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Title: *Double-diffusive processes in the Arctic Ocean - are they of importance?*

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The existence of steps structures in the thermocline above the Atlantic layer and the presence of temperature and salinity inversions in the Atlantic and intermediate waters are among the most conspicuous features of the Arctic Ocean water column. Both the steps and the inversions have extensive ranges and appear almost continuous over entire basins. Their presence and persistence indicate that the turbulent activity in the interior Arctic Ocean is weak and more esoteric processes and effects such as double-diffusive convection, cabbeling, and differential mixing may be important for the transfer and mixing of properties in the water column. The temperature steps have been suggested important in transporting heat from the Atlantic layer by diffusive fluxes through the interfaces and influencing the sea surface heat balance and the ice cover. The inversions have been related to double-diffusively driven interleaving and could be important in redistributing heat from the boundary current at the continental slope to the interior of the deep basins. Most of these conjectures are based on existing laboratory flux laws and on theoretical and modelling work. Here the observational features required for applying the laboratory flux laws to the temperature steps will be examined and the changes in characteristics of the temperature steps observed between the different basins will be discussed. Interleaving structures are found in all background stratifications; diffusively unstable, saltfinger unstable, and stable-stable, which rules out the possibility of applying linear instability analysis to describe all observed intrusions and interleaving. The interleaving is here assumed created by interaction between water masses of different characteristics and a simple conceptual approach is adopted to described how the properties of the inversions vary with different initial background stratification in the interacting water masses. Once inversions are created, double-diffusive fluxes change the properties and densities of the layers and force the different waters to cross the front and penetrate into the opposite water mass. Since the transports across the diffusive and the saltfinger interfaces are different, too thin layers may cause one of the interfaces to overturn, while for thicker layers the interfaces remain stable, the interleaving appears more regular, and the more efficiently transporting interface attains stronger stability and higher stability ratio. The spreading of the intrusions and the front continues as long as lateral property gradients exist. When these disappear the interleaving structures cease to expand and the inversions become fossil, and advect with the mean flow.