International Arctic Buoy Program data and the diagnosis of strong surface winds over the Arctic Ocean

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The IABP has been deploying buoys in the Arctic since 1979, and these provide an immensely valuable resource in a region virtually devoid of conventional surface observations. We are exploring the use of 6-hourly buoy SLP data to investigate the occurrence of strong wind events in the basin. A goal is to compare the organization of extreme storminess so-derived with that obtained from regional or global reanalyses (e.g., Simmonds et al. 2008).

Figure 1(a) shows the time mean SLP recorded by a set of buoys during the month of August 2002 (the mean for each buoy is plotted at the centre of gravity of its locations during the month). Panel (b) of the Figure shows the corresponding monthly mean MSLP analysis from the ERA-40 (Uppala et al. 2005). Clearly there is strong consistency between the two presentations.

Assuming geostrophy, the surface wind vector can be deduced from a trio of buoys. This is achieved by fitting a (unique) plane through the three observations and the geostrophic velocity vector determined from the directional slope of the plane (using the techniques of, e.g., Wang et al. 2009). We are investigating performing the appropriate quality controls and choosing a number of appropriate buoy triangles from which to estimate the wind velocity, thought to be applicable at the centroid of each triangle. We exemplify this method by application to the monthly mean pressures presented above. Figure 2 presents the mean velocity vectors derived from this approach.

References

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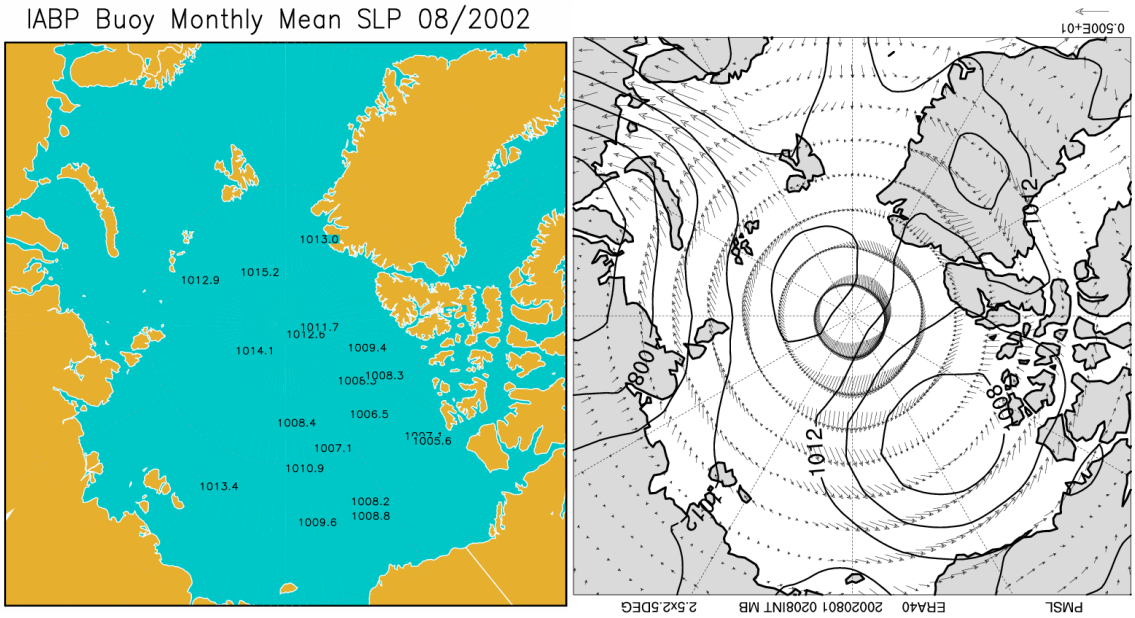

Figure 1: (a, left) Mean SLP recorded by a set of buoys during the month of August 2002 (the mean for each buoy is plotted at the centre of gravity of its locations during the month) and (b, right) the corresponding monthly mean MSLP analysis from the ERA-40.

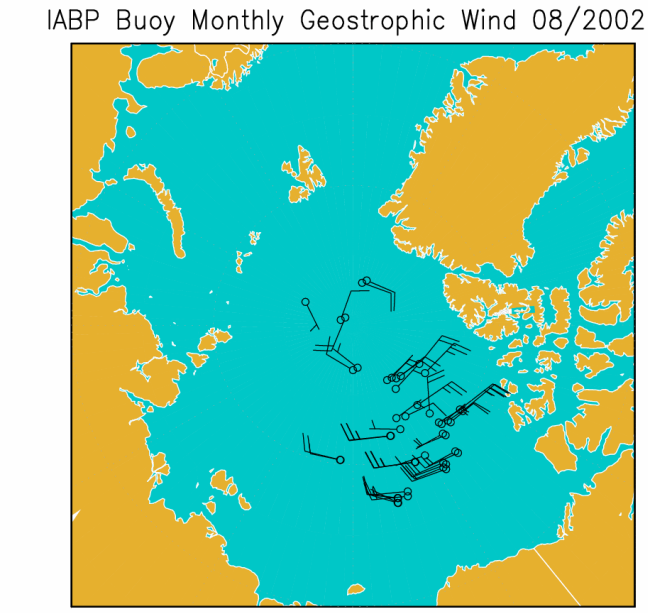

Figure 2: Geostrophic surface wind vectors deduced from a subsample of 'quality controlled' trio of buoys for the mean SLP during August 2002.