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Methods to homogenize wind speeds from ships and buoys

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Long-term homogeneous datasets of marine surface winds are required for climate analysis. However significant temporal changes, in the size and type of observing platform and in the method, have introduced inhomogeneities to databases of archived marine winds. We describe some of the sources of bias in wind reports of recent decades, and apply and assess methods to homogenize these data sets.

This study uses wind reports from buoys moored in Canadian waters and reports of visually estimated and measured wind speeds from nearby ships, from 1980 to 1995. We show that adjusting measured wind speeds to a standard reference level, and using Lindau's improved Beaufort equivalent scale for estimated winds, significantly improves the agreement between ship and buoy. We test several regression methods to remove the remaining difference. An orthogonal regression method produces a relationship that is most effective for converting one dataset to have the same statistical characteristics as the other. We show the effect of the time of day on estimated wind speeds.