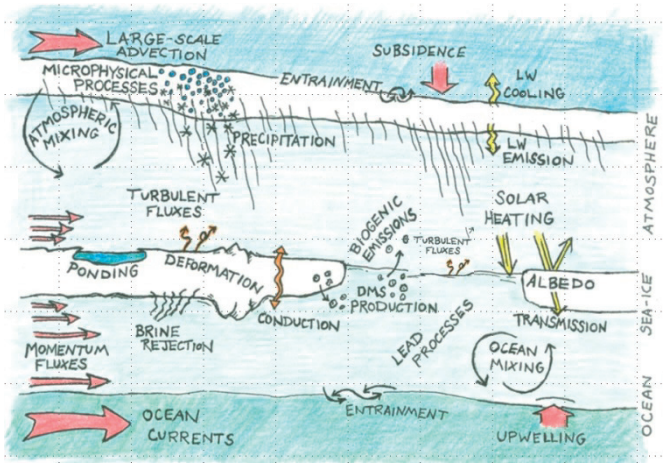

Figure from Matt Shupe

[i] Choi, Y.-S, B.-M Kim, S.-K. Hur, S.-J Kim, J.-H Kim, and C.-H Ho (2014), Connecting early summer cloud-controlled sunlight and late summer sea ice in the Arctic, J. Geophys. Res. Atmos., 119, 11,087-11,099,

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[ii] Cho, K.-H, K. Crane, J. He, S.-H Kang, J.-H Kim, H. Melling, A. Ostrovskiy, R. Pickard, G. Pantelevv, I. Polyakov, K. Shimada, T. Uttal, J. Wang, W. Williams, H. Yamaguchi, J.P. Zhao (2015), 0084 ISAO B2, Arctic Science Summit Week, Toyama, Japan.