



Surficial geology mapping of the Arctic Ocean: a layer for IBCAO

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Barriers to data collection such as perennial ice cover, climate, and remoteness have contributed to a paucity of geologic data in the Arctic. The last decade, however, has seen a multi-national push to increase the quantity and extent of data available at high latitudes, particularly as a result of Extended Continental Shelf mapping efforts by numerous coastal States and Arctic nations. With increased availability of geophysical and geological data holdings, we expand on previous mapping initiatives by creating a comprehensive surficial geology map as a layer to the International Bathymetric Chart of the Arctic Ocean (IBCAO), providing a way to collectively analyze physiography, morphology and geology. Acoustic facies derived from subbottom profiles, combined with morphology illuminated from IBCAO and multibeam bathymetric datasets, and ground truth data compiled from cores and samples are used to map surficial geology units. We identified over 25 seismo-acoustic facies leading to interpretation of 12 distinct geologic units for the Arctic Ocean. The largest variety of seismic facies occurs on the shelves, which demonstrate the complex ice-margin history (e.g. chaotic bottom echoes with amorphous subbottom reflections that imply ice scouring processes). Shelf-crossing troughs generally lead to trough mouth fans on the continental margin with characteristic glacial debris flow deposits (acoustically transparent units) comprising the bulk of the sedimentary succession. Other areas of continental slopes show a variety of facies suggesting sediment mass failure and turbidite deposition. Vast areas of the deep water portion of the Arctic are dominated by parallel reflections, indicative of hemi-pelagic and turbidity current deposition. Some deep water parts of the basin, however, show evidence of current reworking (sigmoidal reflections within bedforms), and contain deep sea channels with thalwegs (bright reflections within channels) and levee deposits (reflection pinch-out). These results delineated in the surficial geology map provide a comprehensive database of regional geologic information of the Arctic Ocean that can be applied to a variety of disciplines, including the study of Arctic sedimentary processes, climatologic and oceanographic processes, environmental and geohazard risk assessment, resource management, and Extended Continental Shelf mapping.