

Tracer Studies of circulation, freshwater distribution, and air/sea gas exchange in the Arctic Ocean

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Over the past decades the Arctic has undergone significant and rapid changes. These changes occur in all domains of the Arctic system including the Arctic Ocean. Tracer data (tritium, ^3He , Ne, radiocarbon, stable isotopes of water, and SF_6) from a series of expeditions to the Arctic Ocean between 1987 and 2015 are used to explore the basic dynamics of the Arctic Ocean and how the overall system changes have influenced some of the key elements of the Arctic circulation and water mass structure. $^3\text{H}/^3\text{He}$ data provide information concerning the stability of the circulation of the upper water column (Atlantic Water Layer and Halocline) over this period of significant change in the Arctic system. A combination of stable isotopes, salinity and nutrient data yield information about the contribution of meteoric water, Pacific Water and sea ice meltwater to the freshwater lens covering the uppermost layer of the Arctic Ocean. A combination of ^{14}C and SF_6 allows us to shed light on the renewal of the bottom waters of the Arctic Ocean. Finally, He and Ne data hold information about the exchange of gases through the sea ice cover of the Arctic Ocean.