The perennial pack ice in the southern Beaufort Sea was not as it appeared in the summer of 2009.

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In situ observations of the atmosphere-sea ice-ocean system in the southeastern Beaufort Sea were made from the Canadian Research Icebreaker (NGCC) *Amundsen* deployed for the ArcticNet/IPY–GeoTraces project between 27 August and 12 September 2009. The cruise track is shown in Figure 1. Canadian Ice Service (CIS) digital ice charts were employed for real-time planning of station locations and sailing routes during the cruise. In situ observations from CCGS *Amundsen* indicate that the MY sea ice pack in the southern Beaufort Sea was not as ubiquitous as it appeared within satellite remote sensing data products (Figure 1) in early September 2009. A large sector of what was remotely sensed to be MY sea

ice at 7 to 9+tenths ice cover, consisting primarily of MY ice floes, was in fact a surface of heavily decayed ice composed of some small MY floes (1 tenth) interspersed in a cover dominated by heavily decayed FY floes (1 tenths) and overlain by new sea ice in areas of negative freeboard and in open water between floes. In some areas (e.g., stations L1 and MYI: Figure 1) the ocean surface was dominated in some areas by MY sea ice that was much thicker than the heavily decayed FY sea ice previously discussed.

In situ measurements of active microwave scattering (to a C-band polarimetric scatterometer) and to passive microwave radiometers (37 and 89 GHz) showed that the rotten ice and the late season multiyear sea ice had overlapping signatures. This case of mistaken identity is physically explained by the factors which contribute to the return to Radarsat-1 from the two surfaces; both ice regimes had similar temperature and salinity profiles in the near-surface volume, both ice types existed with a similar amount of open water between and within the floes, and finally both ice regimes were overlain by similar, recently formed new sea ice in areas of negative freeboard and in open water areas. The fact that these two very different ice regimes could not be differentiated using Radarsat-1 data, *in situ* C-band scatterometer or microwave radiometer measurements, has significant implications for climate studies and for marine vessel navigation in the Canada Basin. The results also suggest that operational agencies (such as the CIS) should consider making ice decay a variable in their ice charts. Our results are also consistent with ice age estimates (Fowler and Maslanik, http://nsidc.org/news/press/20091005_minimumpr.html) that show the amount of multiyear sea ice in the northern hemisphere was the lowest on record in 2009 suggesting that multiyear sea ice continues to diminish rapidly in the Southern Beaufort Sea. This work is presented in more detail in Barber et al. 2009.

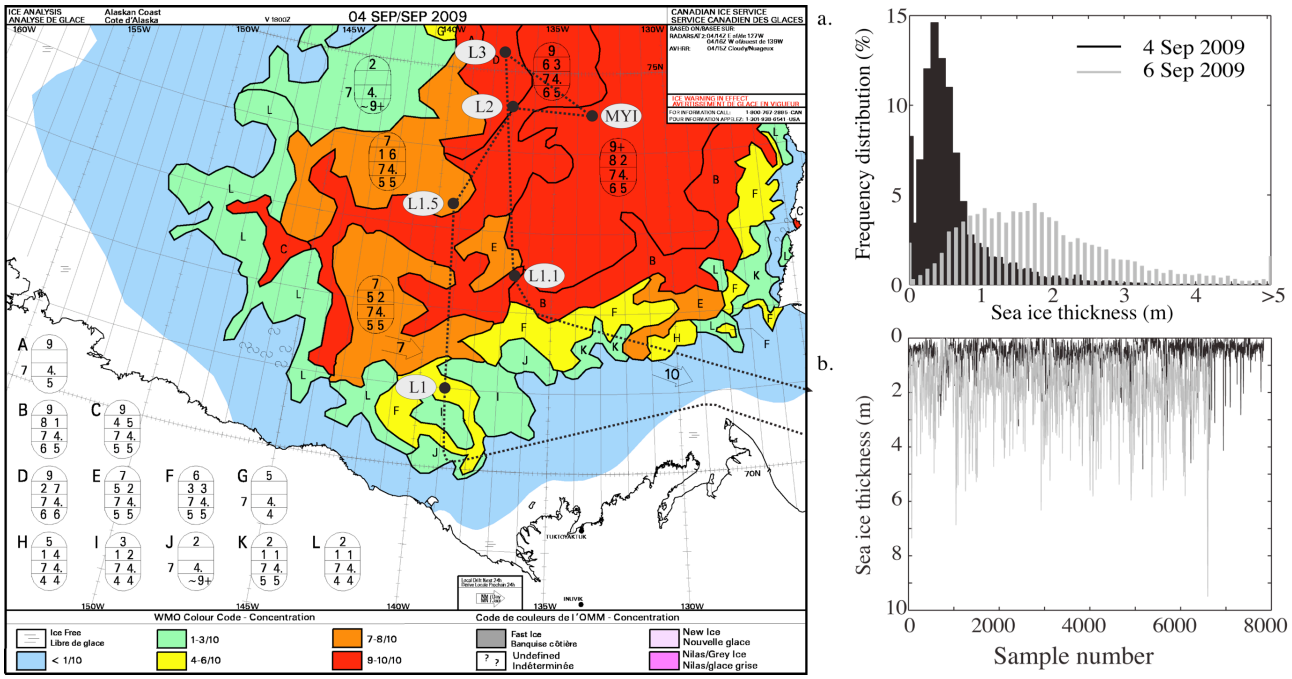

Figure 1. Canadian Ice service (CIS) icechart for Sept 4, 2009. Amundsen transect went from L1 to L1.5 then to L2. This entire transect was in rotten ice (very thin first-year and heavily decayed MY ice forms; see text). We then headed eastwards to MYI (to seek out Multiyear sea ice). At the MYI station we found what was the more expected; thick MY forms of sea ice. EM induction estimates of ice thickness for station MYI (grey) and the rotten ice at L2 (black) are depicted in a histogram (a) and a linear profile of thickness (b).

Citation:

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