

## **ADVANCING COORDINATION OF INTERNATIONAL STUDIES OF ARCTIC POLYNYAS AND THEIR POTENTIAL ROLES IN SHELF-BASIN EXCHANGES**

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Arctic polynyas have long been recognized for their potential roles in the exchange of heat and gases with the atmosphere, in brine formation and resulting effects on the flow of water and dissolved materials, and in their support of critical and often remarkably rich ecosystems. Yet when the International Arctic Polynya Program (IAPP) was first developed under the auspices of the Arctic Ocean Sciences Board (in 1988), polynyas were considered high on the list of poorly studied and poorly understood Arctic phenomena. Now, as the IAPP enters its twelfth year, polynyas have moved off this list, with two of the largest ones ranking among the best studied Arctic systems, especially from an interdisciplinary perspective. The well-defined physical and temporal boundaries of these open-water systems, relative to flaw leads and receding ice edges of the marginal seas, provide unique opportunities to address all disciplinary flavors of Arctic research questions in a coherent and focused manner. This research dream has been realized operationally through two major and highly coordinated international projects -- the German-led Northeast Water (NEW) Polynya Project, using German and US icebreakers during three field seasons (1991-1993), and the Canadian-led North Water (NOW) Polynya Project (1997-1999), using Canadian ships financed jointly in the last year by Canada, US and Japan. Both projects also encompassed coastal ice camps, organized by Polish and Danish contingents, for the parallel study of related land-sea exchanges. Extensive data bases from these regions now exist for disciplinary, interdisciplinary and modeling pursuits. Largely discipline-specific works have appeared first and quickly in the literature, including dedicated special issues, followed by initial efforts to synthesize information across disciplinary boundaries. The latter have resulted in new ways of thinking about arctic carbon sinks and CO<sub>2</sub> exchange with the atmosphere and how wintertime hydrological conditions can re-set a region for significant biological activity during the lighted seasons. Much more remains to be learned from the results of these focused studies; indeed, the NOW project is still underway.

A central element of the NEW and NOW polynya projects, as well as other polynya projects on a smaller scale, has been the question of off-shelf export -- of heat, water, dissolved elements (gases, nutrients, organics), and particulate materials, including life forms (dispersing larvae and feeding adults). In almost all cases, off-shelf export has meant to lower latitudes: e.g., off-shelf into the Greenland Sea (NEW) or off-shelf into Baffin Bay (NOW). The Cape Bathurst (CAB) Polynya, which occurs on the Mackenzie Shelf in Canadian waters as a segment of the circum-Arctic flaw-lead polynya system, represents the only North American polynya that could conceivably influence the Arctic Basin in ways possibly analogous to Russian shelf polynyas. Its proximity to the Mackenzie River outflow (and the attendant research questions linking riverine and polynya processes) and its position on the Canadian flank of the NSF Shelf-Basin-Interactions (SBI) study area (focusing attention on issues of off-shelf export) led the IAPP in January 2000 to call for coordinated international studies of the CAB polynya in the immediate future. Canadian scientists have already generated an extensive international network of

researchers interested in the CAB polynya, as described by Louis Fortier in his presentation at this workshop. Given my recent inheritance from Louis Legendre of the chair of the IAPP Science Coordinating Group, I seek at this workshop an exchange of information, ideas and mechanisms for promoting coordinated international study of the CAB polynya.