A first look at comparing ice thickness from ice charts and submarine data in a GIS

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Polar orbiting satellites collect important data related to sea ice. While sea ice extent and sea ice concentration data sets are produced and accessible, satellites do not capture pertinent information about ice thickness. This is partially due to the complexity of measuring sea ice thickness from space. The National Ice Center (NIC) produces Northern Hemisphere weekly ice charts from 1972 to June 2001 and bi-weekly charts from June 2001 to present. Because the NIC charts assimilate data from a blend of input sources, including satellite imagery, ship observations, aerial observations, output from models and more, they may contain underutilized information about sea ice thickness. The NIC charts use "stage of development" values to identify ice type and each ice type corresponds to an ice thickness range. For example, a "stage of development" code of 83 specifies "young ice" with an ice thickness range from 10 to 30 cm. The submarine data in this study are available from the National Snow and Ice Data Center (NSIDC). Submarines traveling below the ice surface record ice draft measurements from the underside of the sea ice to the water surface. The ice drafts can be converted to ice thickness estimates using a conversion factor based on assumed ice density and snow load. The submarine data used in this study are from the Scientific Ice Expeditions (SCICEX) program, which collected data from U.S. Navy submarines for scientific purposes. In this study, data from both sources are converted to ice thickness. A comparison is performed by analyzing Northern Hemisphere data that overlap in space and time from 1996-1999 in ArcGIS.