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Reconstructing Arctic sea-ice variability from crowdsourced logbook records

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In September last year, Arctic sea-ice cover reached a record low, an unprecedented event in the 30-year satellite record. To really appreciate the significance of this event we need a longer record, to find more and better information about how the sea-ice varied before the satellite record starts. This means recovering the records of mariners who sailed to the Arctic.

The ship logs residing in the US National Archives represent one of the largest and most underutilized collections of meteorological and marine environmental data in existence – a virtual treasure trove of information. These logs contain both detailed weather observations - air and sea temperatures, air pressure, wind and clouds; and qualitative descriptions of sea-ice - comments like 'working through slack ice and broad leads' or 'forcing a lead through heavy pack ice'. There are also scattered measurements of sea-ice thickness. We have been working to mine these records – photographing pages from U.S. Navy and Coast Guard ship logs from Arctic voyages dating back as far as 1850, reading the millions of handwritten entries, and transcribing the weather and ice records. This is a huge task, made possible only by the enthusiastic participation of thousands of volunteer researchers through the oldWeather.org website.

The resulting dataset of historical ice observations allows comparison of sea-ice coverage in marginal ice-zones between the nineteenth century and the satellite era. In a few cases the logbooks also provide information on ice movements (through the movements of ships trapped in the ice for long periods), which can be compared with modern records from drifting buoys that have been continually deployed in the Arctic since 1979.